TOWN OF CALEDON
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Initial Comprehensive Environmental Impact Study and Management Plan & Scoped Subwatershed Study

Tullamore Employment Lands

Caledon, Ontario

Submitted to:
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1. Introduction

GEI Consultants Ltd. (GEI) has been contracted by Tullamore Industrial LP to complete a Comprehensive Environmental Impact Study and Management Plan (CEISMP) and Scoped Subwatershed Study (SWS) (herein referred to as CEISMP) for the properties located north of Mayfield Road, west of Airport Road and east of Torbram Road, bounded generally in the north by greenfield south of Old School Road (herein referred to as the Subject Lands) (**Figure 1, Appendix A**). This submission represents version one of the Initial CEISMP. The final version of CEISMP will be submitted at a later date determined in consultation with Tullamore Industrial LP.

1.1 Study Area and Subject Lands

The Study Area for this Comprehensive Environmental Impact Study and Management Plan (CEISMP) and Scoped Subwatershed Study (SWS) includes the Subject Lands and additional nearby properties within the Subwatershed, detailed further below.

The Subject Lands are located in the Town of Caledon and the Regional Municipality of Peel, Ontario. They encompass properties owned by Tullamore Industrial LP, which include zones proposed for development and ecological management. Spanning approximately 202 ha, the Subject Lands are mainly comprised of actively managed agricultural fields. Two tributaries of the West Humber River flow through the southern part of the site, while Salt Creek runs southward in the northeast corner of the Subject Lands (**Figure 2, Appendix A**). Additionally, the tributary closest to the west side of the property, near Torbram Road (West Tributary of the West Humber River), falls within the Greenbelt Planning Area. This tributary is designated as part of the Natural Heritage System (NHS) under the Greenbelt Plan (2017a).

The Study Area, encompassing the Subject Lands, also extends to cover relevant nearby properties that are outside of the development or management area. This includes sections of both Torbram Road and Airport Road adjacent to the Subject Lands. It also includes the drainage flow area to and through these road segments. Further, properties located at 12429 Torbram Road, 12419 Torbram Road, 12409 Torbram Road, 12399 Torbram Road, 12381 Torbram Road, 12361 Torbram Road are included as they drain to the Subject Lands. Lastly, properties located at 12484 Airport Road, 0 Airport Road (legal description CON 6 EHS PT LOT 20, REG), 12404 Airport Road, 12394 Airport Road, 12374 Airport Road and 12366 Airport Road are included in the study as they are located within the subwatershed.

The Study Area and Subject Lands are not included as part of the existing Tullamore Settlement Area Boundary as outlined in the Town of Caledon Official Plan, Schedule N (April 2018). Peel Region (henceforth referred to as the Region) is currently undergoing a Settlement Area Boundary Expansion (SABE) which includes the Subject Lands. As such, the components of a Scoped Subwatershed Study have been incorporated into this CEISMP per the Town of Caledon.

The proposed Draft Plan of the development (Weston Consulting, 2023) conforms with the boundary expansion map, which identifies the Subject Lands as future employment area.

1.2 Purpose & Objectives

A CEISMP is required to assess the potential impacts of the proposed development on natural heritage features and their associated functions. This work considers applicable policies of the Province of Ontario’s Provincial Policy Statement (PPS; MMAH 2020) and associated provincial implementation guidance contained in the Natural Heritage Reference Manual (NHRM; MNRF 2010) as well as the Town and Region Official Plans, and the Toronto and Region Conservation Authority’s (TRCA) regulation and policies.

This CEISMP considers and includes the following information:

- Description of the development proposal;
- Description of the surrounding environment;
- Identification and assessment of the potential impacts of the proposal on the environment and the significant features and functions of the Core Areas (includes watercourses found on the Subject Lands and features located on adjacent lands; **Figure 2**, **Appendix A**);
- Identification of positive effects of the proposal such as enhancement and/or restoration of significant features;
- Evaluation of the feasibility of alternative mitigation measures or techniques and the ability of such measures to prevent or minimize impacts;
- Outlines recommendations on the advisability of proceeding with the proposal, appropriate mitigation measures, changes to the proposal; and,
- Recommends a monitoring plan and contingency plans should the proposal result in any unexpected impacts, if necessary.

A Scoped Subwatershed Study is required due to the Subject Lands being located outside the Urban Boundary. The purpose of Local Subwatershed Studies has been to assist in developing a sustainable development plan for the subject growth area in Caledon by ensuring protection and benefits to the natural and human environments through the further implementation of the direction, targets, criteria and guidance of the Settlement Area Boundary Expansion Scoped Subwatershed Study (Wood et. al., December 2021). The Local Subwatershed Studies are intended to incorporate a natural heritage systems management approach that will protect, rehabilitate, and enhance the environment within the Secondary Plan Area, and the surrounding lands in the subwatershed. The broader watershed/subwatersheds may have existing downstream constraints beyond the identified Secondary Plan study area and, to the appropriate extent, these will have to be considered in establishing the management strategies based on the overall study objectives and ultimate targets. Where there is an established watershed wide quantity strategy, the established strategy is to be considered a minimum requirement.

The Local Subwatershed Study should:

- Identify the location, extent, present status, significance, and sensitivity of the existing natural environment;
- Identify environmentally sensitive areas and natural hazards, including constraints and opportunities;
- Identify an environmental resource system(s) to protect, rehabilitate, and enhance the ecological function of the system within the Secondary Plan Area and local environs;
- Identify lands where development may be considered, and determine how existing and future land uses can be developed compatibly with natural features;
- Undertake a two-stage, iterative Impact Assessment based on an initial Preliminary Preferred Land Use Plan (This inherently will require establishing an initial land use concept which will need to be tested and assessed, followed by a second refined land use concept developed through the feedback from the initial testing, including input from other technical studies and feedback from stakeholders);
- Provide direction on best management practices (BMPs) to manage impacts from the Secondary Plan (from an environmental and water management perspective), and, where there are established BMPs for infrastructure, these established BMPs are considered a minimum requirement;
- Provide direction on future infrastructure needs (i.e., planning and implementing servicing and transportation infrastructure from an environmental and water management perspective);
- Establish an implementation and management strategy and requirements for environmental systems monitoring;
- Support the Class Environmental Assessment process undertaken as part of the infrastructure planning for the Secondary Plan, specific to natural and water-based systems.

1.2.1 Review and Advancement of Scoped Subwatershed Study Goals, Objectives, Criteria and Targets

Confirmation and refinement of goals, objectives, criteria and targets are developed as part of the Scoped Subwatershed Study process. The objective of the Scoped Subwatershed Study is to maintain, restore and enhance the health of the West Humber River Subwatershed. Throughout this Scoped Subwatershed Process, a set of objectives have been developed based upon the findings of the characterization and insights through impact assessment. A series of targets have been established which represent functional criteria requirements to mitigate impacts. The following table below outlines the preliminary goals, objectives and associated criteria and targets.

Goal	Objective/Target	Management Strategies/Actions
To prevent, eliminate or minimize the risks to life and property caused by flooding and erosion hazards and not create new or aggravate existing hazards.	• To ensure development does not increase the frequency and intensity of flooding, the rate of natural stream erosion. • To ensure development including infrastructure incorporates appropriate mitigation measures in order to avoid adverse impacts to natural features and areas as it relates to natural hazards. • To consider climate change adaptation measures as part of the development of flooding and erosion management strategies.	• Develop floodline mapping, meander belt widths and top of slope to help define hazard limits. • Develop a stormwater management plan to mitigate potential adverse impacts determined by the impact assessment including: erosion through detention of 25mm event and 48 hour release time; quantity through controlling 100-year storm events with TRCA unit flow rates and regional events to the pre-development regional flow rate; and quality through achieving 80% TSS removal per MECP requirements. • Develop a stormwater management plan which incorporates measures to address increased risk of flooding and flood-related impacts and allows for adaptive management.
To protect, restore, or where appropriate, enhance the biodiversity, connectivity and ecological functions of the natural heritage features throughout the Subject Lands.	• To ensure that natural heritage features, and ecological and hydrologic functions are protected from potential adverse impacts of development. • To ensure that buffers, corridors and linkages between natural heritage features, habitat and water features are maintained, restored or where possible improved throughout the natural heritage system.	• Develop mapping that identifies key features and functions associated with core areas of the natural heritage system and evaluates constraints with the proposed draft plan. • Develop mapping that provides recommendations for areas within the existing natural heritage system including buffers, linkages and restoration areas. • Integrate the stormwater management and watercourse management plan with the natural heritage system.

Goal	Objective/Target	Management Strategies/Actions
To protect, improve or restore the quality of water resources within, adjacent to and downstream of the Study Area, including ecological and hydrological functions.	• To ensure fluvial processes and stream morphology are maintained or improved to support important habitat attributes, dynamic channel form and diversity which will contribute to maintaining a sustainable natural heritage system. • To ensure surface and groundwater features and their hydrologic functions are protected, improved or restored through ensuring a site water balance of 5 mm across the site and through water quantity management for both the 100 year storm event using controlled unit flow rates from the TRCA and regional events by using pre-development regional flow rates • To maintain or enhance linkages and related hydrologic functions and natural heritage features. • To consider climate change mitigation and adaption measures as part of establishing management strategies.	• Provide erosion control through detaining 25mm events and releasing over 48 hours. • Meet or exceed stormwater quality requirements for development in accordance with the provincial standards. • Develop stormwater management plan which incorporates measures to address risk and/or allows for adaptive management.
To mitigate negative impacts related to the quality and quantity of stormwater within, adjacent to, and downstream of the Subject Lands.	• To maintain/enhance baseflow to the watercourses. • To maintain/enhance the quality and quantity of recharge to significant hydrologic features. • To ensure that post to pre-development peak flow control (as a minimum)	• Maintain pre-development water budget. • Develop stormwater management plan which incorporates LID BMPs into development and manages water quality. • Following TRCA prescribed unit rates for the West Humber for the 2 to 100 year events .

Goal	Objective/Target	Management Strategies/Actions
	achieves flood control for all storm events (2 year to 100 year). - To ensure the treatment of runoff mitigates surface water quality impacts due to development in accordance with Ministry standards. - To mitigate thermal impacts from stormwater runoff to maintain or restore existing thermal regimes. - To incorporate Low Impact Development (LID), Green Infrastructure and Best Management Practices (BMPs) to treat stormwater at its source. - To consider climate change mitigation and adaption measures as part of establishing stormwater management strategies.	- Provide erosion controls to reduce flow exceedance at key locations along water features. - Meet or exceed stormwater quality control for development according to Ministry guidelines. - Incorporate stormwater management plan measures and practices which mitigate thermal enrichment from urban development. - Develop a stormwater management plan which incorporates LID BMPs into development. - Develop stormwater management plan which incorporates measures to address increased risk and/or allows for adaptive management.

1.3 Guiding Principles of the CEISMP

According to Region of Peel Official Plan (2022 Consolidation) section 5.6.20.14.17 f) the CEISMP should be in accordance with the Terms of Reference prepared to the satisfaction with the Town and Region in consultation with the TRCA.

Recommended Terms of Reference for detailed local subwatersheds are provided in **Appendix F** of the Region of Peel's Scoped Watershed Study Part B Report. The Subwatershed Studies should be conducted in the following three phases:

Phase 1: Characterization and Integration

- Background and field data (i.e., hydrology/hydraulics, groundwater, water quality, stream morphology, aquatic and terrestrial ecology) are to be accessed to establish the form, function and linkages of environmental resources and to identify environmental constraints and opportunities.

Phase 2: Subwatershed Assessment

- Identifies the stressors (past, present, future) and describes and predicts impacts, and assesses these impacts against the preliminary goals, objectives and targets.

Phase 3: Management Strategies

- Uses the findings from Phase 2 to finalize the evaluation of various land use scenarios and recommend a preferred management strategy.

The Region's Scoped Subwatershed Study, Part C Report provides guidance on the completion of detailed studies and a list of key findings and recommendations addressing water management and natural heritage system planning. Local Subwatershed Studies should include multi-year field work supporting detailed technical analyses including hydrology, hydraulics, hydrogeology, geotechnical investigations, fluvial geomorphology, aquatic and terrestrial surveys. The studies should also describe compliance requirements for fisheries and endangered and threatened species compensation if needed.

Through discussions with the approving agencies on file, it was determined that the CEISMP for the Subject Lands would be prepared in two submissions: an Initial CEISMP, followed by a Final CEISMP.

The Initial CEISMP should:

- Be detailed enough to inform and reflect the preferred Secondary Plan. It should also address all comments at the Secondary Plan-level (OPA).
- Detail all environmental constraint mapping and recommendations. This includes identifying features, buffers, setback limits, permitted and non-permitted uses within the subject area, and the conceptual locations of the natural heritage system and stormwater management locations.
- Be completed prior to OPA approval.

The Final CEISMP should:

- Build on the Initial CEISMP and provide sufficient detail to support Draft Plan Approval.
- Be updated to support any site plan approval unless it can be demonstrated that the proposed draft site plan conforms to the approved Final CEISMP.
- Address all comments to the satisfaction of the Town, Region, and TRCA before Draft Plan Approval.

2. Planning Context

An assessment of the quality and extent of natural heritage features found on, and adjacent to, the Subject Lands and the potential impacts to these features from the proposed development was undertaken to comply with requirements of the following regulatory agencies, local and regional municipalities and/or legislation:

- Town of Caledon Official Plan (2018 Consolidation);
- Region of Peel Official Plan (2022);
- O. Reg. 483/22, Zoning Order, September 9, 2022;
- Greenbelt Plan (2017a);
- PPS (2020);
- TRCA policies;
- *Migratory Birds Convention Act* (1994);
- *Endangered Species Act* (ESA; 2019 Consolidation of S.O. 2007, c. 6); and
- *Fisheries Act* (R.S.C., 1985, c. F-14).

2.1 Town of Caledon Official Plan

Development of the Subject Lands are subject to the policies and designations defined within the Town of Caledon Official Plan (OP) (2018). The Subject Lands are located in Tullamore, as shown in Schedule A (Land Use Plan) and are designated to contain both a General Agriculture Area and Environmental Policy Area (EPA) surrounding Salt Creek and the East and West Tributaries of the West Humber River. In addition, on Schedule S (The Greenbelt in Caledon) the West Tributary of the West Humber River located on the Subject Lands is also designated as a Greenbelt Plan NHS.

The Town of Caledon Ecosystem Planning Strategy outlines the policy approach to implementing the Town's ecosystem goals and objectives. The Ecosystem Framework organizes ecosystem components into four categories:

- Natural Core Areas;
- Natural Corridors;
- Supportive Natural Systems; and
- Natural Linkages

It should be noted that this Ecosystem Framework incorporates and refines the components of the Regional Greenlands System as outlined in the Region of Peel Official Plan (2022 Consolidation).

As discussed within Section 5.7 of the Town of Caledon OP, EPAs are all Natural Core Areas and Natural Corridors, including:

- All Woodland Core Areas;

- All Wetland Core Areas;
- All Niagara Escarpment Natural Areas;
- Oak Ridges Moraine Key Natural Heritage Features (as defined by the Oak Ridges Moraine Conservation Plan (ORMCP));
- Oak Ridges Moraine Hydrologically Sensitive Features (as defined by the ORMCP);
- Greenbelt Key Natural Heritage Features (as defined by the Greenbelt Plan);
- Greenbelt Key Hydrologic Features (as defined by the Greenbelt Plan);
- All Environmentally Significant Areas;
- All Life Science Areas of Natural and Scientific Interest (ANSIs);
- All Significant Habitats of Threatened and Endangered Species;
- All Significant Wildlife Habitat (SWH);
- All Core Fishery Resource Areas; and
- All Valley and Stream Corridors.

Within the Greenbelt Plan Area, these EPAs are subject to policies in Section 7.13 of the Town of Caledon OP.

All proposed development within and adjacent to EPA shall require the completion of an Environmental Impact Study (EIS) and Management Plan (MP).

2.2 The Region of Peel Official Plan

The Region of Peel OP has certain policies and designations that can affect land-uses permitted within the Subject Land boundaries. Subject Lands are designated as within the Urban System and the 2051 New Urban Area, while the West Tributary of the West Humber River is identified as within the Rural System as shown on Schedule E-1 (Regional Structure).

Within the Subject Lands, Salt Creek as well as the West Tributary and the East Tributary of the West Humber River are identified as part of the Greenlands System per Schedule C-1 (Greenlands System). The Greenlands System consists of Core Areas, Natural Areas and Corridors (NAC), and Potential Natural Areas and Corridors (PNAC). The West Tributary and Salt Creek are designated as a Core Area of the Greenlands System on Schedule C-2 (Core Areas of the Greenlands System in Peel), which includes the same natural heritage feature types as the Town of Caledon OP EPAs (e.g., ANSIs, Environmentally Significant Areas, fish and wildlife habitat, wetlands, etc.) as stated in policy 2.1. The East Tributary and the area south of the West Tributary are identified as NAC on Regional Greenlands System - Core Areas, Natural Areas and Corridors and Potential Natural Areas and Corridors).

2.2.1 Summary of Applicable Region of Peel Policies

Several policies from the Region of Peel's Official Plan are applicable to the Study Area and have been reviewed to inform the CEISMP and SWS. Policies 2.14.7,2.14.8, 2.14.12, 2.14.14, 2.14.15, and 5.6.20.14.16.

Policy 2.14.7 outlines that development and site alteration within the Greenlands System are permitted in accordance with the policies of the Region of Peel OP subject to provincial legislation, policies and applicable provincial plans. In addition, development and site alteration will not be permitted within or on adjacent lands to natural heritage features and areas identified as Greenlands System Core Areas, NAC and PNAC unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. An EIS will be prepared with the following:

i) inventory components and refine the boundaries of the Greenlands System features and areas;
ii) establish limits of development and site alteration in relation to the Greenlands System's natural heritage features and areas requiring protection;
iii) assess the potential environmental impacts of the development and site alteration;
iv) make recommendations to avoid, minimize, and mitigate impacts including identifying enhancement areas and requirements for buffers and vegetation enhancement adjacent to features; and
v) identify requirements to restore or establish linkages between and among natural heritage features and areas, surface water features and ground water features, where ecologically appropriate.

Per policy 2.14.8, the diversity and connectivity of natural heritage features and areas within the Greenlands System's components shall be maintained, restored and improved.

Policy 2.14.12 defines the Core Areas of the Greenlands System are:

a) significant wetlands;
b) significant coastal wetlands;
c) woodlands meeting one or more of the criteria for Core Area woodland in Table 1 of the Region of Peel OP;
d) Environmentally Sensitive or Significant Areas;
e) Provincial Life Science Areas of Natural and Scientific Interest;
f) Escarpment Natural Areas of the Niagara Escarpment Plan; and
g) valley and stream corridors meeting one or more of the criteria for Core Area valley and stream corridors in Table 2 and as shown on Schedule C-2 of the Region of Peel OP

Natural Areas and Corridors (NAC) of the Greenlands System are:

a) evaluated non-provincially significant wetlands and coastal wetlands;
b) woodlands meeting one or more of the criteria for NAC woodland in Table 1
c) significant wildlife habitat;
d) fish habitat;
e) habitat of aquatic species at risk;
f) habitat of endangered and threatened species;
g) regionally significant life science Areas of Natural and Scientific Interest;
h) provincially significant earth science Areas of Natural and Scientific Interest;
i) Escarpment Protection Areas of the Niagara Escarpment Plan;
j) the Lake Ontario shoreline and littoral zone and other natural lakes and their shorelines;
k) any other valley and stream corridors that have not been defined as part of the Core Areas;
l) sensitive headwater areas and sensitive ground water discharge areas; and

m) any other natural features and functional areas interpreted as part of the Greenlands System Natural Areas and Corridors by the local municipalities, in consultation with the conservation authorities and the Ministry of Natural Resources and Forestry, including, as appropriate, elements of the Potential Natural Areas and Corridors.

According to policy 2.14.14, local municipalities must be in consultation with conservation authorities, appropriate federal and provincial agencies to include objectives and policies in their official plans for the interpretation, protection, enhancement, proper management and stewardship of Core Areas of the Greenlands System.

Policy 2.14.15 prohibits development and site alteration within the Core Areas of the Greenlands System in Peel, except for:

a) Forest, fish and wildlife management;
b) Conservation and flood or erosion control projects, but only if they have been demonstrated to be necessary in the public interest and after all reasonable alternatives have been considered;
c) Essential infrastructure exempted, pre-approved or authorized under an environmental assessment process;
d) Passive recreation;
e) Minor development and minor site alteration;
f) Existing uses, buildings or structures;
g) Expansions or alterations to existing buildings or structures;
h) Accessory uses, buildings or structures;
i) A new single residential dwelling on an existing lot of record.

Policy 5.6.20.14.16 requires the local municipal secondary plan areas be prioritized, advanced, sequenced and approved and on the basis of a staging and sequencing plan, to the satisfaction of the Region, and in accordance with planning-related criteria including but not limited to the following:

- F) Ensure the efficient provision of a Caledon-wide multimodal transportation system that includes sustainable transportation and services;
- G) Identification of community and neighbourhood centres that provide opportunities to locate population-related employment, institutional and residential uses in higher density, mixed-use formats served by transit;
- H) Identification of areas that can provide key community infrastructure including lands for public health, education, recreation, parks and open space, cultural and community facilities, public safety and affordable housing early in the planning approval process;
- I) Provide for the orderly transition from agriculture and agricultural activities and related uses continue for a long as practical; and
- J) Feasibility assessments of implementing alternative and renewable energy systems including district energy systems.

2.3 Zoning Order – O. Reg. 483/22

On September 9, 2022, a Zoning Order was issued for the Subject Lands under the Planning Act for the Zoning By-Law No. 2006-50 of the Town of Caledon.

The Zoning Order describes the uses approved and the zoning requirements for Prestige Industrial Zone and applies to the lands outside of the Greenbelt Plan Area.

2.4 Greenbelt Plan

The Greenbelt Plan works to permanently protect environmentally sensitive areas due to their ecological value within the Golden Horseshoe. It is intended to enhance the natural landscapes by working to facilitate the connection of environmentally significant areas and reduce fragmentation of the landscape. Protection is offered also to permanent agricultural areas ensuring the permanency and sustainability of natural resources. It builds upon the ecological protections provided by the Niagara Escarpment Plan and the ORMCP. As previously indicated, the West Tributary of the West Humber River is located within the Greenbelt Planning Area and is designated as part of the NHS under the Greenbelt Plan (2017a). The NHS includes core areas and linkage areas of the Protected Countryside with the highest concentration of the most sensitive and/or significant natural features and functions. These areas need to be managed as a connected and integrated NHS, given the functional inter-relationships between them and the fact that this system builds upon the natural systems contained in the Niagara Escarpment Plan and the ORMCP. The following policies shall apply for new development or site alteration within the NHS:

i. There will be no negative impacts on key natural heritage features or key hydrologic features or their functions;
ii. Connectivity along the system and between key natural heritage features and key hydrologic features located within 240 metres of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape;
iii. The removal of other natural features not identified as key natural heritage features and key hydrologic features should be avoided. Such features should be incorporated into the planning and design of the proposed use wherever possible;
iv. Except for uses described in and governed by the policies of sections 4.1.2 and 4.3.2,
    a. The disturbed area, including any buildings and structures, of the total developable area will not exceed 25 per cent (40 per cent for golf courses); and
    b. The impervious surface of the total developable area will not exceed 10 per cent; and
    c. At least 30 per cent of the total developable area will remain or be returned to natural self-sustaining vegetation, recognizing that section 4.3.2 establishes specific standards for the uses described there.

Other Components of the Greenbelt Plan include “Settlement Areas” and “Agricultural System” however, these are not applicable to these Subject Lands.

2.5 Provincial Policy Statement and Associated Guideline Documents

The PPS provides direction on matters of provincial interest related to land use planning and development. It, "…supports a comprehensive, integrated and long-term approach to planning…" The PPS is to be read in its entirety and land use planners and decision-makers need to consider all relevant policies and how they work together.

This report addresses those policies that are specific to Natural Heritage (section 2.1) with reference to other policies with relevance to Natural Heritage and impact assessment considerations and areas of overlap (e.g., those related to Efficient and Resilient Development and Land Use Patterns, section 1.1; Sewage, Water and Stormwater, section 1.6.6; Water, section 2.2; Natural Hazards, section 3.1).

Eight types of significant natural heritage features are defined in the PPS, as follows:

- Significant wetlands;
- Significant coastal wetlands;
- Significant woodlands;
- Significant valleylands;
- SWH;
- Fish habitat;
- Habitat of endangered and threatened species; and
- ANSIs.

Development and site alteration shall not be permitted in significant wetlands or significant coastal wetlands. Development and site alteration shall not be permitted in significant woodlands, significant valleylands, SWH or significant ANSIs, unless it is demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Development and site alteration shall not be permitted in the habitat of endangered and threatened species or in fish habitat, except in accordance with provincial and federal requirements. Development and site alteration may be permitted on lands adjacent to significant natural heritage features (i.e., within 120 m of the Subject Lands, as identified in the NHRM; MNRF 2010) provided it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

2.6 Toronto Region Conservation Authority

TRCA conducts reviews of planning processes associated with future development of properties within its jurisdictional boundaries. TRCA provides planning and technical advice to planning authorities to assist them in fulfilling their responsibilities regarding natural hazards, natural heritage, and other relevant policy areas pursuant to the Planning Act. In addition to their regulatory responsibilities, TRCA provides advice as both a watershed-based resource management agency and through planning advisory services.

TRCA administers the Development, Interference with Wetlands, Alterations to Shorelines and Watercourses Regulation, (O. Reg.) 166/06, which defines the areas of interest that allow TRCA to:

- Prohibit, regulate, or provide permission for straightening, changing, diverting, or interfering in any way with the existing channel of a river, creek, stream, watercourse or changing or interfering with a wetland; and
- Prohibit, regulate, or provide permission for development if the control of flooding, erosion, dynamic beaches, pollution, or the conservation of land may be affected by the development.

The Regulation Limit delineates hazardous lands, wetlands, shorelines, and areas susceptible to flooding and associated allowances. The Subject Lands include TRCA regulation limits, the flooding hazards surrounding the East and West Tributaries of the West Humber River, Salt Creek, and their meander belts where applicable (**Figure 2**).

Pursuant to the Development, Interference with Wetland and Alterations to Shorelines and Watercourse Regulation (TRCA; Ontario Regulation 166/06), any development in or on areas defined in the Regulation (e.g., river or stream valleys, hazardous land) requires permission from the Conservation Authority. The Conservation Authority may grant permission for development in or on these areas if, in its opinion, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected by the development. The Regulation also states that it is prohibited to straighten, change, divert or interfere in any way with the existing channel of a river, creek, stream, or watercourse or change or interfere in any way with a wetland without permission from the Conservation Authority.

The TRCA's The Living City Policies (2014) contains the principles, goals, objectives, and policies approved by the TRCA for their planning and development approvals process. This document outlines policies related to the determination of the Natural System and recommends buffer widths for natural heritage features such as woodlands, wetlands, and valley and stream corridors.

2.7 Endangered Species Act, 2007

The provincial Endangered Species Act, 2007 (Consolidation 2021) was developed to:

- Identify species at risk (SAR), based upon best available science;
- Protect SAR and their habitats and to promote the recovery of the SAR; and
- Promote stewardship activities that would support those protection and recovery efforts.

The ESA protects all threatened, endangered, and extirpated species listed on the Species at Risk in Ontario (SARO) list. These species are legally protected from harm or harassment, and their associated habitats are legally protected from damage or destruction, as defined under the ESA.

2.8 Migratory Birds Convention Act, 1994

This federal legislation protects the nests and offspring of listed migratory bird species from destruction or disturbance. In its application, it requires best management practices to detect and avoid disturbance to active nests during development activities.

2.9 Fisheries Act

Fisheries and Oceans Canada (DFO) administers the federal Fisheries Act which defines fish habitat as “spawning grounds and other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes” [subsection (2)1]. The Fisheries Act prohibits the death of fish by means other than fishing [subsection 34.4 (1)] and the harmful alteration, disruption, or destruction of fish habitat [HADD; subsection 35. (1)]. A HADD is defined as “any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat’s capacity to support one or more life processes” (DFO 2019a).

Some projects may be eligible for exemption from the DFO review process, as specified under Step 3 of the DFO Fish and Fish Habitat Protection Program review process (DFO 2019b, e.g., clear-span bridges and bridge maintenance projects where DFO mitigation measures are applied, artificial waterbodies with no hydrological connection to occupied fish habitat, and projects that follow the Standards and Codes of Practice defined by DFO). All other projects or activities that have the potential to impact fish or fish habitat should be submitted to DFO through the “Request for Review” process. DFO will review the proposed project to determine whether there is potential to (1) impact an aquatic SAR, (2) cause the death of fish or (3) result in HADD of fish habitat. The death of fish by means other than fishing or a HADD of fish habitat can be authorized by DFO under paragraphs 34.4(2)(b) or 35(2)(b) of the *Fisheries Act*. Authorizations require the preparation and submission of an application package identifying the impacts on fish and fish habitat as well as the avoidance, mitigation and offsetting measures that will be implemented as well as any monitoring that is proposed.

3. Study Approach

3.1 Background Information Review

GEI reviewed existing background information to gather data on the existing natural heritage features and records of flora and fauna in the area.

Information sources reviewed include the following:

- Ministry of Natural Resources and Forestry (MNRF) Land Information Ontario (LIO) Natural Heritage Areas mapping;
- Natural Heritage Information Centre (NHIC) database;
- DFO Aquatic SAR Map;
- Provincial wildlife atlases;
- Online citizen science databases; and
- Online municipal development proposal databases.

Figure 2 (Attachment A) illustrates the existing natural heritage feature designations for the Subject Lands as described in the following subsections.

3.1.1 Land Information Ontario Natural Heritage Areas

Based on the MNRF LIO (2023) Natural Heritage Areas geographic database, the primary natural heritage features of interest within the Subject Lands are a series of unevaluated wetland units associated with the East Tributary of the West Humber River. This feature bifurcates the Subject Lands north to south.

3.1.2 Natural Heritage Information Centre

GEI searched the NHIC (MNRF 2023) database for records of SAR, provincially rare species (S1 to S3) and rare vegetation communities within the Subject Lands. The database provides occurrence data by 1 km x 1 km squares, which include areas outside of the Subject Lands. The following NHIC squares overlap the Subject Lands: 17NJ9748, 17NJ9848, 17NJ9948, 17NJ9849, 17NJ9949, 17NJ9850 and 17NJ9950.

The following species of interest were noted:

- Species listed as Threatened or Endangered on the SARO List:
    - Redside Dace (*Clinostomus elongatus*)- Endangered;
    - Bobolink (*Dolichonyx oryzivorus*)- Threatened; and
    - Eastern Meadowlark (*Sturnella magna*)- Threatened.

- Species of conservation concern (i.e., listed as Special Concern on the SARO List or identified as an S1–S3 species):
    - Eastern Wood-Pewee (*Contopus virens*)- Special Concern; and
    - Wood Thrush (*Hylocichla mustelina*)- Special Concern.

3.1.3 Ontario Breeding Bird Atlas

The Ontario Breeding Bird Atlas Data Summary: 2001–2005 (Bird Studies Canada 2007) contains detailed information on the population and distribution status of birds in Ontario. The database provides occurrence data by 10 km x 10 km squares. The Subject Lands are located within atlas squares 17NJ94 and 17NJ95, which were used to determine a potential bird species list for the area. The Subject Lands are a small component of the overall atlas squares, and therefore all bird species listed for these atlas squares may not be found within the Subject Lands. Habitat type, availability and size are all contributing factors to bird species presence and use.

A total of 129 bird species were recorded in atlas squares 17NJ94 and 17NJ95, with the following species of interest noted:

- Species listed as Threatened or Endangered on the SARO List:
  - Bank Swallow (*Riparia riparia*)- Threatened;
  - Bobolink- Threatened;
  - Chimney Swift (*Chaetura pelagica*)- Threatened;
  - Red-headed Woodpecker (*Melanerpes erythrocephalus*)- Endangered;
  - Eastern Meadowlark- Threatened; and
  - Prothonotary Warbler (*Protonotaria citrea*)- Endangered.

- Species of conservation concern (i.e., listed as Special Concern on the SARO List or identified as an S1–S3 species; B= breeding population, N=non-breeding population, M= migrant population):
  - American Coot (*Fulica americana*)- S3B, S4N;
  - Barn Swallow (*Hirundo rustica*)- Special Concern;
  - Chipping Sparrow (*Spizalla passerine)*- S5B, S3N;
  - Common Nighthawk (*Chordeiles minor*)- Special Concern;
  - Eastern Towhee (*Pipilo erythrophthalmus*);
  - Eastern Wood-Pewee- S4B, S3N;
  - Field Sparrow (*Spizella pusilla)*- S4B, S3N;
  - Golden-winged Warbler (*Vermivora chrysoptera*)- Threatened;
  - Grasshopper Sparrow (*Ammodramus savannarum*)- Special Concern;
  - Marsh Wren (*Cistothorus palustris)*- S4B, S3B;
  - Pine Warbler *(Setophaga pinus)*- S5B, S3N;
  - Ruddy Duck *(Oxyura jamaicensis)*- S3B, S4N, S5M;
  - Turkey Vulture *(Cathartes aura)*- S5B, S3N;
  - Upland Sandpiper (*Bartramia longicauda*)- S2B; and
  - Wood Thrush- Special Concern.

3.1.4 Ontario Reptile and Amphibian Atlas

The Ontario Reptile and Amphibian Atlas (Ontario Nature 2020) contains detailed information on the population and distribution status of reptiles and amphibians in Ontario. The database provides occurrence data by 10 km x 10 km squares. The Subject Lands are located within atlas squares 17NJ94 and 17NJ95, which were used to determine a potential reptile and amphibian species list for the area. The Subject Lands are a small component of the overall atlas squares, and therefore all reptile and amphibian species listed for these atlas squares may not be found within the Subject Lands. Habitat type, availability and size are all contributing factors to reptile and amphibian species presence and use.

A total of 22 reptile and amphibian species were recorded in atlas squares 17NJ94 and 17NJ95, including four turtle species, four snake species, four salamander species and ten frog and toad species. The following species of interest were noted:

- Species listed as Threatened or Endangered on the SARO List:
    - Jefferson Salamander (*Ambystoma jeffersonianum*)- Endangered;

- Species of conservation concern (i.e., listed as Special Concern on the SARO List or identified as an S1–S3 species):
    - Eastern Musk Turtle (*Sternotherus odoratus*)- Special Concern;
    - Northern Map Turtle (*Graptemys geographica*)- Special Concern; and
    - Snapping Turtle (*Chelydra serpentina*)- Special Concern.

3.1.5 Ontario Butterfly and Moth Atlases

The Ontario Butterfly and Moth Atlases (Toronto Entomologists' Association 2023, 2020) contain detailed information on the population and distribution status of butterflies and moths in Ontario. The database provides occurrence data by 10 km x 10 km squares. The Subject Lands are located within the atlas squares 17NJ94 and 17NJ95, which were used to determine a potential butterfly and moth species list for the area. The Subject Lands are a small component of the overall atlas squares, and therefore all butterfly and moth species listed for these atlas squares may not be found within the Subject Lands. Habitat type, availability and size are all contributing factors to reptile and amphibian species presence and use.

A total of 53 butterfly species and 25 moth species were recorded in atlas squares 17NJ94 and 17NJ95. Of these reported species, one is a species of conservation concern (i.e., listed as Special Concern on the SARO List or identified as an S1–S3 species): Monarch (*Danaus plexippus*)- Special Concern.

3.1.6 Aquatic Species at Risk Distribution Mapping

The DFO Aquatic SAR Map (2023) was reviewed to identify any known occurrences of aquatic SAR, including fish and mussels, in the headwater tributaries of the West Humber River that flow through the Subject Lands. Redside Dace was noted as present or potentially present in the West Tributary of the West Humber River. Habitat for this endangered species was also identified in Salt Creek.

3.1.7 Citizen Science Database: eBird

The eBird (2023) database is a large citizen science-based project that aims to collect, archive and share bird diversity information in the form of checklists in order to inform new data-driven approaches to science, conservation, and education. As the observations can be submitted by anyone, and the records are not officially vetted, the data obtained from this tool should not be used as a clear indicator of species presence. Species may be filtered out based on habitat and target survey efforts.

No species of interest were identified within the Subject Lands or the adjacent 120 m.

3.1.8 Citizen Science Database: iNaturalist

The iNaturalist (2023) database is a large citizen science-based project that aims to collect, archive and share sightings of flora and fauna species. Users can upload species observations, which must be vetted by at least two other users before they are considered “research grade” (i.e., the species identification is confirmed). This tool is valuable as it is used by many recognized experts and improves species distribution maps for the public and scientific community. However, it must also be recognized that anyone can confirm a species ID, irrespective of their knowledge or skill level; further, SAR distribution data is blocked by the NHIC. Therefore, the results of this data review are used for informative purposes only; observations of rare species documented in iNaturalist are subject to review by GEI through field surveys and/or agency correspondence.

No species of interest were identified within the Subject Lands or the adjacent 120 m.

3.1.9 Region of Peel Settlement Area Boundary Expansion Scoped Subwatershed Study

The Region has initiated a Scoped Subwatershed Study to provide water resources and natural heritage input to support a SABE Study that will determine where new settlement area growth is proposed in the Region. The Initial Study Area includes Agricultural and Rural lands in Caledon excluding lands within the Greenbelt. Within this area, a Focus Study Area (FSA) has been established in the southern portion of Caledon where SABE technical studies were conducted and within which the SABE will be identified. The Subject Lands fall within the FSA. The Scoped Subwatershed Study (SWS) prepared by the Region provides the existing conditions and characterization of the natural and water resources features and systems within the FSA which includes the Subject Lands.

Information provided below is summarized from the Scoped SWS where data was provided for the area that included the Subject Lands.

It should be noted that the findings presented within this CEISMP are also intended to meet the Phase 1 requirements of a Scoped Subwatershed Study. Phase 1 of a Subwatershed study characterizes the resources associated with each subwatershed (and outlet) by study discipline (i.e., hydrology/hydraulics, groundwater, water quality, stream morphology, aquatic, and terrestrial ecology). Background and supplemental field data are to be assessed by each discipline, and then across disciplines, to:

- Establish the form, function and linkages of the environmental resources,
- Identify environmental constraints and opportunities related to terrestrial and aquatic habitat, features, and systems,

- Establish surface water and groundwater constraints and opportunities associated with flooding, erosion, water quality, water budgets, including recharge and discharge areas through new numerical tools (models) suitably calibrated to local conditions. Establish criteria and constraints for management opportunities associated with the environmental features and systems.

These criteria have been reviewed and guide the management and restoration recommendations outlined in the Initial CEISMP. Further refinement in adherence to these criteria will be completed as part of the Final CEISMP.

3.1.9.1 Flora

Within the FSA, flora species were identified through secondary sources (NHIC) and then compared to the associated SWSs in Peel Region from the TRCA and CVC. Since the Subject Lands contain tributaries of the West Humber River, data examined from this Scoped Subwatershed Study will focus on the FSA within the West Humber and the West Humber SWS.

There were 93 species recorded within the West Humber FSA, while 271 species were recorded within the SWS. No SAR were identified.

3.1.9.2 Fauna

Within the FSA, fauna species were identified through secondary sources (NHIC) and then compared to the associated SWSs in Peel Region from the TRCA and CVC. Since the Subject Lands contain tributaries of the West Humber River, data examined from this Scoped SWS will focus on the FSA within the West Humber and the West Humber SWS.

Amphibians

Seven species were recorded within the West Humber FSA while nine species were recorded within the SWS. Species reported in both sources include the American Bullfrog (*Lithobates catesbeianus*), American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Green Frog (*Lithobates clamitans)*, Northern Leopard Frog, Spring Peeper (*Pseudacris crucifer)* and Wood Frog (*Lithobates sylvaticus).* The West Humber SWS also indicated the Eastern Red-backed Salamander (*Plethodon cinereus),* Spotted Salamander (*Ambystoma maculatum)* were present. No SAR were identified.

Birds

Forty-four (44) species of birds were recorded within the West Humber FSA while 106 species were recorded within the SWS.

Significant species reported by both sources included:

- Common Nighthawk (*Chordeiles minor*), Threatened species.

- Eastern Wood-Pewee (*Contopus virens*), Wood Thrush (*Hylocichla mustelina*), and Grasshopper Sparrow (*Ammodramus savannarum*) - Special Concern

In contrast, the Chimney Swift, a Threatened species, was only reported within the SWS.

Invertebrates

Only one species was reported in both the West Humber FSA and the SWS: Chimney Crayfish/ Digger Crayfish (*Fallicambarus fodiens*). No SAR were identified.

Mammals

Four species of mammals were reported within the West Humber FSA while 19 species were reported within the SWS. No SAR were identified.

Reptiles

One species of reptile was reported within the West Humber FSA: Midland Painted Turtle, while three species were reported within the SWS: Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), Northern Red-bellied Snake (*Storeria o. occipitomaculata)* and Snapping Turtle. The Snapping Turtle is a species of Special Concern in Ontario.

GEI has considered the importance of flora and fauna from the SWS perspective. The restoration plan has considered species that occur in the Study Area and within the SWS and have considered the replication of suitable habitats for these identified species in the restoration plan detailed further in **Section 8.**

3.1.9.3 Significant Wildlife Habitat

There are several candidate SWH identified by the SWS as potentially occurring on the Subject Lands surrounding the East Tributary of the West Humber River, including:

- Candidate Amphibian Breeding Habitat (Woodland)
- Candidate Amphibian Breeding Habitat (Wetland)
- Candidate Waterfowl Stopover and Staging Areas (Aquatic)
- Candidate Bat Maternity Colonies
- Candidate Bald Eagle and Osprey Nesting, Foraging and Perching Habitat
- Candidate Shorebird Migratory Stopover Areas
- Candidate Turtle Overwintering Areas
- Candidate Marsh Breeding Bird Habitat
- Candidate Shrub and Early Successional Bid Breeding Habitat
- Candidate Terrestrial Crayfish Habitat
- Candidate Amphibian Movement Corridors

GEI has considered the importance of these features from the SABE SWS. Habitat features that support Significant Wildlife Habitat have been considered as part of the potential restoration plan detailed further in **Section 8.**

3.1.9.4 Wetlands

ELC polygons accounted for 203.3 ha (2.5%) of the FSA and adjacent 120 m area, with Open Aquatic (OA) communities occurring the most within the West Humber Subwatershed. Among the seven watersheds within the FSA, the West Humber River SWS had the most wetland features and largest coverage of wetland area (based on area coverage).

3.1.9.5 Woodlands

ELC polygons accounted for 417.6 ha (5.2%) of the FSA and adjacent 120 area. Among the seven subwatersheds within the FSA, the West Humber River SWS had the most woodland features and largest coverage of woodland area.

The findings from the Peel Region SABE SWS are for a study area much larger than the Subject Lands, and the data summarized above may not be present on the Subject Lands. This information has been included to provide a greater understanding of the larger landscape setting surrounding the Subject Lands. The studies completed as part of the SABE SWS were primarily desktop-based with some targeted studies on publicly accessible lands and are considered preliminary in nature.

GEI's analysis provided in the following sections evaluates the presence of natural heritage features on the Subject Lands based on 2021 and 2022 field studies.

3.1.9.6 Management Recommendations

Wood's 2020 Scoped Subwatershed Study was also reviewed to enhance the understanding of the Study Area and integration with the wider landscape. The Scoped Subwatershed Study defers specific management recommendations for the West Humber River Subwatershed to future studies; however, the report does provide high-level recommendation relating to flood control, erosion control, water budget, water quality, and regulatory controls.GEI has reviewed and incorporated these concepts into the Initial CEISMP.

3.1.10 Developments in the Surrounding Area

The Planning Viewer of the City of Brampton and the Current Development Applications Map of the Town of Caledon were thoroughly examined to evaluate the proposed developments located approximately 2 km around the Study Area. The purpose of this review was to offer insights into how the components of this CEISMP integrate with the broader region. An assessment of the neighboring properties with development proposals was conducted. As of the creation of this report, there are no ongoing developments within this specified area that are in the process of preparing Environmental Impact Studies, which could have been referenced for integration into the management and restoration plans.

There is one SPA (2015-0058) proposed directly adjacent to the Block 12; this area only contains industrial lands with no features identifiable through desktop review. The Town of Caledon and City of Brampton development mapping will be reviewed again during preparation of the Final CEISMP to ensure cohesiveness with components of the larger landscape.

Additionally, several environmental assessments led by municipalities have been completed recently. As part of the Initial CEISMP, a preliminary review of these reports was completed to help provide context and background. An additional review of these reports will be completed during detailed design for the restoration plan to find any potential synchronicities that can be explored to further benefit the natural heritage system on a landscape scale. Below is a list of the nearby assessments that were considered during this study:

- Airport Road Improvements Municipal Class Environmental Assessment – Natural Heritage Report, Impact Assessment (LGL Limited, 2015):
    - Within the Subject Lands, Salt Creek is identified as Watercourse 2 in this report.

- Mayfield Road Class Environmental Assessment - Appendix Natural Environmental Technical Report (Natural Resources Solution Inc, 2003):
    - Within the Subject Lands, the East Tributary is identified as Watercourse Crossing 11 (Creek 11) in this report

Consistent with the findings of this CEISMP, the Airport Road Improvements Municipal Class EA determined that Watercourse Crossing 2 (I.e., Salt Creek) contains direct fish habitat. The preliminary design in this report indicated that a bridge replacement will be taking place for Salt Creek, resulting in a larger footprint below the high-water mark. The net change expected as a result of the EA recommended structure included a small decrease in the openness ratio of this crossing, but maintenance of animal movement. Therefore, the proposed changes associated with the EA are not anticipated to impact the recommendations of this CEISMP. Connectivity will also be incorporated into the restoration plan further detailed in **Section 8** to further enhance animal movement on the landscape.

The Mayfield Road Class Environmental EA found that Creek 11 (I.e., the East Tributary) is a permanent channel, consistent with what is described within **Section 4.5.1** of the CEISMP. The East Tributary was also described as providing very limited opportunities for fish habitat. Consequently, no fisheries-related impacts were anticipated to this area as a result of the proposed EA alternative described within the report. The CEISMP proposes realignment of the East Tributary (see **Section 6**) and enhancements to fish habitat (see **Section 8**). The conclusions outlined in the Mayfield Road Class Environmental EA in terms of the ecological value of the East Tributary support the impact assessment associated with the proposed realignment of the East Tributary as detailed in **Section 7**.

3.2 Technical Methods and Field Studies

The following ecological field investigations were completed during the 2021 and 2022 (for expanded Study Area) field seasons:

- Amphibian call counts (2021);
- Bat habitat assessment and acoustic survey (2021);

- Botanical inventory and Ecological Land Classification (ELC) (2021 and 2022);
- Breeding bird surveys (2021);
- Fish community sampling (2021);
- Headwater Drainage Feature Assessment (HDFA) (2021 and 2023); and,
- Turtle basking surveys (2021).

A list of survey types and dates have been provided in **Table 1** (**Appendix B)**.

3.2.1 Botanical Inventory and Ecological Land Classification Methodology

Vegetation communities were first identified on aerial imagery and then verified in the field. Vegetation community types were confirmed, sampled, and revised, if necessary, using the sampling protocol of the ELC for Southern Ontario (Lee at al. 1998). ELC was completed to the finest level of resolution (Vegetation Type) where 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 is based on NHIC (2021b). 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.

GEI also completed a tree inventory, as described within the Arborist Report and in **Section 4** (GEI, 2022).

3.2.2 Feature Staking

A feature staking exercise was undertaken by GEI, Rice Group and TRCA on July 5, October 22, and December 8, 2021. Feature staking was completed for wetlands, top-of-bank, and natural vegetation communities containing woody species. The limits of wetlands were delineated and surveyed in accordance with the methods outlined in the Ontario Wetland Evaluation System (OWES) Manual for Southern Ontario (MNRF 2022).

3.2.3 Amphibian Call Count Methodology

Survey protocols are based on the 'Marsh Monitoring Program' (Bird Studies Canada [BSC] 2014). Survey station locations were determined through an assessment of orthophotography, existing vegetation communities and ground observations.

The call count surveys were conducted at night within the appropriate timing window from approximately 30 minutes after sunset until midnight. Each station was 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 were conducted at least

15 days apart. All calls heard within a survey station were recorded, as well as any call observations outside of the survey station, including on adjacent lands. The provincial and global statuses of species identified on the Subject Lands were obtained from the NHIC (2021b) and the SARO list.

All three call count surveys have been completed and are summarized within this report.

3.2.4 Turtle Basking Methodology

Survey protocols were developed in consideration of MNRF (2015b) and Toronto Zoo (Caverhill et al. 2011) turtle survey methods.

Survey station locations were identified using orthophotograph interpretation (i.e., ponds, open wetlands) and provincial wetland mapping (LIO 2021a) and verified with a full-site vegetation and habitat reconnaissance survey.

Three surveys were conducted, starting in April, shortly after spring thaw conditions, through May. The surveys were conducted during optimal weather conditions (sunny/partly sunny days between 9 am and 5 pm with low/no wind and air temperatures between 6 to 25°C, or if cloudy with temperatures above 15°C).

Binoculars were used to scan, from a distance, for 30 minutes, the edge and surface of each feature for basking turtles. Once scanning was completed, feature micro-habitat data was collected, which included water and air temperatures, water depth, adjacent vegetation composition, percent slope leading to water edge, percent coverage of basking features (i.e., logs, floating vegetation mats, floating/emergent debris like tires) and percent canopy cover.

All three rounds of turtle basking surveys were completed and are summarized below.

3.2.5 Breeding Bird Survey Methodology

Three rounds of breeding bird surveys were conducted following protocols set forth by the Ontario Breeding Bird Atlas (Cadman et al. 2007), the Ontario Forest Bird Monitoring Program (Cadman et al. 1998).

Surveys were conducted between dawn and five hours after dawn with suitable wind conditions, no thick fog or precipitation (Cadman et al. 2007). Point count stations were surveyed in various habitat types, where present, within the Subject Lands and combined with area searches to help determine the presence, variety, and abundance of bird species. Each point count station was surveyed for ten minutes for birds within 100 m and outside 100 m. All species recorded on a point-count were mapped to provide specific spatial information and were observed for signs of breeding behaviour. Surveys were conducted at least seven days apart.

Open grassland habitats, including pasture, hay fields and fallow areas, were surveyed according to the MNRF (2012) Guidelines for Bobolink and Eastern Meadowlark. Point count stations (discussed above) were located within open grassland habitat. Where this habitat was greater than 250 m wide or long, two-point count stations were completed (point count stations are set up every 250 m in large habitats). Transects or area searches were also conducted in addition to the 10-minute point count stations.

3.2.6 Bat Habitat Survey Methodology

Bat habitat assessments are used to determine whether identified features are to be considered candidate SWH, or if the habitat provides conditions favourable for SAR bats. The presence of snags is considered an indicator of high-quality bat maternity roost habitat, and these surveys are required as the first step in confirming presence of bat maternity colony SWH (as per the PPS). Snags may also indicate the presence of high-quality SAR bat habitat; however, all SAR bat habitat, regardless of quality, is protected under the ESA (2007).

Suitable bat roosting trees in hedgerows were identified across the site, and in all appropriate ELC communities present on the Subject Lands, including any Cultural Woodland (CUW), Deciduous Swamp (SWD) and Deciduous Forest (FOD) communities.

Bat habitat assessments have been completed with preliminary results summarized within this report.

3.2.7 Bat Acoustic Survey Methodology

Survey methods were developed based on guidance from the Ministry of Environment Conservation and Parks (MECP), professional experience and MNRF survey guidelines as outlined in “Bats and Bat Habitats: Guidelines for Wind Power Projects” (MNRF 2011).

Surveys to detect bat species were carried out in June 2021 and were completed using Wildlife Acoustics Song Meter SM4BAT recording devices over a duration of ten consecutive evenings.

Survey stations were selected based on aerial interpretation, bat habitat assessments, and ELC vegetation community types.

Passive acoustic recorders were programmed to begin recording at sunset and to end recording at sunrise. In addition, the SM4BAT passive recorder microphones were elevated approximately 2 m above the ground to reduce background noise and echo.

All ultrasonic recordings were filtered to eliminate recordings with high levels of noise or with no bat calls, and then further analyzed using SonoBat’s auto-classification tool. Any calls with a positive identification were manually vetted by a wildlife ecologist with training in bat species identification by sonogram. Calls that were not identifiable to species by SonoBat were manually reviewed by a wildlife ecologist with training in bat species identification by sonogram to identify those calls with characteristics of SAR bats (i.e., calls with frequencies greater than 40kHz). Where recorded, these calls are classified as ‘Unknown *Myotis*’ calls in accordance with MECP guidance.

3.2.8 Headwater Drainage Feature Assessment (HDFA)

A HDFA was completed to document the existing headwater drainage features (HDFs) on the Subject Lands. The HDFA followed the Credit Valley Conservation (CVC) and TRCA Guidelines for the “Evaluation, Classification, and Management of Headwater Drainage Features” (2014). Three site visits were done to characterize HDFs, depending on the hydrology of each feature. GEI Consultants prepared Arc Hydro mapping of potential drainage features.

Several headwater drainage features (HDFs) were identified within the Subject Lands. GEI has extensively surveyed the downstream segments of these HDFs within the Tullamore Employment Lands and determined that the lower reaches were seasonal in nature. Based on this information and the agricultural nature of the Subject Lands, it is likely that the HDFs on lands to the north within the expanded Study Area are also seasonal in nature and would likely be assigned a management recommendation of Mitigation under the Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation’s Headwater Drainage Feature Assessment Guidelines (2014).

Based on the site reconnaissance, there are no hazards associated with this drainage feature, however it should be further assessed under appropriate seasonal windows. Each HDF present on the Subject Lands was evaluated based on its hydrology, riparian habitat, fish habitat (direct or indirect) and terrestrial habitat contributions. Implementation of the classification system within the TRCA Guidelines will result in one of the following management classifications for each HDF on the Subject Lands:

- Protection – protect or enhance the existing feature in-situ;
- Conservation – maintain, relocate and/or enhance drainage feature and its riparian zone corridor;
- Mitigation – replicate or enhance functions provided by the drainage feature;
- Recharge Protection – maintain overall water balance by providing mitigation to maintain groundwater recharge functions;
- Maintain or Replicate Terrestrial Linkage – maintain the corridor through in-situ protection or replicate and enhance the corridor elsewhere; and
- No management required – feature can be removed without mitigation.

3.2.9 Fish Community Sampling Methodology

One fish community sampling event was completed to identify whether the watercourse feature within the East Tributary on the Subject Lands supports direct fish habitat. Prior to commencing the survey, GEI Consultants obtained a License to Collect Fish for Scientific Purposes from the MNRF. During this sampling event, a Halltech HT-2000 Battery Backpack Electrofisher and two D-frame dip nets with a 500-micron mesh size was used to retrieve fish and semi-aquatic organisms (e.g., frogs) from the channel. Sampling was conducted using the Ontario Stream Assessment Protocol standard single pass survey method (Stanfield 2017).

The survey was completed within a defined stretch through riffles, pools and runs. Fish captured was transferred into aerated buckets for processing. Each fish was identified to species level, enumerated, and weighed before being returned to the channel, downstream from the sampling location. Additional information collected during sampling event included water temperature, conductivity, and pH measurements. Weather conditions and electrofisher shocking parameters (e.g., voltage and frequency) were also recorded.

All data recorded was reported to the MNRF in accordance with the License requirements.

Fish community sampling has been completed and results are presented in the forthcoming sections.

4. Existing Conditions and Characterization of Study Area and Surrounding Area

4.1 Ecological Context and Landscape Setting

The Study Area occurs within the Lake Simcoe-Rideau Eco-region 6E (specifically, eco-district 6E-7), 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 (*Acer saccharum*), American Beech (*Fagus grandifolia*), 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*).

The Study Area contains various anthropogenic (cultural) and naturalized vegetation communities including agriculture, hedgerows, ponds, meadow, thickets, and wetland communities. The Subject Lands consist of actively managed agricultural fields and the eastern half of the Study Area contains an old residential building with two larger shed structures. One shed structure was also located on the west side of Salt Creek. Behind the northern shed structure is a dug pond. The property also hosts two barn structures (one located off Mayfield Road and one off Torbram Road).

Consideration of the larger ecological matrix or landscape contributes to a better understanding of potential interactions between abiotic and biotic flows and exchanges. As depicted on **Figure 2** (**Appendix A**), the landscape surrounding the Subject Lands is a mixture of agricultural and industrial land-uses. The West Tributary of the West Humber River and its valley would act as a primary linkage that provides large patches of habitat for a variety of flora and fauna, and also serves as an important wildlife corridor across the landscape in a north-west to south-east direction. The East Tributary provides a secondary linkage function, primarily where it extends south off the Subject Lands and connects into the West Tributary of the West Humber River downstream of Mayfield Road. Wildlife passage underneath the surrounding road networks appears to be facilitated based on the presence of bridge and box culvert crossings at Torbram and Mayfield Roads.

The Salt Creek valley system provides connectivity across the north of the site connecting large networks of woodland southeasterly under Airport Road to the John Ervine Valley in Brampton. The segment of Salt Creek within the Subject Lands has been disturbed by residential and agricultural uses

4.1.1 Existing and Future Climatic Conditions affecting Natural Systems in the Landscape Setting

According to the Resilient Caledon Community Climate Change Action Plan (2021), Caledon's future climate is projected to be warmer, wetter, and more unpredictable. Some actions to lower emissions for natural systems include having an increased infill and densification help preserve forests, wetlands and agricultural land. The Region of Peel Master Climate Change Plan (2021) recommends the following actions:

- Ensure new buildings have high energy performance;
- Buildings to generate low carbon energy;
- Support sustainable transportation for commuting;
- Maximize energy efficiency and energy recovery in water and wastewater systems; and
- Protect and increase green infrastructure throughout Peel.

Green infrastructure can be natural or human-made including parks, trees, shrubs, urban forests, green roofs and walls, gardens, bioswales, natural channels, watercourses, and constructed wetlands. Green infrastructure reduces the risk of heat stress and flooding by increasing infiltration and reducing runoff, increasing evaporative cooling, and providing shading and areas for reprieve. **Section 6.4** outlines the stormwater management strategy and **Section 8** highlights the restoration elements that will incorporate climate adaptation where feasible.

4.2 Physical Characteristics

4.2.1 Physiography and Surficial Geology

The Subject Lands and Study Area are located within the South Slope physiographic region and west of the Peel Plain physiographic region. The South Slope physiographic region comprises the southern slope of the Oak Ridges Moraine and is characterized by scattered drumlins, rolling till plains, moraines, and river valleys (Chapman and Putnam, 1984). As a result of the terrain and relative imperviousness of the fine-grained overburden materials, runoff rates over the South Slope physiographic region are comparatively higher than groundwater recharge rates. Therefore, total annual flows and water quality within the local tributaries over this till plain are predominantly influenced by overland drainage and changes thereto that are occurring in the area (TIL, 2021). The Subject Lands are characterized by drumlinized till plains.

A review of Ontario Geological Survey (OGS) mapping (2012) indicates the Subject Lands and Study Area are underlain by clay to silt-textured Halton Till derived from glaciolacustrine deposits or shale. Modern alluvial deposits are mapped in the southern portion of the Subject Lands associated with the west tributary. Based on a review of the hydrogeological and geotechnical reports prepared for the Subject Lands by Toronto Inspection Limited (TIL) dated June 2021, the observed site-specific surficial geology is consistent with the regional mapping by OGS. The Subject Lands were found to generally by underlain by till deposits, with some coarser-grained materials encountered in the vicinity of the West tributary (TIL, 2021).

4.2.2 Topography and Drainage

The headwaters of the Humber River Watershed rise on the Niagara Escarpment and Oak Ridges Moraine, and flow over clay plains before entering Lake Ontario (TRCA 2008). The

Study Area and Subject Lands have varying topographic relief and contain two tributaries of the West Humber River (the West Tributary and the East Tributary), as well as Salt Creek. Salt Creek flows through the Greenbelt Plan Area, while the West Humber River tributary flows through the centre of the Subject Lands and drains the agricultural lands within the Study Area.The East Tributary of the West Humber River flows through the southwest corner of the Subject Lands (TIL, 2021).

Based on a review of the June 2021 TIL hydrogeology report, the topographic relief in the Subject Lands is shown to have a gentle slope (1-2%) in a southeasterly direction towards the tributaries of the West Humber River and Salt Creek and steeping in the riparian areas of those tributaries. This topography is typical of the entire Study Area, which gradually slopes towards the tributaries, steeping in the riparian areas of those tributaries. Elevations within the Subject Lands range from approximately 230 to 248 m above sea level (masl) (TIL, 2021).

4.2.3 Stream Geomorphology

West Tributary of the West Humber River

The West Tributary enters the Subject Lands via a large culvert under Torbram Road and flows through the southwestern corner of the Subject Lands before exiting the Subject Lands under a span bridge at Mayfield Road. This well-defined valleyland is largely naturalized and relatively undisturbed.

Fieldwork was completed in 2021 for the West Tributary, but a detailed analysis was not completed for the Initial CEISMP. A detailed assessment on the West Tributary will be provided in the Final CEISMP.

East Tributary of the West Humber River

The East Tributary originates within the lower third of the Subject Lands and contains two ponded features (identified as the Upper and Lower ponds), which were established for cattle watering and irrigation as a result of two constructed berms. The East Tributary then exits the Subject Lands under Mayfield Road via a box culvert. Incidental observations of the berms during ecological inventories suggested that these berms may not be stable as water was observed seeping through portions of the lower berm where a culvert may have historically been present, and a perched culvert was observed at the upper berm. It is likely that the berms preventmigration of fish and smaller wildlife between these ponded structures due to the large un-stabilized slopes. Severe evidence of mass-wasting and slumping was observed on the northern berm at the Upper Pond, further illustrating the unstable nature of the berms. Scattered concrete and aggregate were documented along the berms. The perched height of culvert at the downstream side of the Upper Pond was 34 cm, with a jump height measured at 15 cm during early spring assessments.

Fieldwork is scheduled for late 2023 / early 2024 to assess the East Tributary further. This information will be incorporated into the final CEISMP.

Salt Creek

As outlined previously in this report, a portion of Salt Creek is located in the northeast corner of the Subject Lands. GEI conducted a Fluvial Geomorphic Assessment for Salt Creek in January of 2023 (see **Appendix C**). Salt Creek consists of a single, low gradient, intermittently defined channel within a confined valley setting. The main vegetation along this reach was grasses and herbaceous species and occasional trees. Channel geometry was variable along the length of Salt Creek due to flow obstructions, and the dominant habitat type was determined to be runs. The reach was determined to be in transition/stressed, based on the results of a Rapid Geomorphic Assessment (RGA). As Salt Creek in the study area was situated in a confined valley, the erosion hazard is governed by geotechnical considerations rather than the meander belt. The meander belt was determined to delineate Redside Dace habitat limits (which is defined as the meander belt plus vegetated areas or agricultural lands within 30 m of the meander belt), following the TRCA (2004) Belt Width Delineation Procedures. The meander belt width obtained through this method was 56 m.

Other Aquatic Features

Two additional man-made ponds were identified within the Subject Lands: the first pond is immediately north of the Upper Pond (referred to as the cattle pond as this pond was constructed to hold water to support the cattle farm). The second pond is located behind the northern shed structure on the east side of Salt Creek. A total of seven HDFs were also identified within the Subject Lands; these are discussed in **Section 4.5.1.4,** below.

4.2.4 Water Quality

As part of the hydrogeological investigation completed by TIL (2021), groundwater quality samples were collected from monitoring well 21BH-7 located in the central-southeastern portion of site. These results were and analyzed and compared to sanitary and storm sewer discharge criteria listed in the Region of Peel *Wastewater By-Law Number 53-2010* (By-Law 53-2010). The laboratory results indicated that both Total Manganese and Total Zinc were above the concentration for discharge to the municipal storm sewers per the *Table 2 – Limits for Storm Sewer Discharge* of By-Law 53-2010. Additionally, the parameter Sulphate was found at concentration exceeding the discharge criteria outlines in the *Table 1 – Limits for Sanitary Sewer Discharge* of By-Law 53-2010. It was anticipated by TIL that the elevated concentrations of Sulphate identified by this sample are a result of the recent and historical uses of the Subject Lands for agriculture purposes and potential application of fertilizers and animal waste that have taken place. It was recommended by TIL in the 2021 hydrogeological report that additional groundwater samples, distributed spatially across the Subject Lands, be collected to determine the extent of elevated concentrations for sulphate in groundwater and identify potential alternative on-Site or off-Site sources. As of the writing of this report, it is unclear whether these samples were taken. GEI has developed a separate water quality program detailed below.

GEI has developed a baseline surface water quality monitoring program, implemented in 2023. Beginning in the summer of 2023, GEI is completing monthly manual measurements of surface water depth. Manual measurements are supplemented with dataloggers set to record hourly water depth and temperature. This monitoring is scheduled to continue until 2024. Additionally, a surface water quality monitoring program is also underway in 2023. Surface water chemistry samples will be collected and analyzed against various parameters. Water quality monitoring to understand baseline conditions is required to properly inform the stormwater management strategy. The results of GEI's surface water quality monitoring program will be included in the Final CEISMP and will help refine the SWM plan and restoration plan.

4.2.5 Regional Hydrogeology

Based on a review of the hydrogeology report prepared by TIL (2021), the following hydrostratigraphic units overlie the bedrock (from youngest to oldest) in the Study Area:

- Recent Deposits – Consist of surficial geologic deposits
- Halton Till (Aquitard) - Texturally variable; however, generally characterized by sandy silt to clayey silt till units with interbeds of silt, clay, sand and gravel. Based on ORMGP mapping, the deposits of the Halton Till aquitard are expected at the ground surface and to an approximate depth of 9-10 m below ground surface (mbgs).
- Oak Ridges Moraine Aquifer Complex (ORMAC) (Aquifer) - Consists of glaciofluvial to glaciolacustrine-derived deposits of stratified fine sands and silts, with coarse sand and gravel occurring locally. Based on Oak Ridges Moraine Groundwater Program (ORMGP) mapping, the deposits of the ORMAC are expected to be encountered from approximate elevations of 230 to 240 masl from north to south across the development area and may be absent from the hydrostratigraphic progression toward the southeast portion of the Subject Lands. Within the Subject Lands, the deposits of the ORMAC are expected to be confined below the overlying deposits of the Halton Till aquitard.
- Newmarket Till (Aquitard) - A massive, dense, over-consolidated formation consisting of sandy silt to silty sand diamicton marking the separation between the overlying ORMAC and the Thorncliffe Aquifer, Sunnybrook Aquitard, and Scarborough Aquifer, collectively the Lower Sediments. The Newmarket Till formation is expected to be encountered as a thin material deposit (<5 m) overlying the bedrock.
- Lower Sediments – The aquifer and aquitard formations of the Lower Sediments are not expected in the hydrostratigraphic progression of unconsolidated sediments between the ground surface and top of bedrock at the Site based on mapping presented by the ORMGP and shallow depth of bedrock.

The 2021 hydrogeology report from TIL indicates that at a regional scale, groundwater flows generally in a southeasterly direction through the watershed towards Lake Ontario. Shallow groundwater flow will be influenced locally by variations in surficial geological materials as these are known to offer limited recharge potential, and by the many watercourses that meander within the subwatershed and which may have minor contributions from groundwater recharge.

4.2.6 Site-Specific Hydrogeology

The hydrogeology analysis examines the impact of future development and land use changes on groundwater systems. An impact analysis was completed to evaluate the sensitivity of the groundwater flow system to changes in land use resulting from a potential reduction in recharge. Impacts are expected to include a decrease in the water table elevation, changes to stream flow (e.g., baseflow/groundwater discharge) and the potential degradation of groundwater quality. The hydrogeological studies completed for this CEISMP also considered components of subwatershed study requirements:

- Ensuring the groundwater sensitive areas are recognized and protected from future urbanization and disturbances.
- Within the water balance assessment, updates to the overall groundwater budget model along with the surface water components will be made for both existing and future scenarios; The water budget for the study area estimates precipitation, evapo-transpiration, runoff and infiltration, in addition to the groundwater recharge and discharge.
- Where reasonable, any relevant needs are considered within the Source Water Protection Plan.

Detailed geotechnical and hydrogeological investigations were completed by TIL, dated June 24, 2021, and June 30, 2021, respectively and are described under separate cover (TIL, 2021). A summary of the findings is provided herein; however, this summary should be read in combination with the full reports.

The geotechnical investigation involved drilling of thirty-eight (38) boreholes extending to depths of 2.4 to 6.6 m below existing grade. Sixteen (16) of the boreholes were completed as monitoring wells to determine static groundwater conditions and aid in the hydrogeological investigation. The geotechnical investigation revealed the soils underlying the site generally consisted of clayey silt, clayey / sandy silt till of the Halton Till aquitard with isolated deposits of silty sand and sand and gravel (encountered at two of the 38 boreholes, 21BH-6 and 21BH-26). The hydrogeological report by TIL noted that the sandy silt was encountered in an area slightly removed from the tributary on site, however, sandy silt deposits were not encountered in any other boreholes in the vicinity of the tributary. Sand and gravel deposits were also encountered and, like similarly to deposits of the Oak Ridges Moraine Aquifer Complex (ORMAC), may be more prevalent in areas north of the Study Area where deposits of the ORMAC may be expected at shallower elevations and in greater thickness.

The hydrogeological investigation included monitoring of the 16 on-site monitoring wells established as part of the geotechnical investigation. These wells were monitored weekly between June 7 and June 22, 2021. The most complete monitoring dataset was obtained during the June 22, 2021, monitoring event, when groundwater levels ranged from 0.90 - 5.87 m below ground surface (mbgs), or, 227.63 - 246.50 meters above sea level (masl). 21BH-3 (MW) was dry throughout the monitoring period, to a depth of 6.10 mbgs or 229.42 masl. The hydrogeological report noted that a long-term groundwater level monitoring program is to be completed at the site for a period of 12 months; the results of this monitoring were not available to GEI at the time of writing this report. Based on the preliminary monitoring results, local groundwater flow is anticipated to be influenced by the existing West Tributary and East Tributary and flow towards the southeast.

The results of TIL (2021) in-situ hydraulic testing suggest that the clayey silt to sandy silt (Halton Till) screened by most of the monitoring wells within the Subject Lands are of low to very low hydraulic conductivity, ranging from 10^{-9} to 10^{-7} m/s. Testing indicated that there is potential for zones of moderately higher permeability to be encountered as well (on the order of 10^{-6} m/s), including within the fill deposits and native deposits with reduced clay percentage; however, these zones are expected to be limited in extent. Based on the hydrogeological report by TIL, the groundwater dewatering effort during construction will likely not be significant for the construction of underground servicing or the stormwater management pond. The Zone of Influence (ZOI) of dewatering activities is not likely to expand more than 10 m from any excavation. Based on the anticipated areas of dewatering, impacts from water takings, including impacts to land stability and sensitive receptors are not expected. The hydrogeological report (2021) notes that Redside Dace habitat has been identified in the West Tributary and Salt Creek, and that the East Tributary is contributing habitat to Redside Dace. Details regarding mitigation of potential impacts to Redside Dace habitat and contributing habitat are discussed in **Section 7.2** below.

As of the date of this report, GEI has not received any detailed information regarding updates to the TIL (2021) Report. Any such updates made after the submission of this report will be included in the Final CEISMP.

4.2.6.1 Site-Wide Water Balance

Water balance criteria according to TRCA requirements are determined with respect to recharge and protection of natural features. TRCA has undertaken modeling to understand water budget parameters throughout their jurisdiction. The results distinguish between four types of recharge areas within the TRCA's watershed, each with corresponding recharge criteria. According to the modeling results, the Study Area is not located within a significant recharge area (Crozier, 2023).

Per TRCA's criteria, a water balance analysis is required using the average and more frequent precipitation events that comprise the bulk volume of annual precipitation to ensure maintenance of pre-development water balance following development. The target is to match pre-development proportions of infiltration, runoff and evapotranspiration.

The requested water balance assessment for the property has been completed and has been included in the revised FSR completed by Crozier under separate cover (dated January 2023). The water balance will mandate a certain volume of clean water that will need to be infiltrated on each of the blocks to match the pre-development water balance conditions. To mitigate the infiltration deficit for the blocks, it was determined that a combination of rooftop and surface parking drainage from each of the private development blocks could be directed to Low Impact Development (LID) measures designed to promote infiltration. The depth of rainfall to be infiltrated shall be 4.5 mm across the site. An erosion control criteria was also considered as requested by TRCA. The Subject Lands will require onsite retention of 5 mm of runoff generated from the impervious area. The larger target must be applied and subsequently, the 5 mm target was used.

Water balance calculations were completed by Crozier (2023) using the Thornthwaite and Mather Method (1957). The results indicate the proposed development must consider targets for private and public blocks separately; private blocks include Block 1-5 and 7-8, totaling 138 ha. These blocks create an infiltration deficit of 164,519 m^3/year (a 90% decrease from pre-development conditions). Runoff is expected to increase from 278,960 to 807,754 m^3/year, or 290%. The remainder of the Site will be conveyed to the Town post-development and will therefore consist of public land, which are to be reviewed under the Town's CLI-ECA Stormwater Criteria. The water balance for the public land is proposed to be provided completely within the future ROWs on the property. The public blocks are determined to create an infiltration deficit of 9,876 m^3/year.

To achieve the overall water balance, the infiltration deficit will be mitigated through measures within each of the industrial blocks. To mitigate the infiltration deficit for the blocks, it was determined that a combination of rooftop and surface parking drainage from each of the private development blocks could be directed to LID measures designed to promote infiltration. Each private development block has underground infiltration facilities designed to capture and infiltrate the required amount of rainfall from direct rooftop and surface parking drainage. It is noted that that any surface runoff directed to these infiltration facilities will require pre-treatment.

Detailed infiltration facility sizing, including in-situ percolation tests and drawdown calculations for each facility will be completed as part of the detailed design for each Site Plan. However, to maintain existing infiltration levels, it is recommended that LIDs be included in the stormwater management design to promote infiltration. A complete list of LID options considered is presented in the FSSR (Crozier, 2023) included under separate cover. However, feasible LID options are summarized below:

- **Green Roof:** retains stormwater to reduce runoff; does not recharge groundwater. Commercial/industrial development such as proposed in the Draft Plan will include large buildings with flat roof areas conducive to green roof installations.
- **Infiltration galleries**: improves groundwater recharge. High groundwater and tight soils may limit feasible locations for infiltration galleries, feasibility to be confirmed at site plan stage. It is preferred to direct 'clean' rooftop runoff into infiltration galleries; if parking/asphalt areas will be directed to infiltration galleries, quality treatment of runoff will be required.
- **Rainwater harvesting:** retains stormwater to reduce runoff and allows infiltration when used for irrigation of landscaped areas. Runoff from commercial/industrial rooftops could feasibly be directed to a rainwater cistern and used for irrigation of landscaped areas on site. Feasibility to be confirmed at Site Plan.
- **Permeable pavement:** reduces stormwater runoff, improves groundwater recharge. Parking lots and drive aisles could be feasibly converted to permeable pavement to reduce

runoff and promote infiltration. However, consideration on use of road salt alternatives is needed. Feasibility to be confirmed at Site Plan.

GEI will work with Crozier and Toronto Inspections to identify where LID implementation would provide the most benefit to natural features to maintain hydrologic function and water balance. The FSR&SWM Report by Crozier (2023) recommends locations as part of this submission for LID on site.

4.2.6.2 Feature-Based Water Balance

For developments proposed near identified natural features, additional investigation is required to understand water balance impact. The Subject Lands contain wetlands, watercourses and HDFs where water balance impact must be understood. The overall objective is to manage water balance to maintain the quantity of surface water and groundwater contributions to these features. Baseline ecological conditions have been established to assess the water balance target for the Subject Lands. GEI will work with Crozier and Toronto Inspections to determine water balance targets for these features in the Final CEISMP.

Feature-Based Water Balance Risk Assessment

A feature-based water balance risk assessment was completed for retained wetland communities along the Greenbelt Plan Area in accordance with TRCA's Wetland Water Balance Risk Evaluation guidelines (2017b).

A review of the retained wetlands along the West Tributary of the West Humber River was completed. As shown on **Figure 12** (**Appendix A**), two wetlands (MAM2-2) will be retained within the Greenbelt Area. Based on the proposed site plan, the change in catchment size for both MAM communities was determined to have a low magnitude of hydrologic change. Based on the vegetation community type (both communities were MAM2-2), sensitivity of fauna species (both communities had low sensitivity), sensitivity of flora species (the western MAM2-2 community had low sensitivity and the eastern MAM2-2 community had a medium sensitivity) and SWH criteria (both communities had low sensitivity), it was determined that the western MAM2-2 had a low sensitivity, and the eastern MAM2-2 had a medium sensitivity. Based on the magnitude of hydrological change and sensitivity of the wetland, the risk assessment confirmed both wetlands are considered low risk. As discussed within Figure 3 (Wetland Risk Evaluation Decision Tree) of TRCA's Wetland Water Balance Risk Evaluation Guidelines (2017), no monitoring is required for these retained features. no monitoring is required for these retained features.

In detailed design, a non-continuous hydrological model (e.g., Thornthwaite Mather) will be run to ensure that the monthly hydroperiod requirements for each wetland will be maintained. This hydrological model will consider inputs from LIDs and other stormwater infrastructure, which will be further defined in detailed design.

As previously stated, a wetland feature-based water balance will be completed for the Final CEISMP and SWS to review hydroperiods of retained features and develop mitigation strategies to maintain their functions as site changes occur due to the proposed development.

4.3 Terrestrial Ecology

An assessment of terrestrial resources was undertaken as part of this CEISMP and meets the intent of the requirements of a subwatershed study. The following assessment methods were used, in accordance with methods described in the Terms of Reference for Local Subwatershed Studies presented in the SABE.

Detailed field assessment of terrestrial resources has been used to characterize the terrestrial environment and establish a baseline terrestrial environment for the Secondary Plan Area, including the proximity to, and the degree of linkage with other habitats.

Specific consideration has been given to the location and relationship of features and areas within the NHS and opportunities for enhancement of the terrestrial environment has built upon those identified in the SABE scoped Subwatershed study, including confirmation of enhancement area objectives and targets.

4.3.1 Natural Heritage Cover

The current natural cover within the Subject Lands is 36.89 ha and is associated with the natural heritage features of Salt Creek, the East Tributary as well as the West Tributary of the West Humber River within the Greenbelt. This total considers all wetlands (staked, ELC, and MNRF identified), the top of slope (TRCA), the long term stable top of slope (GEI), crest of slope (TRCA), meander belt (GEI), woodlands (dripline and ELC) and the regional floodline (Crozier) of the October 2023 site plan. A detailed review of natural cover to remain post development as well as new natural cover is to be completed in the Final submission of the CEISMP. At the Final CEISMP submission, a figure will be provided detailing the net gain and loss of natural cover within the Subject Lands.Ecological Land Classification

The Study Area consists primarily of anthropogenic vegetation cover, such as agricultural fields and old field meadows with surrounding residential properties. The agricultural fields are actively managed (row crop, planted hay or actively browsed pasturelands). Wetlands are present, associated with HDFs and ponds. Forest communities are also present, though restricted to the valleyland corridor in the Greenbelt Plan Area, and immediately north of the site outside the Subject Lands and Study Area. Six ELC communities were classified to Vegetation Type, while four communities were classified to Ecosite. Overall, these can be broadly quantified as:

- Agricultural = 120.3 ha (79%)
- Cultural = 15.0 ha (10%)
    - Cultural Meadow = 12.5 ha
    - Cultural Thicket = 2.5 ha
- Forest = 3.1 ha (2%)
- Marsh = 5.2 ha (3%)

- Thicket Swamp = 0.2 ha (0.2%)
- Other (e.g., hedgerows, residential, etc.) = 8.2 ha (5%)

ELC mapping of the Subject Lands is shown on **Figure 3 (Appendix A).** A description of each ELC unit is provided in **Table 2** (**Appendix B**). No provincially rare vegetation communities were present on the Subject Lands (NHIC, 2021). Surveys completed by GEI show that wetland is present on the Subject Lands, occupying approximately 4.9 ha overall. The community types observed all have mineral soils and consist of marsh and thicket swamp. These wetlands and associated boundaries were confirmed by GEI staff using the '50/50 rule', where features having over 50% cover of wetland plants were classified as wetland. These boundaries (excluding wetland within the Greenbelt Plan NHS) were later verified by the TRCA on July 5 and October 22, 2021.

The LIO database was accessed to determine if any MNRF-identified wetlands have been mapped on or in the vicinity of the Subject Lands. Such wetlands could include Provincially Significant Wetlands, MNRF evaluated wetlands, or unevaluated wetlands. Results show that eight wetland units (unevaluated) occur on the Subject Lands. Wetland mapping prepared by the MNRF is not always conclusive and is continuously subject to updates and refinements; in many instances, MNRF wetland mapping is developed through imagery analysis without ground verification. The wetland mapping used for analysis in this report was prepared by GEI and is based on ground-truthed observations.

No provincially significant wetlands, as mapped by MNRF, occur on or within 750 m of the Subject Lands.

4.3.2 Botany

Botanical inventories completed on the Subject Lands identified a total of 183 species of vascular plants. Of that number, 94 (51%) are native and 89 (49%) are exotic. A full species list is included in **Table 3 (Appendix B).**

The majority of the native species (90%) are ranked S5 (common and secure in Ontario). Seven species (7%) are ranked S4 (apparently common secure in Ontario; NHIC, 2021b), while the remaining 3% do not have an assigned rank (e.g., native hybrid species). No federally or provincially protected plants were observed, nor were there observations of provincially rare plants. Overall, none of the species had a co-efficient of conservation value of 9 or 10. Nine regionally rare plants were observed, as per the Peel Region rarity rankings (Varga et al. 2005):

- Old Field Aster (*Symphyotrichum pilosum var. pilosum*); R1
- Common Hornwort (*Ceratophyllum demersum*); R3
- Peach-leaved Willow (*Salix amygdaloides*); R6
- Sandbar Willow (*Salix interior*); R5
- White Spruce (*Picea glauca*); R3
- Northern Watermeal (*Wolffia borealis*); R2
- Columbia Watermeal (*Wolffia columbiana*); R3

- Leafy Pondweed (*Potamogeton foliosus* ssp. *foliosus*); R7
- Small Pondweed (*Potamogeton pusillus*); R3

An NHIC search was conducted for the Subject Lands using the MNRF Biodiversity Explorer. No rare or protected plants have been historically documented on or in the vicinity of the Subject Lands.

Invasive species are those that can become (or presently are) a serious problem within a defined location. These species reproduce and spread aggressively, reducing the local biodiversity, and threatening ecological function. Depending on existing conditions, some invasive species can outcompete all other species.

Urban Forest Associates (2002) provides a categorical ranking system for species known to be invasive in southern Ontario. Of the 183 species observed on the Subject Lands, ten (5.5%) are ranked as Category 1 by Urban Forest Associates.

Category 1 species are deemed to be the most invasive and can dominate a site to exclude all other species, remaining dominant on the site indefinitely. These are a threat to natural areas wherever they occur because they have very effective reproduction and dispersal mechanisms, allowing them to move long distances. These are regarded as a top priority for control, where eradication and follow-up monitoring are often necessary to ensure its effective removal, where sought. The ten Category 1 species observed on the Subject Lands are:

- European Swallowort (*Vincetoxicum rossicum*)
- Canada Thistle (*Cirsium arvense*)
- Dame’s Rocket (*Hesperis matronalis*)
- Exotic Honeysuckle (*Lonicera tatarica* and *L.* x *bella*)
- Garlic Mustard (*Alliaria petiolata*)
- Purple Loosestrife (*Lythrum salicaria*)
- European Buckthorn (*Rhamnus cathartica*)
- Manitoba Maple (*Acer negundo*)
- Flowering Rush (*Butomus umbellatus*)
- European Reed (*Phragmites australis ssp. australis*)

4.3.3 Tree Inventory

A tree inventory (**Appendix J)** was completed for all trees on and within 6 meters of the Subject Lands as per Town of Caledon requirements to complete detailed health assessments (biological, structural, and overall). An Arborist Report was prepared by GEI (**Appendix G)** and submitted to the Town in Spring 2022. This report included recommendations for preservation of 20 of the 629 trees inventoried. These recommendations will be updated in the forthcoming arborist report. In response to comments provided by the Town, a follow-up report was prepared and submitted in 2023 to address Phase One soil stripping work only. A Phase Two Arborist Report is currently underway for all trees on and adjacent to the subject property and will be provided with the Final CEISMP. This report will take into considerations tree removals required for Phase One works and will consider opportunities for tree preservation throughout the site based on the Town’s *Terms of Reference for Arborist*

Reports, Tree Preservation Plans and Tableland Tree Removal Compensation and the Town of Caledon's *Official Plan Section 6.2.1.6.2*. Any tree removals should be conducted outside of designated timing windows as per the Migratory Birds Convention Act.

4.4 Wildlife

Summaries of targeted wildlife surveys completed within the Subject Lands are provided below. A master list of all wildlife recorded both individually and during field investigations is provided in **Table 4**, **Appendix B**.

4.4.1 Amphibian Call Count

A total of ten amphibian call count stations were surveyed within the Subject Lands. Stations were located within swamps, marshes, and ponds (**Figure 4**, **Appendix A**).

A total of three amphibian species were documented during the targeted amphibian call count surveys, and one amphibian species (Northern Leopard Frog; *Lithobates pipiens*) was recorded incidentally during turtle basking surveys. All four species were provincially ranked S5. A table documenting the results of the Amphibian Call Count Surveys is provided in **Table 5**, **Appendix B**).

4.4.2 Turtle Basking Survey

A total of three turtle basking stations were established to survey five features within the Subject Lands (**Figure 5**, **Appendix A**).

Two turtle species were recorded within the Subject Lands in the anthropogenic ponds associated with the East Tributary to the West Humber River. Midland Painted Turtles (*Chrysemys picta*) are provincially ranked S4. The Snapping Turtle is provincially ranked as Special Concern. A table documenting the results of the Turtle Basking Surveys is provided in **Table 6**, **Appendix B**)

4.4.3 Birds

A total of 11 point count stations were surveyed within the Subject Lands and are illustrated on **Figure 6** (**Appendix A**).

Forty-two (42) bird species were observed within the Subject Lands during Breeding Bird Surveys (BBS). Of this total, nine species are confirmed, 14 are probable and 16 are possible breeders on the Subject Lands. The remaining three bird species are considered non-breeders, flyovers, or migrants. No additional species were observed on the surrounding lands within 120 m. The observed breeding bird species are discussed in the sections below. All species observed on the Subject Lands are listed in **Table 7** (**Appendix B**)**.** One additional species, Common Raven (*Corax corax*; S4B, G5) was observed nesting on a barn silo during amphibian surveys in April, but the nest had fledged and the young had departed the lands before the BBS was conducted.

A total of 39 (100%) of the confirmed, probable, or possible breeders are provincially ranked S5, S4 or SNA (species not native to Ontario). No bird species are considered provincially rare (S1-S3; NHIC 2021b).

The following SAR birds were observed on the Subject Lands:

Bobolink: Threatened in Ontario

Bobolink were detected on eight point count stations. An estimate of population size was determined by the spatial distribution of males detected, due to their conspicuous plumage and behavior. Females are easily overlooked due to their secretive behavior and dull plumage and present a more difficult method to estimate how many birds are present. As such, a minimum of 37 male Bobolink were observed on the subject lands. Breeding was confirmed on multiple occasions, throughout the site where suitable habitat, mainly hay and pasture, was found during surveys completed in 2021.

Eastern Meadowlark: Threatened in Ontario

Meadowlarks were observed at four point count stations during round one and five stations during round two during surveys completed in 2021. Population size was determined to consist of two male territories during round one and 3 male territories in round two. Meadowlark is polygamous and therefore a male may have several females in one territory.

4.4.4 Bats

4.4.4.1 Bat Habitat

All trees that overlap with the proposed development plan were assessed for suitability for roosting bats. While only woodland communities can be considered candidate habitat for SWH Bat Maternity Colonies, any tree can be considered roosting habitat under the ESA for SAR bat species.

One woodland exists on the Subject Lands, in the Greenbelt NHS. This forest community was considered candidate SWH for Bat Maternity Colonies and will be protected.

All hedgerow trees and trees identified elsewhere on the Subject Lands were assessed for suitability for roosting by SAR bats and are presented on **Figure 7** (**Appendix A**).

4.4.4.2 Bat Acoustic Surveys

Two acoustic monitoring stations set up on the Subject Lands associated with suitable roosting trees for bats, as shown on **Figure 7** (**Appendix A**). A total of 4 passes of an 'Unknown *Myotis'* species were recorded at the monitoring station TULL2. No bat SAR were recorded at monitoring station TULL1. A summary of all bats recorded is provided in **Table 4**, **Appendix B**.

Acoustic monitoring station TULL2 was located in a hedgerow near a large pond (refer to **Figure 7**, **Appendix A**). Therefore, based on the low number of 'Unknown *Myotis*' species passes recorded (i.e., four passes over 11 nights) and the presence of a large pond near the recording site, it is assumed that the species was foraging in the area, and not using the area for roosting or breeding.

Furthermore, we assume that the species may be roosting offsite or in the higher quality forests associated with the West Tributary of the West Humber River, or the woodland north of the Subject Lands associated with Salt Creek.

4.5 Aquatic Ecology

Aquatic ecology studies have been completed in accordance with assessment criteria for Phase 1 of the subwatershed study for the purpose of assessing the potential impacts of future land uses.

Recommendations have been identified for improvement of aquatic habitat, including removal of barriers and on-line ponds, and retrofitting existing altered habitats. The assessment relates physical characteristics and processes of the aquatic environment to biological communities.

Detailed assessment has focused on the significant areas identified and areas immediately downstream of the Subject Lands.

Three regulated watercourses were identified through the TRCA online mapper (as shown on **Figure 2**, **Appendix A**). Two features (East and West Tributaries) were associated with the West Humber River. The third feature is Salt Creek in the northwest portion of the Subject Lands.

A constraint ranking has been assigned to each watercourse to identify potential management approaches. Specifically, two constraint rankings have been considered including Medium Constraint and High Constraint. Those features not warranting a Medium or High Constraint ranking were further considered as HDFs.

High Constraint watercourses meet TRCA's criteria to be considered a regulated watercourse. No realignment/relocation or large-scale alterations of these watercourses would typically be permitted as a result of the significance and sensitivity of the feature. Typically, High Constraint watercourses are permanently flowing, with well-defined channel morphology with a range of substrates, established riparian vegetation communities that provide important riparian function and a diverse resident fish community. The recommended management approach for High Constraint watercourses would be to protect them in place with appropriate ecological buffers and hazard setbacks. Small scale alterations may be permitted for restoration or localized SWM infrastructure (e.g., SWM pond outfalls), but realignment/relocation would not be permitted.

Medium Constraint watercourses meet TRCA's criteria to be considered a regulated watercourse but lack important characteristics that would warrant protection in place. As a result, Medium Constraint watercourses can be realigned/relocated, provided appropriate designs (using natural channel design; NCD) and appropriate buffers/setbacks are included in the corridor. Medium Constraint watercourses are typically intermittently flowing and lack well-defined natural morphology and riparian vegetation. They may provide seasonal fish habitat when wet in the spring and/or may provide indirect fish habitat functions (e.g., flow conveyance, water quality regulation, organic and inorganic materials) to support downstream direct habitat. Typically, Medium Constraint watercourses have been altered as a result of local land use (e.g., channelization and alterations to natural riparian vegetation due to agriculture).

4.5.1 Watercourse Characterization and Constraint Rankings

A general characterization of each of the watercourses (East and West Tributaries, and Salt Creek) within the Subject Lands is discussed below. No targeted aquatic habitat assessments were completed within these features. Watercourses and associated constraint rankings for each feature is shown on **Figure 8** (**Appendix A**).

4.5.1.1 West Tributary

The West Tributary of the West Humber River enters the site under Torbram Road via a large Corrugated Steel Pipe culvert. The watercourse flows south-east across the south-eastern corner of the property before exiting the site under Mayfield Road. The Mayfield Road crossing is a large bridge structure.

This watercourse is a permanently flowing feature that is classified as a coolwater system and supports various fisheries, including being identified as Redside Dace habitat (as discussed above within **Section 3.1.6** of this report). The West Tributary is located within a well-defined valleyland, which is generally well vegetated along both banks. This feature is largely naturalized and relatively undisturbed. Various channel morphologies were recorded including riffles, pools and run habitats.

As a result of these characteristics, it was confirmed that this feature meets the criteria to be considered a regulated watercourse and was assigned a High Constraint ranking as a result of the degree of naturalness, prominence on the landscape and designated habitat for SAR (i.e., Redside Dace).

4.5.1.2 East Tributary

The East Tributary of the West Humber River originates within the lower third of the Subject Lands. This feature receives inputs from HDFs upstream of the Upper Pond; however, it does not begin to become a defined watercourse feature within the Subject Lands until downstream of the Upper Pond. While TRCA's mapping illustrates that the East Tributary contains two regulated watercourses (formerly associated with HDFs H6 and H7) these drainage features have been identified as Watercourses 1 and 2 (as discussed further below). The East Tributary exits the Subject Lands under Mayfield Road via a box culvert that was recently upgraded as a result of the Mayfield Road Municipal Class EA (Stantec Consulting Ltd. 2004).

The East Tributary contains two ponded features (identified as the Upper and Lower Ponds) with constructed earthen berms. Incidental observations of the berms during ecological inventories suggested that these berms were not stable. Moreover, a perched culvert was observed at the upper berm that would act as a permanent barrier to fish migration. The perched height of culvert at the downstream side of the Upper Pond was 34 cm, with a jump height measured at 15 cm during early spring assessments. Moreover, severe evidence of mass wasting/slumping was recorded at the downstream end of the Upper Pond, further illustrating the unstable nature of the berms. The Lower Pond appeared to drain through the berm (either through an eroded culvert or seeping through the berm) before outletting into a wetland unit, which ultimately flowed under Mayfield Road. The Lower Pond berm also appeared to act as a migratory barrier for fish movement. A SWM pond outlet from the adjacent (eastern) property was identified immediately south of the Lower Pond. The East Tributary has been assessed as contributing Redside Dace habitat (as discussed further within **Section 5.1.7**); however, it should be noted that the East Tributary is highly altered and degraded as a result of historic land-management within the Subject Lands. Both ponds likely contribute significant warming to downstream fisheries. As a result, this branch is assumed to support warmwater fish habitat. The two constructed berms act as permanent barriers to fish migration within the East Tributary.

As a result of these characteristics, it was confirmed that the East Tributary meets the criteria to be considered a regulated watercourse immediately downstream (south) of the Upper Pond and was assigned a Medium Constraint ranking.

Within the East Tributary, two drainage features flow into the Upper Pond. During consultation with TRCA, it was noted that several reaches previously identified as HDFs, including H6S1, H6S2, H7S1 and H7S2, should be considered regulated watercourses instead of HDFs.

GEI and Croziers completed an analysis of the drainage areas of these features and confirmed that they are generally greater than 50 ha. Accordingly, these reaches are being treated as regulated watercourses, and labeled as Watercourse 1 (west arm) and Watercourse 2 (east arm) as shown on **Figure 8** (**Appendix A**). Characterizations of these watercourses are provided below and may change with proposed upcoming changes to policies guiding management of aquatic resources.

Watercourse 1 (formerly identified as HDF H6)

This watercourse is an approximately 920 m long, 16 to 40 m wide linear meadow marsh, originating in the middle of the property and terminating at the Upper Pond. The reach was flowing in early spring, but was reduced to periodic, isolated standing pockets of water by late spring. The reach was fully dry upon summer assessment. Some portions of the wetland contain a defined channel, while others have no or limited channel definition. No fish were captured in the reach during the fish community assessment, and it does not generally appear capable of providing direct fish habitat. The watercourse was determined to not provide suitable amphibian breeding habitat.

Watercourse 1 was assigned a Medium Constraint ranking given ongoing impacts from adjacent agricultural practices and the presence of several tractor crossings.

Watercourse 2 (formerly identified as HDF H7)-

This watercourse originates at the northern property line and flows in a southerly direction towards the Upper Pond. The upstream portions of this watercourse generally consist of undefined features or swales that run through cattle pasture and cropped agricultural lands. These upstream reaches were either flowing or standing in early spring but were dry by late spring. The downstream most portion is a wetland associated with the Upper Pond. That section of the watercourse contained flowing water in early spring but was reduced to isolated pockets of standing water within defined depressions by late spring. The reach was dry upon summer assessment.

Watercourse 2 was assigned a Medium Constraint ranking given impacts from adjacent agricultural practices including warming inputs from the cattle pond (discussed further in **Section 5.1.2**). Rehabilitation through the removal of ponds in this reach is recommended to restore natural channel functions and fisheries connectivity. Details on the restoration planned for this watercourse are outlined in **Section 8,** and pond removal in particular is discussed in **Section 8.3.1**.

Salt Creek

A portion of Salt Creek traverses the study area, as an intermittently defined channel within a confined valley setting. This reach of Salt Creek was identified by DFO mapping as occupied Redside Dace habitat. As such, the meander belt has been used to delineate the limits of habitat (i.e., 30 m from the meander belt). The meander belt was used to delineate habitat limits for Redside Dace, defined as the meander belt width, plus vegetated areas or agricultural lands within 30 metres of the meander belt.

The Geomorphic Assessment completed for this purpose can be found in **Appendix C** and is summarized in **Section 4.2.3.**

Salt Creek flows southeasterly through the northwest corner of the site. The channel geometry varies within the reach assessed due to the presence of flow obstructions like wood debris. Occasionally, multiple flow paths were present, as well as cut-off channels.

4.5.1.3 Headwater Drainage Feature Classification & Management Recommendations

As shown on **Figure 8** (**Appendix A**) a total of seven HDFs, comprised of 19 distinct reaches, were observed and evaluated on the Subject Lands. The physical and biological characteristics of each reach are briefly described in the following sections.

HDF H1

This feature, which consists of a single reach (H1S1), originates on the eastern side of Torbram Road, and flows into the West Humber River just upstream from the Mayfield Road bridge. There is no culvert at Torbram Road, so this feature only receives surface water runoff from the road and surrounding lands. The feature primarily consists of a wetland within a defined corridor through an agricultural field. The downstream end of the feature has been highly altered because of Mayfield Road construction. The reach contained flowing water in early spring and had pockets of flowing and standing water in late spring but was dry at the downstream end. The reach was dry upon summer assessment.

HDF H2

This HDF, which consists of a single reach (H2S1), originates from agricultural field runoff north of the West Humber River valley. The reach consists of an approximately 220 m long, 10 to 15 m wide, linear tableland wetland running along the top of the valley. As per the HDFA Guideline (CVC/TRCA 2014), the HDF was only delineated to the top of the valley slope. The HDF was flowing in early spring, although flow was observed to be dissipating into the valley slope and riparian area with no discharge to the West Humber River occurring. The HDF was dry in late spring.

HDF H3

This HDF, which consists of a single reach (H3S1), originates from agricultural field drainage west of Torbram Road and enters the Subject Lands via a culvert. From the culvert outlet, it runs within a swale for approximately 130 m before entering a pipe at the border with the adjacent residential property, which generally coincides with the vegetated valleylands of the West Humber River. Although the outlet of the pipe was not located, it is expected to discharge to the river. The feature was flowing in early spring, although by late spring it was generally dry at the upstream end with pockets of standing water in the lower reaches. However, there was minimal flow leaving the reach through the culvert at the downstream end. The downstream portions of this reach are somewhat entrenched due to erosion. The reach was dry upon summer assessment.

HDF H4

This swale, which consists of two reaches (H4S1 and H4S2), originates in an active agricultural field, and flows towards the East Tributary of the West Humber River. The swale contained flowing water in early spring and was dry in late spring. Reach H4S2 is located within the active agricultural field and reach H4S1 is located within a meadow where it flows down the slope toward the receiving watercourse. The downstream end of the reach has been highly altered by the Mayfield Road widening.

HDF H5

This HDF consists of two main reaches (H5S1 and H5S2) and one tributary HDF reach (H5S2a) flowing into the East Tributary of the West Humber River. The downstream reach (a swale) was flowing, and the upstream reaches (identified as undefined) contained standing water in early spring, while all reaches were dry in late spring. During the late spring assessment, soil addition to the agricultural field as part of normal agricultural practices on the property, had eliminated portions of the upstream reach of this HDF.

HDF H6

This HDF consists of several tributary HDFs that flow into Watercourse 1 (formerly HDFs H6S1 and H6S2). The HDFs generally consist of poorly defined swales or undefined features.

These HDFs, which run through agricultural crop land, were each flowing in early spring, but were dry by late spring.

HDF H7

This HDF consists of one main branch (H7S3) and four tributary HDFs off Watercourse 2 (formerly HDFs H7S1 and H7S2).

One HDF consisted primarily of an anthropogenic pond (also referred to as the cattle pond) on the tablelands east of Watercourse 2. The pond was constructed to supply water to a downstream cattle watering structure (via underground piping from the pond). Although the pond itself is expected to hold water throughout the year, limited hydrologic connection was documented during the spring freshet period where the pond overtopped its banks and flowed down a steep hill via an ill-defined, swale.

Other areas on the tablelands east of this pond were also investigated during the Round 1 assessment, given that they appeared to contain water on aerial images from spring 2019. This tableland cattle pasture does contain undulating topography with numerous depressions that do hold water during and following precipitation events. However, no outflow was observed from any of these areas, and as a result, they were not classified as HDFs.

4.5.1.4 Headwater Drainage Feature Classifications and Management Recommendations

Part 2 of the HDFA Guidelines (CVC/TRCA 2014) provides an approach to classify HDFs by providing a step-by-step characterization of specific functions that may be associated with the features assessed, including hydrology, riparian function and provision of fish or terrestrial habitat. **Table 8** (**Appendix B**) highlights the key components of this analysis based on the three rounds of HDFA completed in 2021, as well as the supporting fish community and amphibian surveys.

Part 3 of the HDFA Guidelines (CVC/TRCA 2014) provides guidance on linking the characteristics and functions of features to specific management recommendations that may be applied to those features. To assist, the HDFA Guidelines include Figure 2: “Flowing Chart Providing Direction on Management Options.” The flow chart depicts various decision points associated with hydrology, fish habitat, riparian vegetation, and terrestrial habitat, and ultimately leads the user to an appropriate management recommendation for each HDF segment. Management recommendations can include the following:

- Protection;
- Conservation;
- Mitigation;
- Maintain Recharge;
- Maintain/Replicate Terrestrial Linkage; or
- No Management Required.

The flow chart was used to determine the management recommendation for the HDFs on the Subject Lands based on the CVC/TRCA (2014) guidelines; this is provided in the second to last column of **Table 8** (**Appendix B**). As noted in the final column of **Table 8** (**Appendix B**), some feature or reach management recommendations were adjusted from the management recommendation based on the HDFA Guideline flow chart, to better reflect their ecological and hydrological importance on the landscape, based on site specific observations and proposed management approaches.

The resulting GEI management recommendations for each reach are depicted in **Figure 8** (**Appendix A**) and discussed in the following sections.

Only one HDF reach (H1S1) was identified for Protection. This reach consists of a wetland located within a defined valley corridor that provides contributing habitat for the downstream Redside Dace population. The majority of this HDF is located with the Greenbelt Plan area. As shown on **Figure 12** (**Appendix A**), no alterations to this HDF are proposed in the Site Plan.

Two HDF reaches (H2S1, H3S1) are recommended for Conservation, generally on the basis that they are wetlands and/or provide contributing habitat for the downstream (off-site) Redside Dace population. As per the HDFA Guideline (CVC/TRCA 2014) these reaches must generally remain on the landscape but can be realigned and/or relocated, provided that the important ecological and biophysical headwater functions they provide are maintained.

The majority of the remaining reaches have been identified for Mitigation on the basis of early spring hydrological function (i.e., conveyance of ephemeral flows to downstream watercourses). These reaches are generally dry by late spring and therefore only provide seasonal HDF functions, as well as flow conveyance during and following precipitation events. The function of these reaches will be replicated on site through stormwater management infrastructure including a combination of traditional stormwater management facilities water quality and temperature and also flood attenuation wetlands that provide consideration for extreme precipitation events by providing flood attenuation in addition to continuous passage opportunities for fish in a low flow channel that also provides improved allochthonous contributions to habitat for the East Tributary. Details on the flood attenuation wetlands and stormwater management infrastructure are being developed by Crozier and will be incorporated into the final CEISMP and SWS. However, a preliminary summary of details is provided in **Section 6.4.** The final design will also incorporate considerations detailed from the Department of Fisheries (DFO) and Ministry of Environment, Conservation and Parks (MECP) during the Request for Review and Information Gathering Form processes.

Six reaches have been identified as No Management Required (per the terminology in the HDFA guideline). These HDFs were only identified to contain standing water in the early spring but were providing no downstream flow conveyance. These features typically consisted of undefined or swale features within active agricultural crop land or cattle pastureland. The anthropogenic cattle watering pond (HDF H7S2B) was also included in this category as, even though it contains water on a year-round basis (to support cattle watering), it provides no headwater functions. The HDFs in this category can be removed from the landscape with no negative impact on headwater functions.

4.5.1.5 Slope Stability Analysis

In February of 2022 GEI completed a Slope Stability Report for the East and West Tributaries. The toe erosion allowance and stable slope were determined and combined to form the Long Term Stable Top of Slope (LTSTOS) through this study as per TRCA's Living City Policies (2014). In all cases, apart from one, the LTSTOS for slopes along the East and West Tributaries coincided with the existing Top of Slope as established by GEI in some locations and staked by TRCA in others. Agencies determined that the LTSTOS presented in **Appendix I** is acceptable.

An assessment of the LTSTOS for the Salt Creek system as it pertains to the Subject Lands is still under review at the time of this report. Delineation of this feature will be included as part of the final CEISMP and SWS.

4.5.2 Fish Community Sampling Results

Watercourse 1 and on-site ponds were electrofished and/or minnow trapped on May 7, 2021. Initially, MNRF issued a Scientific Collectors Permit to conduct fish community sampling within the ponds and associated HDFs for a July sampling date. GEI requested an amendment to the permitted collection date to sample the seasonal features within the Subject Lands. Ultimately, the MNRF approved an earlier sampling date within Watercourse 1 as well as Upper and Lower ponds and the cattle pond.

Fish community sampling was conducted within the above noted features. No fish were collected within Upper Pond, cattle pond or Watercourse 1; however, three juvenile Green Sunfish (*Lepois cyanellus*) were captured within minnow traps in Lower Pond. While no fish were collected within Upper Pond and the cattle pond, these ponds were known to have been historically stocked to support recreational fishing.

A Fish Collectors Report will be submitted to MNRF Aurora District summarizing survey results to satisfy permitting requirements.

5. Analysis of Natural Heritage Features

5.1 Provincial Policy Statement

Eight types of natural features are identified in the PPS (MMAH 2020):

- Significant wetlands;
- Significant coastal wetlands;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Fish habitat;
- Habitat of endangered and threatened species; and
- Significant ANSIs.

The presence/absence of these natural features on the Subject Lands are discussed in the subsequent sections of this CEISMP. The NHRM (MNRF 2010), Peel Region Official Plan (2018 Consolidation), Town of Caledon Official Plan (2018 Consolidation) and TRCA Ontario Regulations 166/06 were referenced to assess the potential significance of other natural features, and their associated forms and functions on the landscape.

Where natural features are present on the Subject Lands, their sensitivities are discussed.

5.1.1 Significant Wetlands

There are no Provincially Significant Wetlands identified in LIO mapping on or adjacent to the Subject Lands.

The MNRF no longer reviews or approves OWES files. The evaluation of a wetland is considered final after the evaluator deems it to be final per OWES requirements.

Final evaluations are submitted to the appropriate planning authority for filing purposes, and final boundaries are to be submitted to MNRF to update LIO database. All existing Provincially Significant Wetlands (PSW's) will retain the PSW status until a re-evaluation is completed.

5.1.1.1 Other Wetland Units

The following wetland communities were identified within the Subject Lands (**Figure 3, Appendix A**):

- Mineral Meadow Marsh (MAM2);
- Reed-canary Grass Mineral Meadow Marsh (MAM2-2);
- Pondweed Mixed Shallow Aquatic (SAM1-4)
- Shallow Aquatic (SA);

- Mineral Shallow Marsh (MAS2); and
- Willow Mineral Thicket Swamp (SWT2-2).

These vegetation communities were identified by GEI, and the outer boundaries were confirmed by TRCA. Each of these wetland communities are riparian, under 2 ha in size, and are associated with HDFs, watercourses and/or online ponds.

5.1.2 Significant Coastal Wetlands

Similar to significant wetlands, the MNRF or their designates identify significant coastal wetlands present on the landscape. Coastal wetlands are defined in the NHRM (MNRF 2010) as:

> *"Any wetland that is located on one of the Great Lakes or their connecting channels (Lake St. Clair, St. Mary's, St. Clair, Detroit, Niagara and St. Lawrence Rivers); or*
>
> *Any wetland that is on a tributary to any of the above-specified water bodies and lies, either wholly or in part, downstream of a line located two km upstream of the 1:100-year floodplain (plus wave run-up) of the large water body to which the tributary is connected."*

No significant coastal wetlands are identified on the Subject Lands.

5.1.3 Significant Woodlands

Significant woodlands are identified by the planning authority in consideration of criteria established by the MNRF. Under the NHRM (2010), woodlands are defined as:

> *"...treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels."*

In accordance with this definition, natural treed communities (FOC, FOD, FOM, SWC, SWD, mixed swamp) and cultural forest/plantation communities (CUW, CUP) are considered woodlands (i.e., meet the Forestry Act woodland density requirements).

As per the PPS, significant woodlands are to be defined using criteria established by the Province (i.e., NHRM, Recommended criteria). The general guidelines for determining significance of these features are presented in the NHRM for Policy 2.1 of the PPS and have been considered as guidance for assessment in this report. The criteria suggested by the NHRM for designating significant woodlands include size, shape, proximity to other woodlands or natural features, linkages, species diversity, uncommon characteristics, and economic and social values.

Two adjacent, forested ELC community types (Dry-Fresh Sugar Maple Deciduous Forest; FOD5 and Fresh-Moist Willow Lowland Deciduous Forest; FOD7-3) were identified within the Subject Lands along the West Tributary valley corridor in the Greenbelt NHS. This woodland unit is treated as significant.

Along the northeastern property boundary is a woodland community, herein referred to as the Salt Creek Valley woodlands. This feature is considered a significant woodland based on the size of the feature and it being identified as a Core Feature under the Regional OP.

5.1.4 Significant Valleylands

Significant valleylands are defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the NHRM (MNRF 2010) for Policy 2.1 of the PPS. Recommended criteria for designating significant valleylands includes prominence as distinctive landform, degree of naturalness, and importance of its ecological functions, restoration potential and historical and cultural values.

Table 8-1 of the NHRM provides recommended evaluation criteria for determining significant valleylands.

The West Tributary has been identified as a significant valleyland based on its landform-related functions and attributes, as well as its ecological features and functions.

The East Tributary has not been identified as significant due to the significant anthropogenic alteration that has occurred within the feature effecting the prominence and continuity of the landform within the greater landscape. Moreover, the East Tributary currently has poor linkage function due to the two man-made berm structures and created ponds (Upper and Lower Ponds).

The valleyland associated with Salt Creek could be considered provincially significant based on the presence of the following criteria identified within Table 8-1 of the NHRM (2010):

- Surface Water Functions (presence of riparian wetlands, Salt Creek is considered an intermittent feature);
- Landform Prominence;
- Degree of Naturalness (natural vegetation associated with feature);
- Habitat Value (Salt Creek identified as Redside Dace occupied habitat);
- Linkage Function (wildlife corridor generally north-south within the landscape);
- Restoration and Potential Value (restoration efforts could improve ecological benefits).

5.1.5 Significant Wildlife Habitat

SWH is one of the more complex natural heritage features to identify and evaluate. There are several provincial documents that discuss identifying and evaluating SWH including the

NHRM (MNRF 2010), the Significant Wildlife Habitat Technical Guide (MNRF 2000), and the SWH Eco-Region Criterion Schedule (MNRF 2015a). The Subject Lands are located in Eco-Region 6E and were therefore assessed using the 6E Criterion Schedule (MNRF 2015a).

There are four general types of SWH:

- Seasonal concentration areas;
- Rare or specialized habitats;
- Habitat for species of conservation concern; and
- Animal movement corridors.

General descriptions of these types of SWH are provided in the following sections.

5.1.5.1 Seasonal Concentration Areas

Seasonal concentration areas are those sites where large numbers of a species gather together at one time of the year, or where several species congregate. Seasonal concentration areas include deer yards; wintering sites for snakes, bats, raptors and turtles; waterfowl staging and molting areas, bird nesting colonies, shorebird staging areas, and migratory stopover areas for passerines or butterflies. Only the best examples of these concentration areas are usually designated as SWH.

5.1.5.2 Rare or Specialized Habitats

Rare and specialized habitat are two separate components. Rare habitats are those with vegetation communities that are considered rare in the province. SRANKS are rarity rankings applied to species at the ‘state’, or in Canada, at the provincial level, and are part of a system developed under the auspices of the Nature Conservancy (Arlington, VA). Generally, community types with SRANKS of S1 to S3 (extremely rare to rare-uncommon in Ontario), as defined by the NHIC (2021b), could qualify. It is to be assumed that these habitats are at risk and that they are also likely to support additional wildlife species that are considered significant. Specialized habitats are microhabitats that are critical to some wildlife species. The NHRM (MNR 2010) defines specialized habitats as those that provide for species with highly specific habitat requirements, areas with exceptionally high species diversity or community diversity, and areas that provide habitat that greatly enhances species’ survival.

5.1.5.3 Habitats for Species of Conservation Concern

Species of conservation concern include those that are provincially rare (S1 to S3), provincially historic records (SH) and Special Concern species. Several specialized wildlife habitats are also included in this SWH category, including Terrestrial Crayfish habitat, and significant breeding bird habitats for marsh, open country, and early successional bird species.

Habitats of species of conservation concern do not include habitats of endangered or threatened species as identified by the ESA (2019 Consolidation). Endangered and threatened species are discussed in **Section 5.1.7** (below).

5.1.5.4 Animal Movement Corridors

Animal movement corridors are areas that are traditionally used by wildlife to move from one habitat to another. This is usually in response to different seasonal habitat requirements, including areas used by amphibians between breeding and summer/over-wintering habitats, called amphibian movement corridors.

Table 9 (Appendix B) discusses SWH types present within the Subject Lands. Candidate and confirmed SWH types are illustrated on **Figure 9 (Appendix A)**. The following SWH have been identified on the Subject Lands:

- Candidate Bat Maternity Colonies (FOD5 and FOD7-3);
- Confirmed Habitat for Species of Conservation Concern- Snapping Turtle (East Tributary)

5.1.6 Significant Habitat of Endangered and Threatened Species

SAR and their habitats are considered provincially sensitive information. The survey methods, results and potential impacts to SAR species and their habitats will be submitted to the MECP through the Information Gathering Form (IGF), or similar processes. Due to the sensitive nature of this information, all correspondence and outcomes will remain with the MECP and its jurisdiction.

The following SAR and their habitat have been confirmed or are assumed present within or adjacent to the Subject Lands:

5.1.6.1 Bat SAR

All bats in the genus *Myotis* have been designated at Endangered on the SARO list and are afforded protection under the ESA (2007). As described in **Section 4.3.4**, surveys to assess potential bat SAR habitat and acoustic monitoring to identify bats have been undertaken within the Subject Lands. Bat habitat is assumed present within the deciduous forest communities in the Greenbelt NHS and associated with the West Tributary of the West Humber River. The remainder of the Subject Lands are not considered habitat for bat SAR.

Acoustic monitoring identified a total of 4 passes of ‘Unknown *Myotis*’ species was recorded at the monitoring station TULL2 (Refer to **Figure 7**, **Appendix A**). This acoustic monitoring station was located in a hedgerow near a large pond. Therefore, based on the low number of ‘Unknown *Myotis*’ species passes recorded (i.e., four passes over 11 nights) and the presence of a large pond near the recording site; it is assumed that the species was using the pond as foraging and/or drinking habitat.

5.1.6.2 Bobolink and Eastern Meadowlark

Both Bobolink and Eastern Meadowlark are designated as Threatened on the SARO list and receive protection under the ESA (2007). As described in **Section 4.4.3**, through breeding bird surveys conducted within the Subject Lands, both species were confirmed breeding in suitable habitats within the Subject Lands. Suitable habitats include agricultural fields with hay, and pasture used to support the farm cattle.

Bobolink were detected eight-point count stations (Stations: 2, 3, 5, 6, 7, 8, 9 and 11) during the first round of surveys and at six point count stations (Stations: 3, 5, 6, 7, 8 and 9) during the second round. Both adult males and females were observed.

Eastern Meadowlark were observed at four-point count stations during round one (BBS Stations: 3, 6, 7, and 8) and five stations during round two (BBS Stations: 3, 4, 5, 6 and 7). Population size was determined to consist of two male territories during round one and three male territories in round two.

Since the time of surveys in 2021, the agricultural use on-site has transitioned from cattle to row crop agriculture. As a result, the hay or pasture lands formerly used by these species are no longer present. Suitable habitat continues to exist in the Humber River valley within the Greenbelt.

Locations of the point count stations are provided on **Figure 6**, **Appendix A**.

5.1.6.3 Redside Dace

Salt Creek

Salt Creek was identified within the northeastern portion of the Study Area to contain Occupied Habitat for Redside Dace. The watercourse was dry on two occasions , which suggests that this feature is seasonally (intermittently) wet. However, Salt Creek is still classified as a permanent stream, assumed to support seasonal, direct cool-water fish habitat.

West Humber River

The portion of the main branch of the West Tributary of the West Humber River flowing through the southwest portion of the Subject Lands is also identified by DFO and MECP as “occupied habitat” for Redside Dace. Regulated habitat in this area would consist of all naturally vegetated and agricultural lands within 30 m of the meander belt on each side of the watercourse. No other watercourses or HDFs on the Subject Lands are considered to be “occupied” or recovery habitat for Redside Dace (i.e., they don’t provide direct habitat, nor have the potential to provide direct habitat for the species at any point in the future).

In addition to occupied or recovery habitats, Section 29.1(1)(v) of O. Reg. 242/08 under the ESA (2007) indicates that within the Regional Municipality of Peel, the following areas are also prescribed as the habitat of Redside Dace:

> “*a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i or ii, provided the part of the stream or watercourse has an average bankfull width of 7.5 m or less”.*

This type of habitat prescribed in the regulation is considered to be “contributing” habitat for Redside Dace, since it helps maintain flow, sediment, and water quality conditions within occupied habitat. Therefore, an assessment was completed to confirm if the East Tributary and any of the HDFs present on the Subject Lands were considered to be contributing habitat.

The East Tributary on the Subject Lands (i.e., downstream from the Upper Pond and Lower Pond) flows into the West Humber River approximately 800 m downstream from Mayfield Road. Based on aerial photo interpretation, the West Humber River appears to have a bankfull width <7.5 m where the East Tributary discharges and therefore, the East Tributary watercourse could be contributing if it meets the other criteria. This watercourse provides hydrological contributions; it flows beneath the Mayfield Road bridge as seen by staff in May 2021. Therefore, it appears the watercourse contributes baseflows to the downstream occupied Humber River watercourse. Based on this, the portion of the watercourse on the Subject Lands is considered to provide contributing Redside Dace habitat. However, the value of that contributing habitat is relatively limited based on the presence of the Upper and Lower Ponds. Both ponds are expected to cause thermal impacts downstream due to elevated water temperatures given the relatively large pond surface area and surface outlets. Therefore, the presence of these ponds may actually be impairing the suitability of downstream Redside Dace habitat. Further, the ponds are expected to be a sink for any coarse sediment that could potentially be flowing in from upstream HDFs, interrupting sediment transport downstream.

The HDFs on the Subject Lands were also evaluated to determine if they provided contributing habitat for the downstream Redside Dace population. Factors in this assessment included:

- All headwater wetlands (with the exception of H2S1, which did not have an observed hydrological connection with the West Humber River) and Watercourses 1 and 2 were considered to be contributing habitat on the basis that they were conveying flows on a seasonal basis and likely assist in maintaining downstream water quality to a limited degree.
- H3S1 was assessed as contributing habitat. Although it was not identified as a wetland, it flowed through meadow habitat on the Subject Lands and was providing downstream flow contributions in early and late spring, directly to occupied habitat in the West Humber River.
- HDFs that provided early spring flow but that were located within active agricultural fields were not identified as contributing habitat for Redside Dace. These HDFs typically consist of flow through row crops or cattle pasture lands, both of which are land uses that are expected to degrade water quality and impact hydrology and as a result, these reaches do not warrant status as contributing habitat. Hydrology of these areas will be addressed through conventional SWM and LID practices. Proposed restoration associated with the development may result in improved contributing habitat conditions relative to the existing agricultural land use associated with these HDFs.
- HDFs that were only identified as containing standing water were not considered to be contributing habitat as they do not augment downstream baseflows.

Contributing habitat status for each HDF reach is identified in the "Step 3. Fish Habitat" column of **Table 4** (**Appendix B**) along with the supporting rationale, based on the above-noted criteria. Contributing habitat designations will need to be confirmed with MECP through the Information Gathering Form process, which is ongoing at the time of this report.

5.1.7 Fish Habitat

Fish habitat, as defined in the federal *Fisheries Act,* c. F-14, means "spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes." Fish, as defined in S.2 of the *Fisheries Act*, c. F-14, includes "parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals."

The West Tributary and Salt Creek are identified as permanent, direct fish habitat as both support fish year-round. As previously discussed, it is known that fish were historically anthropogenically stocked within the Upper and Lower ponds to attract locals to recreationally fish. Fish were collected using minnow traps during targeted sampling efforts within the Lower Pond. While no fish were collected or observed within the Upper Pond during targeted surveys, it is possible that fish may be present within the feature from historical stocking activities. The Upper Pond is identified as candidate, permanent direct fish habitat while the Lower Pond is identified as (confirmed) permanent, direct fish habitat. It should, however, be recognized that fish would not have been able to naturally migrate into these ponded features due to the fish barriers (perched culverts in manmade berms) at the Lower and Upper Ponds. The cattle pond (HDF H7S2B) is an anthropogenic pond that is weakly connected following large storm events and/or spring freshet where the pond overtops it banks and flows down a steep gradient in an agricultural field into receiving Watercourse 2. This pond has been identified as not providing fish habitat.

One anthropogenic pond appears to be located behind the northern shed structure. During site investigations, it was observed to have limited connectivity to Salt Creek, though it could support amphibian and reptile species. Detailed assessments during spring freshet period should be conducted to understand whether this pond is (seasonally) hydrologically connected to Salt Creek and to determine its value for amphibian and turtle habitat.

All reaches assigned a conservation and/or mitigation management recommendation and that did not have fish captured within them provide indirect fish habitat to downstream fisheries. Features designated as providing indirect fish habitat contribute allochthonous materials and flows to downstream habitats. Reaches assigned no management recommendation provided no fish habitat.

Figure 10 (Appendix A) illustrates direct, indirect and no fish habitat within the Subject Lands.

5.1.8 Significant Areas of Natural and Scientific Interest

No ANSIs were identified on or within the general vicinity of the Subject Lands.

5.1.9 Summary of Key Natural Heritage Features under the PPS

The following confirmed and candidate significant natural heritage features were identified within the Subject Lands:

- Significant Woodlands (West Tributary valley woodlands and Salt Creek valley woodlands);
- Significant Valleylands (West Tributary and Salt Creek);
- SWH (candidate Bat Maternity Colonies and confirmed Habitat of Species of Conservation Concern – Barn Swallow, Snapping Turtle);
- Habitat for Endangered and Threatened Species (Redside Dace- occupied and contributing habitat)
- Fish Habitat

5.2 TRCA Regulated Features

Pursuant of Ontario Regulation 166/06, the TRCA has the authority to regulate development within its regulated areas. The TRCA regulates the following features:

- *"Lands adjacent to or close to the shoreline of the Great Lakes-St. Lawrence River System that may be affected by flooding, erosion or dynamic beaches;*
- *River or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse;*
- *Hazardous lands;*
- *Wetlands; and*
- *Other areas where development could interfere with the hydrologic function of a wetland, including areas up to 120 m of all PSWs and wetlands greater than 2 ha in size, and areas within 30 m of wetlands less than 2 ha in size."*

The East and West Tributaries and Salt Creek would be considered regulated features under the TRCA as they are watercourse features with defined beds and banks. The East Tributary meets the criteria to be considered a regulated watercourse immediately downstream (south) of the Upper Pond. In addition, as discussed above within **Section 4.2**, following discussions with the TRCA, two regulated watercourses (Watercourses 1 and 2; formerly assessed as HDFs H6 and H7) associated with the East Tributary were also identified upstream of the Upper Pond (see **Figure 8, Appendix A**). All wetland communities (MAM2, MAM2-2, MAS, SA, SWT2-2) present within the Subject Lands are also regulated features; no wetland features exceed 2 ha in size.

Within the East Tributary, two drainage features flow into the Upper Pond. During consultation with TRCA, it was noted that several reaches previously identified as HDFs, including H6S1, H6S2, H7S1 and H7S2, should be considered regulated watercourses instead of HDFs. GEI and Croziers completed an analysis of the drainage areas of these features and confirmed that they are generally greater than 50 ha. Accordingly, these reaches are being treated as regulated watercourses, and are labeled Watercourse 1 (west arm) and Watercourse 2 (east arm) as shown on **Figure 8** (**Appendix A**).

The portion of Watercourse 1 that flows through Block 1 will be addressed through compensation in lieu under agreement with the TRCA (detailed in **Section 7.2.1.1**). Review of Watercourse 2 has not yet occurred with agencies. Replication of the form and function of these watercourses is contingent upon findings and recommendations from the DFO and MECP permitting processes (Request for Review and IGF, respectively). These findings will be used to illustrate the replication of these features if required within the proposed restoration areas.

5.3 The Ecosystem Framework as Per the Town of Caledon Official Plan

As per Table 3.1 of the Town's OP, the following ecosystem components of the Town's Ecosystem Planning Strategy are identified on the Subject Lands:

Natural Core Areas and Natural Corridors:

- Significant Woodlands (West Tributary valley woodlands and Salt Creek valley woodlands);
- SWH (candidate Bat Maternity Colonies and confirmed Habitat of Species of Conservation Concern – Snapping Turtle, Barn Swallow);
- Habitat for Endangered and Threatened Species (Redside Dace - contributing and occupied habitat); and
- All valley and stream corridors (West Tributary, East Tributary and Salt Creek); and
- All KNHFs and KHFs and their VPZs identified as part of the Greenbelt.

Supportive Natural Systems and Natural Linkages

- Other wetlands (MAM2, MAM2-2, SWT2-2, SAM1-4, SA, MAS) and wetland adjacent lands

5.4 Key Natural Heritage and Hydrologic Features per Region of Peel Official Plan

The Region of Peel Official Plan (2022 Consolidation) identifies the following key natural heritage and hydrologic features as part of the NHS of the Greenbelt Plan:

- Key Natural Heritage Features (KNHF)
    - Significant habitat of endangered, threatened and special concern species;
    - Fish habitat;
    - Wetlands;
    - Life Science ANSIs;
    - Significant valleylands;

  - Significant woodlands;
  - SWH;
  - Sand barrens, savannahs, and tallgrass prairies; and
  - Alvars.
- Key Hydrologic Features (KHF)
  - Permanent and intermittent streams;
  - Lakes (and their littoral zones);
  - Seepage areas and springs; and
  - Wetlands.

As previously discussed, the following KNHF and KHF may be present within the Subject Lands:

Key Natural Heritage Features:

- Significant habitat of endangered, threatened and special concern species (Redside Dace - contributing and occupied habitat);
- Fish habitat;
- Wetlands (MAM2, MAM2-2, SWT2-2, SAM1-4, SA, MAS);
- Unevaluated wetlands (MAM2, MAM2-2, SWT2-2, MAS);
- Significant valleylands (West Tributary and Salt Creek);
- Significant woodlands (West Tributary valley woodlands and Salt Creek valley woodlands);
- SWH (candidate Bat Maternity Colonies and confirmed Habitat of Species of Conservation Concern – Snapping Turtle, Barn Swallow);

Key Hydrologic Features:

- Permanent (West Tributary and Salt Creek) and intermittent (East Tributary) streams; and
- Wetlands (MAM2, MAM2-2, SWT2-2, SAM1-4, SA, MAS).

5.5 Existing Ecological Constraints Analysis

As described in **Section 5.3**, KNHF and KHF are present within the Subject Lands. In accordance with Section 7.3.1.4 of the TRCA's Living City Policies (2014), Town of Caledon OP (2018), Region of Peel OP (2022) and Section 3.2.5 of the Greenbelt Plan (2017a), the following setbacks were considered to both protect natural features where possible and inform development of the site plan.

- 30 m setback from significant valleylands for the West Tributary as determined through the floodline mapping from Crozier;
- 15 m setback from significant valleylands for Salt Creek as determined through the floodline mapping from Crozier;
- 10 m setback from non-significant valleylands (East Tributary);

- 10 m setback from unevaluated wetlands or 30 m setback from provincially significant wetlands;
- 30 m setback from the staked Significant Woodland Limit (FOD);
- 30 m setback from meander belt (West Tributary);
- 10 m setback from the Regulatory Floodplain; and,
- 30 m setback from meander belt to inform Regulated Redside Dace habitat and fish habitat (West Humber River and Salt Creek).

These features and associated setbacks are illustrated on **Figure 11**, **Appendix A**.

While the limit of contiguous vegetation was staked with TRCA, the limits of individual wetland units were not captured. ELC linework ground-truthed to submetre accuracy has been used to supplement field staking survey linework, and was confirmed acceptable to TRCA, as discussed with TRCA staff in the field in December 2021 and via email in January 2023.

Within the Region of Peel OP (2022), policy 2.14.7 states that development and site alteration within the Greenlands System shall be in accordance with the policies of the Region of Peel OP, subject to provincial legislation. While policy 2.14.8 notes that natural heritage features and areas within the Greenlands System shall be maintained, restored and diversity and connectivity improved.

In addition to the policies and constraints identified above, performance measures of the Town of Caledon's OP Ecosystem Planning Strategy and have been established for each component of the Ecosystem Framework identified in **Section 5.3**. As per Policy 3.2.4, all development within the Town of Caledon must satisfy these performance measures. Performance measures described for each natural heritage feature are provided below.

Woodlands

No development is permitted in Woodland Core Areas. This is upheld in the development proposal as Significant Woodlands are to be retained on the landscape and protected by a setback. The Restoration Plan, further detailed in Section 8, follows the recommendations by the Town to include establishing native forest ecosystems, infilling forest gaps, reconnecting fragmented woodlands and re-establishing the forest understory.

Wetlands

No Significant wetlands were identified on the Subject Lands. Although the remainder of the wetlands present on the Subject Lands are unevaluated, these features are under 2 ha and do not require evaluation under OWES (2022). New development is not permitted in 'other wetlands' unless it can be demonstrated that the development will not degrade the ecosystem integrity. A total of 9.037 ha of wetland, including buffers, is proposed for removal/replication as per the updated Draft Plan. Approximately 6 hectares of restoration habitat will be established within the Block 12 Environmental Protection Area. Block 12 will serve as a natural heritage system and be utilized for flood attenuation to manage extreme storm events. Additionally, two separate wetlands for stormwater management will be created on-site in Blocks 13 and 14. However, these wetlands are not considered in the wetland compensation calculation, as their primary function is stormwater management.

Habitat of Threatened and Endangered Species

No development is permitted within habitat of Threatened and Endangered Species. Management and restoration of these habitats shall comply to the Town's ecosystem goals and objectives, policies and performance measures, as well as any policies or guidelines established by the MECP. Identified SAR habitat for bats, Bobolink, Eastern Meadowlark and Redside Dace are confined within the Greenbelt Plan Area. This area will be retained on the landscape and buffered from the proposed development.

Any additional impacts to SAR will be addressed through a submission of an Information Gathering Form (IGF) submitted to the Ministry of Environment, Conservation and Parks (MECP).

Wildlife Habitat

No development is permitted within SWH. All wildlife habitat has been evaluated within the Subject Lands. Management and restoration of these habitats shall comply to the Town's ecosystem goals and objectives, policies and performance measures, as well as any policies or guidelines established by the MNRF. SWH identified on the Subject Lands include:

- Bat maternity colonies SWH identified within the Greenbelt will be retained and protected from development;

- Habitat for species of conservation concern (Barn Swallow). Structures containing Barn Swallow nests will be removed outside the active breeding season to avoid adverse impacts, and nesting structures will be considered for installation as part of the restoration of EPA blocks associated with the East Tributary and Salt Creek.

- Habitat for species of conservation concern (Snapping Turtle). Ponds associated with the East Tributary that are identified as SWH are proposed for removal. The restored NHS, including Salt Creek and West Tributary systems, will aim to continue to provide all critical habitat components, including overwintering habitat and existing ecological functions for this species where feasible, and where opportunity to incorporate these functions into the restoration plan is appropriate.

Valley and Stream Corridors

No development is permitted in valley and stream corridors. Risk management issues such as flooding and erosion shall be addressed though the planning process. The quality and quantity of surface water entering the valley and stream corridors will be maintained. The restoration and conservation of valley and stream corridors along with any steep slopes and slope instability areas is encouraged. A riparian habitat zone shall also be established.

No development is proposed within the West Tributary of the West Humber River or Salt Creek.

Fisheries

No development is permitted within Core Fishery Areas. Any development on lands adjacent to Core Fishery Areas will not harmfully alter, disrupt or destroy fish habitat. There will be no net loss but rather a net gain of productive capacity of fish habitat, if possible.

Direct fish habitat is identified with the West Tributary and Salt Creek. Under the Fisheries Act, a DFO Request for Review will be submitted to take measures to avoid and mitigate any potential impacts.

Groundwater

New development will protect, maintain and not negatively impact the quality and quantity of groundwater recharge and discharge as well as the flow distribution. Any potential impacts on groundwater by the proposed development shall be required to complete all necessary hydrogeological investigations. Detailed geotechnical and hydrogeological investigations for the CEISMP were completed by TIL, dated June 24, 2021, and June 30, 2021, respectively and are described under separate cover (TIL, 2021).

Greenbelt Key Natural Heritage and Key Hydrologic Features

No development within Greenbelt Key Natural Heritage Features and Key Hydrologic Features and their related Vegetation Protection Zones is permitted. The Greenbelt Plan Area will be retained on the landscape and protected from development.

6. Development Proposal

6.1 Development Plan Overview

The proposed development, as outlined in the Draft Plan (Weston Consulting, 2023), includes seven (7) development blocks, three (3) 26 m right-of-ways (ROWs), one (1) street reserve block and two (2) stormwater management (SWM) blocks (including a sediment drying area). The Draft Plan proposes no development within the Greenbelt Plan Area of the site. Details on the transportation ROWs are further detailed in **Section 6.5.**

Similar to the previous submission, the development plan identifies three large blocks to be protected: Greenbelt Plan Area and two EPA areas (East Tributary and Salt Creek). Wetland compensation to account for portions of the proposed wetland removals on site is proposed adjacent to the realigned low flow channel tie-in locations in the EPA block north of Mayfield Road.

The proposed development currently requires realignment and associated restoration of the East Tributary and Watercourses 1 and 2, as a result of the decommissioning of the manmade berms, as well as the removal of certain HDFs (discussed further in **Section 7.2.5.3**). The form and function of these features (i.e., the quantity and quality of water) will be addressed in the SWMP and within the SWM and EPA areas on site (see **Section 8** and **Figure 12, Appenix A**). These removals and their associated compensation efforts will be refined in the Final CEISMP and are subject to approval from DFO and MECP. Of priority as a part of this development plan, both Upper and Lower ponds continue to be recommended for removal due to embankment stability concerns (and associated potential ecological and public safety impacts) and their negative impacts to downstream fisheries habitats (including contributing Redside Dace habitat). Additional discussions with reviewing agencies (including the TRCA, DFO, and MECP) are warranted; however, it is GEI's recommendation that these berms are removed, and the ponds are taken offline with a new channel and wetlands designed within Block 12. The low flow channel and associated flood attenuation wetlands will be designed by GEI with the input from Crozier. The low flow channel will use NCD principles and will incorporate flood resistant native plant materials that enhance the overall NHS. Various specialized wildlife habitat structures will also be installed throughout the corridor to create new functional habitats.

Within the first submission of the CEISMP, the SWM pond was mistakenly shown as part of the NHS. The SWM pond is not shown as part of the NHS, however the SWM Pond block contains landscaped features compatible with natural heritage and is considered Landscape per the Ministerial Zoning Order.

6.2 Engineering Design Updates

The changes made to the Draft Plan, as described above were made in response to comments received from TRCA, Region of Peel, and Town of Caledon. The updated version of the Draft Plan is designed such that the Stormwater Management Ponds no longer require retaining walls.

Updates to the overall SWM design of the site included increasing on-site retention in line with recommendations from the TRCA, to achieve a of 5mm across the entire property. In previous submittals, the SWM block was initially increased in size to accommodate a sediment drying area and to allow for a more efficient space for the layout of the pond. The most recent updates included expanding flood attenuation to Block 12 to meet criteria for regional control. As previously mentioned, this block will continue to function as a natural heritage floodplain.

The SWM block was also relocated to be outside of the existing NHS system. A consistent grading of 4:1 is provided from the wetlands/access road to the bottom of the environmental protection area/NHS. Hydrologic modeling has been completed for the SWM ponds, which included a detailed outlet structure design. This structure will outlet into the natural channel via a headwall and riprap spill way. Additionally, the pond has been designed as per MECP's Guidance for Development Activities in Redside Dace Protected Habitat (2016).

An Erosion and Sediment Control (ESC) plan and spill action plan will be prepared and submitted as part of the detailed design package.

6.3 Hydraulic Model

Hydraulic modeling has been completed that demonstrates that the regional flood event will be contained under post-development conditions. Regional flood evaluations have also been established with updated hydrology. The modeling also confirms that the existing culvert under Mayfield Road will continue to provide the same level of service (flow conveyance) as the Subject Lands are fully developed. The impacts of the proposed development on the conveyance capacity of the culvert under Mayfield Road have now been analyzed. The East Tributary has now been added to the engineered hydraulic model. This includes the east and west branches of the eastern tributary, as the estimated model only included the western branch of the eastern tributary. The hydraulic model has been included in the FSR under separate cover.

6.4 Stormwater Management

C.F. Crozier & Associates Inc. (Crozier) has prepared a Functional Servicing and Stormwater Management Report (FSSR) (October 2023) that describes the recommended servicing and SWM strategy for the Subject Lands. A summary is provided below, but it is recommended the FSSR be reviewed in conjunction with this CEISMP for further detail.

Overall, both quantity and quality control for the proposed development will be provided by two (2) stormwater management facilities and a Natural Heritage System (NHS) / Environmental Protection Area (EPA). The proposed grading on site is designed to maintain the existing drainage patterns as closely as possible. Under post-development conditions, most stormwater flows will outlet to the West and the East Tributaries, with some minor flows being directed towards Salt Creek uncontrolled, mimicking existing conditions.

Most of the stormwater runoff from the Site will continue to drain to the East Tributary under proposed conditions, as it currently does during existing conditions. The proposed SWM facilities are located near the southeast corner of the site. Flows will enter the proposed stormwater management facilities primarily through the proposed internal storm sewer system and by overland flow. Stormwater runoff from the industrial blocks will be captured by the internal block storm sewer systems and controlled on-site to the 5-year post-development design storm event. Controlled Block flows will discharge to the proposed storm sewer system within Street B and convey to the proposed SWM facilities located near the southeast corner of the Site. It is important to note that the ponds will be designed in accordance with the Guidance for Development Activities in Redside Dace Protected Habitat Version 1.2 (MNRF, 2016) due to the proposed outlet to the East Tributary, which has been identified as contributing habitat for Redside Dace. The SWM facilities are designed to provide quantity, quality, and erosion control of stormwater runoff prior to its release to the East Tributary. The following design concepts will be carried forward to the detail design of the stormwater management wetlands on the Subject Lands:

- The SWM blocks will be graded with a maximum of 5:1 side slope for 3.0m above and below the permanent pool and maximum of 3:1 everywhere else within the wetland perimeter as per MECP guidelines. 4:1 grading is currently proposed from the top of the wetlands and access road to the bottom of the EPA.
- Design stormwater management facilities as wetlands to mitigate thermal impacts and discharge water at temperatures below 24°C.
- Design the facilities as extended detention to detain runoff from 25 mm storm events and release volume over a minimum 48-hour period to maximize the absorption of nutrients and contaminants to prevent them from entering the stream.
- Help shade the pond to minimize temperature by planting in the shoreline fringe and flood fringe of wet ponds.

Stormwater runoff from the proposed ROWs will be conveyed through the Site to the SWM facilities. Proposed storm sewers within the ROWs will convey the 100-year design storm event from these catchments. Runoff from storms exceeding the capacity of the sewer system will be conveyed overland, contained within the ROWs, ultimately discharging to the southmost SWM facility.

The Greenbelt area will remain undisturbed and stormwater runoff from this catchment will continue to drain towards the West Tributary under proposed conditions. It is noted that no flows are proposed to outlet to Airport Road post-development.

Sediment drying areas are provided within the SWM blocks, adjacent to the forebay and adjacent to the main cell and Street B to facilitate maintenance of the facilities. This area, only used temporarily during maintenance of the SWM facilities, will otherwise be landscaped with naturalized features compatible with the wetland restoration block (EPA).

The proposed development will not alter the external drainage catchments, and conveyance for all external catchments will be maintained post-development. Drainage from external lands located immediately west and north of the site will continue to drain through the site and will be captured by the proposed storm sewer systems within the industrial blocks and conveyed through the site to the proposed SWM facilities. It is noted that these external catchments are routed through the SWM facilities uncontrolled.

6.4.1 Quantity Control

Based on a review of the FSR&SWM Report completed by Crozier in October 2023, the total runoff directed to Salt Creek is expected to decrease post-development. The 2-year Regional storm event flows are expected to decrease and therefore peak flow controls are not proposed for areas draining towards Salt Creek under the proposed development conditions.

Under the proposed development conditions, the Greenbelt area and the proposed rooftop compensation area will drain to the West Tributary. The proposed rooftop compensation area has been delineated to represent the minimum area required to provide balance for the volume of water directed to the West Tributary during the 25 mm event and will be further refined through the Site Plan Application stage.

It is noted that the roof areas for all industrial blocks are not specified at the Draft Plan stage. As a result, a larger roof area may be directed to the West Tributary following development. Crozier recommends that post-development peak flows to the West Tributary be reviewed during the detailed design stage of Block 2. If flows to the West Tributary are increased post-development, storage requirements will need to be reviewed to ensure proper control is provided to ensure the pre-development flow rates to the West Tributary are not exceeded following development. If on-site storage options are required for this area, rooftop storage, underground storage systems, and LIDs may be considered.

As part of the SABE Study, it is recommended that for the West Humber Watershed stormwater management for quantity controls would be required to control post-development flows to pre-development levels for all events including the Regional Storm event, in order to mitigate both local and subwatershed-scale flood risks. Analyses completed by TRCA for the Humber River SWM Quantity Control Criteria Updates have concluded that over-control of peak flows would be required to achieve watershed-scale flood protection, based on the application of synthetic design storms for hydrologic analysis (Wood, 2022). Future studies will be required to determine stormwater management for quantity controls that would be required to control post-development flows to pre-development levels for all events including the Regional Storm event, in order to mitigate both local and subwatershed-scale flood risks.

The majority of the site will drain towards the East Tributary. Quantity control will be required for most of the site to avoid a significant increase in peak flows to the East Tributary. Crozier has detailed peak flow targets for each block of the development, and storage volume requirements and peak flow controls will need to be reviewed and refined at the Site Plan Application stage to meet these targets. Storage options may include rooftop storage, at-grade ponding, and/or underground storage systems. Emergency overland flow routes for the Blocks are designed to direct stormwater runoff above the 100-year event towards the municipal ROWs proposed within the Site, which convey these flows overland to the proposed southmost SWM facility.

6.4.2 Thermal Mitigation

The West Tributary of the Humber River, the East Tributary, and Salt Creek flowing through the Subject Lands have been identified as habitat or contributing habitat for Redside Dace. As such, the Guidance for Development Activities in Redside Dace Protected Habitat Version 1.2 (MECP, March 2016) needs to be followed. Per their standard, the MECP requires thermal mitigation for effluent from SWM facilities directed to Redside Dace habitats to be reduced to a temperature of 24ºC.

Thermal mitigation of runoff from the proposed development will be provided by the SWM facilities. The SWMFs are designed with a bottom draw outlet which will capture the cooler water found below the water surface to reduce the temperature loading to the channel. The SWMFs will also have ample vegetation, providing shade over the facilities, which reduces heating of sitting water.

6.4.3 Erosion Control

The design of the SWM facilities includes extended detention volume control as well as surface treatment measures to reduce the risk of erosion at the wetland berms, receiving watercourse, and near the existing Mayfield Road culvert. The SWM facilities have been designed to detain runoff from the 25 mm design storm event, and the extended detention orifices within the outlet structures have been designed to release this volume over a minimum period of 48 hours. Further, TRCA required onsite retention of 5 mm of runoff generated from the total impervious area to minimize erosion on site. This target was used for the infiltration target for water balance and erosion control requirements for all blocks. In addition, Block 12 will be designed to support the SWM facilities for regional control through flood attenuation wetlands. Block 12 will include a culvert and berms near the outlet as additional control features. However, Crozier will design the culvert to allow for continuous passage opportunities for fish in the low flow channel.

Concrete cable mat is proposed as an erosion treatment at wetland inlets, wetland outlets, overland spillways, forebay berms, and emergency spillways. Minor system flows enter the SWM facilities forebay through a storm sewer connection. Major system (overland) flows enter Wetland 2 at the west end of the main cell via the major overland flow route. At each inlet location, as well as the forebay berms, emergency spillways, and wetland outfalls, cable concrete mat is proposed to resist the tractive force of the unattenuated Regulatory storm event. The cable concrete will be sized by the manufacturer prior to approval.

6.5 Transportation Network

The first ROW (Street A) runs east-west through the Subject Lands and connects to Airport Road on the east. The second ROW (Street B) runs north-south through the Subject Lands connecting to Mayfield Road at the south limit of the site and extending to the north property limit where it ends with a cul-de-sac. The third ROW (Street C) runs east-west through the Subject Lands and connects to Torbram Road on the west. An additional reserve block, Block 6 has been added to the development plan to accommodate a potential east-west street connection to Airport Road and Street B at the request of the Region. This street is still under review as the property east of the Subject Lands that connects to Airport Road is not owned by the proponent.

6.5.1 Street D Alternatives Assessment

An east-west road connecting Airport Road to the internal road network, Street D, is proposed as a reserve block (Block 6) on the Concept Plan (**Figure 12, Appendix A**). The alignment of Street D was considered with respect to impacts to the natural environment, future development, and alignment with existing road networks. Initially, conversations between Crozier and the Region suggested a new east-west ROW occur in the northern sections of the Subject Lands near Salt Creek to connect to an existing street east of Airport Road. However, as depicted in **Figure 12A, Appendix A**, there are several environmental constraints that would significantly affect the feasibility of a ROW in this area. These constraints include those associated with Redside Dace habitat, Salt Creek and its valleylands, existing wetlands and wetland buffers, and the northern Significant Woodland and its buffer. The ROW would necessitate the creation of a significant intersection within this area, which would be challenging to implement and design due to the ROW's proximity to the existing natural heritage features.

The preferred alignment of Street D avoids the Salt Creek corridor and the associated environmental constraints in the area. It also falls within the requested 400-meter range from the corridor, which will assist in managing through traffic anticipated with future development in the area.

6.6 Phasing

It is understood that the proposed development will be phased and will not be constructed at the same time. Phasing of the Site has not been included as part of the Initial CEISMP. The Final CEISMP in support of Draft Plan of Subdivision will include a phasing strategy, the resulting interim solutions for managing impacts, and the final ultimate solutions.

7. Impact Assessment, Avoidance and Mitigation

7.1 General Approach

This section provides an iterative assessment of the potential impacts of future land use changes on the natural environment and water systems within the Subject Lands. The intent is to assess the impacts of the draft plan of subdivision and to inform the preliminary establishment of initial management strategies which:

- Protect the critical elements and systems of the subwatershed and local drainage system;
- Prevent environmental degradation;
- Provide adequate flexibility for integration with adjacent development and redevelopment areas;
- Assist in the establishment of open space linkages;
- Identify opportunities and constraints to development;
- Provide a strategy to manage existing land uses;
- Detail preliminary locations and areas for stormwater management (LID BMPs and end-of-pipe facilities); and
- Identify restoration and enhancement opportunities.

A summary of the potential impacts on KNHF and KHF, identifies proposed avoidance and mitigation measures to avoid or minimize impacts and identifies proposed enhancement measures associated with the implementation of the development plan and associated restoration of the East Tributary and Salt Creek natural heritage systems (additional detail on enhancements is provided in **Section 8**).

Potential effects to the natural heritage features and environmental functions that exist within, and adjacent to, the site have been evaluated over the short and long term, with consideration given to measures to avoid and/or mitigate negative impacts, where appropriate and provide a net benefit.

The range of potential impacts from the proposed project can generally be divided into two categories:

- Direct impacts are normally associated with the physical removal or alteration of natural features that could occur based upon a land use application; and
- Indirect impacts may be changes or impacts (these could be minor or major) to less visible functions or pathways that could cause negative impacts to natural heritage features over time.

This evaluation was formulated based on the expected permanent footprint of the development, anticipated temporary construction impacts and the proposed long-term post-restoration scenario. The key potential direct and indirect effects of the project, and a summary of recommended avoidance, mitigation and restoration strategies are provided in **Table 10, Appendix B**.

7.2 Key Natural Heritage Features

7.2.1 Wetlands

The proposed project footprint has been designed to avoid all features found within the Greenbelt NHS associated with the West Tributary to the West Humber River, and the Salt Creek corridor. Wetlands identified on the Subject Lands were reviewed in accordance with the OWES Guidelines (December 2022), and due to their individual sizes (<2ha) do not warrant evaluation.

A total of 9.037 ha of wetland and buffer are proposed for removal and approximately 6 ha of restoration area is proposed for on-site compensation/enhancement agreements within Block 12 of the Subject Lands. In addition, other ecological enhancement features are proposed within other EPAs on site. All wetlands proposed for removal are riparian wetlands. A conceptual restoration plan overview identifying environmental protection blocks to be restored is provided within **Section 8.0.**

Unevaluated wetlands, each under 2 ha in size, are presently associated with the East Tributary and will be replicated in Block 12 as part of the development and restoration project. The proposed development plan will directly impact the meadow marsh, shallow marsh, shallow aquatic, and thicket swamp communities that are associated with the man-made ponds and HDFs (East Tributary, north of Mayfield Road). The specific vegetation community types are MAM2, MAM2-2, MAS2, SAM1-4, and SWT2-2.

7.2.1.1 Wetland Compensation Plan

TRCA’s Guidelines for Determining Ecosystem Compensation (2018) require both ecosystem structure compensation (to ensure that removed habitats are replaced with the same or similar ecosystem structure and habitat type) and land base compensation (to ensure that the removal of any natural systems is replaced with an equal amount of land for natural systems). TRCA requires that both ecosystem structure and land base compensation requirements be met. Ecosystem structure and land base compensation can be combined into the same areas (i.e., a single compensation area can meet both ecosystem structure and land base compensation requirements).

TRCA’s compensation guidelines require land-base (natural system) compensation at a 1:1 ratio. Where natural features are removed from the land in support of the proposed development, additional lands are to be added into the NHS. Where lands are not available for land-base compensation, cash-in-lieu options will be explored in agreement with TRCA. A preliminary cash-in-lieu calculation has been prepared for Block 1 of Tullamore under separate cover (see **Appendix D**). This memo has been approved by TRCA and addresses 1.57 ha of proposed wetland removals within Block 1 of the Subject Lands. Across the Subject Lands, a total of 9.037 ha of wetland, including buffers, is proposed for removal as per the updated Conceptual Plan. Further cash-in-lieu memorandums will be prepared and included in the final submission of the CEISMP as required to address the proposed removals.

A total of approximately 6 ha of restoration habitat will be created within designated wetland compensation areas, accounted for separately from the stormwater management wetlands. A 10 m vegetated wetland buffer will be incorporated into the design. In addition to this wetland compensation block, wetland creation will also occur within the Salt Creek Environmental Protection block. A figure identifying opportunities and conceptual designs for wetland compensation is still under development and will be provided as part of the Final CEISMP submission.

During the detailed design phase, a Wetland Implementation Plan will be prepared. This plan will follow TRCA's guiding documents including:

- Erosion and Sediment Control Guideline for Urban Construction, TRCA, 2019;
- Guideline for Determining Ecosystem Compensation, TRCA, June 2018;
- Post-Construction Restoration Guidelines, TRCA, July 2004;
- Preserving and Restoring Healthy Soil: Best Practices for Urban Construction, TRCA, June 2012; and
- Seed Mix Guidelines, TRCA, January 2022.

The components of the Wetland Implementation Plan will include:

- Description of wetland habitats to be removed;
- Description and rationale for compensation locations;
- Compensation area existing site conditions (aspect, soils, drainage, etc.);
- Principles and objectives for wetland creation;
- Broad habitat types (e.g., mineral marsh, shallow marsh, thicket swamp, shallow aquatic) and areas proposed for land base wetland compensation areas;
- Planting plan concepts, including species composition, tree and shrub planting stock type, plant densities, types of seed mixes, soil amendments, planting windows, wildlife habitat features, opportunities for plant/soil salvage and transplantation/placement. The planting plan concepts will be submitted to TRCA for review and approval ahead of preparing Landscape Restoration plans for wetland compensation areas;
- Detailed design drawings (grading, ESC, landscape restoration plans); and
- Construction Phasing Plan, including timing of feature removal relative to feature creation.

Overall, implementation of the proposed restoration project on the East Tributary is predicted to result in an improved system for fish habitat, provide sustained flows through the site in an open channel and provide functional, connected wetland habitat for amphibians and reptiles. The wetlands proposed to be removed are a result of (or at least influenced by) present and historical anthropogenic land use (e.g., construction of berms, agricultural land practices that affect the extent and condition of wetlands, etc.). MAM2-2 occupied the majority of the wetland types proposed for removal, the dominant species of which is an aggressive plant that can establish quickly in recently disturbed soil. The MAS communities were dominated by

Flowering Rush, which is an exotic invasive plant known to outcompete other species. Loss of some low functioning wetland areas may be considered to be reasonable for the expected overall ecological benefits for the headwater stream system and downstream sensitive Redside Dace habitat in the West Humber River.

A wetland water balance risk assessment has been prepared for retained wetland units (as previously discussed within **Section 4.2.6**).

7.2.1.2 Locally and Regionally Rare Species

Seven regionally rare plants were documented in these wetlands, five of which occurred exclusively in the two ponds (mapped as MAS2/SA and SAM1-4; discussed in **Section 4.3.3**). Each of these species are considered common in Ontario. Of the species within the ponds, these plants are regionally rare in Peel, likely in part due to the limited availability of habitat, as they require permanent water. Opportunities for flora salvage and transplant of these regionally rare species will be considered as part of restoration plans for the Salt Creek corridor, as appropriate, noting that shallow aquatic species are not suitable for flora salvage.

7.2.2 Significant Woodlands

Two adjacent, forested ELC community types (Dry-Fresh Sugar Maple Deciduous Forest; FOD5 and Fresh-Moist Willow Lowland Deciduous Forest; FOD7-3) were identified within the Subject Lands. These forested units are located within the Greenbelt NHS and are considered significant. This Significant Woodland will be retained and enhanced through the establishment of the 30 m vegetated buffers.

Along the northern property boundary, outside the Subject Lands, is a woodland community. This feature is considered a Significant Woodland based on the size of the feature and it being identified as a Core Feature under the Regional OP. It is located outside of the Subject Lands and has been afforded a 30m setback to protect the woodland.

Provided that the mitigation and restoration measures defined herein are implemented, no negative impacts to Significant Woodlands are predicted.

7.2.3 Significant Valleylands

7.2.3.1 West Tributary and Salt Creek

The proposed development will avoid the West Tributary valleyland located in the Greenbelt NHS, and the Salt Creek valleyland located in the northeast portion of the Subject Lands. No impacts are anticipated to these significant valleyland features. A review of the LTSTOS for Salt Creek through geotechnical investigations is currently underway. For the purpose of this report, the TRCA Crest of Slope plus 10 meters was used to delineate the EPA in Block 9. A review of this linework will be completed and assessed as part of the Final CEISMP submission.

SWH and other non-significant habitats associated with the West Tributary and Salt Creek will be retained in-place and enhanced through buffer plantings. The vegetated buffer will enhance primary linkage functions within the Subject Lands and within the larger landscape offsite to allow for increased abiotic and biotic movement. Buffers provide a physical separation of natural heritage features from the proposed development. The NHRM suggests that buffers "contribute substantially to the protection of wetlands, woodlands, valleylands and other natural heritage features" (MNRF 2010). The existing West Tributary and Salt Creek are already biodiverse as they host a variety of locally, regionally, and provincially significant species, as well as common and secure species. To further enhance the existing biodiversity, the vegetated buffers will focus on increasing the availability of habitat throughout the corridor (e.g., increasing thicket habitat near Mayfield Road or increasing wetland habitat near Torbram Road; removal of invasive species near Airport Road). The establishment of these vegetated buffers can also prevent erosion and sedimentation into existing natural heritage features, provide habitat for terrestrial species such as birds and small to medium sized mammals, enhance linkage and connectivity functions and protect existing features from the proposed development.

Table 13-1 within the NHRM (MNRF 2010) suggests buffers provide the following ecological benefits to existing natural heritage features:

- "*Reduction of encroachment;*
- *Reduction of light and noise;*
- *Space for tree-fall;*
- *Protection of root zones;*
- *Enhancement of woodland interior;*
- *Allowance for hunting habits of cats and dogs;*
- *Location of trails; and*
- *Attenuation of runoff*".

The proposed industrial land-use will not increase the introduction of pests into the West Tributary or Salt Creek. The vegetative buffers will extend the functional edge of the woodlands, protect existing plants, and enhance long-term tree health. Specifically, vegetative buffers will shelter existing trees from any disturbance caused within the developable area, protect the root zones of existing trees, maintain moisture conditions, and prevent soil erosion. No negative impacts to the significant valleylands are expected as a result of the proposed development.

7.2.3.2 East Tributary

Some short-term disturbance within the valleylands of the East Tributary may occur (e.g., removal of berms and Upper and Lower Ponds) during construction. These necessary disturbances would result in increased ecological connectivity while addressing stability concerns associated with the failing berms. Any alterations within the valleylands will be restored using ecological restoration principles. No long-term impacts are predicted as a result of disturbance within the valleylands.

7.2.4 Significant Wildlife Habitat

As discussed in **Section 3.1.9.3**, confirmed and candidate SWH types were identified on the Subject Lands. An assessment of potential impacts and recommended mitigation strategies for each of these habitat types is provided below.

7.2.4.1 Seasonal Concentration Areas

Seasonal concentration areas identified on the Subject Lands include candidate bat maternity colonies, located in the Greenbelt. No tree removal is proposed in woodland communities that have potential to support bat maternity colonies, therefore no impact is expected to this candidate SWH type.

However, bats may roost in single trees that have suitable characteristics outside of the woodland. To prevent potential impacts to bat species, the removal of trees (>10 cm DBH) should not occur between April 1 and September 30 to prevent disruption to bats during critical reproductive and juvenile growth periods. If tree removal is required during this period due to unexpected circumstances, bat surveys and nest sweeps will be completed by a qualified biologist. If no bats are observed within trees proposed for removal, the tree(s) can be removed within 24 hours. Tree removals should also be conducted outside of designated timing windows as per the Migratory Birds Convention Act.

7.2.4.2 Rare Vegetation Communities

No rare vegetation communities were identified on the Subject Lands.

7.2.4.3 Specialized Wildlife Habitat

The ponds associated with East Tributary are not considered suitable as turtle overwintering area SWH, as the features are manmade/dug ponds. Though it should be noted that both Midland Painted Turtle and Snapping Turtle were observed during 2021 field investigations within the features. To mitigate direct impacts on turtles in the ponds during pond dewatering and restoration activities, a biologist should periodically inspect the dewatered area for the presence of turtles and if any are observed, they should be removed and relocated to an area outside of the work zone. A Scientific Wildlife Collectors Authorization will be applied for from the MNRF to facilitate active capture and relocation of turtles if this is deemed necessary to ensure their protection during implementation of the project.

7.2.4.4 Habitat for Species of Conservation Concern

Confirmed SWH for Species of Conservation Concern (i.e., Barn Swallow and Snapping Turtle) was identified on the Subject Lands.

Barn Swallows are Special Concern on the SARO List**.** As described in **Section 4.4.3**, through breeding bird surveys conducted within the Subject Lands, two sets of farm buildings have been confirmed to support a total of 18 Barn Swallow nests. The farm buildings were found north of point count stations 9 and 11 (Refer to **Figure 6, Appendix A**)

Farm buildings which currently provide nesting habitat are proposed to be removed which will result in loss of breeding habitat for the species. Habitat removals will occur outside of the Barn Swallow active season (beginning of May to end of August) to avoid adverse impacts. Where feasible, nesting structures for Barn Swallow will be considered for installation in the restoration areas in Salt Creek and the East Tributary EPA Blocks, or within the Greenbelt block.

Confirmed SWH for Species of Conservation Concern (i.e., Snapping Turtle) was identified on the Subject Lands. Permanent reconfiguration of pond and nesting habitat associated with the East Tributary will temporarily remove habitat for Snapping Turtle. Although opportunities to retain the ponds associated with the East Tributary were considered, the removal of the failing manmade berms is required due to safety, and thus they cannot be maintained on the landscape while simultaneously meeting project objectives to improve downstream water quality and enhance long-term safety and stability of the East Tributary system. The restored NHS, including Salt Creek and West Tributary systems, will aim to continue to provide all critical habitat components, including overwintering habitat and existing ecological functions for this species where feasible.

Creation of new habitats within the East Tributary and Salt Creek will allow for increased connectivity and linkage opportunities that are not currently present within this tributary due to the constructed berms. Currently, the Upper and Lower Ponds are acting as a permanent barrier to fish and wildlife movement due to the steep berm walls, depth of the constructed valleyland, and perched/damaged culverts. GEI continues to recommend that removal of these berms be completed to provide a significant ecological contribution to the system. By restoring the connection to habitats north of Mayfield Road through removing the constructed berms, it will encourage wildlife movement freely into the system. The East Tributary ultimately connects into the West Humber Tributary approximately 650 m downstream of the Subject Lands. Maintaining secondary corridors within a system, like the East Tributary, helps to maintain population connectivity and biodiversity while creating a more functional, natural landscape.

Wildlife enhancement structures will also be installed throughout the East Tributary and Salt Creek to provide habitat diversity that is not currently present and/or to compensate for those that are proposed for removal. While the specific abundance, location and type of habitat structure will be defined within the detailed design stage of this project, wildlife enhancement structures will attract and protect a variety of wildlife. Additional discussion on wildlife enhancement structures is presented within **Section 8.**

Where habitat removals are proposed, fish and wildlife salvages will occur, if feasible, prior to dewatering and/or removal to rescue any wildlife from these features. Opportunities for phasing of fish and wildlife salvages will be explored during the detailed design process depending on the proposed site development phasing. Depending on the phasing of the watercourse decommissioning, the removal of habitat may occur prior to the establishment of the final/ultimate wetland restoration area. Should the habitats be removed prior to the establishment of the wetland restoration area, wildlife will likely be relocated downstream (offsite) along the East Tributary, into Salt Creek system, or within the West Tributary. Exact locations will be determined in consultation with the MNRF as part of the fish and wildlife salvage permitting process. Through the above-noted proposed phasing opportunity and the creation of compensation habitats within the created East Tributary restoration area, and Salt Creek, no negative impacts to SWH and non-significant habitats are expected.

Overall, the updated Draft Plan of Subdivision will allow for increased movement, connectivity, and habitat diversity within the downstream reaches of the East Tributary, while working to protect and enhance existing wildlife functions along the West Tributary and Salt Creek. No impacts to SWH are expected as a result of the proposed mitigative and restoration measures.

7.2.5 Habitat of Endangered or Threatened Species

As per the *ESA*, all threatened, endangered and extirpated species itemized on the SARO list are legally protected from harm or harassment and their associated habitats are legally protected from damage or destruction. Four species listed as Threatened or Endangered on the SARO list were identified on the Subject Lands: Bat SAR (‘Unconfirmed *Myotis*’ sp.), Bobolink, Eastern Meadowlark and Redside Dace.

Potential impacts to each species and/or their habitat are provided below along with suitable mitigation measures.

Any additional impacts to SAR will be addressed through a submission of an IGF submitted to the MECP.

7.2.5.1 Bats

Suitable maternity roosting habitat for bat SAR may occur within the significant woodland community within the Greenbelt Area. This woodland will be retained in place and further enhanced through the establishment of a 30 m buffer. No impacts to SAR bat habitat are expected as a result of the proposed development. Proposed restoration activities are expected to provide an overall benefit to local SAR bat populations. Enhanced foraging habitat on the Subject Lands (e.g., wetlands, pond habitats) will attract a greater abundance and diversity of preferred aerial insects including flies, bugs, butterflies, moths, bees, wasps, beetles, grasshoppers, crickets, stoneflies, and mayflies. Seed mixes applied throughout restoration areas will include nectaring species to attract local insect populations. Increasing the availability of flowering plant species will subsequently increase the availability of habitat for bat foraging. Therefore, given the extent of both foraging and maternity roosting habitat in the Greenbelt NHS and the Salt Creek corridor woodlands to be retained; the proposed development is not anticipated to have a measurable impact on the availability of foraging or roosting habitat for these species.

7.2.5.2 Bobolink and Eastern Meadowlark

Since the time of surveys in 2021, the agricultural use on-site has transitioned from cattle to row crop agriculture. As a result, the hay or pasture lands formerly used by Bobolink and Eastern Meadowlark is no longer present within the development footprint. Suitable habitat continues to exist in the Humber River valley within the Greenbelt.

As described in **Section 5.1.7**, habitat for grassland birds continues to persist only within the Greenbelt Plan Area associated with the Humber River valley. This area continues to be protected as Environmental Protection Area in the Draft Plan of Subdivision.

7.2.5.3 Redside Dace

As previously noted, the West Tributary of the West Humber River and Salt Creek are designated as occupied habitat for Redside Dace. The proposed development will avoid the West Tributary of the West Humber River and Salt Creek, though construction activities within the Subject Lands could affect the West Tributary due to erosion and sedimentation. To avoid impacts to the occupied habitat, an ESC plan has been developed. As well, the West Tributary will receive buffer plantings which will provide natural buffering functions.

The proposed development will impact contributing Redside Dace habitat associated with the East Tributary of the West Humber River, Watercourses 1 and 2 and associated HDFs. Realignment of the East Tributary and Watercourses 1 and 2, as well as the removal of HDFs will occur in accordance with MNRF's Guidelines for Development Activities in Redside Dace Protected Habitat (2016). These watercourses and any associated compensation efforts will be refined in the Final CEISMP and are subject to approval from DFO and MECP. Moreover, the SWM facilities will be designed in accordance with these guidelines to minimize impacts to Redside Dace (e.g., consideration of installation of bottom draw outlets) as previously described in **Section 6.**

The restoration area and removal of man-made berms will remove barriers to fish passage and create more complex habitat structures for Redside Dace and other fish. The removal of online Upper and Lower Ponds will result in improved thermal conditions in downstream reaches and restore fish passage in the East Tributary of West Humber River. Additional discussion regarding benefits to fish and fish habitat are discussed below within **Section 7.2.6**.

For all the aforementioned species, consultation with the MECP will be completed to ensure that all requirements under the *ESA* are addressed prior to commencement of implementation of the proposed project.

7.2.6 Fish Habitat

As discussed in **Section 5.1.6**, Fish Habitat is present on the Subject Lands. Fish Habitat associated with the West Tributary will be protected within the Greenbelt Area. Fish Habitat will be disturbed and altered as a result of the proposed restoration concept for the East Tributary. Overall, proposed removal of manmade berms and the restoration of the East Tributary will benefit downstream Redside Dace fish populations in the West Humber River. Removing the anthropogenic ponds created by the berms is expected to result in reductions in the temperature of water being discharged from this headwater environment. This is expected to improve downstream (off-site) habitat conditions in the West Humber River watershed. It is noted that final determination of whether the berms will be removed will be made in consultation with reviewing agencies; however, it is GEI's continued recommendation that these berms are removed as it will result in increased ecological connectivity and will address safety concerns.

The existing HDFs and Watercourses 1 and 2 on the Subject Lands do not provide direct fish habitat; however, they do provide important indirect fish habitat functions including: (i) flow conveyance, (ii) surface and potentially groundwater contributions to baseflow, and (iii) input of allochthonous organic materials and, to a lesser degree, sediments that provide forage material for fish and benthic invertebrates and assist in maintaining habitat-forming biophysical processes (e.g., a reduced ability for sediment transport due to the existence of the berms). The importance of indirect fish habitat on the Subject Lands is augmented by connections to downstream Redside Dace habitat in the West Humber River. Upstream movement of fish onto the Subject Lands north of the Lower Pond is limited given the low flows within the watercourses and the presence of barriers created by the two berms.

Salt Creek is documented by DFO as supporting Redside Dace, therefore, this feature is assumed to support seasonal, direct cool-water fish habitat.

HDFs assigned a No Management Required management recommendation are classified as having no direct fish habitat.

The existing fish community within the anthropogenic ponds is limited and comprised of introduced fish species from historic pond stocking activities from residents on the farm. Direct impacts to fish habitat for these species will result from the proposed restoration of the East Tributary and the removal of the Upper Pond and Lower Pond berms.

HDFs assigned a Mitigation management recommendation can have their functions replicated through targeted mitigation actions (e.g., wetland creation, LID solutions at Site Plan, clean rooftop water diversion). HDFs assigned a Conservation management recommendation can maintain or replace on-site flows using mitigation measures and/or wetland creation. HDFs assigned a Protection management recommendation will be retained in place on the site. The stormwater management system in Blocks 13 and 14 combined with the EPA in Block 12 will provide similar water management as the existing HDFs on site. As detailed in **Section 6** Crozier has completed a site water balance to ensure that water conveyance across the site meets the target of a 5mm retention rate for the entire property per the TRCA.

The West Tributary and Salt Creek were assigned a High Constraint ranking and will be retained in place on the landscape and setback from any associated site alteration and/or development. The East Tributary as well as Watercourses 1 and 2 were assigned a Medium Constraint ranking and will be enhanced/restored using NCD principles (as discussed further within **Section 8**).

The Block 12 EPA will include a meandering low flow channel, designed using NCD principles. The low flow channel will incorporate riffle-pool morphology with a range of grain sizes and hydraulic conditions to increase habitat complexity and biophysical functioning of the channel, relative to current, relatively homogenous habitat conditions. Riffles, which are not generally present in the existing watercourse, will assist with aeration and provide habitat for specialized benthic invertebrate species, and potentially fish. Furthermore, the riffles are designed to force critical velocity at their crests and will be ‘hardened’ with larger sized and more massive materials to resist movement. This forcing of critical velocity has the added benefit of reducing kinetic energy available in the system for erosion, thereby ensuring that the channel cross-sections and full profile will remain stable and graded. The channel will be designed with deepened pool centres (approximately 0.5 m below mean channel elevation) and Large Woody Debris (LWD) that are expected to provide shading, and more complex refuge habitat for fish as well as bank stabilization via bioengineered hardening and eco-hydraulics optimization. The portions of the corridor outside the low flow channel will be planted with a range of wetland vegetation species and forms to provide functioning riparian wetland habitat, designed to stabilize watercourse banks and the floodplain, provide long-term shading of the channel, and enhance allochthonous inputs (e.g., twigs, leaves) to provide a source of forage and habitat within and downstream from the realigned reach.

The proposed restoration plan involves the removal of the two manmade berms and their resulting online ponds (Upper and Lower Ponds) as both an ecological enhancement and an ecological/public safety measure. From an aquatic habitat perspective, removal of the online ponds is expected to provide a significant ecological benefit. Although they may be providing direct fish habitat, the presence of the ponds is expected to have a negative impact on the overall functioning of the watercourse and in turn, could be impacting downstream habitats and aquatic biota. Fish found within these ponds are likely associated with historical stocking efforts or from natural vectors (e.g., bird transfer), as it is unlikely that they were able to naturally migrate into these ponds due to downstream barriers (e.g., perched and collapsed culverts). First, the presence of the ponds is expected to be causing thermal loading in the watercourse, which would significantly degrade its function as contributing habitat for Redside Dace. Removal of the online ponds will eliminate this source of thermal loading and assist in maintaining cooler temperatures in the watercourse, which may have substantial benefits for the downstream Redside Dace population. Secondly, the existing ponds are expected to have an impact on existing erosion and sediment transport processes. It is likely that eroded sediments from the upstream portion of the watercourse are being deposited within the ponds, effectively interrupting natural sediment movements. This may be resulting in sediment-starved downstream reaches and possibly causing increased erosion and/or lack of coarse habitat-building sediments via the well-documented clear water effect that channel barriers are known to promote. Re-establishment of a more natural sediment transport regime is expected to have substantial benefits for the overall biophysical function of the watercourse and associated habitat for fish and benthic invertebrates.

The existing embankments downstream of each of the ponds are thought to be functioning as a barrier to upstream fish movement. Removal of the online ponds and construction of a low flow channel is expected to significantly enhance the ability of fish to move upstream into this system. This may result in increased productivity both upstream and downstream from the existing obstructions, with the existing fish community downstream potentially able to exploit seasonal habitat functions upstream, while also enhancing the longitudinal connectivity in a downstream direction, which may facilitate downstream transport of forage for benthos and fish.

In addition to the proposed direct enhancements within the channel and corridor, additional wetland replication is proposed adjacent to the channel to ensure that flood attenuation functions of the wetlands impacted by the development plan are replicated. Existing wetlands likely provide contributing aquatic habitat functions, including water quality maintenance and hydrology functions such as flood attenuation and provide contributing habitat for Redside Dace. Replication of wetlands will ensure that these important aquatic functions are maintained in the watercourse system. Further discussion on wetland replication was discussed within **Section 7.2.1**.

Drainage from the entirety of the site will be maintained. Drainage on site will be directed to the Stormwater Management Infrastructure in Blocks 13 and 14. The SWM infrastructure will provide quantity and quality controls prior to outletting into Block 12 EPA's low flow channel. The realigned channel with Block 12 will use natural channel design principles and meander through the EPA before the tie in to the existing watercourse downstream near Mayfield Road. Ecological functions will be replicated within Block 12 EPA where appropriate (e.g., created wetlands) and supplemental restoration of degraded features will be considered within the Salt Creek NHS in Block 9.

Potential impacts to direct and indirect fish habitat during construction include direct disturbance of fish in the Upper and Lower Ponds, erosion and sedimentation due to construction activities on the Subject Lands, accidental spills during construction, and alterations in flow in the downstream watercourse during construction. Mitigation measures to address potential indirect effects are discussed in the following sections.

Impacts specific to Redside Dace will be addressed under the Endangered Species Act. Impacts to fish and fish habitat will be reviewed through the DFO Request for Review process.

7.2.7 Direct Disturbance of Fish due to In-water Work

In-water work, including pond water level lowering, berm removal and installation of localized erosion protection materials could potentially result in disturbance of fish in the Upper and Lower Ponds. In order to avoid disturbance during critical reproductive periods for the warm-water spring spawning fish species known to be present in the ponds, in-water works should avoid the period between March 15 and July 15 of any given year. Removal of the ponds and/or realignment of the watercourse should occur during minimal flow periods or in the dry to reduce impact.

Water level reductions in the Upper and Lower Ponds could potentially have negative impacts on fish if individual fish were to become dewatered (i.e., they did not move out of the area being dewatered) or if they were to be trapped in isolated pools within the dewatered area. To avoid associated injury or mortality of fish, monitoring will be completed as pond water levels are reduced and any fish trapped during dewatering will be salvaged and moved to a predetermined location, if feasible. Fish salvage will be completed, if possible, under the authority of a License to Collect Fish for Scientific Purposes from the MNRF. Based on the baseline fish surveys, only green sunfish are expected to be located in this area; however, these ponds are known to be historically stocked so it is possible that other warmwater fish (e.g., Bass) may be present within the features. Opportunities for phasing of fish and wildlife salvages will be explored.

7.2.8 Erosion and Sedimentation During Construction

Erosion and sedimentation from the disturbed work area associated with the proposed development could potentially result in adverse effects to water quality (e.g., increased turbidity) or sedimentation and associated effects on fish (e.g., injury or mortality due to suspended sediments or altered habitat use) or fish habitat (e.g., loss of interstitial spaces in rocky areas, smothering of aquatic vegetation and/or incubating eggs) in downstream areas.

An ESC Plan has been prepared and will be implemented during construction to minimize the potential for erosion and sedimentation from the construction site. The ESC Plan has been developed based on the guidance provided in the Erosion and Sediment Control Guidelines for Urban Construction (TRCA 2019). Basic elements of the plan include consideration of:

1. Construction phasing to minimize the amount of time soils are barren and therefore, more susceptible to erosion;
2. Requirements and timing for rehabilitation of disturbed areas;
3. SWM strategies during construction;
4. Erosion prevention measures (e.g., erosion control matting);
5. Sedimentation control measures (e.g., silt fences); and
6. Inspection and performance monitoring requirements and adaptive management considerations.

Implementation of an effective ESC Plan, incorporating both erosion and sedimentation controls, coupled with regular inspection and performance monitoring and implementation of any remedial actions necessary to ensure effective performance, is anticipated to be largely effective in preventing the movement of eroded soil particles off-site towards downstream direct fish habitat in portions of the East Tributary south of Mayfield Road.

Overall, no adverse effects to direct fish and fish habitat are predicted to occur as a result of erosion and sedimentation during construction, provided an effective ESC Plan, including monitoring and adaptive management, is implemented.

7.2.9 Accidental Spills During Restoration Project Implementation

Accidental spills of potentially hazardous materials (e.g., fuel and oil from heavy equipment), if transported to the headwater streams on the Subject Lands and eventually to downstream reaches of the West Humber River, could cause stress or injury to fish and other aquatic biota (e.g., benthic invertebrates).

In order to mitigate the potential for adverse effects on downstream fish and fish habitat due to accidental spills during implementation of the restoration project, spill prevention and response measures will be implemented, including, but not limited to appropriate material handling and storage protocols (e.g., refueling in locations at least 30 m from watercourses), maintenance of spill kits on-site, monitoring measures and spill response plans (i.e., emergency contact procedures, including the Spills Action Centre, and response measures including containment and clean-up). Implementation of an effective spill prevention and response plan is expected to be largely effective in preventing adverse effects on fish and fish habitat.

7.2.10 Road Salt

Following construction of the site and Block 12 EPA, increased contributions of road salts during the winter months are expected as a result of site development. A salt management plan is recommended to be prepared to mitigate use of chloride-based ice/snow controls (roads and sidewalks) within the proposed development. This will minimize the potential for discharge of chloride-laden water to the natural heritage features and their buffers. In addition, it will be communicated to the end user that road salts should be stored away from Environmental Protection blocks, including the West Tributary and Salt Creek, to limit the amount of input of road salts into the system.

7.2.11 Impacts on Downstream Flows During Restoration Project Implementation

Temporary alterations to the flow regime of the headwater streams on the Subject Lands during implementation of the restoration and development project could potentially result in downstream flow or water level reductions that could cause negative impacts on direct off-site fish and fish habitat. Temporary alterations to the flow regime could occur as a result of worksite isolation and associated pumping and pond dewatering.

Active pumping is expected to be required in several locations during implementation of the restoration and berm removal project. Worksite isolation and flow bypass plans will be developed to ensure that there is no disruption to downstream flows outside of the in-water work areas. Pumping will continue as long as work-site isolation is required, and contingency measures and monitoring protocols will be place.

Impacts to fish and fish habitat will be addressed with DFO to ensure that all requirements under the *Fisheries Act* are met.

A conceptual restoration plan for the Block 12 EPA is described below within **Section 8** of this report. The low flow channel will be designed using NCD principles. Wetland creation within Restoration Area corridor will help restore wetland functions (e.g., soil stabilization, increase flood storage capacity, increase water quality and clarity, reduce erosion potential).

Overall, when combined with other mitigative measures, the proposed wetland restoration area with low flow channel, pond and barrier removal and restoration plan is expected to have substantial aquatic ecological benefits both within the realigned reach on the Subject Lands, but also in downstream reaches. The primary benefits are expected to be realized through removal of the existing online ponds (e.g., elimination of thermal loading and restoration of fish passage and more natural sediment transport). Secondary benefits are expected through the proposed low flow channel and riparian wetlands, which will increase habitat complexity relative to existing conditions in the channel, which is expected to provide improved direct habitat for fish and benthos, while also enhancing contributing functions that would benefit downstream habitats.

7.3 Key Hydrologic Features

7.3.1 Permanent Streams

The West Tributary and Salt Creek are considered permanent streams on site. Portions of the East Tributary are considered permanent streams and are assessed as part of **Section 7.2.5** and **Section 7.2.6** above.

Various phasing opportunities and mitigation measures (e.g., ESC plan, spill action plan) will be explored in detailed design to minimize short-term impacts during construction.

Restoration and enhancement activities along the East and West Tributaries will work to create, protect and/or enhance hydrologic functions.

Overall, the updated Draft Plan of Subdivision will allow for increased movement, connectivity, and habitat diversity within the downstream reaches of the East Tributary, while working to protect and enhance existing wildlife functions along the West Tributary and Salt Creek. A benefit to aquatic water quality and fish passage are expected should removal of migratory obstructions (e.g., berms, perched culverts) occur.

7.3.2 Seepage Areas and Springs

No seepage areas or springs were identified within the Subject Lands; therefore, no impacts to seepage areas or springs are anticipated.

7.3.3 Wetlands

Potential impacts to wetlands and the proposed avoidance and mitigation measures have previously been addressed in **Section 7.2.1**.

7.4 Hydrogeological Impact Assessment

A hydrogeological impact assessment was completed as part of the TIL (2021) hydrogeological investigation. The impact assessment and mitigation as reported by TIL is summarized below; however, the original report should be read for completeness.

Impacts to the groundwater system during construction may include temporary lowering of the groundwater table during construction dewatering; however, construction dewatering is expected to be limited. Impacts may also include the introduction of contamination from spills; TIL recommends a Spill Prevention and Response plan during construction and storage of potentially hazardous materials in designated areas with appropriate containment as well as away from areas of high vehicle traffic. Assuming protocols are in place for managing construction-related sources of groundwater contamination, no short-term impacts to the groundwater system are anticipated.

Long-term impacts to the groundwater system may include reductions in annual recharge which have a compounding effect on groundwater levels as well as from land-uses where high-risk activities are proposed. Best management practices for the storage and handling of chemicals and road salt over the long-term are encouraged. Since the Subject Lands are not anticipated to be an area of significant groundwater recharge, adverse impacts to the groundwater recharge on the Subject Lands are not anticipated due to development. However, as existing watercourses on the Subject Lands are anticipated to rely more strongly on surface water runoff, the retention and release of overland drainage at a quantity and quality appropriate to the ultimate receptor will be integral to maintaining the Site's water balance over the long-term.

Short-term impacts to the surface water system include changes in the hydrological regime caused by land grading changes or the deposition of sediment, hazardous materials, or other deleterious substances into waterbodies and watercourses including nearby Redside Dace habitat. Potential impacts are anticipated to be effectively mitigated where a Site-specific Spill Prevention and Response Plan as well as an Erosion and Sediment Control (ESC) Plan are in place. Groundwater and Dewatering Discharge Plans should consider the potential impacts of discharge to these habitats and include strategies for mitigation and contingency action, and routine monitoring of ESC measures will ensure the form and function of these controls in preventing off-Site impacts to the surface water system adjacent to the Subject Lands. No unacceptable impacts to the surface water system during construction are anticipated by TIL where environmental controls are stabilized and monitored during the construction period.

Long-term impacts to the surface water system for new development may include reductions in the catchments areas of tributaries as well as the introduction of urban contaminants. An overall site water balance analysis was undertaken by Crozier as part of the FSR&SWM Report (January 2023). This analysis concluded that LID measures would be necessary to mitigate the loss in infiltration anticipated due to development. Calculation details and infiltration targets are provided within the FSR&SWM Report.

Impacts to surrounding groundwater users include impacts to both the quantity and quality of groundwater available. Limited groundwater takings within the development area for the short term and unacceptable losses to groundwater recharge are not anticipated. Impacts from contamination are expected to be mitigable where a Spill Prevention and Response Plan is in place and best management practices for the storage and use of potential sources of contamination are followed. Therefore, no unacceptable impacts to other groundwater users during construction are expected.

As no long-term water takings from local water supply aquifers are required in the long-term and no adverse reductions in groundwater recharge are expected, no unacceptable long-term impacts to other groundwater users identified in the hydrogeological investigation are expected.

7.5 Climate Change Impacts of Development

7.5.1 Benefits and Enhancements Brought by the Development

The future climate in Caledon is expected to be warmer, wetter, and more unpredictable. This development, along with its associated restoration, aims to mitigate some of the impacts of climate change and offer a range of other ecological benefits. The Subject Lands Stormwater Management and restoration plans, as described in **Section 8** and indicated in **Section 6**, yield numerous positive impacts to onsite water management.

Some of the benefits that could be seen from development of the Subject Lands and the installation of stormwater management system include:

- Comprehensive Stormwater Facilities: The proposed development includes two stormwater management facilities in the form of wetlands and a Natural Heritage System (NHS) / Environmental Protection Area (EPA) to ensure both quantity and quality control of stormwater.
- Preservation of Natural Drainage: The on-site grading has been designed to emulate existing drainage patterns as closely as feasible, ensuring that natural flows are minimally disrupted. This resemblance to the natural system will preserve the natural drainage evolved over time to manage existing events and subsequently will be designed to provide resilience to extreme weather events.
- Erosion Control: The stormwater management (SWM) facilities are engineered not only for water quantity and quality but also for erosion control, ensuring the sustainable release of stormwater to the East Tributary. Currently, the site is used for active agricultural practices, which might contribute to sedimentation and erosion, potentially adding sediments to on-site watercourses. By developing wetlands that not only receive and filter water, but also adhere to MECP guidelines regarding slopes that are stabilized with vegetation, the potential for erosion on the site will be significantly reduced. As extreme weather events become more frequent, building erosion resilience into the site will greatly benefit the entire system.
- Thermal Impact Mitigation: The facilities will be equipped with bottom draw outlets, cooling trenches, floating islands, and a minimum average depth of 3m within the pond, all aimed at reducing the thermal impacts to the watercourses. Reduced thermal inputs will benefit the cool water fisheries that are downstream and support species-at-risk including Redside Dace.
- Temperature Regulation Through Natural Shading: Landscape plans will be developed for the stormwater management ponds and temperature will be further regulated by planting along the wetland and pond edges, creating natural shade to further mitigate temperature extremes.

The Restoration Plan also results in positive impacts to climate change in the long term. A high-level list of potential positive impacts is included below and details on the Restoration Plan are elaborated on in **Section 8**:

- Thermal Loading Reduction: The Restoration Plan considers the removal of two online ponds that discharge water into sensitive Redside Dace habitat downstream. Online ponds are known to increase water temperatures due to their increased surface area. By removing online ponds in Caledon, — the current thermal loading regime will be reduced, benefiting the sensitive Redside Dace Habitat.
- Fish Passage Restoration: Fish habitat will be restored by eliminating barriers to fish movement and restoring a natural channel. This new channel will feature natural pools, providing essential refuge spots for fish during anticipated high-temperature events.
- Beneficial Functions for Redside Dace Habitat: There will be enhanced contributing functions that positively impact the downstream occupied Redside Dace habitat including improvements to water quantity and water quality for this sensitive species.
- Wildlife Habitat Improvement: The quality of wildlife habitats will see significant enhancement and the final restoration plan will consider climate change resiliency in species selections. Furthermore, landscape plans devised for the Restoration Plan could incorporate various measures to bolster the resilience of the Natural Heritage System against climate change. These measures may include planting native species, introducing habitat features like perches or turtle overwintering habitats, and managing invasive species.

7.5.2 Potential Adverse Impacts of Development and Mitigation Options

The development of any site can bring potential impacts linked to climate change. Presented below is a list of some of these short-term climate change-related impacts, accompanied by their corresponding mitigation strategies:

- Disturbance to Wildlife and Habitats: Development activities can disrupt the habitats and movement patterns of species within the NHS, which may also already be expected to shift due to climate change. To counteract this, buffer zones to existing natural heritage features are implemented as part of the environmental constraints exercise and habitat restoration will occur in designated EPAs to provide a more resilient NHS post-construction.
- Alteration of Natural Drainage: Changes in landform and impervious surfaces can affect the natural flow of water within the Subject Lands, and, as previously mentioned, Caledon’s climate is projected to be wetter as a result of climate change. To mitigate this, a stormwater management plan has been developed for the site to manage erosion, quantity, and quality of water as it enters and exits the Subject Lands.
- Water Quality Degradation: Construction runoff might introduce sediments into the water resource system and natural heritage system, this may add to erosion associated with increased extreme weather events. An erosion and sediment control plan has been developed to manage and protect these features.
- Thermal Impacts to Water Bodies: Exposed surfaces can increase localized temperatures, exacerbating climate change related effects on adjacent water bodies within the water resource system. To reduce these impacts, planting will be prescribed in the SWM

infrastructure, EPAs, and as part of the streetscape to increase cover and provide shade and cooling opportunities throughout the site.

8. Restoration and Enhancement

8.1 Conceptual Restoration

8.1.1 Background

Ecological offsetting is a mitigation strategy that is often considered in an effort to achieve a net ecological benefit to projects, subject to the approval of the planning authority. This compensation strategy quantifies the proposed loss of natural features in order to provide compensation through habitat recreation or alternative consultation process. Ecological offsetting approaches are typically applied as a last resort (after avoidance and mitigation have been considered) where minor negative impacts will result from encroachment.

The TRCA released their Guideline for Determining Ecosystem Compensation (After the Decision to Compensate Has Been Made*;* 2018), which recognizes that "ecosystem compensation becomes an important tool to help ensure that critical ecosystem functions and services lost through development and infrastructure are restored back on the landscape for the betterment of communities" (TRCA 2018).

As illustrated within **Section 7** (above), the proposed development plan will require the alteration and/or removal of the following features:

- Realignment of regulated watercourse (East Tributary)/HDFs and alteration of fish habitat;
- Removal of online Upper and Lower Ponds, and the cattle pond;
- Removal of wetlands;
- Removal of candidate SWH habitat; and
- Removal of contributing habitat for Redside Dace (SAR).

The proposed development plan will protect and enhance the existing significant valleylands and significant woodlands associated with the West Tributary of the West Humber River, and the Salt Creek corridor. Ecological constraint linework was based off of the existing features constraint analysis presented within **Section 5.5.** Retained natural cover outside of development within the Greenbelt Area is 22.37 ha . Natural cover within Block 12 will be provided at the detailed design and incorporated into the Final CEISMP. Delineation of natural cover in EPA Block 9 is contingent on determining the Long Term Stable Top of Slope for the area pending winter 2023 investigations. These results will also be incorporated into the Final CEISMP.

Restoration and enhancement areas are proposed within Block 12 EPA, Block 9 Salt Creek NHS and adjacent to the West Tributary valleyland. The restoration and enhancement areas are envisioned to function as a healthy and diverse ecosystem where ecological functions will be augmented and replicated (as described further below). The vegetated buffers applied to the boundary of the key natural heritage and key hydrologic features provide mitigation for potential negative impacts to the NHS. The proposed restoration and enhancement areas will contain resilient, self-sustaining native vegetation communities that will contribute to a robust

NHS over the long-term. Where feasible, onsite ecosystem compensation will occur. Should onsite compensation not be feasible due to the proposed development plan, offsite compensation and/or cash in-lieu opportunities will be discussed with the TRCA and the Town of Caledon (as described within section 2 of TRCA's Ecosystem Compensation Guidelines). It is understood that on-site compensation is the preferred compensation option.

At the detailed design stage, Landscape Plans, including planting plans, will be developed along with a corresponding Natural Heritage Design Brief that will provide specific details for each restoration area, including plant species lists, proposed plant stock type and sizing, and planting timing considerations. Wetland water balance information will also be available at the detailed design stage so that plant species lists are developed that suit the restoration area hydrological conditions (i.e., within the Block 12 wetland replication area). Plantings will be selected to establish a suitable restoration trajectory towards the intended target vegetation community, as defined within the Natural Heritage Design Brief. The Natural Heritage Design Brief will be prepared by one of GEI's Certified Ecological Restoration Practitioners.

8.1.2 Guiding Documents

The following documents will inform the proposed restoration and enhancement plan as outlined within the Natural Heritage Design Brief:

- Region of Peel SWS Parts A, B and C (2022);
- Town-Wide Design Guidelines (Town of Caledon 2017);
- TRCA's Crossings Guideline for Valley and Stream Corridors (2015);
- TRCA's Guideline for Determining Ecosystem Compensation (After the Decision to Compensate Has Been Made; June 2018);
- TRCA's Erosion and Sediment Control Guide for Urban Construction (2019);
- TRCA's Post-Construction Restoration Guidelines (2004);
- TRCA's Preserving and Restoring Healthy Soil: Best Practices for Urban Construction Guidelines (Version 1.0; 2012);
- TRCA's Seed Mix Guidelines (2022);
- TRCA's Valley and Stream Corridor Management Program (1994);
- Society for Ecological Restoration's International Principles and Standards for the Practice of Ecological Restoration (2nd Edition; 2019);
- Settlement Area Boundary Expansion (SABE) Scoped Subwatershed Study (2022); and
- Society for Ecological Restoration's International Primer on Ecological Restoration (2004).

8.2 Restoration Goal and Objectives

Through the establishment of designated restoration and enhancement areas, a variety of ecosystem benefits will be provided including increased habitat connectivity and linkage across the site, invasive species management and increased biodiversity of native species on site. The restoration effort will enhance the ecological form and function of the Subject Lands by contributing biologically diverse habitats. The restoration goal is to establish a healthy and diverse NHS that complements and enhances the ecological functions of existing habitats within the Subject Lands and the surrounding landscape.

The restoration design reflects a combination of aquatic, wetland, and terrestrial habitat elements. Overall, the restoration effort has been designed to enhance the ecological form and function of the NHS by contributing biologically and structurally diverse aquatic, riparian, tableland wetland, and upland features to the existing mosaic of vegetation communities.

The replicated wetland, low flow channel and surrounding upland vegetation communities are expected to promote improved wildlife habitat functions, compared to existing conditions, to ensure that self-sustaining habitat persists on the landscape over the long term. Ecological restoration objectives for the Subject Lands include:

1. Provide riparian wetland replication on the Subject Lands as compensation for proposed removal of the existing SWT2-2, MAM2-2 and MAS vegetation communities on the Subject Lands;
2. Deter establishment of non-native / invasive plant species by establishing native tree, shrub and groundcover plantings;
3. Inclusion of meandering low flow channels, incorporate riffle-pool morphology with a range of grain sizes and hydraulic conditions, increased habitat complexity and increased biophysical complexity;
4. Enhance animal migration and improve connectivity through the removal of migratory fish barriers (perched culverts and two man-made berms) to facilitate free movement of fish within the East Tributary;
5. Reduce thermal loading within East Tributary to downstream occupied Redside Dace habitats;
6. Include nectaring plants and Milkweed species within groundcover planting areas to attract / support local insect populations (e.g., Monarch and food source for aerial insectivores (swallows and bats);
7. Stabilize soils through the application of an annual cover crop seed mix applied in conjunction with native perennial seed mixes;
8. Create vegetatively diverse vegetation communities that will be self-organizing and resilient over the long-term;
9. Develop diverse plant species lists that will improve structural diversity, floral diversity, and support a variety of native fauna species;
10. Include diverse vegetation plantings within the Restoration Areas to create shade and contribute allochthonous material input to downstream watercourses;
11. Manage any Category 1 invasive species within the retained NHS, as appropriate;
12. Derive planting stock from locally propagated species (Seed Zone 33/34), where available.
13. Establishment of wildlife habitat structures, where feasible and appropriate, including amphibian breeding pools, turtle nesting areas and basking logs; and
14. Removal of instream concrete abutments in Salt Creek.

As previously discussed within **Section 7.2.1.1**, wetland compensation will occur on site. A total of 9.037 ha of wetland habitat is proposed for removal and approximately 6 ha of restored wetland and stream habitat will be created within the Block 12 EPA. The wetlands created within this EPA will not only retain the functions of the removed wetlands and HDFs upstream by providing habitat and water quality services, but may also offer additional benefits. With careful planning and execution, these new wetlands can be designed to optimize ecosystem services, potentially resulting in improved water filtration, increased biodiversity, increased native plants, and more robust habitat structures compared to the original sites. Furthermore, the restoration process provides an opportunity to rectify any previous issues or inefficiencies in the original wetlands, leading to an overall enhancement of ecological functions.

8.2.1 Additional Restoration Opportunities for Consideration

While the primary focus is on replicating features within the same subwatershed system as they are removed, there is potential for additional ecological enhancement within the Salt Creek valleylands. Opportunities for improvement within this EPA encompass:

- Enhancing the existing pond to provide a more suitable habitat for amphibians and reptiles. This can be achieved by placing basking logs, and grading the pond to create gentler slopes, which will improve accessibility for overwintering and basking.
- Eradicating invasive common buckthorn in the CUT1 and CUM1 ELCs, and considering the planting of suitable native species.
- Installing raptor perches.
- Creating brush piles or rock piles (provided that materials are available) for nesting, resting, escape from predators, and protection against harsh weather conditions.
- Preserving snags of suitable species to enhance perching opportunities.
- Placing downed woody debris (if materials are available) to mimic fallen trees, which could increase water retention and repurpose removed materials on-site.

These opportunities have not yet been quantified as part of the Initial CEISMP. A further discussion with the reviewing agencies is recommended closer to the detailed design phase of the restoration plan. This dialogue will help to refine the opportunities for ecological restoration and enhancement on-site.

8.2.2 Region of Peel Scoped Subwatershed Study Management Recommendations

The Scoped SWS completed for the Region included goals for the NHS in order to provide guidance for future studies and land use planning within the FSA of the SWS. Goals include developing an NHS that will:

- Balance policy direction, emerging science and natural heritage planning best practices.
- Become an ecologically resilient and robust system for the long-term benefit of environmental and public health, well-being, and safety.
- Allow for enhancement to establish a sustainable system in a changing landscape matrix and that supports climate change resilience.

In addition, aligned with the goals presented in the Conservation Authority NHS for the Region of Peel (CVC, 2019), another long-term goal and opportunity of local area municipalities is to provide outdoor appreciation and recreational opportunities and to promote healthy communities.

General targets were set for the FSA NHS to inform management approaches. They include no net loss of natural cover and increasing natural cover by 30%. Specific habitat targets are described below.

- Wetland Habitat- ensure ‘no net loss’ of wetland area, increase and maintain total wetland cover through NHS enhancements based on historic reference conditions.
- Forest Habitat- ensure ‘no net loss’ of woodland cover. 30% forest cover is the minimum forest cover threshold for a high-risk development approach with anticipated substantial reductions in biodiversity and aquatic system health. 40% forest cover and 50% forest cover represent moderate and low risk development approaches. Increase total woodland cover through NHS enhancement with a focus on creation of table land features.
- Riparian Habitat- 75% of stream length should be naturally vegetated through protection of existing, enhancement or restoration.
- Valley and Stream Corridor- ensure ‘no net loss’ of ecological and hydrological functions. Increase natural cover within valley and stream corridors through NHS enhancement.
- Successional / Open Habitats- Maintain important existing successional / open habitats. Increase representation and quality of open country habitats across the landscape through NHS enhancement opportunities; strive to create at least one habitat area with a minimum size threshold of 5ha.
- Sand Barrens, Savannahs, Grassland Habitats- Protect these habitats where they occur.

The quantified targets outlined above and developed through the Region of Peel Scoped Subwatershed Study will inform the specific targets for the final restoration plan, which is to be submitted as part of the Final CEISMP.

8.3 Restoration Plan and System Targets

8.3.1 Retained Natural Cover and Restoration Targets

The current natural cover within the Subject Lands is 36.89 ha. The retained natural cover outside of development is 22.37 ha which comprises Salt Creek, the West Tributary and the surrounding natural heritage features within the Greenbelt Plan Area. The area proposed for restoration within Block 12 is approximately 6 ha. However, there are opportunities for natural heritage enhancement in other locations on site including Block 9 EPA.

8.3.2 Strategic Implementation of Region's Scoped Subwatershed Study Recommendations: Enhancing Natural Cover through Mapping and Restoration

An analysis of the existing natural cover within the Study Area has been completed. However, updates and finalizations of the remaining natural cover will occur during the detailed design stage. This refinement will be realized through the creation of the final Restoration Plan in the Final Comprehensive Environmental Impact and Sustainability Management Plan (CEISMP). Upon submission of the Final CEISMP, a detailed figure delineating existing and enhanced natural cover will be incorporated into the CEISMP.

8.3.3 Watercourse Management and Restoration

Watercourses in the Study Area are characterized in **Section 4.5.1**. Reach-specific management recommendations will be defined in the final CEISMP.

Watercourse replication will occur within Block 12 EPA, employing a natural channel design approach. The low flow channel will emulate a meandering stream, featuring key elements such as riffle and pool sequences. Consideration will also be given to incorporating pools that provide cool refugia for fish during warmer water conditions. GEI and Crozier will work in close collaboration to design the channel, striving to replicate the natural stream geomorphology within this EPA. This design will include complementary features such as vegetation and wetlands.

Additionally, other habitat features will be taken into consideration for this area, including downed woody debris, appropriately sized bottom substrate, and tall vegetation to shade the creek. Enhanced riparian buffer zones will stabilize and vegetate the slopes, providing habitat for invertebrates and feeding opportunities for fauna. The banks will be vegetated with live stakes to offer both stabilization and habitat. Fish passage improvements will be made by removing existing barriers and installing passable culverts.

Adjacent areas will be restored to create a functioning floodplain, serving both as a natural heritage system and for water storage benefits. The water quality of the stream will be improved by incorporating filtering wetlands as part of the SWM system, which will discharge into the watercourse.

Appendix F contains design typicals specifically for stream restoration, illustrating the features that will be considered as part of the watercourse restoration within Block 12.

8.3.4 Removal of Online Ponds

The proposed restoration plan involves the removal of the two online ponds (Upper and Lower Ponds) as both an ecological enhancement and an ecological/public safety measure. From an aquatic habitat perspective, removal of the online ponds is expected to provide a significant ecological benefit. Although they may be providing direct fish habitat, the presence of the ponds is expected to have a negative impact on the overall functioning of the watercourse and in turn, could be impacting downstream habitats and aquatic biota.

First, the presence of the ponds is expected to cause thermal loading in the watercourse, which would significantly degrade its function as contributing habitat for Redside Dace. Removal of the online ponds will eliminate this source of thermal loading and assist in maintaining cooler temperatures in the watercourse, which may have substantial benefits for the downstream Redside Dace population.

Secondly, the existing ponds are expected to have an impact on existing erosion and sediment transport processes. It is expected that eroded sediments from the upstream portion of the watercourse are being deposited with the ponds, effectively interrupting natural sediment movements. This may be resulting in sediment starved downstream reaches and possibly causing increased erosion and/or lack of coarse, habitat-building sediments. Re-establishment of a more natural sediment transport regime is expected to have substantial benefits for the overall biophysical function of the watercourse and associated habitat for fish and benthic invertebrates.

Finally, the existing embankments downstream from the each of the ponds are thought to be functioning as a barrier to upstream fish movement. Removal of the online ponds and construction of a natural channel is expected to significantly enhance the ability of fish to move further upstream through this watercourse system and into newly created wetland habitat areas. This may result in increased productivity both upstream and downstream from the existing obstructions, with the existing fish community downstream potentially able to exploit seasonal habitat functions further upstream, while also enhancing the longitudinal connectivity in a downstream direction, which may facilitate downstream transport of forage for benthos and fish.

8.3.5 Wetland Replication

In addition to the proposed direct enhancements within the channel and corridor, wetland replication will be completed in part adjacent to the realigned low flow channel. Existing wetlands provide contributing aquatic habitat functions, including water quality maintenance and hydrology functions and provide contributing habitat for Redside Dace. Replication of wetlands will ensure that these important aquatic functions are maintained in the watercourse system. Wetland replication is to occur within Block 12 EPA that is approximately 6 ha in size.

Native wetland plant species will be carefully selected and planted to ensure successful colonization and to provide essential habitat for wetland fauna. These plants play a crucial role in filtering pollutants from the water, stabilizing soil, and contributing to overall biodiversity.

Invasive species that threaten the health and functionality of the wetlands will be systematically identified and removed. This action is vital to prevent the displacement of native species and to maintain the ecological balance of the wetland habitat.

To enhance habitat complexity and provide additional shelter for wildlife, features such as logs, rocks, and brush piles will be strategically placed within the wetland area. These structures mimic natural debris and contribute to the heterogeneity of the habitat, offering various microhabitats for different species.

The edges of the wetland will be a focus for restoration as well, ensuring that the transition zones between the wetland and adjacent upland areas are properly vegetated with native species. This buffer zone is essential for filtering runoff before it enters the wetland and provides additional habitat and travel corridors for wildlife.

8.3.6 Wetland Cash In-Lieu

As previously discussed, a preliminary cash-in-lieu calculation has been prepared for proposed wetland removals within Block 1 of Tullamore under separate cover (see **Appendix D**). This memo has been approved by TRCA and addresses 1.57 ha of proposed wetland removals associated with Watercourse 1. Across the Subject Lands, a total of 9.037 ha of wetland, including buffers, is proposed for removal, as per the updated Conceptual Plan. Further cash-in-lieu memorandums will be prepared and included in the final submission of the CEISMP as required to address the proposed removals.

8.3.7 Wildlife Habitat and Linkage Creation

Furthermore, the new habitats created within the East Tributary will allow for increased connectivity and linkage opportunities that currently are not present within this tributary due to the constructed berms. Currently, the Upper and Lower Ponds are acting as a permanent barrier to wildlife movement due to the steep berm walls and depth of the constructed valleyland. By restoring the connection to habitats north of Mayfield Road through removing the constructed berms, wildlife movement will be encouraged throughout the corridor. The East Tributary ultimately connects into the West Humber Tributary approximately 650 m downstream of the Subject Lands. Maintaining secondary corridors within a landscape, like the East Tributary, helps to maintain population connectivity and biodiversity while creating a more functional, natural landscape.

Wildlife enhancement structures will also be installed throughout the East Tributary to provide habitat diversity that is not currently present and/or compensate for those that are proposed for removal. While the specific abundance, location and type of habitat structure will be defined within the detailed design stage of this project, wildlife enhancement structures will attract and protect a variety of wildlife. The following wildlife enhancement structures will be considered:

- Amphibian breeding and overwintering habitat;
- Turtle basking, nesting and overwintering habitat;
- Snake hibernacula;
- Brush and rock piles;
- Barn Swallow nesting kiosks;
- Pollinator habitat;
- Snags; and
- Bat rocket boxes.

These types of structures will provide wildlife with habitat for resting, feeding, escaping predators, sheltering from bad weather, raising young and breeding/roosting. While these habitat types may be present within the West Tributary or within the East Tributary on the southside of Mayfield Road, creation of these habitats within Salt Creek and the wetland enhancement area on the Subject Lands will encourage amphibians, reptiles, small to medium sized mammals and birds to use this corridor.

Currently, there is limited bat maternity roosting habitat present along the East Tributary. By installing bat rocket boxes within the watercourse corridor, it will encourage bats to roost within this portion of the NHS. Additionally, there is limited pollinator habitat within the existing East Tributary corridor due to the presence of invasive species (e.g., Flowering Rush) and monocultural wetland communities. The inclusion of a variety of nectaring species that flower from mid-spring to mid-fall will increase the availability of pollinator habitat within the watercourse corridor and increase foraging habitat for aerial insectivores. Moreover, no snake hibernacula were identified within the Subject Lands; therefore, the creation of naturalized habitats may be warranted to enhance and increase the availability of snake overwintering habitat on the landscape. The creation of these features in close proximity to summer foraging habitat (i.e., meadow, wetland) may allow snakes to concentrate home ranges and activity centres within the East Tributary corridor. Finally, the creation of amphibian and turtle breeding and/or overwintering habitat will be explored within constructed floodplain pools and/or realigned channel pools (depending on hydrological modelling) within the East Tributary corridor. These habitats are currently present within the constructed ponds and will need to be replicated within the landscape.

As identified within the IGF pending submission to the MECP, the following species may be impacted by the changes in land use.

Bobolink and Eastern Meadowlark

Habitat for Bobolink and Eastern Meadowlark will be protected in the Greenbelt Plan Area. Disturbance to the species as a result of construction activities will be temporary in nature and will be addressed through construction best practices. This species will be carried forward through the ESA review process with MECP for indirect impacts to the species when present that may be mitigated through construction timing, and disturbance setbacks.

Redside Dace

The West Tributary of the West Humber River and Salt Creek are designated as occupied habitat for Redside Dace. The proposed development will avoid the West Tributary and Salt Creek, though construction activities may indirectly impact the West Tributary. The proposed development will however impact contributing Redside Dace habitat associated with the East Tributary of the West Humber River, Watercourses 1 and 2 and associated HDFs. These watercourses and any associated compensation efforts will be refined in the Final CEISMP and are subject to approval from DFO and MECP. As per Paragraph 34.4(2)(b) or 35(2)(b) of the *Fisheries Act*, impacts to Redside Dace will also be addressed via a DFO Request for Review.

In summary, the Restoration and Landscape Plan when combined with other mitigation measures will provide benefit to both the aquatic and terrestrial ecosystems through the following:

- Elimination of thermal loading;
- Restoration of fish passage;
- Naturalized sediment transport;
- Increased contributing functions that benefit the downstream occupied Redside Dace habitat;
- Increased quality of wildlife habitat;
- Increased diversity of wildlife habitat; and,
- Increased linkage and connectivity between natural features that improved wildlife movement.

8.3.8 Planting Guidelines

The proposed restoration and enhancement design will enhance existing NHS features and long-term functions within the West Tributary and Salt Creek, including corridor and linkage functions, while creating new, functional habitats that will provide additional flood control measures within the East Tributary. Plantings will be focused within the stormwater management wetland edges, wetland replication and low flow channel area in Block 12, which will contain wetland and upland plant species, as well as the West Tributary and Salt Creek buffer and wetland plantings.

Buffer plantings will provide natural buffering functions (i.e., attenuation functions, protection from edge effects, noise, and light pollution) and allow natural successional processes to occur. The NHS buffer (and other restoration areas between the NHS boundary and the development limit) will serve to further protect features within NHS, increase the biodiversity of native flora and fauna, and provide breeding, rearing and foraging habitat for woodland species over the long term. Strategic plantings within the East Tributary (Block 13) will be explored to mitigate thermal loading to downstream Redside Dace habitats.

The proposed native plant assemblages will be tailored to suit targeted vegetation communities based on available light, soil, slope, and growing conditions. Plants will be selected to provide a diverse assemblage of species and include fast-growing and pioneer species more tolerant of harsher/variable growing conditions. Native plant materials should be sourced from appropriate Native Plant Nurseries and Seed Suppliers within 100 km of the Subject Lands, as available, to reduce transplant shock. Bareroot plant materials can be used in early spring or late fall planting, otherwise potted material is required. None of the proposed plant species will be regionally or locally rare. A cover crop will be applied along with the native perennial seed mix to stabilize soils and to aid in the establishment of native vegetation. The exact cover crop selection depends on the timing of planting. Several appropriate options will be provided in the Natural Heritage Design Brief.

Given the nature of the Subject Lands (actively managed agricultural fields), soil amendments may be required to ensure that the soils located within the proposed restoration and enhancement areas can support planted materials. The quality of the soil should be tested by a credited soil scientist to ensure that it will promote healthy vegetation growth, per the TRCA's Preserving and Restoring Healthy Soil Guideline.

8.3.9 Invasive Species Management

There are four basic approaches to invasive plant management that are widely accepted by the scientific community:

- Prevention – limit vector pathways;
- Eradication – complete removal including reproductive propagules;
- Containment – prevent establishment or to control a plant species beyond a predefined area known as a containment unit; and
- Asset-based protection – limiting invasive plant control to portions of an infestation that directly threaten high value conservation targets.

Should Category 1 invasive species be identified in the retained vegetation communities within NHS, invasive species management opportunities will be considered. Best Management Practices (BMPs) for invasive species management (e.g., Ontario Invasive Plant Council's BMPs) will be reviewed to determine the appropriate management approach. Management techniques can be classified into three broad categories:

1. Mechanical control (e.g., cutting, mowing, burning)
2. Chemical control (e.g., herbicides, insecticides)
3. Biological control (introduction of organisms that feed on or infect the target species)

Management opportunities will be further explored and discussed within the Natural Heritage Design Brief at the detailed design stage.

Potential areas for invasive species management may include both the Block 12 EPA and Block 9 EPA. Invasive species management will occur in areas that are deemed necessary through the finalization of the restoration plan. These details will be included in the Final CEISMP.

8.4 Wildlife Enhancement Opportunities

As previously identified within **Section 5**, several wildlife functions are present within the Subject Lands including:

- Permanent, direct fish habitat for warmwater fish;
- Foraging habitat for aerial insectivores (birds and bats);
- Breeding habitat for amphibians and turtles;
- SAR habitat for Redside Dace (contributing and occupied habitat); and
- Potential habitat for marsh breeding birds and colonial nesting birds.

Opportunities for wildlife enhancement functions (e.g., artificial bark or rocket boxes to support bat maternity roosting, amphibian breeding and overwintering, turtle basking and nesting, etc.)

will be reviewed during the detailed design stage and could be applied in the Block 12 or 9 EPA. If hydrology can be supported, the opportunity to create habitat for amphibian and reptile breeding/overwintering within the wetland restoration block or in the Salt Creek valleylands will be explored. **Appendix E** features examples of potential habitat enhancement typicals that may be considered as part of the final restoration plan in the EPAs.

Moreover, the existing East Tributary has two permanent barriers to fish movement (perched culverts) identified during aquatic surveys (as discussed above within **Section 4.5.1.2**). Removal of those barriers will allow for movement of fish species upstream. The low flow channel and lower reaches of the East Tributary will be designed/enhanced using NCD principles and will incorporate various fish habitat structures (e.g., riffle-pool morphology, strategic placement of LWD) to enhance fish habitat within the East Tributary. The proposed removal of online ponds (1, 2 and cattle) will help reduce thermal loading to occupied Redside Dace habitats downstream of Mayfield Road.

8.5 Management Plan Recommendations

8.5.1 Water Quality Management

GEI has developed a baseline surface water quality monitoring program, beginning in 2023. GEI is currently conducting monthly manual surface water depth and temperature measurements within the ponds on site. Dataloggers have been installed at each monitoring location to obtain continuous measurements to supplement manual monitoring results. This monitoring program commenced in the summer of 2023 and will continue until 2024. Additionally, surface water quality samples will be taken and analyzed against various parameters. Water quality monitoring to understand baseline conditions is required to properly inform the stormwater management strategy. As per the SABE Study, water quality criteria for the West Humber Watershed receiver is 80% TSS removal (and less than 25 mg/L above background conditions), thermal (below 24 degrees Celsius), dissolved oxygen of at least 7 mg/L. The results of GEI's surface water quality monitoring program will be included in the final CEISMP and will help inform the SWM plan and restoration plan.

8.5.2 Groundwater Management Strategies

A Spill Prevention and Response Plan is recommended by TIL (2021) during construction to mitigate potential spills and it is recommended that potentially hazardous materials be stored in designated areas with appropriate containment as well as away from areas of high vehicular traffic. To manage potential long-tern impacts to the surface water system, best management practices for the storage and handling of chemicals and road salt over the long-term are encouraged by TIL (2021).

Potential short-term impacts to the surface system are anticipated to be effectively mitigated where a Site-specific Spill Prevention and Response Plan as well as an Erosion and Sediment Control (ESC) Plan are in place. Where a Groundwater and Dewatering Discharge Plan is required during construction, it should also consider the potential impacts of discharge to surface water habitats (such as habitat for Redside Dace) and include strategies for mitigation and contingency action. Routine monitoring of ESC measures will ensure the form and function of these controls in preventing off-Site impacts to the sensitive surface water system adjacent to the site. In order to manage long-term impacts to groundwater recharge, Crozier has completed a water balance assessment (2023) which establishes infiltration targets for the site post-development and recommends the use of LID measures to achieve the infiltration targets.

Potential impacts from contamination to other groundwater users are expected to be mitigable where a Spill Prevention and Response Plan is in place and best management practices for the storage and use of potential sources of contamination are followed.

8.5.3 Phasing Considerations and Technical Framework for Future Infrastructure

Phasing considerations and the technical framework for future infrastructure will be addressed in the final CEISMP, once additional information from Crozier, MECP, and DFO is available. This section will be updated to include recommendations to detail a comprehensive approach to the natural heritage system strategy, public infrastructure placement, and stormwater management practices.

8.5.4 Future Studies

Additional studies are required to be completed in support of the future site plans to meet the objectives and targets of the CEISMP. The scope for additional studies should include:

- Complete hydrologic and/or hydraulic modelling to verify the stormwater management criteria established as part of the FSR & SWM Plan are met with the development of each site plan.
- Completion of water quality monitoring and reporting to verify baseline water quality levels for the systems on site. This is currently in process at this time;
- Geotechnical investigations of the Salt Creek LTSTOS to determine the appropriate limit for development and finalize boundaries of Block 9;
- Fluvial geomorphic investigations of the West Humber River and tributaries that flow through the site to provide accurate characterization and management recommendations; and
- Additional site-specific environmental studies and approvals that would be needed to support subsequent site plan applications.

9. Monitoring and Adaptive Management Plan

A Monitoring Plan will be developed for review and approval at the time of detailed design. The monitoring locations, frequency and type of monitoring will be established based on the final design and restoration targets.

Considerations for terrestrial and wetland monitoring for areas within the Peel Region SABE study area are outlined in the Region of Peel SWS. Monitoring will address and confirm predicted effects and the early outcomes of any proposed NHS restoration, including:

- Pre-construction monitoring: establishment of monitoring stations/locations, baseline inventories, etc.
- Construction monitoring: environmental protection and mitigation measures effectiveness monitoring, which may include buffer/setback integrity monitoring.
- Post-construction monitoring: assessment of early NHS restoration success, including addressing restoration planting establishment.

The duration of the monitoring program will be determined based upon the timeframe for implementation. Generally monitoring will be conducted at least 2 years prior to construction and should continue until at least 80 % build-out of the area.

The proposed ecological monitoring program is intended to insure that:

- Protective mitigation strategies and actions (**Section 7**) are effectively implemented during construction;
- Ecological restoration measures (**Section 8**) are effectively implemented; and,
- Created features and associated functions are developing along projected trajectories.

Construction monitoring is intended to monitor the effectiveness of measures and practices designed/implemented to manage impacts due to construction. This form of monitoring most often translates into ensuring that all ESC measures are in place and functioning; however, other aspects of construction monitoring can relate to Redside Dace turbidity monitoring, and installation of restoration plant materials, or other parameters of concern. ESC guidance is provided in **Section 7.2.8**. Regular inspection and maintenance are required and also outlined within the ESC plan.

The post-construction ecological monitoring program described below is intended to assess the change in retained and constructed ecological features between pre- and post-construction periods. The terrestrial and aquatic data collected by GEI within the Subject Lands will serve as a baseline for ecological monitoring.

Post-construction compliance monitoring is also driven by the need to comply with permits or other approvals. It is intended to demonstrate that the constructed NHS is functioning as designed. This monitoring is relatively local in scale and associated with specific works. For the Subject Lands, it would apply to restoration areas, habitat compensation measures, and any plant materials (e.g., landscape warranty).

Annual monitoring reports will be submitted to reviewing agencies summarizing monitoring results. Adaptive management plans will be prepared for post-construction monitoring.

The Management, Implementation, and Monitoring Plan shall also recommend the phasing of development, and address climate change considerations, particularly demonstrating compliance with Peel Region's Climate Change Master Plan. This will permit changes to recommend mitigation measures and management strategies for future phases of the development, in the case results of monitoring from the initial phases suggest that changes are warranted.

Proposed monitoring protocols and methods will consider the following:

9.1 Vegetation

The objectives of the vegetation monitoring include assessing the long-term condition and function of the vegetation communities while updating the boundary of the vegetation features. This will be accomplished by:

1) Establishing long term monitoring plots following the standards associated with the Ecological Monitoring and Assessment Network Protocols (Roberts-Pichette and Gillespie 1999)
2) Periodically updating the ELC (Lee et al. 1998) of the NHS in order to maintain up-to date coverage of vegetation communities.

9.2 Breeding Birds

The objective of breeding bird monitoring is to assess changes in bird communities and/or individual species within and outside of the SABE related to development. The monitoring program should be based on the protocols established by the Ontario Breeding Bird Atlas (Cadman et al. 2007), Forest Bird Monitoring Program (Cadman 1998), and the standard methods for monitoring songbird populations in the Great Lakes Region (Howe et al. 1997). Monitoring stations should be established in habitats found in both the development area as well as the undeveloped area for comparison.

9.3 Amphibians

The objective of amphibian monitoring is to assess changes in the occurrence and abundance of calling amphibian species that occur within and outside of the SABE related to development. monitoring protocols should follow standard approaches identified in Marsh Monitoring Program protocol (BSC 2009). Monitoring stations should be established in habitats found in both the development area as well as the undeveloped area for comparison.

9.4 Other Terrestrial Monitoring

Based on site-specific conditions, monitoring for other plant and wildlife groups may also be required. This may include invasive species and targeted species surveys for bats, and reptiles. Under the ESA permitting process, SAR monitoring could be completed with this monitoring program. Where applicable, monitoring protocols should follow existing standards.

9.5 Monitoring Requirements for Redside Dace

The West Humber Subwatershed and Salt Creek contain Redside Dace habitat. As such, and in addition to the foregoing, continuous monitoring for instream dissolved oxygen, turbidity, and conductivity should be conducted where land use changes and site alteration are proposed on adjacent lands. The TSS and turbidity results from the wet weather and dry weather grab sampling should be used to generate a mathematical relationship between the two parameters for each monitoring site; this relationship would be used to generate a continuous TSS dataset based on mathematical relationships between TSS and turbidity.

10. Conclusions

This CEISMP addresses the natural heritage features and associated functions found on and immediately adjacent to the Subject Lands. Presently, the Subject Lands are dominated by agricultural land-use and are traversed by two tributaries to the West Humber River in the southwest, and a portion of Salt Creek in the northeast. Portions of the Greenbelt Planning Area are identified within the southeast corner of the Subject Lands.

Based on the ecological findings, the following natural heritage features were identified within the Subject Lands:

- Significant habitat of endangered, threatened and special concern species (Redside Dace contributing and occupied habitat, Candidate SAR bats);
- Fish habitat;
- Unevaluated wetlands (MAM2, MAM2-2, SWT2-2, MAS);
- Significant valleylands (West Tributary to West Humber River, Salt Creek);
- SWH (candidate Bat Maternity Colonies; and confirmed Habitat of Species of Conservation Concern – Snapping Turtle, Barn Swallow); and
- Permanent (West Tributary to West Humber River; Salt Creek) and intermittent (East Tributary to West Humber River) streams.

Feature staking was completed on site over 3 site visits and included top of bank, contiguous vegetation and wetlands. Natural features that were not included in the previous site visits, such as the northern woodlot and that were added to the site plan upon receipt of the Ministerial Zoning Order, were not subject to confirmation of feature limit by TRCA. These areas have been shown as ground-truthed by GEI.

The proposed development plan respects the Greenbelt Planning Area and the West Tributary, with a 30 m vegetated buffer being recommended to enhance and protect natural heritage features' form and function.

The removal of the anthropogenic berms associated with the East Tributary is required as they have been determined to be unstable and could cause negative human and environmental impacts should they fail. In its place, a realigned low flow channel is proposed within a wetland block downstream of the stormwater management blocks which will be designed using NCD principles. Moreover, a total of9.037 ha of wetland habitat, including its 10m buffers, is proposed for removal to accommodate the proposed site plan. To compensate for the wetland removals, a combination of on-site wetland replication and cash-in-lieu is proposed. Wetland habitat will be created in the vicinity of the Lower Pond, which will be restored upon removal of the manmade berm. A Natural Heritage Design Brief and Wetland Implementation Plan will be prepared during detailed design outlining the restoration and monitoring requirements for this component of the overall development project, including proposed phasing for the removal of the manmade berms and decommissioning of the Upper and Lower Ponds.

The conclusions and recommendations in this CEISMP are based upon the Draft Plan as presented in this report. As development discussions proceed and as site plans are developed for each block in more detail, predicted effects, and detailed mitigation measures should be reassessed and confirmed.

The implementation of mitigation measures and appropriate construction monitoring will contribute to the maintenance of important local features and functions over time, as well as enhancing and protecting natural heritage features. Predicted ecological outcomes of proposed ecological restoration/mitigation measures include retaining, restoring, and enhancing biodiversity and promoting long-term ecological sustainability and functions of natural heritage features.

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Appendix A

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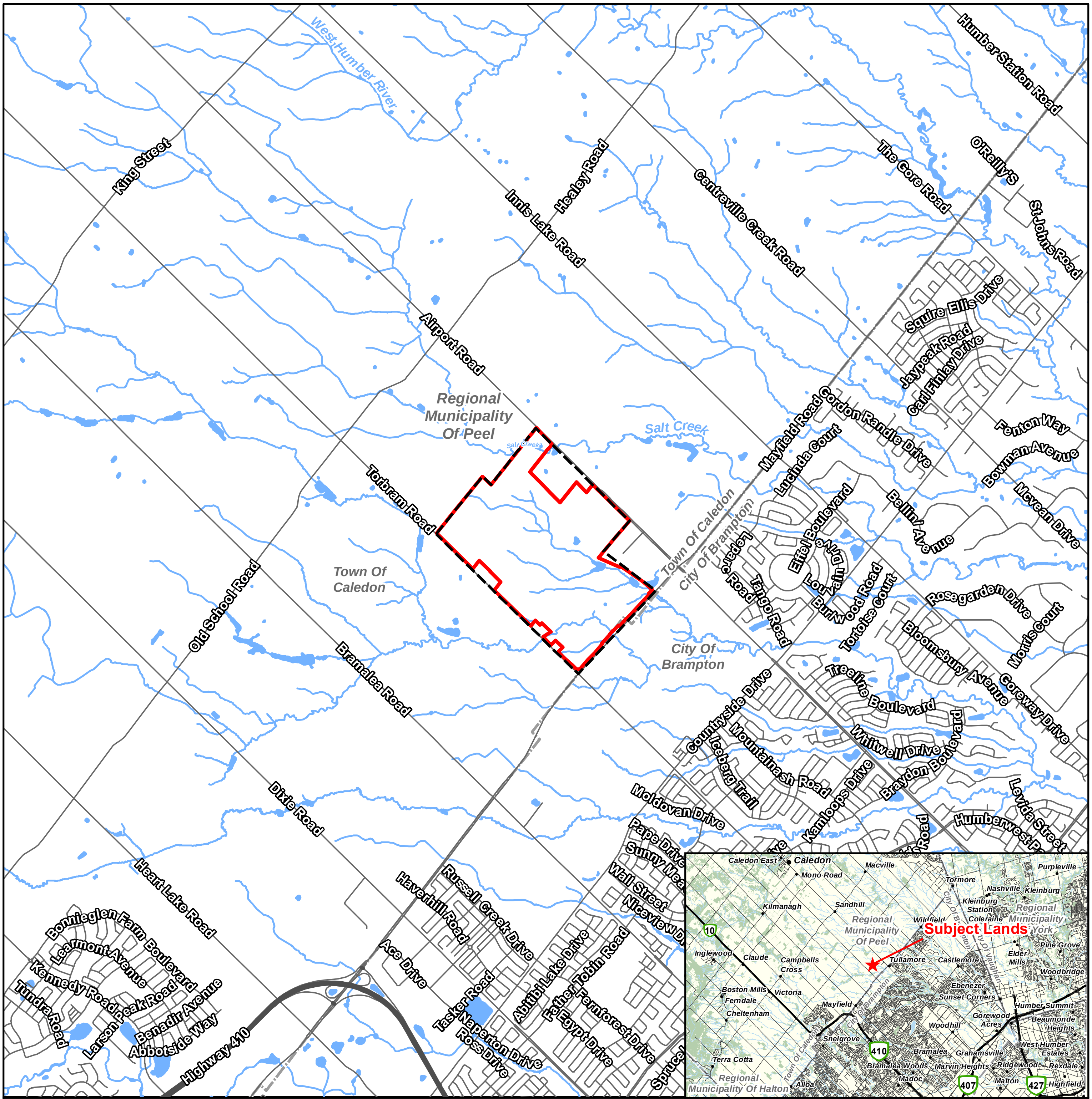

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Legend

- 🟥 Subject Lands
- ▭ Study Area
- ┼ Railway
- ━ Highway
- ─ Road
- ▭ Municipal Boundary, Lower/Single Tier
- ▬ Municipal Boundary, Upper Tier
- ─ Watercourse (LIO)
- ■ Waterbody (LIO)

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 1
Location of Subject Lands

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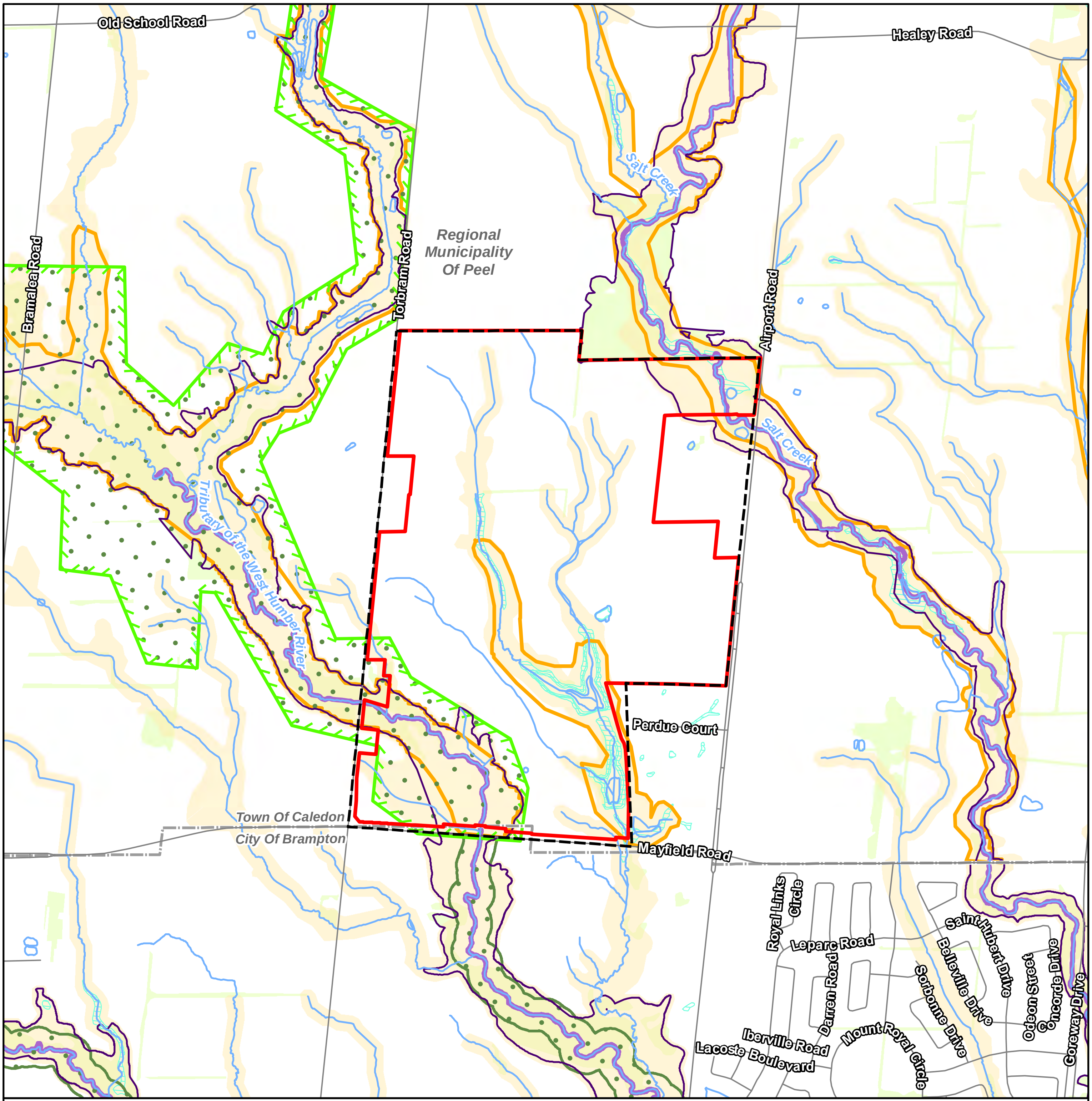
Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 2
Landscape Setting



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Legend

- 🟥 Subject Lands
- ⬚ Study Area
- — Watercourse (TRCA)
- ☐ Waterbody (LIO)
- ⬚ Municipal Boundary, Lower/Single Tier
- 🟩 Wooded Area
- ▨ Wetland - Not evaluated per OWES
- ▬ Aquatic Species at Risk - Fish
- ☐ Greenbelt Boundary
- ▨ Greenbelt NHS
- ☐ Core Areas of the Greenlands System (Region of Peel)
- 🟧 Environmental Policy Area (Town of Caledon)
- ▭ TRCA Regulation Limits

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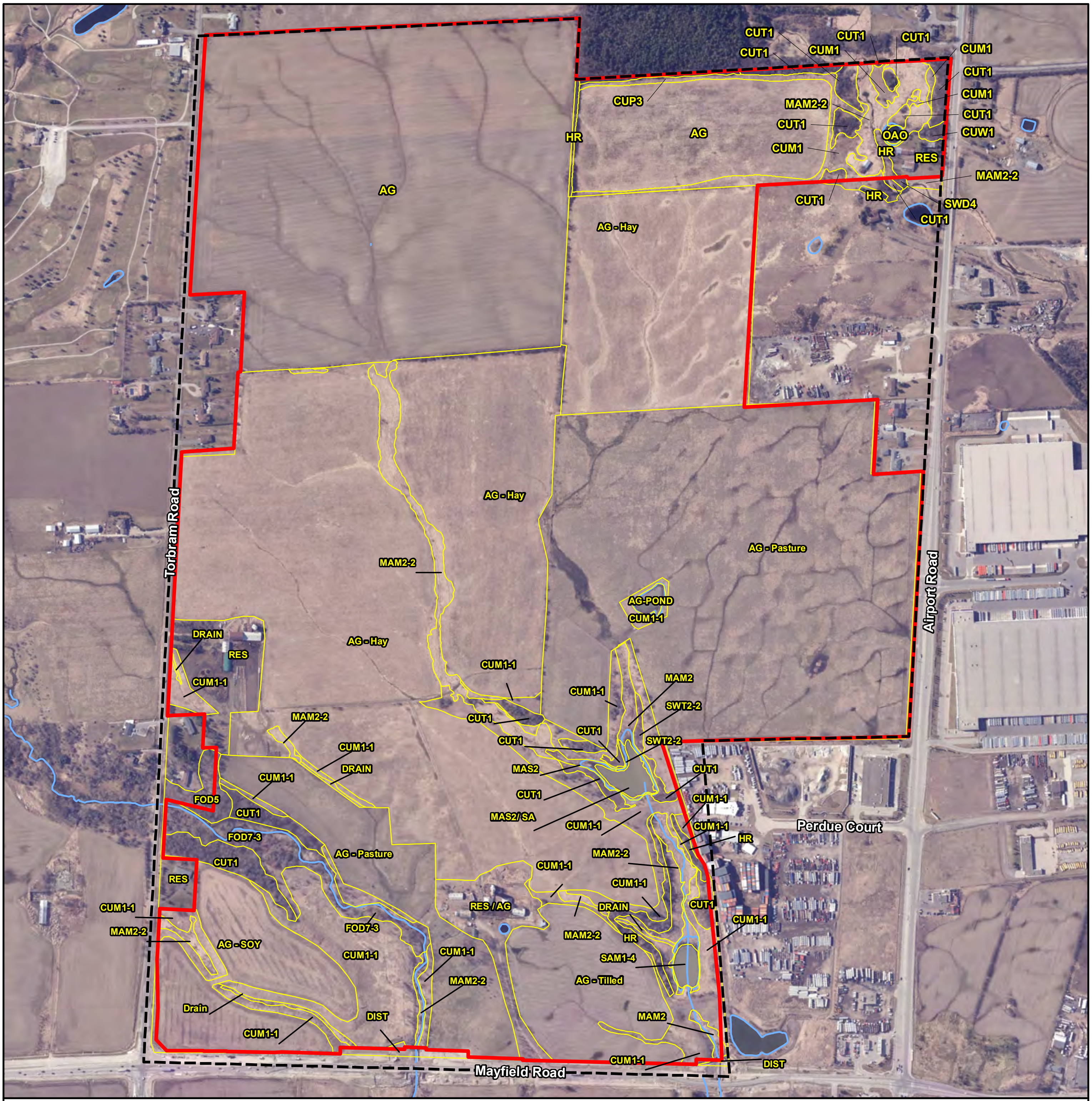

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Legend

🟥 Subject Lands
⬚ Study Area
— Watercourse (TRCA)
▭ Waterbody (LIO)
▭ Ecological Land Classification

ELC Legend

ELC Code, ELC Description

AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
HR, Hedgerow
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2 / SA, Mineral Shallow Marsh / Shallow Aquatic
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

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Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 3
Ecological Land Classification

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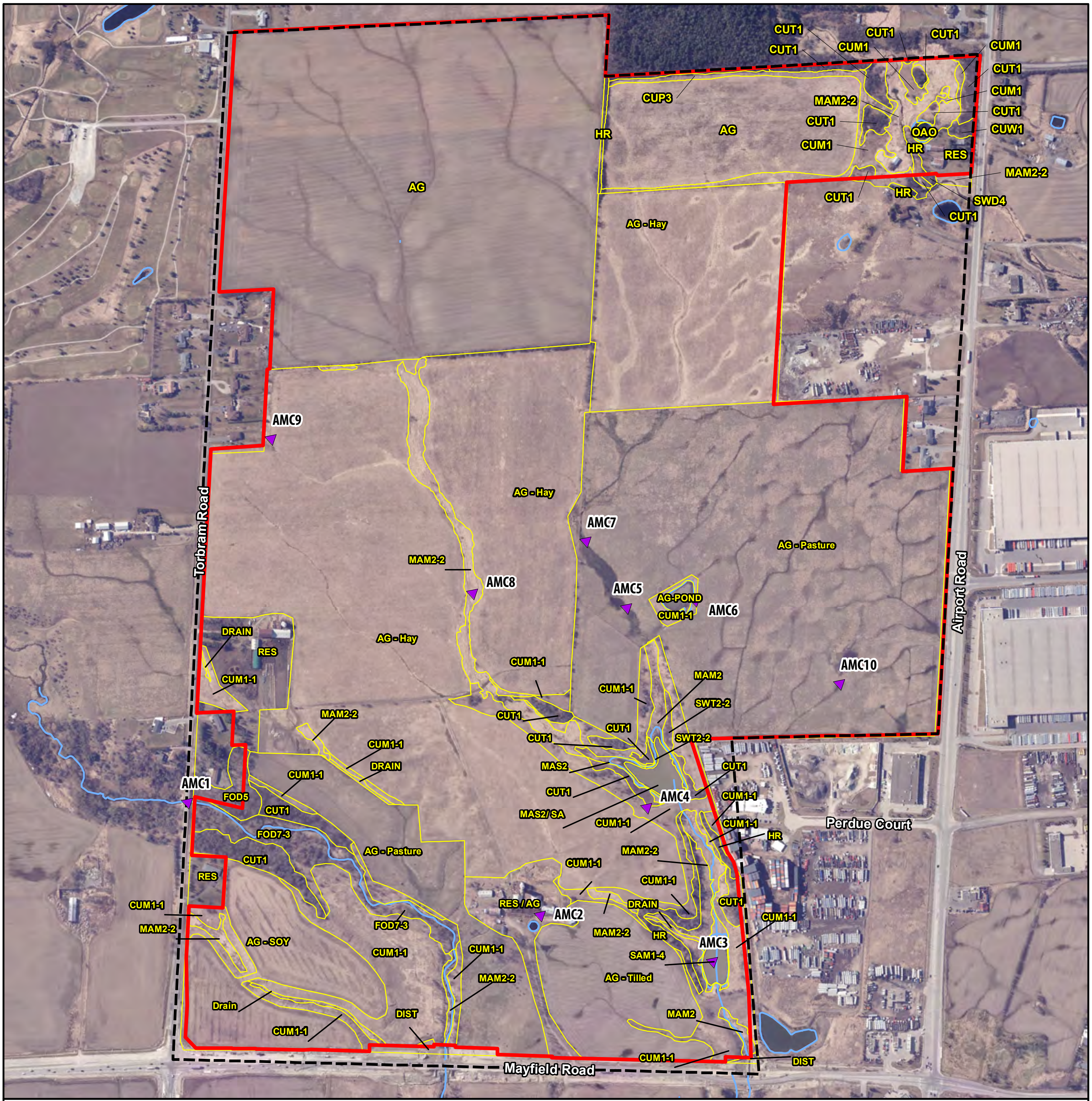

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Legend

🟥 Subject Lands
▭ Study Area
— Watercourse (TRCA)
▭ Waterbody (LIO)
▲ Amphibian Call Count Survey Station
▭ Ecological Land Classification

ELC Legend
ELC Code, ELC Description
AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
HR, Hedgerow
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2 / SA, Mineral Shallow Marsh / Shallow Aquatic
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 4
Amphibian Call Count Survey Locations

0 100 m
1:9,700

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GEI Consultants

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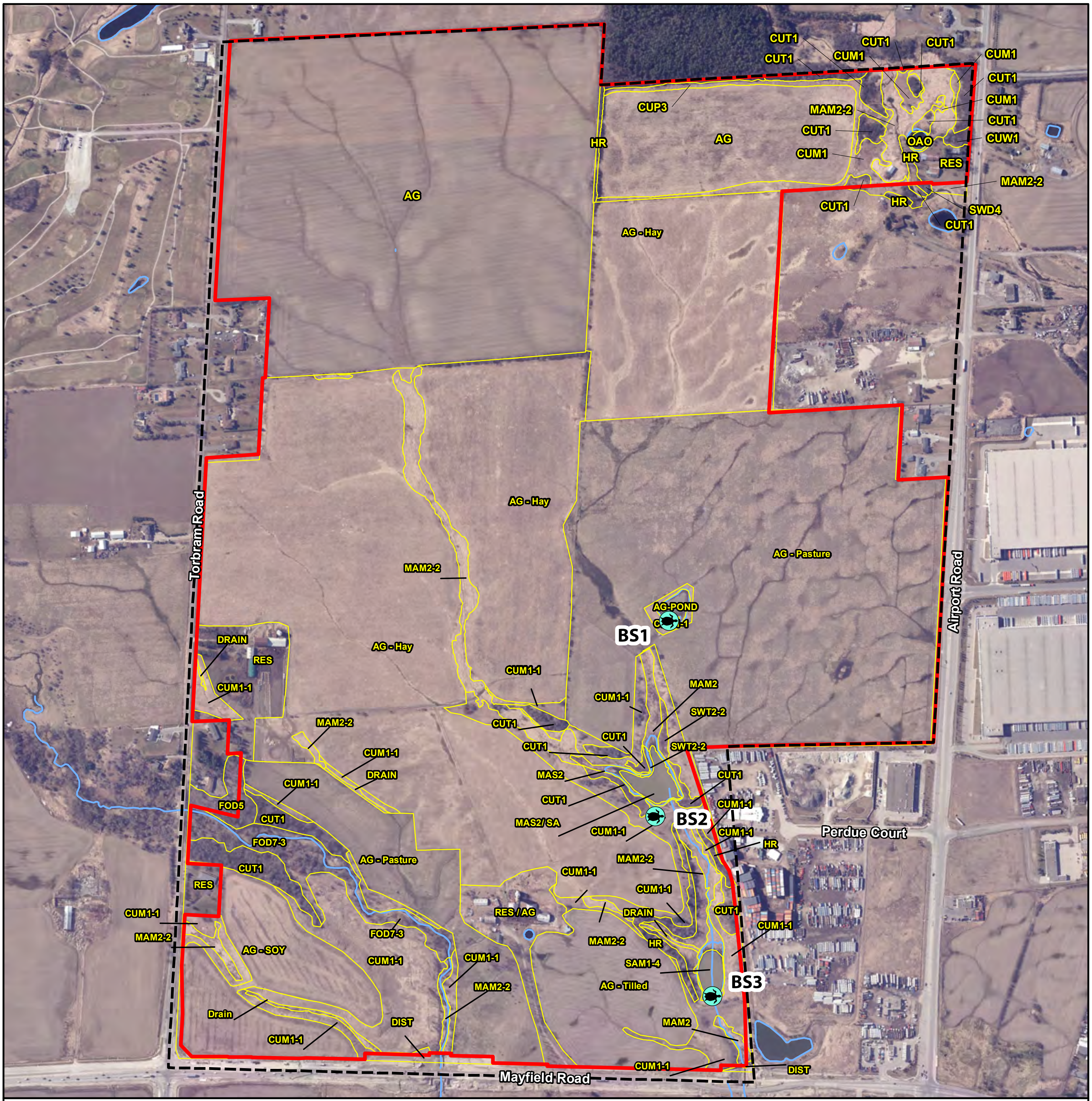

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Legend

- 🟥 Subject Lands
- ▭ Study Area
- — Watercourse (TRCA)
- ▭ Waterbody (LIO)
- ● Turtle Basking Survey Stations
- ▭ Ecological Land Classification

ELC Legend

ELC Code, ELC Description

AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

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Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 5
Turtle Basking Survey Locations

0 100 m
1:9,700

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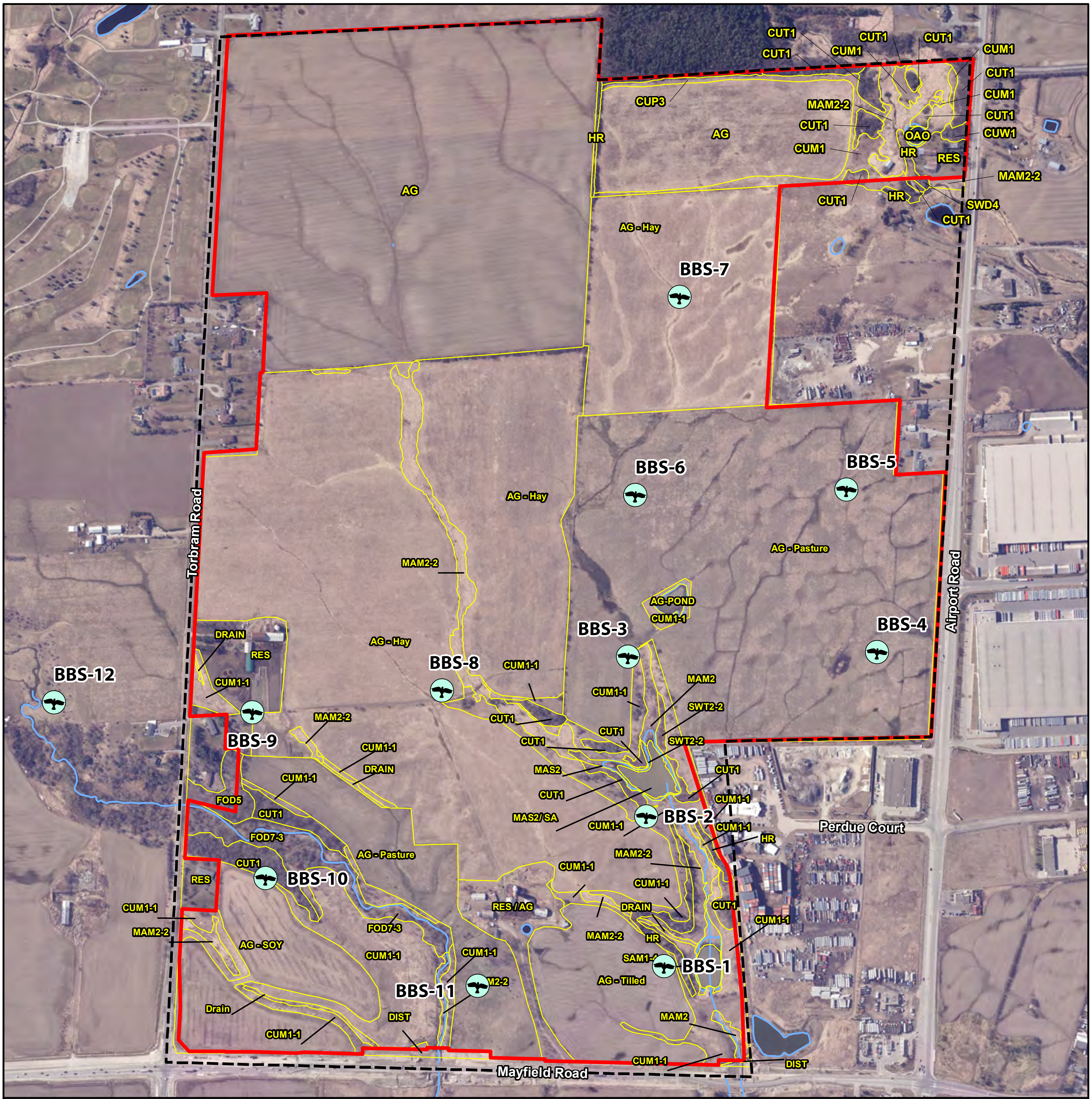

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Legend

- 🟥 Subject Lands
- ⬚ Study Area
- — Watercourse (TRCA)
- ▭ Waterbody (LIO)
- ● Breeding Bird Survey Station
- ▭ Ecological Land Classification

ELC Legend

ELC Code, ELC Description

AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
HR, Hedgerow
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2 / SA, Mineral Shallow Marsh / Shallow Aquatic
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

Comprehensive Environmental Impact Study and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 6
Breeding Bird Survey Point Count Locations

0 100 m
1:9,700

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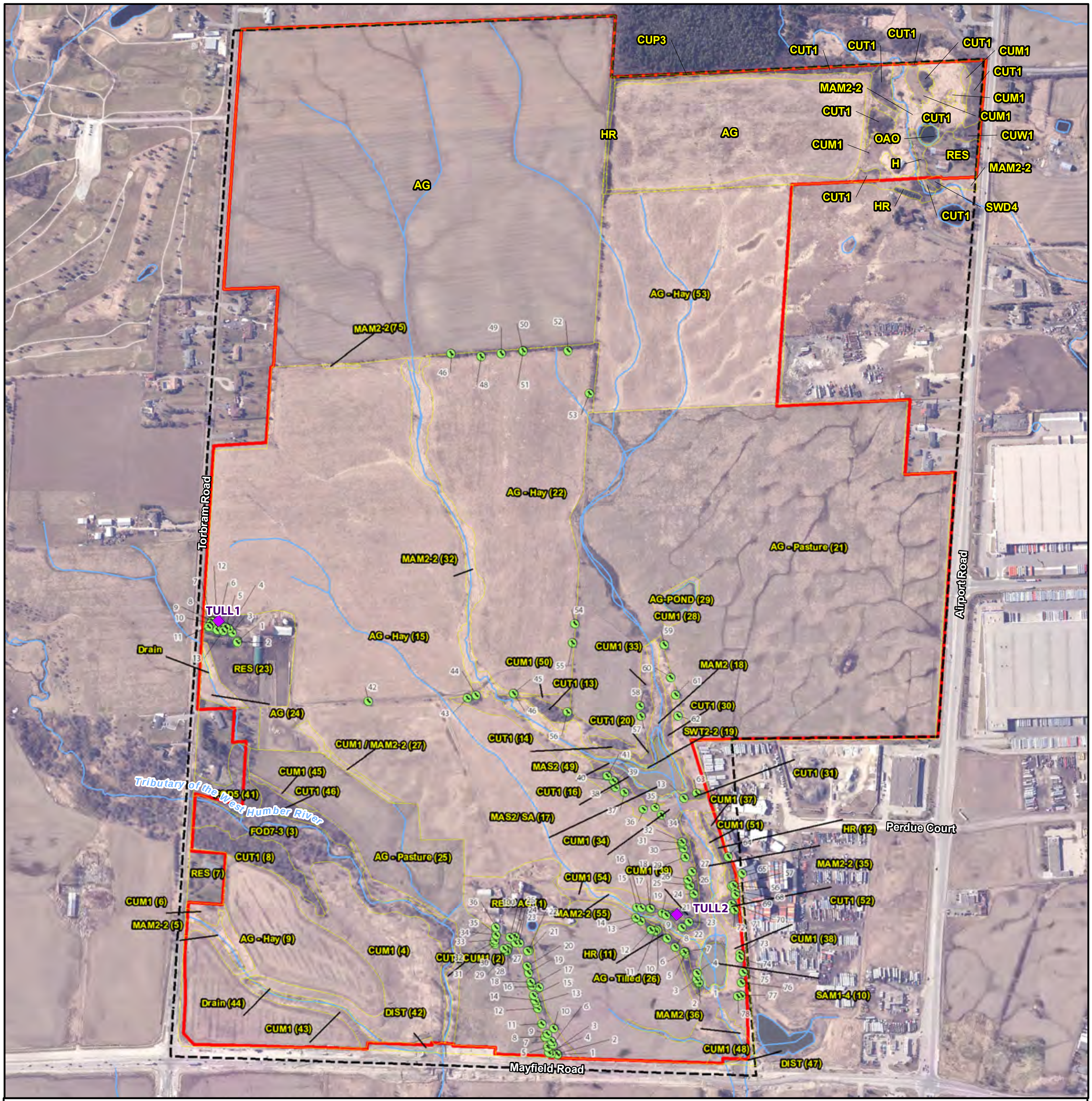
GEI Consultants



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Legend

- 🟥 Subject Lands
- ⬚ Study Area
- ● Bat Snag Tree
- ■ Bat Accoustic Monitoring Station
- — Watercourse (TRCA)
- ☐ Waterbody
- ☐ Ecological Land Classification

ELC Legend

ELC Code, ELC Description

AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
HR, Hedgerow
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2 / SA, Mineral Shallow Marsh / Shallow Aquatic
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

Tullamore Employment Lands
Rice Commercial Group Limited

Figure 7
Bat Survey Locations

0 100 m
1:9,700

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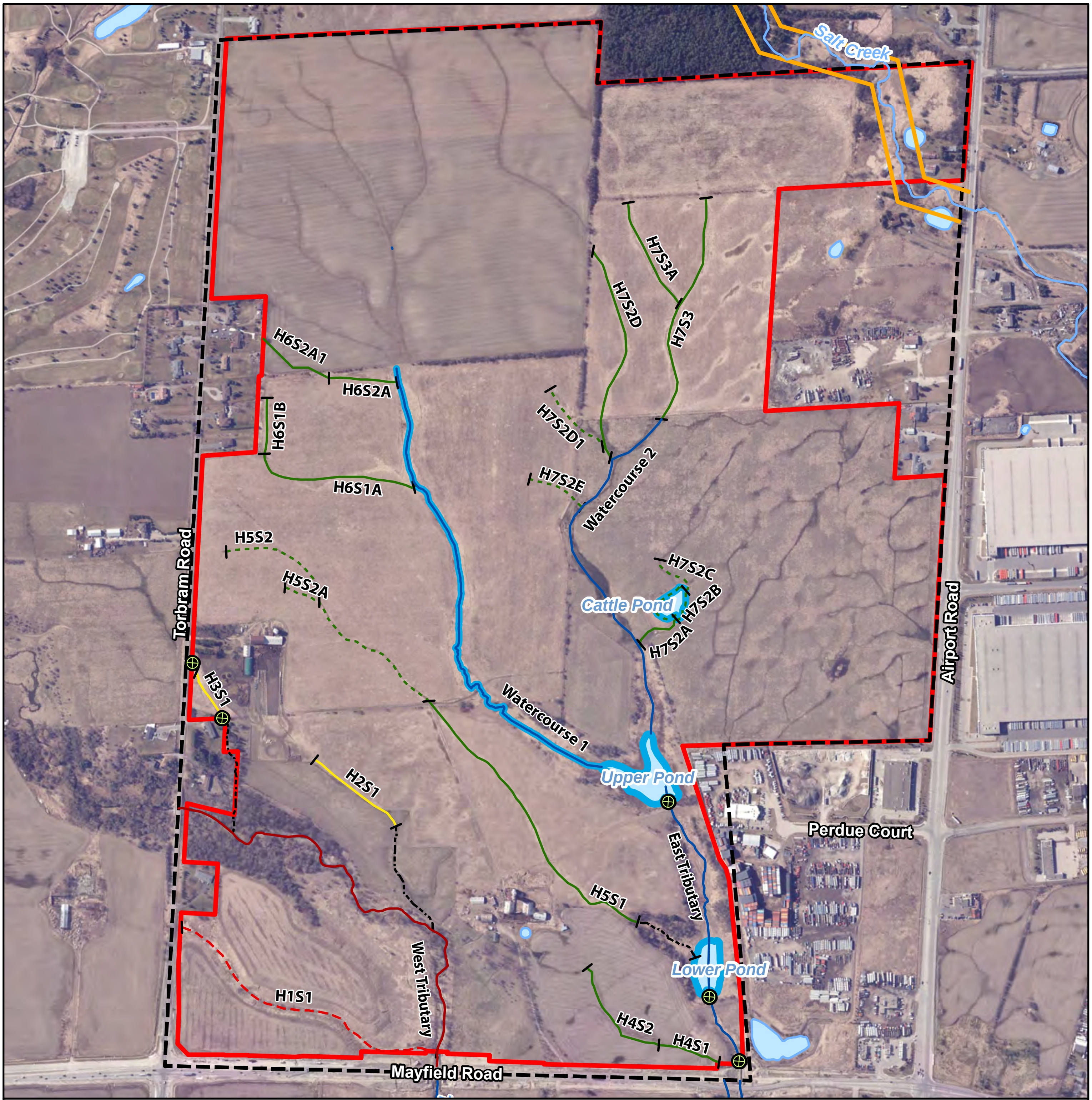

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Legend

- 🟥 Subject Lands
- ▭ Study Area
- 🟦 Waterbody (LIO)
- ⊗ Culvert
- ━ Meander Belt (GEI, 2023)
- ━ Salt Creek

Fish Community Sampling

- ━ Sampling Location

Headwater Drainage Feature Management Recommendations

- ╌ Protection
- ━ Conservation
- ━ Mitigation
- ╌ No Management Required
- ╌ Unassessed Feature - Protected within Valley

Watercourse Constraint Rankings

- ━ High Constraint
- ━ Medium Constraint

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 8
Aquatic Survey Locations

0 200 m

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GEI Consultants

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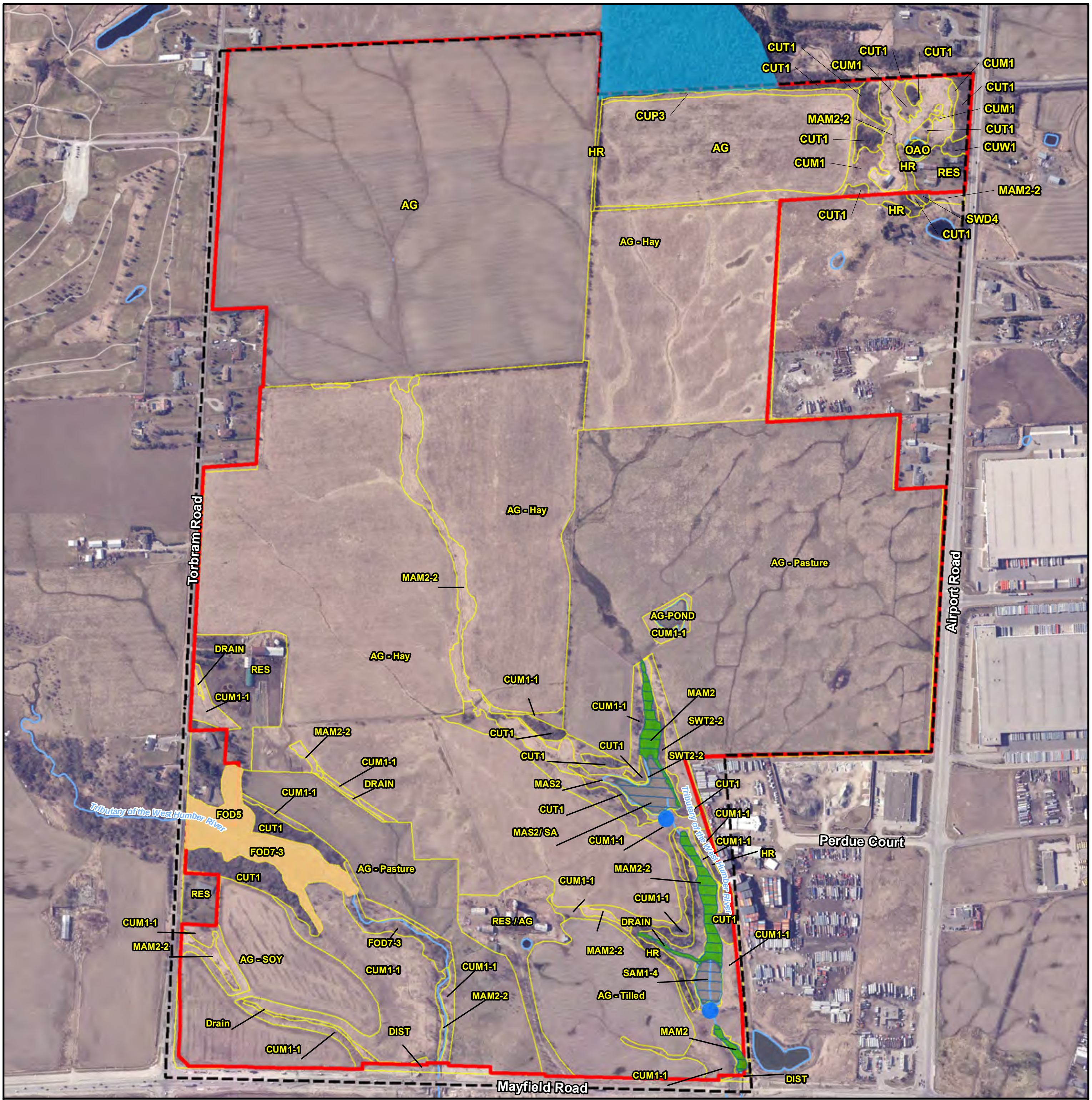

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Legend

- 🟥 Subject Lands
- ⬚ Study Area
- — Watercourse (TRCA)
- ▢ Waterbody (LIO)
- ▢ Ecological Land Classification

Candidate Significant Wildlife Habitat

- ▨ Marsh Breeding Bird Habitat
- 🟦 Colonial Bird Nesting Sites (bank/cliff)
- 🟧 Bat Maternity Colonies
- 🟩 Turtle Nesting Areas, Significant Wildlife Habitat for Species of Conservation Concern (Snapping Turtle)
- 🟦 Candidate Significant Wildlife Habitat and SAR Habitat, Confirmed Significant Woodland (offsite)

ELC Legend

ELC Code, ELC Description

AG, Agricultural
CUM1, Mineral Cultural Meadow
CUM1-1, Dry - Moist Old Field Meadow
CUP3, Coniferous Plantation
CUT1, Mineral Cultural Thicket
CUW1, Mineral Cultural Woodland
DIST, Disturbed
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
HR, Hedgerow
MAM2, Mineral Meadow Marsh
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2 / SA, Mineral Shallow Marsh / Shallow Aquatic
MAS2, Mineral Shallow Marsh
OAO, Open Aquatic
RES, Residential
SAM1-4, Pondweed Mixed Shallow Aquatic
SWD4, Willow Mineral Deciduous Swamp
SWT2-2, Willow Mineral Thicket Swamp

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 9
Significant Wildlife Habitat

0 100 m
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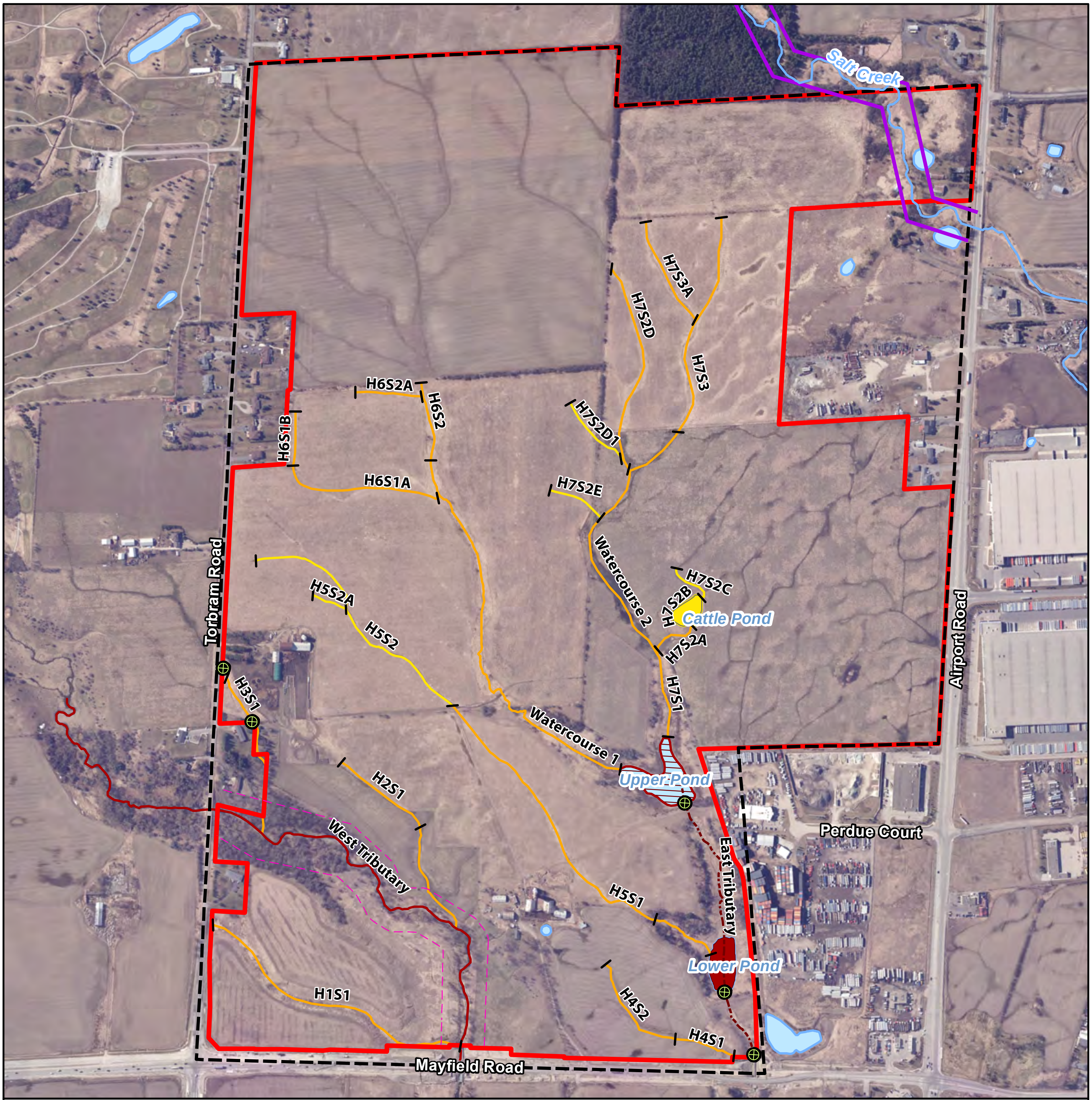

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3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2019.

Legend

- 🟥 Subject Lands
- ⬚ Study Area
- 🟦 Waterbody (LIO)
- ⊗ Culvert
- — Salt Creek
- — Meander Belt (GEI, 2023)
- - - Redside Dace Occupied Habitat

Fish Habitat Type

- -·- Candidate, Permanent, Direct Fish Habitat
- — Permanent, Direct Fish Habitat
- ▨ Candidate, Direct Fish Habitat (Pond)
- ■ Permanent, Direct Fish Habitat (Pond)
- — Indirect Fish Habitat
- — No Fish Habitat
- 🟨 No Fish Habitat (Pond)

Tullamore Employment Lands
Rice Commercial Group Limited

Figure 10
Fish Habitat

0 200 m
1:10,000

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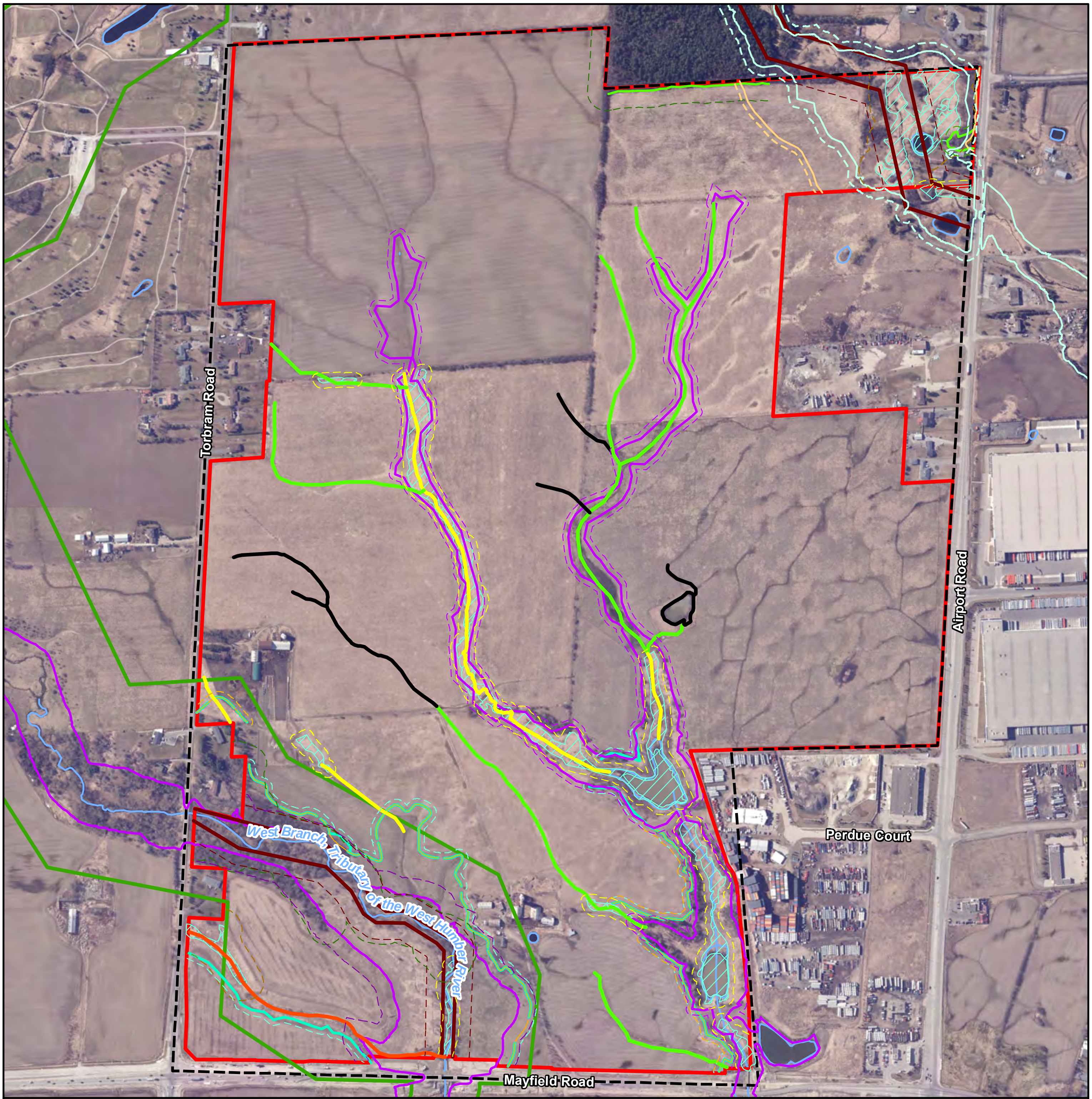

Project 2100975

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** Contributing Redside Dace Habitats would also include wetlands and their associated setbacks*

Legend

- Subject Lands
- Study Area
- Watercourse (TRCA)
- Waterbody (LIO)
- Greenbelt Plan
- Wetland
- Long Term Stable Top of Slope (LTSTOS, GEI, 2022)
- TRCA Staked Natural Features (Top of Slope/Dripline)
- Regional Floodline (Croziers, 2022)
- Dripline (GEI, Jan 2023)
- Meander Belt

HDF Management Recommendations

- Conservation
- Mitigation
- No Management Required
- Protection
- Crest of Slope (TRCA)
- LTSTOS +10M
- Meander Belt +30m
- Regional Floodline +10m
- Regional Floodline +30m
- Staked Natural Features (Top of Slope/Dripline) +10m
- Wetland +10m
- Wetland +30m
- Woodland +10m
- Woodland +30m
- Crest of Slope (TRCA) +10m
- Salt Creek Floodline (Crozier)
- Salt Creek Floodline +15m (Crozier)

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 11
Existing Ecological Constraints Analysis

0 100 m
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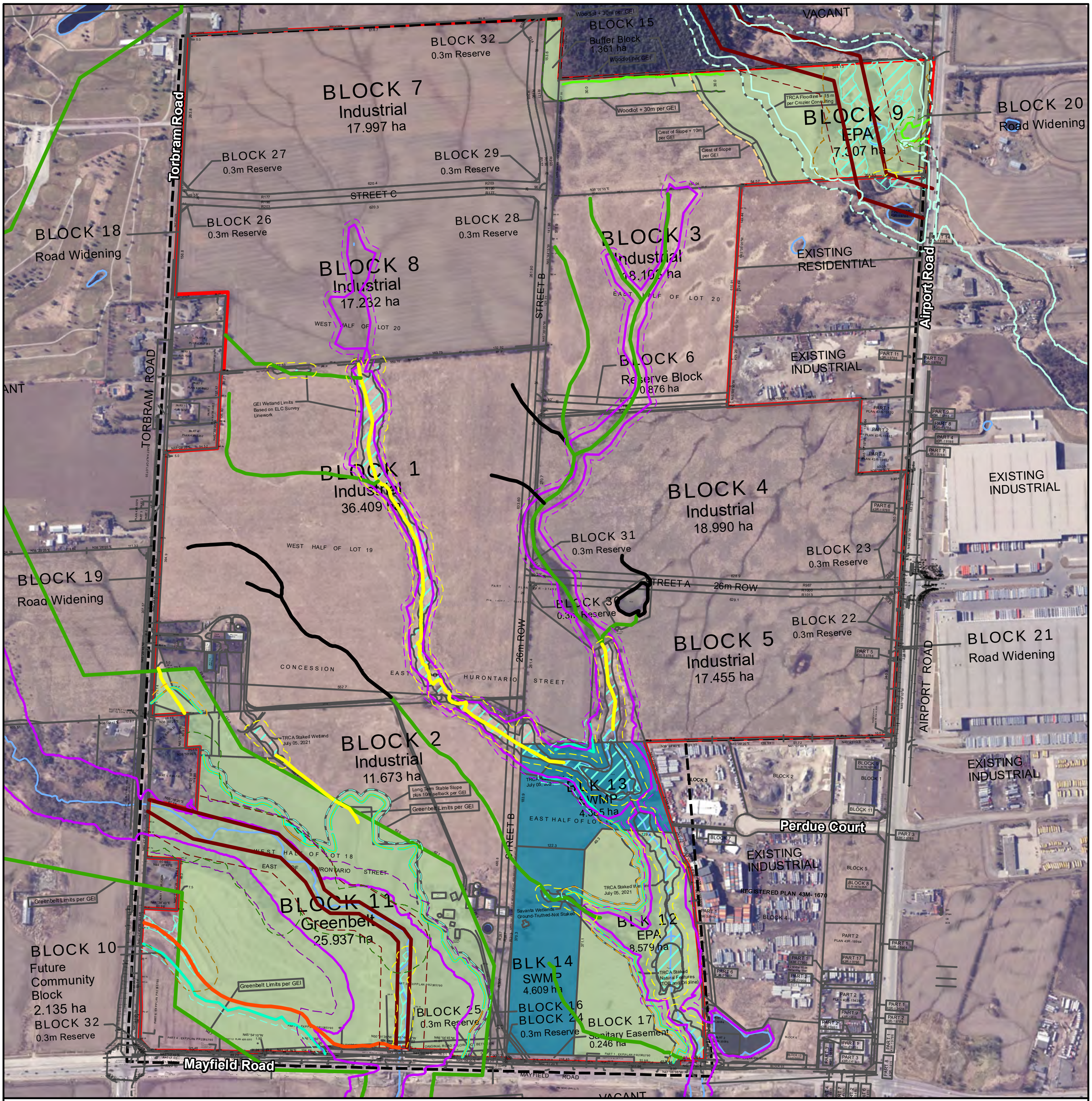

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4. Concept Plan: 10208 Draft Plan D6_2023-10-24.

** Contributing Redside Dace Habitats would also include wetlands and their associated setbacks*

Legend

- Subject Lands
- Study Area
- Draft Plan (2023-10-24)
- Watercourse (TRCA)
- Waterbody (LIO)
- Greenbelt Plan
- Wetland
- Long Term Stable Top of Slope (LTSTOS, GEI, 2022)
- TRCA Staked Natural Features (Top of Slope/Dripline)
- Regional Floodline (Croziers, 2022)
- Dripline (GEI, Jan 2023)
- Meander Belt

HDF Management Recommendation

- Conservation
- Mitigation
- No Management Required
- Protection
- LTSTOS +10M
- Meander Belt +30m
- Regional Floodline +10m
- Regional Floodline +30m
- Staked Natural Features (Top of Slope/Dripline) +10m
- Wetland +10m
- Wetland +30m
- Woodland +10m
- Woodland +30m
- Crest of Slope (TRCA) +10m
- Salt Creek Floodline (Crozier)
- Salt Creek Floodline +15m (Crozier)
- Natural Heritage System
- Landscaped Stormwater Management Blocks

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 12
Conceptual Plan and Natural Heritage System

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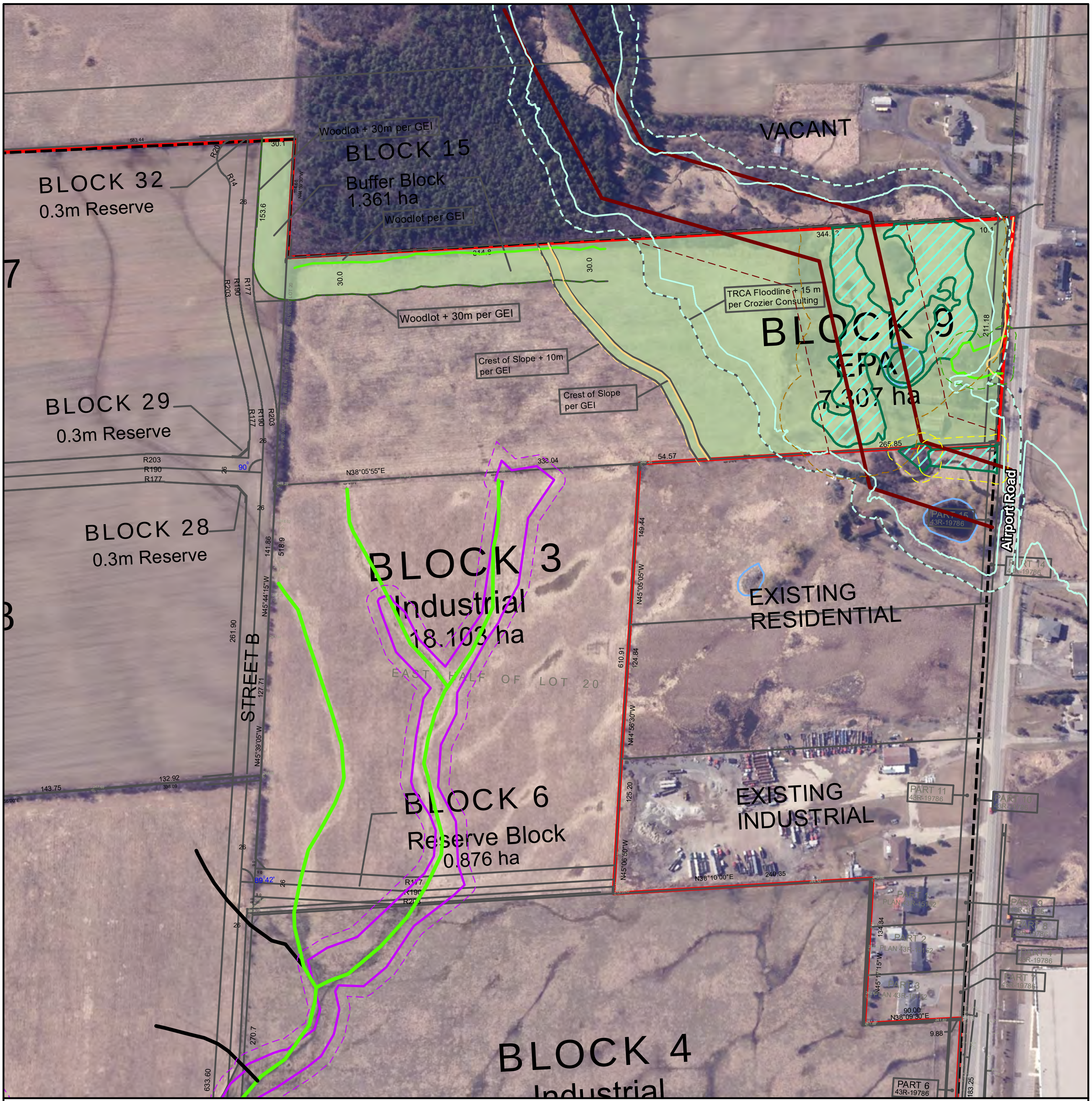

Project 2100975

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4. Concept Plan: 10208 Draft Plan D6_2023-10-24.

** Contributing Redside Dace Habitats would also include wetlands and their associated setbacks*

Legend

- Subject Lands
- Study Area
- Draft Plan (2023-10-24)
- Waterbody (LIO)
- Wetland
- ELC Wetlands (Ground-Truthed, Not Staked)
- Regional Floodline (Croziers, 2022)
- Dripline (GEI, Jan 2023)
- Meander Belt

HDF Management Recommendation

- Mitigation
- No Management Required
- Crest of Slope (TRCA)
- Meander Belt +30m
- Regional Floodline +10m
- Wetland +10m
- Wetland +30m
- Woodland +10m
- Woodland +30m
- Crest of Slope +10m
- Salt Creek Floodline (Crozier)
- Salt Creek Floodline +15m (Crozier)
- Natural Heritage System

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 12A
Conceptual Plan and Natural Heritage System (Salt Creek Area)

0 100 m

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Appendix B

Tables

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Table 3: Vascular Plant List
Table 4: Master Wildlife List
Table 5: Amphibian Call Count Survey Results
Table 6: Turtle Basking Survey Results
Table 7: Master Bird Table
Table 8: HDFA Management Recommendations
Table 9: Significant Wildlife Habitat Assessment

Table 1: Field Studies and Natural Inventories (2021)

SURVEYORS	SURVEY ROUND	SURVEY TYPE	DATE	TIME		AIR TEMP (°C)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
2021										
Leslie, J.	1	Spring Botanical and Ecological Land Classification Survey	21-MA	10:00	16:30	28.8	43	80	4	Mostly Cloudy
Robinson, O., Boucher, N.	1	Headwater Drainage Feature Assessment	29-MR	09:00	16:00	5	49	5	5	Moderately Clear
Lee, R., Leslie, J.	1	Amphibian Call Count Survey	20-AP	21:15	23:00	9	73	100	2	Light Rain
Williamson, L., Szabo, A.	1	Bat Habitat Assessment	22-AP	09:00	16:00	4.5	53	100	5	Snow Showers
Lee R., Lee E.	1	Turtle Basking Survey	23-AP	14:30	16:00	13	33	0	1	Clear skies
Szabo, A.	1	Bat Habitat Assessment	28-AP	09:00	13:45	14.8	95	100	3	Cloudy, Fog
Robinson, O., Rochon, M.	1	Fish Community Sampling	7-MA	11:30	14:00	8	68	80	3	Mostly Cloudy
Lee R., Lee E.	2	Turtle Basking Survey	12-MA	16:00	18:00	17	54	0	1	Clear Skies
Boucher, N., Ng, P.	2	Headwater Drainage Feature Assessment	17-MA	09:00	14:00	23	36	0	5	Clear Skies
Lee R., Lee E.	2	Amphibian Call Count Survey	19-MA	21:20	22:45	20	37	10	0	Cloudy
Lohnes, S.	3	Turtle Basking Survey	27-MA	10:30	13:00	16	47	0	4	Clear Skies
Lee R., Nieroda, M.	1	Bat Acoustic Monitoring Device Deployment	3-JU	20:00	20:30	18	88	0	4	Clear Skies

Table 1: Field Studies and Natural Inventories (2021)

SURVEYORS	SURVEY ROUND	SURVEY TYPE	DATE	TIME		AIR TEMP (°C)	HUMIDITY (%)	CLOUD COVER (%)	BEAUFORT WIND SPEED	PRECIPITATION COMMENTS
				START	END					
Lee, R., Nieroda, M.	3	Amphibian Call Count Survey	4-JU	21:20	22:35	21	75	10	0	Clear skies
Foerster, L.	1	Breeding Bird Survey	13-JU	06:20	10:00	19.3	63	70	3	Mostly Cloudy
Szabo, A., Martin, S.	1	Tree Inventory	23-JU	11:00	17:00	25	70	40	3	Few Clouds
Szabo, A., Martin, S.	1	Tree Inventory	24-JU	09:00	18:00	22.9	45	85	5	Mostly Cloudy
Martin, S.	1	Tree Inventory	25-JU	14:00	20:00	22	80	100	3	Rain and Fog
Foerster, L.	2	Breeding Bird Survey	26-JU	06:28	10:00	21.8	93	100	5	Cloudy
Szabo, A.	1	Tree Inventory	27-JU	11:00	14:00	28.6	59	70	5	Mostly Cloudy
Leslie, J. Lohnes, S.	1	Feature Staking	05-JL	-	-	28.9	60	10	2	Mainly Clear
Leslie, J. Lohnes, S.	2	Feature Staking	22-OC	-	-	8	67	80	2	Mostly Cloudy
Leslie, J, Lohnes, S	3	Feature Staking	8-DE	-	-	4	92	50	2	None

LEGEND:

BEAUFORT WIND SPEED SCALE	
1	Calm (<1 km/hr)
2	Light Air (1-5 km/hr)
3	Light Breeze (6-11 km/hr)
4	Gentle Breeze (12-19 km/hr)
5	Moderate Breeze (20-28 km/hr)

MONTH (CODE)	
JA	January
FB	February
MR	March
AP	April
MA	May
JU	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December

Table 2: Ecological Land Classification (ELC) Community Descriptions

ELC TYPE	COMMUNITY DESCRIPTION	S-RANK (NHIC 2021)
FOREST		
Deciduous Forest		
FOD5 Dry-Fresh Sugar Maple Deciduous Forest	• This community was dominated by Sugar Maple (*Acer saccharum)* with American Basswood (*Tilia americana*), White Ash (*Fraxinus americana*), Black Cherry (*Prunus serotina*) and Eastern Hop-Hornbeam (*Ostrya virginiana*). • Understory species often include canopy seedlings as well as Virginia Waterleaf (*Hydrophyllum virginianum var. virginianum*), Garlic Mustard (*Alliaria petiolate*), Yellow Avens (*Geum aleppicum*) and Canada Enchanter's Nightshade (*Circaea canadensis ssp. canadensis*).	Not ranked
FOD7-3 Fresh-Moist Willow Lowland Deciduous Forest	• This mid-aged community was composed mainly of Hybrid Crack Willow (*Salix X fragilis*) and Manitoba Maple (*Acer negundo*) with Black Walnut (*Juglans nigra*) and Red Ash (*Fraxinus pennsylvanica*). • The understory and shrub layers were limited in this community but consisted mainly of Riverbank Grape (*Vitis riparia*) and European Buckthorn (*Rhamnus cathartica*). • The understory consisted of variety of species including Purple-Stemmed Aster (*Symphyotrichum puniceum*) Panicled Aster (*Symphyotrichum lanceolatum ssp. Lanceolatum*), Blue vervain (*Verbena hastata*), Wild Cucumber (*Echinocystis lobata*), Spotted Joe-pye Weed (*Eutrochium maculatum*) and Spotted Jewelweed (*Impatiens capensis*).	S4S5
CULTURAL		
Cultural Meadow		
CUM1-1 Dry-Moist Old Field Meadow	• Cultural meadow communities each contained less than 25% tree and shrub cover. Different variations of this community were observed, consisting of: o A sparse canopy was present that consisted of Sugar Maple, Black Walnut, Bur Oak (*Quercus macrocarpa*) and Red Ash. The ground layer contained the dominate vegetation form and consisted of Smooth Brome (*Bromus inermus*), Kentucky Bluegrass (*Poa pratensis*), Tall Goldenrod (*Solidago altissima*), New England Aster (*Symphyotrichum novae-angliae*), Common Milkweed (*Asclepias syriaca*), Canada Thistle (*Cirsium arvense)* and Quackgrass (*Elymus repens*). o A sparse canopy and shrub layer was present that consisted of Siberian Elm (*Ulmus pumila*), Common Pear (*Pyrus communis*), Manitoba Maple, European Buckthorn,	Not ranked

Table 2: Ecological Land Classification (ELC) Community Descriptions

ELC TYPE	COMMUNITY DESCRIPTION	S-RANK (NHIC 2021)
	Chokecherry (*Prunus virginiana var. virginiana*) and North American Red Raspberry (*Rubus idaeus ssp. strigosus*). The ground layer contained the dominant vegetation form and consisted mainly of Kentucky Bluegrass, Smooth Brome, Tall Goldenrod, Canada Thistle, Spiked Sedge (*Carex spicata*), and Field Sow-Thistle (*Sonchus arvensis ssp. arvensis*).	
Cultural Thicket		
CUT1 Mineral Cultural Thicket	• Cultural thicket communities each contained less than 25% tree cover and over 25% shrub cover. Different variations of this community were observed, consisting of: o Large-Thorned Hawthorn (*Crataegus macracantha*) and Common Pear prevalent in tall shrub canopy with low shrub understory inclusive of Showy Fly Honeysuckle (*Lonicera x bella*), European Buckthorn, and English Hawthorn (*Crataegus monogyna var. monogyna*). Herbs often consisting of Smooth Brome, Tall Goldenrod, Common St. John's-Wort (*Hypericum perforatum ssp. perforatum*), Wild Carrot (*Daucus carota*), and Common Dandelion (*Taraxacum officinale*). o Sandbar Willow (*Salix interior)* with fewer occurrences European Buckthorn and Showy Fly Honeysuckle in shrub layer. Herb layer with abundance of Bird's-Foot Trefoil (*Lotus corniculatus*) and common associations of White Sweet-Clover (*Melilotus albus*), Variable Crown Vetch (*Securigera varia*), New England Aster, and Tall Goldenrod, with sparsely scattered occurrences of Reed Canary Grass (*Phalaris arundinacea var. arundinacea)*. This community transitions into a thicket swamp (SWT2-2), as described below. o Tall shrub layer dominated by European Buckthorn with fewer Large-Thorned Hawthorn. Herb layer most commonly consisting of Yellow Avens, with associations of Wild Strawberry (*Fragaria virginiana*), White Avens (*Geum canadense*), Garlic Mustard, and Orchard Grass (*Dactylis glomerata*).	Not ranked
SWAMP		
Thicket Swamp		
SWT2-2 Willow Mineral Thicket Swamp	• This community lacked a well-defined canopy or subcanopy; however, shrubs dominated the community.Common shrubs included Cottony Willow (*Salix eriocephala*) and Sandbar Willow. • The ground layer consisted of Reed Canary Grass, Panicled Aster, Purple Loosestrife (*Lythrum salicaria*), Tall Goldenrod, Wild Carrot, Bittersweet Nightshade (*Solanum dulcamara*) and Yellow Avens.	S5

Table 2: Ecological Land Classification (ELC) Community Descriptions

ELC TYPE	COMMUNITY DESCRIPTION	S-RANK (NHIC 2021)
MARSH		
Meadow Marsh		
MAM2 Mineral Meadow Marsh	• A sparse canopy of Hybrid Crack Willow was present. The shrub layer consisted of Red-Osier Dogwood (*Cornus sericea*), Purple Willow (*Salix purpurea*) and Cottony Willow. • The ground layer contained the dominant vegetation form and consisted mainly of: Reed Canary Grass, Small-Leaved Watercress (*Nasturtium microphyllum*), Rice Cutgrass (*Leersia oryzoides*), Nodding Beggarticks (*Bidens cernua*), American Hog Peanut (*Amphicarpaea bracteate*) and Wild Cucumber.	Not ranked
MAM2-2 Reed Canary Grass Mineral Meadow Marsh	• Different variations of this community were observed, which generally consisted of: Manitoba Maple, Hybrid Crack Willow, Peach-Leaved Willow (*Salix amygdaloides*), Eastern Cottonwood (*Populus deltoides ssp. deltoides*) • The ground layer was dominant by Reed Canary Grass with Narrow-Leaved Cattail (*Typha angustifolia*), Hairy Willowherb (*Epilobium hirsutum*), Panicled Aster, Fowl Bluegrass (*Poa palustris*), Purple Loosestrife and New England Aster.	S5
Shallow Marsh		
MAS2 Mineral Shallow Marsh	• The ground layer contained the dominant vegetation form and consisted mainly of Flowering-Rush (*Butomus umbellatus*) with Great Duckweed (*Spirodela polyrhiza*), Leafy Pondweed (*Potamogeton foliosus ssp. foliosus*), Common Hornwort (C*eratophyllum demersum*) and Rice Cutgrass.	Not ranked
SHALLOW WATER		
Mixed Shallow Aquatic		
SAM1-4 Pondweed Mixed Shallow Marsh	• The ground layer contained the dominant vegetation form and consisted mainly of Great Duckweed, Northern Watermeal (*Wolffia borealis*), Columbia Watermeal (*Wolffia columbiana*), Small Duckweed (*Lemna minor*) and Flowering Rush.	S5
OTHER		
Pond	• The feature consisted of Small Pondweed (*Potamogeton pusillus*), Reed Canary Grass, Floating-Leaved Pondweed (*Potamogeton*	Not ranked

Table 2: Ecological Land Classification (ELC) Community Descriptions

ELC TYPE	COMMUNITY DESCRIPTION	S-RANK (NHIC 2021)
	natans), Blue Cattail (*Typha x glauca*) and Soft-Stemmed Bulrush (*Schoenoplectus tabernaemontani*). - Due to active cattle use and evident trampling, this feature was classified as an agricultural pond.	

Table 3: Master Plant List

													LOCAL / REGIONAL STATUS	
FAMILY	LATIN NAME	COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	OWES WETLAND SPECIES	WEEDINESS INDEX	INVASIVE EXOTIC RANK (Urban Forest Associates 2002)	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC STATUS		PEEL (Varga 2005)	AUTHORITY
Adoxaceae	Viburnum lentago	Nannyberry	4	0	T			S5	G5				X	L.
Adoxaceae	Viburnum opulus ssp. opulus	Cranberry Viburnum		-3		-1	4	SNA	G5				X	L.
Amaranthaceae	Amaranthus retroflexus	Redroot Amaranth		3		-1		SNA	G5				X	L.
Anacardiaceae	Toxicodendron radicans var. rydbergii	Western Poison Ivy	2	0				S5	G5				X	(Small ex Rydberg) Erskine
Apiaceae	Cicuta maculata var. maculata	Spotted Water-Hemlock	6	-5	I			S5	G5T5				X	L.
Apiaceae	Daucus carota	Wild Carrot		5		-2		SNA	GNR				X	L.
Apocynaceae	Asclepias syriaca	Common Milkweed	0	5				S5	G5				X	L.
Apocynaceae	Vincetoxicum rossicum	European Swallowwort		5			1	SNA	GNR				X	(Kleopow) Barbaricz
Asteraceae	Achillea millefolium	Common Yarrow		3		-1		SNA	G5				X	L.
Asteraceae	Arctium lappa	Great Burdock		3				SNA	GNR				X	L.
Asteraceae	Arctium minus	Common Burdock		3		-2		SNA	G?T?				X	(Hill) Bernh.
Asteraceae	Bidens cernua	Nodding Beggarticks	2	-5	I			S5	G5				X	L.
Asteraceae	Bidens frondosa	Devil's Beggarticks	3	-3	I			S5	G5				X	L.
Asteraceae	Carduus acanthoides ssp. acanthoides	Spiny Plumeless Thistle		5		-1		SNA	GNR				X	L.
Asteraceae	Cichorium intybus	Wild Chicory		5		-1		SNA	GNR				X	L.
Asteraceae	Cirsium arvense	Canada Thistle		3		-1	1	SNA	GNR				X	(L.) Scop.
Asteraceae	Cirsium vulgare	Bull Thistle		3		-1		SNA	G5				X	(Savi) Tenore
Asteraceae	Erigeron annuus	Annual Fleabane	0	3				S5	G5				X	(L.) Pers.
Asteraceae	Erigeron canadensis	Canada Horseweed	0	3				S5	G5				X	(L.)
Asteraceae	Erigeron strigosus	Rough Fleabane	4	3				S5	G5				X	Muhlenb. ex Willd.
Asteraceae	Eupatorium perfoliatum	Common Boneset	2	-3	I			S5	G5				X	L.
Asteraceae	Euthamia graminifolia	Grass-Leaved Goldenrod	2	0				S5	G5				X	(L.) Nutt.
Asteraceae	Eutrochium maculatum var. maculatum	Spotted Joe Pye Weed	3	-5	I			S5	G5T5				X	(L.) E.E. Lamont
Asteraceae	Inula helenium	Elecampane		3	T	-2	4	SNA	GNR				X	L.
Asteraceae	Leucanthemum vulgare	Oxeye Daisy		5		-1		SNA	GNR				X	Lam.
Asteraceae	Solidago altissima var. altissima	Tall Goldenrod	1	3				S5	GNR				X	L.
Asteraceae	Solidago flexicaulis	Zigzag Goldenrod	6	3				S5	G5				X	L.
Asteraceae	Sonchus arvensis ssp. arvensis	Field Sow-Thistle		3				SNA	GNR				X	L.
Asteraceae	Sonchus oleraceus	Common Sow-Thistle		3		-1		SNA	GNR				X	L.
Asteraceae	Symphyotrichum ericoides var. ericoides	White Heath Aster	4	3				S5	G5T5				X	(L.) G.L. Nesom
Asteraceae	Symphyotrichum lanceolatum ssp. lanceolatum	Panicled Aster (ssp. lanceolatum)	3	-3	I			S5	G5T5				X	(Willd.) G.L. Nesom
Asteraceae	Symphyotrichum novae-angliae	New England Aster	2	-3				S5	G5				X	(L.) G.L. Nesom
Asteraceae	Symphyotrichum pilosum var. pilosum	Old Field Aster	1	3				S5	G5T5				R1	(Willd.) G.L. Nesom
Asteraceae	Symphyotrichum puniceum	Purple-Stemmed Aster	6	-5	I			S5	G5				X	(L.) Á. & D. Löve
Asteraceae	Tanacetum vulgare	Common Tansy		5		-1	3	SNA	GNR				X	L.
Asteraceae	Taraxacum officinale	Common Dandelion		3		-2		SNA	G5				X	F.H. Wiggers
Asteraceae	Tragopogon dubius	Yellow Goatsbeard		5		-1		SNA	GNR				X	Scopoli
Asteraceae	Tripleurospermum inodorum	Scentless Chamomile		0		-1		SNA	GNR				X	(L.) Schultz-Bip.
Asteraceae	Tussilago farfara	Coltsfoot		3	T	-2	4	SNA	GNR				X	L.
Balsaminaceae	Impatiens capensis	Spotted Jewelweed	4	-3	I			S5	G5				X	Meerburgh
Betulaceae	Ostrya virginiana	Eastern Hop-Hornbeam	4	3				S5	G5				X	(Miller) K. Koch
Boraginaceae	Hackelia virginiana	Virginia Stickseed	5	3				S5	G5				U	(L.) I.M. Johnston
Boraginaceae	Hydrophyllum virginianum var. virginianum	Virginia Waterleaf	6	0				S5	G5				X	L.
Boraginaceae	Lithospermum officinale	European Gromwell		5		-1		SNA	GNR				X	L.
Brassicaceae	Alliaria petiolata	Garlic Mustard		0		-3	1	SNA	G5				X	(M. Bieb.) Cavara & Grande
Brassicaceae	Barbarea vulgaris	Bitter Wintercress		0		-1	3	SNA	GNR				X	W.T. Aiton
Brassicaceae	Capsella bursa-pastoris	Common Shepherd's Purse		3		-1		SNA	GNR				X	(L.) Medikus
Brassicaceae	Erysimum cheiranthoides	Wormseed Wallflower		3		-1		S5					X	L.
Brassicaceae	Hesperis matronalis	Dame's Rocket		3		-3	1	SNA	G4G5				X	L.
Brassicaceae	Lepidium campestre	Field Peppergrass		5		-1		SNA	GNR				X	(L.) W.T. Aiton
Brassicaceae	Nasturtium microphyllum	Small-Leaved Watercress		-5	I	-3		SNA	GNR				X	(Boenn.) Reichb.
Caprifoliaceae	Lonicera tatarica	Tartarian Honeysuckle		3		-3	1	SNA	GNR				X	L.
Caprifoliaceae	Lonicera x bella	Showy Fly Honeysuckle		3		-3		HYB_e	GNR				X	Zabel
Caryophyllaceae	Cerastium fontanum ssp. vulgare	Common Mouse-Ear Chickweed		3		-1		SNA	GNR				X	(Hartman) Greuter & Burdet
Caryophyllaceae	Dianthus armeria ssp. armeria	Deptford Pink		5		-1		SNA	GNR				X	L.
Caryophyllaceae	Stellaria graminea	Grass-Leaved Starwort		5	T	-2		SNA	GNR				X	L.
Ceratophyllaceae	Ceratophyllum demersum	Common Hornwort	4	-5	I			S5	G5				R3	L.
Convolvulaceae	Convolvulus arvensis	Field Bindweed		5		-1	3	SNA	GNR				X	L.
Cornaceae	Cornus sericea	Red-Osier Dogwood	2	-3	I*			S5	G5				X	L.
Cucurbitaceae	Echinocystis lobata	Wild Cucumber	3	-3	T			S5	G5				X	(Michx.) Torr. & A. Gray
Fabaceae	Amphicarpaea bracteata	American Hog Peanut	4	0	T			S5	G5				X	(L.) Fernald
Fabaceae	Lotus corniculatus	Garden Bird's-Foot Trefoil		3		-2	2	SNA	GNR				X	L.
Fabaceae	Medicago lupulina	Black Medick		3		-1	4	SNA	GNR				X	L.
Fabaceae	Medicago sativa ssp. sativa	Alfalfa (ssp. sativa)		5		-1	4	SNA	GNRTNR				X	L.
Fabaceae	Melilotus albus	White Sweet-Clover		3		-3	2	SNA	GNR				X	Medik.
Fabaceae	Melilotus officinalis	Yellow Sweet-Clover		3		-1	2	SNA	GNR				X	(L.) Pallas
Fabaceae	Robinia pseudoacacia	Black Locust		3		-3	2	SNA	G5				X	L.
Fabaceae	Trifolium pratense	Red Clover		3		-2	4	SNA	GNR				X	L.
Fabaceae	Trifolium repens	White Clover		3		-1	4	SNA	GNR				X	L.
Fabaceae	Vicia cracca	Tufted Vetch		5		-1	2	SNA	GNR				X	L.
Fagaceae	Quercus macrocarpa	Burr Oak	5	3	T			S5	G5				X	Michaux
Fagaceae	Quercus rubra	Northern Red Oak	6	3				S5	G5				X	L.
Geraniaceae	Geranium robertianum	Herb-Robert	2	3		-2		S5	G5				X	L.
Hypericaceae	Hypericum perforatum ssp. perforatum	Common St. John's-Wort		5		-3	4	SNA	GNR				X	L.
Juglandaceae	Juglans nigra	Black Walnut	5	3				S4?	G5				X	L.
Lamiaceae	Leonurus cardiaca ssp. cardiaca	Common Motherwort		5		-2		SNA	GNR				X	L.
Lamiaceae	Nepeta cataria	Catnip		3		-2	4	SNA	GNR				X	L.
Lythraceae	Lythrum salicaria	Purple Loosestrife		-5	I	-3	1	SNA	G5				X	L.
Malvaceae	Abutilon theophrasti	Velvetleaf		3		-1	3	SNA	GNR				X	Medikus
Malvaceae	Tilia americana	Basswood	4	3				S5	G5				X	L.
Oleaceae	Fraxinus americana	White Ash	4	3				S4	G5				X	L.
Oleaceae	Fraxinus pennsylvanica	Red Ash	3	-3	T			S4	G5				X	Marshall
Oleaceae	Syringa vulgaris	Common Lilac		5		-2	2	SNA	GNR				X	L.
Onagraceae	Circaea canadensis ssp. canadensis	Canada Enchanter's Nightshade	2	3				S5	G5T5				X	(L.) Hill
Onagraceae	Epilobium ciliatum ssp. ciliatum	Northern Willowherb	3	-3	I*			S5	G5T?				X	Raf.
Onagraceae	Epilobium hirsutum	Hairy Willowherb		-3	I	-2		SNA	GNR				X	L.
Onagraceae	Epilobium parviflorum	Small-Flowered Willowherb		3	T	-1		SNA	GNR				X	Schreber
Onagraceae	Oenothera parviflora	Small-Flowered Evening Primrose	1	3				S5	G4?				X	L.

													LOCAL / REGIONAL STATUS	
FAMILY	LATIN NAME	COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	OWES WETLAND SPECIES	WEEDINESS INDEX	INVASIVE EXOTIC RANK (Urban Forest Associates 2002)	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC STATUS		PEEL (Varga 2005)	AUTHORITY
Papaveraceae	Chelidonium majus	Greater Celandine		5		-3		SNA	GNR				X	L.
Plantaginaceae	Veronica serpyllifolia	Thyme-Leaved Speedwell		0				SNA	G5				X	L.
Polygonaceae	Persicaria hydropiper	Marshpepper Smartweed		-5	I			SNA	GNR				X	(L.) Delarbre
Polygonaceae	Persicaria lapathifolia	Pale Smartweed	2	-3	T			S5	G5				X	(L.) Delarbre
Polygonaceae	Persicaria maculosa	Spotted Lady's-Thumb		-3	T	-1		SNA	G3G5				X	Gray
Polygonaceae	Rumex crispus	Curled Dock		0	T	-2		SNA	GNR				X	L.
Ranunculaceae	Ranunculus acris	Common Buttercup		0	T	-2		SNA	G5				X	L.
Ranunculaceae	Ranunculus sceleratus	Cursed Buttercup	2	-5	I			S5	G5				X	L.
Rhamnaceae	Rhamnus cathartica	European Buckthorn		0	T	-3	1	SNA	GNR				X	L.
Rosaceae	Amelanchier laevis	Smooth Serviceberry	5	5				S5	G5				U	Wiegand
Rosaceae	Crataegus monogyna var. monogyna	English Hawthorn		3		-1	3	SNA	G5				X	Jacquin
Rosaceae	Crataegus punctata	Dotted Hawthorn	4	5				S5	G5				X	Jacquin
Rosaceae	Fragaria virginiana	Wild Strawberry	2	3				S5	G5				X	Miller
Rosaceae	Geum aleppicum	Yellow Avens	2	0	T			S5	G5				X	Jacquin
Rosaceae	Geum canadense	White Avens	3	0	T			S5	G5				X	Jacquin
Rosaceae	Geum laciniatum	Rough Avens	4	-3	T			S4	G5				X	Murray
Rosaceae	Malus pumila	Common Apple		5		-1		SNA	G5				X	Miller
Rosaceae	Potentilla recta	Sulphur Cinquefoil		5		-2		SNA	GNR				X	L.
Rosaceae	Prunus serotina var. serotina	Black Cherry	3	3				S5	G5				X	Ehrhart
Rosaceae	Prunus virginiana var. virginiana	Chokecherry	2	3				S5	G5T?				X	L.
Rosaceae	Pyrus communis	Common Pear		5		-1		SNA	G5				X	L.
Rosaceae	Rubus idaeus ssp. strigosus	North American Red Raspberry	2	3				S5	G5T5				X	(Michaux) Focke
Rosaceae	Rubus occidentalis	Black Raspberry	2	5				S5	G5				X	L.
Rubiaceae	Galium mollugo	Smooth Bedstraw		5		-2	2	SNA	GNR				X	L.
Rubiaceae	Galium verum	Yellow Bedstraw		5		-1	3	SNA	GNR				X	L.
Salicaceae	Populus deltoides ssp. deltoides	Eastern Cottonwood	4	0	T			S5	G5T5				X	Bartram ex Marshall
Salicaceae	Populus tremuloides	Trembling Aspen	2	0	T			S5	G5				X	Michaux
Salicaceae	Populus x canadensis	Canada Poplar					4	HYB_n	GNA				XSR	Moench
Salicaceae	Salix amygdaloides	Peach-Leaved Willow	6	-3	T			S5	G5				R6	Andersson
Salicaceae	Salix eriocephala	Cottony Willow	4	-3	T			S5	G5				X	Michaux
Salicaceae	Salix interior	Sandbar Willow	1	-3	T			S5	GNR				R5	Rowlee
Salicaceae	Salix purpurea	Purple Willow		-3	T	-1	4	SNA	G5				X	L.
Salicaceae	Salix x fragilis	Hybrid Crack Willow			T	-3	3	HYB_e	GNA				XSR	L.
Salicaceae	Salix x sepulcralis	Golden Weeping Willow						HYB_e	GNA				XSR	Simonkai
Sapindaceae	Acer negundo	Manitoba Maple	0	0	T		1	S5	G5				X	L.
Sapindaceae	Acer platanoides	Norway Maple		5		-3	2	SNA	GNR				X	L.
Sapindaceae	Acer saccharinum	Silver Maple	5	-3	I			S5	G5				X	L.
Sapindaceae	Acer saccharum	Sugar Maple	4	3				S5	G5				X	Marshall
Scrophulariaceae	Verbascum thapsus ssp. thapsus	Common Mullein		5		-2		SNA	GNR				X	L.
Solanaceae	Solanum dulcamara	Bittersweet Nightshade		0	T	-2	3	SNA	GNR				X	L.
Ulmaceae	Ulmus americana	White Elm	3	-3	T			S5	G5				X	L.
Ulmaceae	Ulmus pumila	Siberian Elm		3		-1	2	SNA	GNR				X	L.
Urticaceae	Boehmeria cylindrica	Small-Spike False Nettle	4	-5	I			S5	G5				X	(L.) Swartz
Urticaceae	Urtica dioica ssp. gracilis	Slender Stinging Nettle	2	0	T			S5	G5T5				X	(Aiton) Selander
Verbenaceae	Verbena hastata	Blue Vervain	4	-3	I			S5	G5				X	L.
Violaceae	Viola pubescens	Downy Yellow Violet	5	3				S5	G5				X	Aiton
Vitaceae	Parthenocissus vitacea	Thicket Creeper	4	3				S5	G5				X	(Knerr) Hitchcock
Vitaceae	Vitis riparia	Riverbank Grape	0	0				S5	G5				X	Michaux
Cupressaceae	Thuja occidentalis	Eastern White Cedar	4	-3	T			S5	G5				X	L.
Pinaceae	Larix decidua	European Larch		5		-1		SNA	GNR				X	Miller
Pinaceae	Picea abies	Norway Spruce		5		-1		SNA	GNR				X	(L.) Karsten
Pinaceae	Picea glauca	White Spruce	6	3	T			S5	G5				R3	(Moench) Voss
Pinaceae	Picea pungens	Blue Spruce		3				SNA	G5					Engelm.
Pinaceae	Pinus banksiana	Jack Pine	5	3				S5	G5				XSR	Lamb.
Pinaceae	Pinus nigra	Austrian Pine		5		-1		SNA	GNR					Arnold
Pinaceae	Pinus strobus	Eastern White Pine	4	3	T			S5	G5				X	L.
Pinaceae	Pinus sylvestris	Scots Pine		3		-3	2	SNA	GNR				X	L.
Alismataceae	Alisma triviale	Northern Water-Plantain	1	-5	I			S5	G5				X	L.
Alismataceae	Sagittaria latifolia	Broad-Leaved Arrowhead	4	-5	I			S5	G5				X	Willdenow
Araceae	Lemna minor	Small Duckweed	5	-5	I			S5	G5				X	L.
Araceae	Spirodela polyrhiza	Great Duckweed	4	-5	I			S5	G5				U	(L.) Schleiden
Araceae	Wolffia borealis	Northern Watermeal	4	-5	I			S5	G5				R2	(Engelm.) Landolt & Wildi ex Gandhi, Wiersema & Brouillet
Araceae	Wolffia columbiana	Columbia Watermeal	4	-5	I			S5	G5				R3	H. Karsten
Butomaceae	Butomus umbellatus	Flowering-Rush		-5	I	-2	1	SNA	G5				X	L.
Cyperaceae	Carex cristatella	Crested Sedge	3	-3	I			S5	G5				X	Britton
Cyperaceae	Carex spicata	Spiked Sedge		3		-1		SNA	GNR				X	Hudson
Cyperaceae	Carex stipata var. stipata	Awl-Fruited Sedge	3	-5	I			S5	G5				X	Muhlenb. ex Willdenow
Cyperaceae	Cyperus esculentus var. leptostachyus	Perennial Yellow Flatsedge	1	-3	T			S5	G5				X	Boeckeler
Cyperaceae	Eleocharis erythropoda	Red-Stemmed Spikerush	4	-5	I			S5	G5				X	Steudel
Cyperaceae	Eleocharis obtusa	Blunt Spikerush	5	-5	I			S5	G5				U	(Willd.) Schultes
Cyperaceae	Schoenoplectus tabernaemontani	Soft-Stemmed Bulrush	5	-5	I			S5	G5				X	(C.C. Gmelin) Palla
Liliaceae	Erythronium americanum ssp. americanum	Yellow Trout Lily	5	5				S5	G5T5				X	Ker Gawler
Poaceae	Agrostis stolonifera	Creeping Bentgrass		-3	T			SNA	G5				X	L.
Poaceae	Beckmannia syzigachne	American Sloughgrass	4	-5	I			S4	G5				X	(Steud.) Fernald
Poaceae	Bromus inermis	Smooth Brome		5		-3	4	SNA	G5TNR				X	Leysser
Poaceae	Dactylis glomerata	Orchard Grass		3		-1	3	SNA	GNR				X	L.
Poaceae	Echinochloa crus-galli	Large Barnyard Grass		-3	T	-1		SNA	GNR				X	(L.) Palisot de Beauvois
Poaceae	Elymus repens	Quackgrass		3		-3	3	SNA	GNR				X	(L.) Gould
Poaceae	Eragrostis minor	Little Lovegrass		5		-1		SNA	GNR				X	Host
Poaceae	Hordeum jubatum ssp. jubatum	Foxtail Barley	0	0	T			S5?	G5T5				X	L.
Poaceae	Leersia oryzoides	Rice Cutgrass	3	-5	I			S5	G5				X	(L.) Swartz
Poaceae	Lolium multiflorum	Annual Ryegrass						SNA	GNR					Lamarck
Poaceae	Panicum dichotomiflorum ssp. dichotomiflorum	Fall Panicgrass		-3		-1		SNA	G5				X	Michaux
Poaceae	Phalaris arundinacea var. arundinacea	Reed Canary Grass	0	-3	T		P	S5	GNR				X	L.
Poaceae	Phleum pratense ssp. pratense	Common Timothy		3		-1		SNA	GNR				X	L.
Poaceae	Phragmites australis ssp. australis	European Reed		-3	T		1	SNA	G5T5				X	(Cav.) Trinius ex Steudel
Poaceae	Poa palustris	Fowl Bluegrass	5	-3	I			S5	G5				X	L.
Poaceae	Poa pratensis	Kentucky Bluegrass	0	3			2	S5	G5				X	L.

Table 3: Master Plant List

													LOCAL / REGIONAL STATUS	
FAMILY	LATIN NAME	COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	OWES WETLAND SPECIES	WEEDINESS INDEX	INVASIVE EXOTIC RANK (Urban Forest Associates 2002)	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC STATUS		PEEL (Varga 2005)	AUTHORITY
Poaceae	Setaria pumila ssp. pumila	Yellow Foxtail		0		-1	4	SNA	GNR				X	(Poir.) Roemer & Schultes
Potamogetonaceae	Potamogeton foliosus ssp. foliosus	Leafy Pondweed	4	-5	I			S5	G5				R7	Rafinesque
Potamogetonaceae	Potamogeton natans	Floating-Leaved Pondweed	5	-5	I			S5	G5				U	L.
Potamogetonaceae	Potamogeton pusillus	Small Pondweed	4	-5	I			S4?	G5T5				R3	L.
Typhaceae	Typha angustifolia	Narrow-Leaved Cattail		-5	I		P	SNA	G5				X	L.
Typhaceae	Typha latifolia	Broad-Leaved Cattail	1	-5	I			S5	G5				X	L.
Typhaceae	Typha x glauca	Blue Cattail		-5	I		P	HYB_n	GNA				X	Godron

STATISTICS		
Species Diversity		
Total Number of Species:	183	
Native Species:	94	51%
Exotic Species:	89	49%
S1-S3 Species:	0	0%
S4 Species:	6	6%
S5 Species:	86	91%
Floristic Quality Indices		
Mean Co-efficient of Conservatism (CC)	3.2	
CC 0 - 3 = lowest sensitivity	44	47%
CC 4 - 6 = moderate sensitivity	47	50%
CC 7 - 8 = high sensitivity	0	0%
CC 9 - 10 = highest sensitivity	0	0%
Floristic Quality Index (FQI)	31	
Weedy & Invasive Species		
Mean Weediness Index (Oldham et al):	-1.7	
-1 = low potential invasiveness	44	49%
-2 = moderate potential invasiveness	20	22%
-3 = high potential invasivenss	16	18%
Mean Exotic Rank (Urban Forest Associates):	3	
Category 1	10	11%
Category 2	11	12%
Category 3	10	11%
Category 4	13	15%
Potentially Invasive (P)	3	3%
Wetland Species		
Mean Wetness Index	0.7	
Upland	35	19%
Facultative upland	63	34%
Facultative	22	12%
Facultative wetland	30	16%
Obligate wetland	29	16%

Table 4: Master Wildlife List

COMMON NAME	Provincial Status (S RANK)	Global Status (G RANK)	SARO (MECP)	COSEWIC (Federal)	Local Status Halton	Local Status Hamilton	Local Status TRCA	Regional Status Region of Waterloo	Local Status CVC	Niagara Region CA Status	SWH Indicator Species 6E	SWH Indicator Species 7E
AMPHIBIANS												
American Toad	S5	G5					L4	X		W	X	X
Gray Treefrog	S5	G5					L2	X		L	X	X
Wood Frog	S5	G5					L2	X		L	X	X
REPTILES												
Snapping Turtle	S4	G5	SC	SC			L3				X	X
Midland Painted Turtle	S4	G5T5		SC			L3			L	X	X
BIRDS										L		
Mallard	S5	G5					L5			U	X	X
Rock Pigeon	SNA	G5										
Mourning Dove	S5	G5					L5					
Killdeer	S4B	G5					L4					
Spotted Sandpiper	S5B	G5								U		
Ring-billed Gull	S5	G5					L4				X	X
Herring Gull	S4B,S5N	G5					L4					X
Great Blue Heron	S4	G5				m	L3	X		R	X	X
Cooper's Hawk	S4	G5			HU	m	L4	X		U	X	X
Red-bellied Woodpecker	S5	G5			HU	m	L4	X		R		
Eastern Kingbird	S4B	G5					L4					
Willow Flycatcher	S4B	G5			HU		L4	X		U	X	X
Warbling Vireo	S5B	G5					L5	X				
Red-eyed Vireo	S5B	G5					L4			C		
Blue Jay	S5	G5					L5					
American Crow	S5	G5					L5			C		
Horned Lark	S4	G5			HU		L3					
Tree Swallow	S4S5B	G5					L4			C		
Northern Rough-winged Swallow	S4B	G5			HU		L4			C	X	X
Cliff Swallow	S4S5B	G5				m	L5			C	X	X
Barn Swallow	S4B	G5	THR	SC			L4			U		
Black-capped Chickadee	S5	G5					L5			C		
American Robin	S5	G5					L5			U		
Gray Catbird	S5B, S3N	G5					L4			C		
Brown Thrasher	S4B	G5				m	L3	X		C	X	X
European Starling	SNA	G5				E	L+			U		
Cedar Waxwing	S5	G5					L5					
House Sparrow	SNA	G5				E	L+			C		
American Goldfinch	S5	G5					L5					
Savannah Sparrow	S5B, S3N	G5					L4				X	X
Song Sparrow	S5	G5					L5			C		
Bobolink	S4B	G5	THR	THR			L2					
Eastern Meadowlark	S4B, S3N	G5	THR	THR		m	L3			U		

COMMON NAME	Provincial Status (S RANK)	Global Status (G RANK)	SARO (MECP)	COSEWIC (Federal)	Local Status Halton	Local Status Hamilton	Local Status TRCA	Regional Status Region of Waterloo	Local Status CVC	Niagara Region CA Status	SWH Indicator Species 6E	SWH Indicator Species 7E
Orchard Oriole	S4B	G5			HR	m	L5	X				
Red-winged Blackbird	S5	G5					L5			C		
Brown-headed Cowbird	S5	G5					L5			C		
Common Grackle	S5	G5					L5					
Common Yellowthroat	S5B, S3N	G5					L4					
Yellow Warbler	S5B	G5					L5					
Northern Cardinal	S5	G5					L5			U		
Indigo Bunting	S5B	G5					L4					

SUMMARY

Total Odonata:	0
Total Butterflies:	0
Total Other Arthropods	0
Total Amphibians:	3
Total Reptiles:	2
Total Birds:	42
Total Breeding Birds:	9
Total Mammals:	0

SIGNIFICANT SPECIES

Global:
National:
Provincial:
Regional:
Local:

Explanation of Status and Acronymns

COSSARO: Committee on the Status of Species at Risk in Ontario
COSEWIC: Committee on the Status of Endangered Wildlife in Canada
S1: Critically Imperiled—Critically imperiled in the province (often 5 or fewer occurrences)
S2: Imperiled—Imperiled in the province, very few populations (often 20 or fewer),
S3: Vulnerable—Vulnerable in the province, relatively few populations (often 80 or fewer)
S4: Apparently Secure—Uncommon but not rare
S5: Secure—Common, widespread, and abundant in the province
SX: Presumed extirpated
SH: Possibly Extirpated (Historical)
SNR: Unranked
SU: Unrankable—Currently unrankable due to lack of information
SNA: Not applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#: Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species
S#B- Breeding status rank

S#N- Non Breeding status rank
?: Indicates uncertainty in the assigned rank
G1: Extremely rare globally; usually fewer than 5 occurrences in the overall range
G1G2: Extremely rare to very rare globally
G2: Very rare globally; usually between 5-10 occurrences in the overall range
G2G3: Very rare to uncommon globally
G3: Rare to uncommon globally; usually between 20-100 occurrences
G3G4: Rare to common globally
G4: Common globally; usually more than 100 occurrences in the overall range
G4G5: Common to very common globally
G5: Very common globally; demonstrably secure
GU: Status uncertain, often because of low search effort or cryptic nature of the species; more data needed.
T: Denotes that the rank applies to a subspecies or variety
Q: Denotes that the taxonomic status of the species, subspecies, or variety is questionable.
END: Endangered
THR: Threatened
SC: Special Concern
NAR: Not At Risk
IND: Indeterminant, insufficient information to assign status
DD: Data Deficient
6: Rare in Site Region 6
7: Rare in Site Region 7
Area: Minimum patch size for area-sensitive species (ha)
H- highly significant in Hamilton Region (i.e. rare)
m- moderately significant in Hamilton Region (i.e. uncommon)
L1- extremely rare locally (Toronto Region)
L2- very rare locally (Toronto Region)
L3- rare to uncommon locally (Toronto Region)
HR- rare in Halton Region, highly significant
HU- uncommon in Halton Region, moderately significant

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Table 5: Amphibian Call Count Survey Station Results

SURVEY ROUND	STATION NUMBER	SPECIES CODE												WATER
		NOAM	AMTO	FOTO	GRTR	SPPE	CHFR	WOFR	NLFR	PIFR	GRFR	BULL	MIFR	Present (Y/N)
1	AMC1	X												Y
2	AMC1		1(1)		1(1)									Y
3	AMC1				1(3)									Y
1	AMC2	X												Y
2	AMC2		1(1)											Y
3	AMC2	X												Y
1	AMC3	X												Y
2	AMC3	X												Y
3	AMC3				1(5)									Y
1	AMC4	X												N
2	AMC4				1(1)									Y
3	AMC4				3									Y
1	AMC5	X												Y
2	AMC5	X												Y
3	AMC5	X												N
1	AMC6							1(1)						Y
2	AMC6	X												Y
3	AMC6				1(4)									Y
1	AMC7	X												Y
2	AMC7	DRY												N
1	AMC8	X												N
2	AMC8	DRY												N
1	AMC9	X												Y
2	AMC9	DRY												N
1	AMC10	X												Y
2	AMC10	DRY												N

Table 5: Amphibian Call Count Survey Station Results

LEGEND:

SPECIES CODE	COMMON NAME	SCIENTIFIC NAME
NOAM	No Amphibians	No amphibians despite survey effort
AMTO	American Toad	*Anaxyrus americanus*
FOTO	Fowler’s Toad	*Anaxyrus fowleri*
GRTR	Gray Treefrog	*Hyla versicolor*
CHFR	Western Chorus Frog	*Pseudacris triseriata*
WOFR	Wood Frog	*Lithobates sylvaticus*
NLRF	Northern Leopard Frog	*Lithobates pipiens*
PIFR	Pickerel Frog	*Lithobates palustris*
GRFR	Green Frog	*Lithobates clamitans*
BULL	American Bullfrog	*Lithobates catesbeianus*
MIFR	Mink Frog	*Lithobates septentrionalis*

CALL CODES	
X	No amphibians heard
1	Calls can be counted without error
2	Calls overlap but can be reliably estimated
3	Calls overlap too much to estimate number

Note: For each species, the first number is the call code and the second number, which is in brackets, is the number of individuals of that species heard calling.

Table 6: Turtle Survey Results

DATE SURVEYED (2021)	SURVEY ROUND	TRANSECT OR STATION NUMBER	SPECIES CODE								
			NOTU	MPTU	SNTU	MATU	BLTU	SSTU	WOTU	STIN	SPTU
23-AP	1	BS1		1							
13-MA	2	BS1	X								
27-MA	3	BS1	X								
23-AP	1	BS2		4							
13-MA	2	BS2		8							
27-MA	3	BS2		1							
23-AP	1	BS3		1							
13-MA	2	BS3		13	1						
27-MA	3	BS3		1							

LEGEND:

SPECIES CODE	COMMON NAME	SCIENTIFIC NAME
NOTU	No Turtles	No turtles despite survey effort
MPTU	Midland Painted Turtle	*Chrysemys picta marginata*
SNTU	Snapping Turtle	*Chelydra serpentina*
MATU	Northern Map Turtle	*Graptemys geographica*
BLTU	Blanding's Turtle	*Emydoidea blandingii*
SSTU	Spiny Soft-shelled Turtle	*Apalone spinifera*
WOTU	Wood Turtle	*Glyptemys insculpta*
STIN	Stinkpot Turtle	*Stemotherus odoratus*
SPTU	Spotted Turtle	*Clemmys guttata*

DATE	
MONTH	CODE
January	JA
February	FE
March	MR
April	AP
May	MA
June	JN
July	JL
August	AU
September	SE
October	OC
November	NO
December	DE

Table 7: Master Bird List

No.	X	Common Name	Species Code	Scientific Name	Provincial Status (S Rank)	Global Status (G Rank)	COSSARO (MNRF)	COSEWIC (Federal)	SWH Indicator Species	Highest Breeding Evidence
	X									
	X									
	X	**Anseriformes**								
	X	***Anatidae***								
		Mallard	MALL	*Anas platyrhynchos*	S5	G5			X	PO-H
	X									
	X	**Columbiformes**								
	X	***Columbidae***								
		Rock Pigeon	ROPI	*Columba livia*	SNA	G5				PO-H
		Mourning Dove	MODO	*Zenaida macroura*	S5	G5				PR-T
	X									
	X	**Charadriiformes**								
	X	***Charadriidae***								
		Killdeer	KILL	*Charadrius vociferus*	S5B, S5N	G5				PR-P
	X									
	X	***Scolopacidae***								
		Spotted Sandpiper	SPSA	*Actitis macularius*	S5	G5			X	PO-H
	X									
	X	***Laridae***								
		Ring-billed Gull	RBGU	*Larus delawarensis*	S5B,S4N	G5			X	OB-X
		Herring Gull	HEGU	*Larus argentatus*	S5B,S5N	G5			X	OB-X
	X									
	X	**Pelecaniformes**								
	X	***Ardeidae***								
		Great Blue Heron	GBHE	*Ardea herodias*	S4	G5			X	OB-X
	X									
	X	**Accipitriformes**								
	X	***Accipitridae***								
		Northern Harrier	NOHA	*Circus hudsonius*	S4B	G5	NAR	NAR	X	PR-T
		Cooper's Hawk	COHA	*Accipiter cooperii*	S4	G5	NAR	NAR	X	PR-T
	X									
	X	**Piciformes**								
	X	***Picidae***								
		Red-bellied Woodpecker	RBWO	*Melanerpes carolinus*	S4	G5				PO-H
	X									
	X	**Passeriformes**								
	X	***Tyrannidae***								
		Eastern Kingbird	EAKI	*Tyrannus tyrannus*	S4B	G5				CO-NE
		Willow Flycatcher	WIFL	*Empidonax traillii*	S5B	G5			X	PR-T
	X									
	X	***Vireonidae***								
		Warbling Vireo	WAVI	*Vireo galvis*	S4B	G5				PR-T
		Red-eyed Vireo	REVI	*Vireo olivaceus*	S5B	G5				PO-S
	X									
	X	***Corvidae***								
		Blue Jay	BLJA	*Cyanocitta cristata*	S5	G5				PR-T
		American Crow	AMCR	*Corvus brachyrhynchos*	S5B	G5				PO-H
	X									
	X	***Alaudidae***								
		Horned Lark	HOLA	*Eremophila alpestris*	S5B	G5				PO-S
	X									
	X	***Hirundinidae***								
		Tree Swallow	TRES	*Tachycineta bicolor*	S4B	G5				PO-H
		Northern Rough-winged Swallow	NRWS	*Stelgidopteryx serripennis*	S4B	G5			X	PO-H
		Cliff Swallow	CLSW	*Petrochelidon pyrrhonota*	S4B	G5			X	CO-AE
		Barn Swallow	BARS	*Hirundo rustica*	S5B	G5	THR	THR		CO-FY
	X									
	X	***Paridae***								
		Black-capped Chickadee	BCCH	*Poecile atricapillus*	S5	G5				PO-H
	X									
	X	***Turdidae***								
		American Robin	AMRO	*Turdus migratorius*	S5B	G5				CO-FY
	X									
	X	***Mimidae***								
		Gray Catbird	GRCA	*Dumetella carolinensis*	S4B	G5				PR-T
		Brown Thrasher	BRTH	*Toxostoma rufum*	S4B	G5			X	PR-T
	X									
	X	***Sturnidae***								
		European Starling	EUST	*Sturnus vulgaris*	SNA	G5				PO-H

Table 7: Master Bird List

No.	X	Common Name	Species Code	Scientific Name	Provincial Status (S Rank)	Global Status (G Rank)	COSSARO (MNRF)	COSEWIC (Federal)	SWH Indicator Species	Highest Breeding Evidence
	X									
	X									
	X									
	X	***Bombycillidae***								
		Cedar Waxwing	CEDW	*Bombycilla cedrorum*	S5B	G5				PR-T
	X									
	X	***Passeridae***								
		House Sparrow	HOSP	*Passer domesticus*	SNA	G5				PO-H
	X									
	X	***Fringillidae***								
		American Goldfinch	AMGO	*Spinus tristis*	S5B	G5				PR-P
	X									
	X	***Passerellidae***								
		Savannah Sparrow	SAVS	*Passerculus sandwichensis*	S4B	G5			X	CO-CF
		Song Sparrow	SOSP	*Melospiza melodia*	S5B	G5				CO-FY
	X									
	X	***Icteridae***								
		Bobolink	BOBO	*Dolichonyx oryzivorus*	S4B	G5	THR	THR		CO-FY
		Eastern Meadowlark	EAME	*Sturnella magna*	S4B	G5	THR	THR		CO-CF
		Orchard Oriole	OROR	*Icterus spurius*	S4B	G5				PO-S
		Red-winged Blackbird	RWBL	*Agelaius phoeniceus*	S4	G5				CO-CF
		Brown-headed Cowbird	BHCO	*Molothrus ater*	S4B	G5				PO-P
		Common Grackle	COGR	*Quiscalus quiscula*	S5B	G5				PO-H
	X									
	X	***Parulidae***								
		Common Yellowthroat	COYE	*Geothlypis trichas*	S5B	G5				PO-S
		Yellow Warbler	YWAR	*Setophaga petechia*	S5B	G5				PR-T
	X									
	X	***Cardinalidae***								
		Northern Cardinal	NOCA	*Cardinalis cardinalis*	S5	G5				PR-T
		Indigo Bunting	INBU	*Passerina cyanea*	S4B	G5				PR-T
	X									

Species Common Name and Scientific Name:	Chesser, R. T., K. J. Burns, C. Cicero, J. L. Dunn, A. W. Kratter, I. J. Lovette, P. C. Rasmussen, J. V. Remsen, Jr., D. F. Stotz, and K. Winker. 2019. Check-list of North American Birds (online). American Ornithological Society. Available online: http://checklist.aou.org/taxa
Species Code:	Consistent with the American Ornithologists' Union. 2019. Species 4-Letter-Codes. Available online: http://www.birdsontario.org/atlas/codes.jsp?lang=en&pg=species
Highest Breeding Evidence:	Codes assigned for breeding evidence are consistent with the Ontario Breeding Bird Atlas (OBBA). 2018. Breeding Evidence Codes. Available online: http://www.birdsontario.org/atlas/codes.jsp?lang=en&pg=breeding&sortorder=aou
S ranks:	Provincial ranks are from the Natural Heritage Information Centre; S1 (critically imperiled), S2 (imperlied), S3 (vulnerable), S4 (apparently secure), S5 (secure); ranks were updated using NHIC species list December 2018. Available to download from: https://www.ontario.ca/page/get-natural-heritage-information
G ranks:	Global ranks are from the Natural Heritage Information Centre; G1 (extremely rare), G2 (very rare), G3 (rare to uncommon), G4 (common), G5 (very common); ranks were updated using NHIC species list December 2018. Available to download from: https://www.ontario.ca/page/get-natural-heritage-information
COSSARO (MNRF):	Ontario Species at Risk as listed by the Committee on the Status of Species at Risk in Ontario (from NHIC Table December 2018 and updates posted on Ontario Regulation 230/08 Species at Risk in Ontario website as of August 1, 2018: https://www.ontario.ca/laws/regulation/080230/); END - Endangered; THR - Threatened; SC - Special Concern; NAR - Not at Risk
COSEWIC:	Assessed Species at Risk at the national level as listed by the Committee on the Status of Endangered Wildlife in Canada (from COSEWIC: https://wildlife-species.canada.ca/species-risk-registry/sar/index/default_e.cfm); END - Endangered, THR - Threatened, SC - Special Concern, NAR - Not at Risk
SWH Indicator Species:	SWH refers to Significant Wildlife Habitat as defined by the MNRF (2015) Significant Wildlife Habitat Criteria Schedules for Ecoregions 7E and 6E (as appropriate for the Subject Lands). SWH indicator species are identified in this table and any potential SWH is discussed in the text of this report. Available online: http://www.townofnemi.on.ca/wp-content/uploads/2016/02/NEMI-OP-App-C-schedule-6e-jan-2015-access-ver-final-s.pdf

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
H1S1	FT – 6 (wetland) FC – 4 (Round 1) FC – 4 (Round 2) FC – 2 (Round 3; predicted) **Important** – Reach was flowing during Round 1. Flow observed within portions of reach in Round 2, but there was no flow at downstream end. It is possible that this feature will contain pockets of isolated	Reach receives surface runoff from Torbram Road (does not receive drainage from properties west of Torbram as no culvert under roadway)	**Important –** feature is a wetland Meadow habitat located on either side of the feature.	**Valued -** Reach does not support direct fish habitat, but provides contributing habitat functions to downstream occupied Redside Dace habitat	**Important** – feature is a wetland and could support amphibian habitat.	🟥 **Protection (Predicted)** – Reach assigned a Protection management recommendation as it may support important hydrology (to be confirmed during Round 3 assessment) and is also a wetland providing contributing Redside Dace habitat	🟥 **Protection (Predicted)**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	water during the summer months					🟥	🟥
H2S1	FT – 6 (wetland) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment. Although flow in the reach was noted in the early spring, there was no downstream hydrological connection observed at	Agricultural	**Important –** feature is a wetland Meadow habitat located on either side of the feature.	**Contributing** – No direct fish habitat is present. Given that the reach was not observed to have a direct hydrological connection with the West Humber River during Round 1, it has been assessed as not providing contributing habitat functions for the downstream Redside Dace population.	**Valued** – feature is a wetland; however, was determined to be unsuitable amphibian breeding habitat (dry upon first round call count visit)	**Conservation**	**Conservation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	the time of study.						
H3S1	FT – 7 (swale) FC – 4 (Round 1) FC – 4 (Round 2) FC – 2 (Round 3; predicted) **Valued** – Reach was flowing during early spring assessment. Most of reach was dry in late spring, but there was minimal flow at the downstream culvert. It is possible that this reach could contain	Agricultural Reach receives drainage from Torbram Road and upstream (offsite) properties	**Valued** - Meadow Meadow habitat located on the right bank. Torbram Road is located along the left bank of the reach.	**Valued** - Reach does not support direct fish habitat, but provides contributing habitat functions to downstream occupied Redside Dace habitat	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Conservation (Predicted)**	**Conservation (Predicted)**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	isolated pockets of water within the summer months.						
H4S1	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.	Agricultural	**Valued** – meadow	**Contributing** – No direct fish habitat is present. Although some flow was coming from upstream cropped agricultural field during Round 1, this is not considered to be contributing habitat for Redside Dace.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**
H4S2	FT – 7 (swale) FC – 4 (Round 1)	Agricultural	**Limited –** Cropped Cropped (agricultural)	**Contributing** – No direct fish habitat is present. Although	**Limited –** As per Table 7 in HDFA Guidelines, swale provides	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.		vegetation is located on either side of the reach.	some flow was coming from upstream cropped agricultural field during Round 1, this is not considered to be contributing habitat for Redside Dace.	limited terrestrial function.		
H5S1	FT –7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the agricultural field during Round 1, this is not considered to be contributing	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	spring assessment.			habitat for Redside Dace given the minimal flow observed and agricultural land use.		🟩	🟩
H5S2	FT – 4 (no defined feature) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late spring assessment.	Agricultural Portion of reach had been removed by fill spread on the agricultural field as part of normal agricultural practices in Round 2	**Limited** – Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Reach only contained standing water in Round 1 and is not considered to be contributing habitat for Redside Dace given the lack of hydrological contribution and agricultural land use.	**Limited** – As per Table 7 in HDFA Guidelines, undefined feature provides limited terrestrial function.	**No Management Required**	**No Management Required**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
H5S2A	FT – 4 (no defined feature) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late spring assessment. No flow was observed.	Agricultural. Reach had been removed prior to Round 2 by fill spread on the agricultural field as part of normal agricultural practices	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Reach only contained standing water in Round 1 and is not considered to be contributing habitat for Redside Dace given the lack of hydrological contribution and agricultural land use.	**Limited –** As per Table 7 in HDFA Guidelines, undefined feature provides limited terrestrial function.	**No Management Required**	**No Management Required**
H6S1	FT – 6 (wetland) FC – 4 (Round 1) FC – 2 (Round 2)	Agricultural land use adjacent to this reach are expected to influence hydrology in the reach	**Important** - feature is a wetland Meadow and scrubland habitat located on	**Valued -** Reach provides contributing habitat functions to downstream occupied	**Valued** – feature is a wetland; however, was determined to be unsuitable amphibian breeding	**Protection (Predicted)**	**Conservation (Predicted)** - A Protection management recommendation is not warranted for this wetland as this wetland was

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	FC – 1 (Round 3; predicted) **Contributing** – Reach was flowing during early spring assessment, had periodic isolated pockets of standing water during late spring assessment and is predicted to be dry in the summer.		either side of the feature.	Redside Dace habitat (e.g., water quality maintenance in the headwater wetland)	habitat (dry upon first round call count visit)	🟥	anthropogenically formed as a result of the downstream berms preventing flows from moving through the landscape and instead pooling creating wetland habitat. A Conservation management recommendation will allow for realignment, restoration and natural channel design to maintain the ecological and physical functions this reach provides. Amphibian breeding habitat can be replicated within realigned channel corridor. The realigned channel corridor will provide increased ecological function within the landscape.

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
H6S1A	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the agricultural field during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and agricultural land use.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**
H6S1B	FT – 4 (no defined feature) FC – 4 (Round 1) FC – 1 (Round 2)	Agricultural	**Contributing – Lawn** Residential lawn present on one side of feature and cropped	**Contributing** – No direct fish habitat is present. Although some flow was present in the	**Limited –** As per Table 7 in HDFA Guidelines, no defined feature provides limited terrestrial function.	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	Contributing – Reach was flowing during early spring assessment and was dry upon late spring assessment.		(agricultural) vegetation is located on either side of the reach.	agricultural field during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and agricultural land use.			
H6S2	FT – 6 (wetland) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late	Agricultural	**Important –** feature is a wetland Cropped (agricultural) vegetation located on either side of the feature.	**Valued -** Reach may provide some limited contributing habitat functions to downstream occupied Redside Dace habitat (e.g., headwater wetlands supporting water quality maintenance)	**Valued** – feature is a wetland; however, was determined to be unsuitable amphibian breeding habitat (dry upon first round call count visit).	**Protection** - Feature is a wetland providing contributing Redside Dace habitat	**Conservation (Predicted)** - A Protection management recommendation is not warranted for this wetland type is very common and can be readily replicated elsewhere on the landscape. A Conservation management recommendation will allow for relocation and to maintain or

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	spring assessment			although no downstream flow from feature was observed that would supplement baseflows.		🟥	enhance the ecological and physical functions this reach provides. The realigned channel corridor will provide increased ecological function within the landscape.
H6S2A	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the swale during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and adjacent agricultural land use.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
H6S2A1	FT- 7 (swale) FC- 4 (Round 1) FC- 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the swale during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and adjacent agricultural land use.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**
H7S1	FT – 6 (wetland) FC – 4 (Round 1) FC – 2 (Round 2) FC – 1 (Round 3; predicted)	Agricultural land uses upstream from the feature (pastureland) may influence	**Important –** feature is a wetland Scrubland and meadow habitat is located on	**Valued -** Reach provides contributing habitat functions to downstream occupied	**Important** – feature is a wetland and could support breeding amphibians (although no call surveys were	**Protection (Predicted)** – this reach was assigned a Protection management recommendation as it provides valued fish habitat and important	**Conservation (Predicted) -** A Protection management recommendation is not warranted for this wetland as it was anthropogenically formed as a result of

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	Valued – Reach was flowing during early spring assessment, had isolated standing water pockets during late spring assessment and is predicted to be dry in summer.	hydrology in the reach	either side of the feature.	Redside Dace habitat	completed to verify this assumption).	riparian vegetation (wetland)	the downstream berm preventing flows from moving through the landscape and instead pooling creating wetland habitat. A Conservation management recommendation will allow for realignment, restoration and natural channel design. Amphibian breeding habitat can be replicated within realigned channel corridor. The realigned channel corridor will provide increased ecological function within the landscape.
H7S2	FT – 4 (no defined feature) FC – 4 (Round 1) FC – 2 (Round 2)	Agricultural Active pastureland (from late spring onwards)	**Limited –** Cropped Cropped (agricultural) vegetation is located on	**Contributing** – No direct fish habitat is present. Although some flow was present	**Limited –** As per Table 7 in HDFA Guidelines, undefined feature provides limited	**Mitigation (Predicted)**	**Mitigation (Predicted)**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	**MODIFIERS**					
	FC – 1 (Round 3; predicted) **Valued** – Reach was flowing during early spring assessment, had one standing water pocket (artificial pool for cattle) during late spring assessment and is predicted to be dry upon summer assessment		either side of the reach.	in the reach during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and existing agricultural (cattle pasture) land use.	terrestrial function.		
H7S2A	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2)	Agricultural Active pastureland (from late spring onwards)	**Limited –** Cropped Cropped (agricultural) vegetation is located on	**Contributing** – No direct fish habitat is present.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	Contributing – Reach was flowing during early spring assessment and was dry upon late spring assessment.	Narrow overflow channel downstream of cattle watering pond	either side of the reach.		terrestrial function.	🟩	🟩
H7S2B	FT – 9 (pond) FC – 2 (Round 1) FC – 2 (Round 2) FC – 2 (Round 3; predicted) **Limited** – Pond holds water year-round but was not contributing downstream flows during any of the	Agricultural Feature is a man-made pond which retains water Pond was constructed to act as a watering hole for cattle	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** - Man-made pond with augmented flows to supply downstream cattle watering structure; not be considered fish habitat	**Important** – Amphibians were recorded within the pond during targeted call count surveys.	**No Management Required** – Anthropogenic pond that provides no downstream hydrological contributions	**No Management Required**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	assessment periods						
H7S2C	FT – 7 (swale) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late spring assessment.	Agricultural Active pastureland (from late spring onwards)	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Reach does not provide any contributing habitat functions for the downstream Redside Dace population	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**No Management Required**	**No Management Required**
H7S2D	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the reach during Round	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	flowing during early spring assessment and was dry upon late spring assessment.			1, this is not considered to be contributing habitat for Redside Dace given the minimal flow observed and existing agricultural land use.		🟩	🟩
H7S2D1	FT – 7 (swale) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late spring assessment.	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the reach during Round 1, this is not considered to be contributing habitat for Redside Dace given the lack of downstream	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**No Management Required**	**No Management Required**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
				flow and existing agricultural land use.			
H7S2E	FT – 7 (swale) FC – 2 (Round 1) FC – 1 (Round 2) **Limited** – Reach had standing water during early spring assessment and was dry upon late spring assessment.	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the reach during Round 1, this is not considered to be contributing habitat for Redside Dace given the lack of downstream flow and existing agricultural land use.	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**No Management Required**	**No Management Required**
H7S3	FT – 7 (swale) FC – 4 (Round 1)	Agricultural	**Limited –** Cropped	**Contributing** – No direct fish habitat is present.	**Limited –** As per Table 7 in HDFA Guidelines,	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring assessment and was dry upon late spring assessment.		Cropped (agricultural) vegetation is located on either side of the reach.	Although some flow was present in the reach during Round 1, this is not considered to be contributing habitat for Redside Dace given the minimal downstream flow and existing agricultural land use.	swale provides limited terrestrial function.		
H7S3A	FT – 7 (swale) FC – 4 (Round 1) FC – 1 (Round 2) **Contributing** – Reach was flowing during early spring	Agricultural	**Limited –** Cropped Cropped (agricultural) vegetation is located on either side of the reach.	**Contributing** – No direct fish habitat is present. Although some flow was present in the reach during Round 1, this is not considered to be	**Limited –** As per Table 7 in HDFA Guidelines, swale provides limited terrestrial function.	**Mitigation**	**Mitigation**

Table 8: Headwater Drainage Feature Classification and Management Recommendations

DRAINAGE FEATURE SEGMENT	STEP 1. HYDROLOGY		STEP 2. RIPARIAN	STEP 3. FISH HABITAT	STEP 4. TERRESTRIAL HABITAT	MANAGEMENT RECOMMENDATION (PER HDFA GUIDELINES)	GEI'S PRELIMINARY MANAGEMENT RECOMMENDATION
	FUNCTION	MODIFIERS					
	assessment and was dry upon late spring assessment.			contributing habitat for Redside Dace given the minimal downstream flow and existing agricultural land use.		🟩	🟩

LEGEND:

FT	Feature Types (1-defined natural channel, 2-channelized, 3-multi-thread, 4-no defined feature, 5-tiled drainage, 6-wetland, 7-swale, 8-roadside ditch, 9-online pond outlet)
FC	Flow Conditions (1-no surface water, 2-standing water, 3-interstitial flow, 4-surface flow minimal, 5-surface flow substantial)

Note: Codes correspond with Ontario Stream Assessment Protocol (OSAP) guidelines

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
1. SEASONAL CONCENTRATION AREAS					
Waterfowl Stopover and Staging Areas (terrestrial)	Yes – CUT1 and CUM1 vegetation communities are present on the Subject Lands.	No – No evidence of sheet water during spring surveys.	No	N/A	Not Present
Waterfowl Stopover and Staging Areas (aquatic)	Yes – MAS vegetation communities are present on the Subject Lands.	No – pond sizes considered insufficient to support significant aggregations of migratory waterfowl.	No	N/A	Not Present
Shorebird Migratory Stopover Areas	Yes – MAM2 vegetation communities are present on the Subject Lands.	No – MAM vegetation communities are small features and ponds are too small to provide substantive stopover shoreline habitats. These features would not attract or support migratory shorebirds.	No	N/A	Not Present
Raptor Wintering Areas	Yes – CUT, CUM and FOD vegetation communities are present on the Subject Lands.	No – The upland and forested communities on the Subject Lands do not meet minimum	No	N/A	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
		combined size criteria (>20 ha).			
Bat Hibernacula	No – Eligible vegetation communities are absent from the Subject Lands.	No	No	N/A	Not Present
Bat Maternity Colonies	Yes – FOD5 and FOD7-3 vegetation communities are present on the Subject Lands within the Greenbelt.	Yes – Vegetation communities contain large diameter snag trees (>25cm DBH) to support maternity colonies on the Subject Lands.	Yes	Based on the abundance of suitable roosting and woodland cover on the Subject Lands, Bat Maternity Colonies are assumed to be present in the FOD5 and FOD7-3.	Candidate Habitat
Turtle Wintering Areas	Nos – While ponds (i.e., SA, MA, and OA vegetation communities) are present on the Subject Lands, all three features are manmade/dug ponds which are not considered suitable habitat for this type of SWH.	No – SA and OA features (i.e., East Tributary ponds and cattle pond) are manmade/dug ponds; therefore they are not considered suitable habitat for this types of feature	No	N/A	Not Present
Reptile Hibernacula	Yes – Ecosites are present on the Subject Lands.	Yes – old farmstead outbuildings may provide suitable access to below frost-line; no rock outcrop	Yes – any reptiles observed will be recorded during	Potential suitable habitat for these species may occur on the Subject Lands. No observations of snake species were	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
		features were identified within the proposed project footprint.	all field investigations,	recorded during surveys conducted by GEI in 2021.	
Colonial Bird Nesting Sites (bank/cliff)	Yes - CUT1 CUM1 vegetation communities are present on the Subject Lands. Areas of eroding sandy slopes exist associated with manmade berms at East Tributary.	Yes – failure of the manmade berms has created eroding sandy slopes	Yes	No: While breeding bird surveys were completed and both indicator species (i.e., Cliff Swallow and Northern Rough-winged Swallow) were recorded on the Subject Lands. No nests of the species or breeding pairs were recorded within the areas of eroding sandy slopes exist associated with manmade berms at East Tributary.	Not Present
Colonial Bird Nesting Sites (tree/shrubs)	No – Eligible vegetation communities are absent from the Subject Lands.	No	No	N/A	Not Present
Colonial Bird Nesting Sites (ground)	No – No rocky islands or peninsulas are present on the Subject Lands.	No	No	N/A	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
Migratory Butterfly Stopover Areas	No – Subject Lands are over 5km from Lake Ontario.	N/A	No	N/A	Not Present
Migratory Landbird Stopover Areas	Yes – FOD vegetation communities are present on the Subject Lands.	No – Subject Lands are greater than 5 km from Lake Erie and Lake Ontario.	No	N/A	Not Present
Deer Yarding Area / Winter Congregation Areas	No – MNRF has not identified the Subject Lands a Wildlife Values Area (White-tailed Deer Wintering Area – Stratum 2).	As identified by MNRF	No	As identified by MNRF	Not Present
2. RARE VEGETATION COMMUNITIES OR SPECIALIZED HABITAT FOR WILDLIFE					
2a. Rare Vegetation Communities					
Rare Vegetation Types (cliffs, talus slopes, sand barrens, alvars, old-growth forests, savannahs, and tallgrass prairies)	No – Eligible vegetation communities are absent from the Subject Lands.	No	No	N/A	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
Other Rare Vegetation Types (S1 to S3 communities)	N/A	N/A	Yes	Three-season botanical inventory and refinements to existing Ecological Land Classification mapping were undertaken by GEI in 2021. No rare vegetation communities were identified on the Subject Lands.	Not Present
2b. Specialized Wildlife Habitat					
Waterfowl Nesting Area	Yes – MAM2, MAS, SA vegetation communities on the Subject Lands.	No – upland areas adjacent to wetlands on the Subject Lands less than 120m ha in width.	No	N/A	Not Present
Bald Eagle and Osprey Habitats	Yes – FOD vegetation communities are present on the Subject Lands.	Yes – Forested communities occur adjacent to the West Tributary of West Humber River.	Yes	No bald eagle or osprey nests were observed during field investigations	Not Present
Woodland Raptor Nesting Habitat	Yes – Forested ecosites are present on the Subject Lands.	No – Minimum size criteria (i.e., >30 ha with >4 ha interior habitat) aren't met.	No	N/A	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
Turtle Nesting Areas	Yes – MAM and MAS vegetation communities are present on the Subject Lands.	No – Suitable substrates were not identified near the ponds .	No	N/A	Not Present
Seeps and Springs	Yes – Forested vegetation communities are present on the Subject Lands.	No – Forested vegetation communities on the Subject Lands are associated with permanent stream of West Tributary.	No	None observed.	Not Present
Woodland Amphibian Breeding Habitats (within or < 120m from woodland)	No – Breeding pools are not present within 120 m of woodland habitat on the Subject Lands.	N/A	No	Minimum species diversity and numbers not met. No significant wildlife habitat for amphibian breeding present on the subject lands.	Not Present
Wetland Amphibian Breeding Habitats (wetland >120m from woodland)	Yes – OA and SA vegetation communities are present on the Subject Lands.	Yes	Yes	Minimum species diversity and numbers not met. No significant wildlife habitat for amphibian breeding present on the subject lands.	Not Present
Woodland Area-Sensitive Bird Breeding Habitat	Yes – FOD vegetation communities are present on the Subject Lands.	No – woodland on the Subject Lands are smaller than 30 ha in	No	N/A	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
		size and contain no interior forest habitat.			
3. SPECIES OF CONSERVATION CONCERN					
Marsh Bird Breeding Habitat	Yes – MAM and CUM1 vegetation communities are present on the Subject Lands.	Yes – All wetlands that contain shallow water and emergent aquatic vegetation should be considered.	Yes	No – Breeding Bird Surveys were conduct on the Subject Lands and none of the indicator species were recorded.	Not Present
Open Country Bird Breeding Habitat	Yes – CUM1 vegetation community is present on the Subject Lands.	No – Minimum size criteria (>30 ha) are not met.	No	N/A	Not Present
Shrub/Early Successional Bird Breeding Habitat	Yes – CUT vegetation communities are present on the Subject Lands.	No – Minimum size criteria (>10 ha) are not met.	No	N/A	Not Present
Terrestrial Crayfish	Yes – MAM, MAS and SWT vegetation communities are present on the Subject Lands.	Yes – No minimum size requirement.	Yes	No – Terrestrial crayfish were searched for in suitable habitat during other field investigations (i.e., aquatic habitat assessment, breeding bired surveys, turtle basking surveys etc.) On one occasion a single terrestrial crayfish burrow (i.e., one chimney) was	Not Present

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
				noted within a dry wetland on the north-west branch of the Upper Pond. No other chimneys were identified within this wetland unit. Based on this singular observation, significance has not meet achieved. Field investigations were not yet complete at the time of report preparation.	
3a. Special Concern and Rare Wildlife Species					
(i) Snapping Turtle (*Chelydra serpentine*)	N/A	Yes – Shallow, slow-moving waterbodies are present on the Subject Lands in the anthropogenic ponds associated with the East Tributary.	Yes	Three rounds of turtle basking surveys were completed on the Subject Lands. One Snapping Turtles was observed in the upper pond on East Tributary. Two turtle nesting sites and suitable nesting substrate were also identified on the Subject Lands.	Present - Confirmed

Table 9: Significant Wildlife Habitat Assessment (6E Ecoregion)

SIGNIFICANT WILDLIFE HABITAT (SWH) TYPE	ELC ECOSITE(S) PRESENT	HABITAT CRITERIA MET	TARGETED FIELD STUDIES REQUIRED	DEFINING CRITERIA MET (MINIMUM ABUNDANCES AND/OR DIVERSITY REQUIRED TO CONFIRM SWH)	SWH TYPE PRESENT
4. ANIMAL MOVEMENT CORRIDORS					
Amphibian Movement Corridors	N/A	No – No Amphibian Breeding Habitat – Wetland is present on the Subject Lands; therefore, this habitat type does not need to be assessed.	No	N/A	Not Present

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
		KEY NATURAL HERITAGE FEATURES		
Significant Wetlands	• Not present/not applicable.	• N/A	• N/A	• N/A
Significant Coastal Wetlands	• Not present/not applicable.	• N/A	• N/A	• N/A
Significant Woodlands	• Two Significant forested ELC community types (Dry-Fresh Sugar Maple Deciduous Forest; FOD5 and Fresh-Moist Willow Lowland Deciduous Forest; FOD7-3) were identified within the Subject Lands (**Figure 3, Appendix A**). • The Salt Creek Valley woodland just outside the northeastern property boundary is also a Significant Woodland.	Direct Impacts • No direct impacts to Significant Woodlands are anticipated. These features will be maintained in place. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect Significant Woodlands due to erosion and sedimentation. • Accidental spills associated with construction could indirectly affect Significant Woodlands. • Increased contributions of road salts during the winter months are expected as a result of site development.	Direct Impacts • A 30 m vegetated buffer will be established around the FOD5 and FOD7-3 communities. • The offsite Salt Creek Valley Significant Woodland has been provided a 30 m setback. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to Significant Woodlands via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	Direct Impacts • No direct effects to Significant Woodlands are predicted. • In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: o Reduction of encroachment; o Reduction of light and noise; o Space for tree-fall; o Protection of root zones; o Enhancement of woodland interior; o Location of trails; and o Attenuation of runoff. o Increase in primary linkage function o Increase in habitat availability o Prevention of erosion and sedimentation Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact Significant Woodlands on the Subject Lands.
Significant Valleylands	• The valleylands associated with the West Tributary and Salt Creek are Significant Valleylands (**Figure 11 Appendix A**).	Direct Impacts • The proposed development will avoid the West Tributary valleyland located in the Greenbelt NHS, and the Salt Creek valleyland located in the northeast portion of the Subject Lands. • No direct impacts to Significant Valleylands are anticipated. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect Significant Valleylands due to erosion and sedimentation. • Accidental spills associated with construction could indirectly affect Significant Valleylands. • Increased contributions of road salts during the winter months are expected as a result of site development.	Direct Impacts • Vegetated buffers will be applied to the Salt Creek and West Tributary valleylands. Buffers will be vegetated with native groundcover seed mix and native shrubs and trees. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to Significant Valleylands via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental	Direct Impacts • No direct effects to Significant Valleylands are predicted. • In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: o Reduction of encroachment; o Reduction of light and noise; o Space for tree-fall; o Protection of root zones; o Enhancement of woodland interior; o Location of trails; and o Attenuation of runoff. o Increase in primary linkage function o Increase in habitat availability o Prevention of erosion and sedimentation Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
			Protection blocks. A salt management plan will also be prepared.	expected to negatively impact Significant Valleylands on the Subject Lands.
Significant Wildlife Habitat – Seasonal Concentration Areas	- Seasonal concentration areas identified on the Subject Lands include candidate bat maternity colonies, located in the Greenbelt.	Direct Impacts - No tree removal is proposed in woodland communities that have potential to support bat maternity colonies, therefore no direct impact is expected to this candidate SWH type. Indirect Impacts - Construction activities within the Subject Lands could indirectly affect SWH due to erosion and sedimentation. - Accidental spills associated with construction could indirectly affect SWH. - Increased contributions of road salts during the winter months are expected as a result of site development.	Direct Impacts - In some cases, bats may roost in single trees that have suitable characteristics outside of the woodlands identified on the Subject Lands. - To prevent potential impacts to bats, the removal of trees (>10 cm DBH) should not occur between April 1 and September 30. Removals will also be conducted in accordance with MBCA timing windows. - If tree removal is required during this period due to unexpected circumstances, bat surveys and nest sweeps will be completed by a qualified biologist. Indirect Impacts - An ESC plan will be developed to avoid indirect impacts to SWH via erosion and sedimentation. - Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. - It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	Direct Impacts - No direct impacts are expected to this candidate SWH type. - Vegetated buffers are expected to increase habitat availability and reduce light and noise, which may benefit bats on site. Indirect Impacts - Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact SWH on the Subject Lands.
Significant Wildlife Habitat – Rare Vegetation Communities	- Not present/not applicable.	- N/A	- N/A	- N/A
Significant Wildlife Habitat – Specialized Wildlife Habitat	- Not present/not applicable. - Although Midland Painted Turtles and Snapping Turtles were identified in the ponds associated with the East Tributary (**Figure 5, Appendix A**), these ponds are not considered suitable turtle overwintering habitat because they are manmade. - These ponds are planned to be dewatered in order to improve downstream water quality and enhance long-term safety and stability of the East Tributary system. Impacts to turtles will be mitigated through	- N/A	- N/A	- N/A

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
	periodic inspection by a biologist and relocation of turtles as needed. • Establishment of turtle habitat in the Salt Creek EPA Block is proposed as part of the restoration plan.			
Significant Wildlife Habitat – Habitat for Species of Conservation Concern	• Barn Swallow: o Two sets of farm buildings have been confirmed to support a total of 18 Barn Swallow nests (**Figure 6, Appendix A**). • Snapping Turtle o Snapping Turtles were identified in the manmade ponds associated with the East Tributary (**Figure 5, Appendix A**)	Direct Impacts • Barn Swallow: o Farm buildings which currently provide nesting habitat for Barn Swallow are proposed to be removed, which will result in loss of breeding habitat for the species. • Snapping Turtle: o Permanent reconfiguration of pond and nesting habitat associated with the East Tributary will temporarily remove habitat for Snapping Turtle. o Opportunities to retain the ponds associated with the East Tributary were considered; however, the removal of the failing manmade berms is required due to safety. Consequently, the ponds cannot be maintained on the landscape while simultaneously meeting project objectives to improve downstream water quality and enhance long-term safety and stability of the East Tributary system. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect habitat for species of conservation concern due to erosion and sedimentation. • Accidental spills associated with construction could cause stress or injury to species of conservation concern. • Increased contributions of road salts during the winter months are expected as a result of site development.	• Barn Swallow: o Habitat removals will occur outside of the Barn Swallow active season (beginning of May to end of August) to avoid adverse impacts. • Snapping Turtle: o Fish and wildlife salvages will occur prior to dewatering and/or removal to rescue any wildlife from these features. o The restored NHS, including Salt Creek and West Tributary systems, will aim to continue to provide all critical habitat components for Snapping Turtles, including overwintering habitat and existing ecological functions for this species where feasible. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to species of conservation concern via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	• Barn Swallow o Wildlife enhancement structures, such as Barn Swallow nesting kiosks, will be considered for installation throughout the East Tributary and Salt Creek to provide habitat diversity that is not currently present and/or to compensate for those that are proposed for removal. These will be further defined at the detailed design stage. o No negative impacts to SWH are expected as a result of the proposed mitigative and restoration measures. • Snapping Turtle: o Creation of new habitats within the East Tributary and Salt Creek will allow for increased connectivity and linkage opportunities that are not currently present within this tributary due to the constructed berms. o Wildlife enhancement structures will be installed throughout the East Tributary and Salt Creek to provide habitat diversity that is not currently present and/or to compensate for those that are proposed for removal. These will be further defined at the detailed design stage. o No negative impacts to SWH are expected as a result of the proposed mitigative and restoration measures. Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact habitat for species of conservation concern on the Subject Lands.
Fish Habitat	• West Tributary: o The West Tributary is identified as confirmed, permanent, direct fish habitat.	Direct Impacts • West Tributary: o Fish Habitat associated with the West Tributary will be retained in place and	Direct Impacts • West Tributary: o Buffers will be planted with native species.	Direct Impacts • West Tributary: o No direct effects to fish habitat are predicted.

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
	• Salt Creek: o Salt Creek is identified as confirmed, permanent, direct fish habitat. • East Tributary and Associated Features: o The East Tributary is identified as candidate, permanent, direct fish habitat. o The Upper Pond is identified as candidate, permanent, direct fish habitat while the Lower Pond is identified as confirmed, permanent, direct fish habitat. It should be recognized that fish are only present in these ponds due to anthropogenic stocking. Fish passage from the downstream reach is not feasible to these ponds due to berms and perched culverts. o Watercourses 1 and 2 on the Subject Lands provide indirect fish habitat functions. • HDFs: o All reaches assigned a conservation and/or mitigation management recommendation and that did not have fish captured within them provide indirect fish habitat. Reaches assigned no management recommendation provide no fish habitat. • See **Figure 10, Appendix A** for direct and indirect fish habitat identified within the Subject Lands. • Occupied Redside Dace habitat is present in the main branch of the West Tributary of the West Humber River where it flows through the Subject Lands. Salt Creek is also documented to be supporting Redside Dace (see Habitat of Endangered and Threatened Species section below for more information on Redside Dace).	setback from the development; therefore, no direct impacts are anticipated. • Salt Creek: o Fish Habitat associated with the Salt Creek will be retained in place and setback from the development; therefore, no direct impacts are anticipated. • East Tributary and Associated Features: o Fish Habitat associated with the East Tributary will be disturbed and altered as a result of the proposed restoration concept. o In-water work, including pond water level lowering, berm removal and installation of localized erosion protection materials could potentially result in direct disturbance of fish in the Upper and Lower Ponds as well as downstream. o Watercourses 1 and 2 are to be enhanced/restored, potentially resulting in direct disturbance of fish. o Temporary alterations to the flow regime could occur as a result of worksite isolation and associated pumping and pond dewatering. • HDFs: o Temporary alterations to the flow regime of the headwater streams on the Subject Lands during implementation of the restoration and development project could result in downstream flow or water level reductions that could cause negative impacts on direct off-site fish and fish habitat. o Some Mitigation HDFs may be removed, and their functions replicated. o Conservation HDFs will maintain their function on site, with conveyance of flows being replicated into their receiving systems. Final form of conservation HDFs will be confirmed in detail design in coordination with DFO and MECP.	• Salt Creek: o Buffers will be planted with native species. • East Tributary and Associated Features: o In water works will follow the prescribed timing windows from the MNRF toavoid disturbance during critical reproductive periods for the warm-water spring spawning fish known to be present in the ponds. o Removal of the ponds should occur during minimal flow periods or in the dry to reduce impacts. o To avoid associated injury or mortality of fish, monitoring will be completed as pond water levels are reduced and any fish trapped or dewatered will be salvaged and moved to a predetermined location approved by the DFO through the Request for Review process, if feasible.[SJ1][MS2] o Drainage from the entirety of the site will be maintained. Where drainage flows through Watercourses 1 and 2, these input locations will be maintained where they meet the Block 13 Restoration Area. o Worksite isolation and flow bypass plans will be developed to ensure that there is no disruption to downstream flows outside of the in-water work areas. • HDFs: o Drainage from the entirety of the site will be maintained. o HDFs assigned a Mitigation management recommendation can have their functions replicated through targeted mitigation actions (e.g., wetland creation, LID solutions). o HDFs assigned a Conservation management recommendation can maintain or replace on-site flows using mitigation measures and/or wetland creation. Indirect Impacts	o In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: ▪ Reduction of encroachment; ▪ Reduction of light and noise; ▪ Space for tree-fall; ▪ Protection of root zones; ▪ Enhancement of woodland interior; ▪ Location of trails; and ▪ Attenuation of runoff. ▪ Increase in primary linkage function ▪ Increase in habitat availability ▪ Prevention of erosion and sedimentation • Salt Creek: o No direct effects to fish habitat are predicted. o In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: ▪ Reduction of encroachment; ▪ Reduction of light and noise; ▪ Space for tree-fall; ▪ Protection of root zones; ▪ Enhancement of woodland interior; ▪ Location of trails; and ▪ Attenuation of runoff. ▪ Increase in primary linkage function ▪ Increase in habitat availability ▪ Prevention of erosion and sedimentation • East Tributary and Associated Features: o Removal of the online ponds will assist in maintaining cooler temperatures in the watercourse, which may have benefits for the downstream Redside Dace population. o It is likely that eroded sediments from the upstream portion of the watercourse are being deposited within the ponds. This may be resulting in sediment-starved downstream reaches. Re-establishment of a more natural sediment transport regime is expected to have substantial benefits for the overall biophysical function of the watercourse and associated habitat for fish and benthic invertebrates.

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
		o Protection HDFs will be retained in place; therefore, no direct impacts are anticipated. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect fish habitat due to erosion and sedimentation. • Accidental spills associated with construction could cause stress or injury to fish and other aquatic biota (e.g., benthic invertebrates). • Increased contributions of road salts during the winter months are expected as a result of site development.	• An ESC plan will be developed to avoid indirect impacts to fish habitat via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	o Removal of the online ponds and construction of a low flow channel is also expected to significantly enhance the ability of fish to move upstream into this system. • HDFs: o On-site flows are not expected to be impacted, provided mitigation, conservation, and protection measures are employed as described. Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact fish habitat on the Subject Lands.
Significant Areas of Natural and Scientific Interest	Not present/not applicable.	N/A	N/A	N/A
Habitat of Endangered & Threatened Species	Bat SAR • Suitable maternity roosting habitat for bat SAR may occur within the Significant Woodland within the Greenbelt Area. Bobolink and Eastern Meadowlark • Both species were confirmed to be breeding in suitable habitats within the Subject Lands. Suitable habitats include agricultural fields with hay, and pasture used to support the farm cattle. • Since the time of surveys in 2021, the agricultural use on-site has transitioned from cattle to row crop agriculture. As a result, the hay or pasture lands formerly used by these species are no longer present. The Subject Lands do not provide habitat for these species. Redside Dace • Salt Creek was identified to contain Occupied Habitat for Redside Dace. • The main branch of the West Tributary of the West Humber River flowing through the southwest portion of the Subject Lands is also identified by DFO and MECP as "Occupied Habitat" for Redside Dace.	Direct Impacts • Bat SAR o Significant Woodlands on the Subject Lands will be retained in place. No impacts to SAR bat habitat are expected as a result of the proposed development. • Bobolink and Eastern Meadowlark o NA • Redside Dace o The West Tributary of the West Humber River and Salt Creek will be retained in place. No direct impacts to occupied habitat are anticipated. o The proposed development will impact contributing Redside Dace habitat associated with the East Tributary of the West Humber River, Watercourses 1 and 2, and associated HDFs. Indirect Impacts	Direct Impacts • Bat SAR o A 30 m vegetated buffer will be established around the FOD5 and FOD7-3 communities. o The offsite Salt Creek Valley Significant Woodland has been provided a 30 m setback. o Seed mixes applied throughout restoration areas will include nectaring species to attract local insect populations. o Consultation with MECP will be completed to ensure that all requirements under the ESA are addressed prior to commencement of implementation of the proposed project. • Bobolink and Eastern Meadowlark o NA • Redside Dace o The West Tributary and Salt Creek will be set back from the development and buffers will be planted with native species.	Direct Impacts • Bat SAR o The proposed development is not anticipated to have a negative impact on the availability of foraging or roosting habitat for these species. o Restoration areas are expected to increase the availability of flowering plant species, consequently increasing the availability of habitat for bat foraging. o In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: ▪ Reduction of encroachment; ▪ Reduction of light and noise; ▪ Space for tree-fall; ▪ Protection of root zones; ▪ Enhancement of woodland interior; ▪ Location of trails; and ▪ Attenuation of runoff. ▪ Increase in primary linkage function ▪ Increase in habitat availability ▪ Prevention of erosion and sedimentation • Bobolink and Eastern Meadowlark

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
		KEY NATURAL HERITAGE FEATURES		
	• The East Tributary appears to support baseflows in the downstream, occupied West Humber River watercourse. Based on this, the portion of the watercourse on the Subject Lands is considered to provide contributing Redside Dace habitat; however, the value of that contributing habitat is relatively limited based on the presence of the Upper and Lower Ponds and the berms impeding fish passage, which contribute negative impacts to Redside Dace habitat including barriers to passage and thermal inputs • Contributing habitat status for each HDF reach is identified in the "Step 3. Fish Habitat" column of **Table 4** (**Appendix B**) along with the supporting rationale.	• Construction activities within the Subject Lands could indirectly affect SAR habitat due to erosion and sedimentation. • Accidental spills associated with construction could cause stress or injury to fish and other aquatic biota (e.g., benthic invertebrates). • Increased contributions of road salts during the winter months are expected as a result of site development.	o Realignment of the East Tributary and Watercourses 1 and 2, as well as the removal of HDFs will occur in accordance with MECP's Guidelines for Development Activities in Redside Dace Protected Habitat (2016). o SWM facilities will be designed in accordance with MNRF guidelines to minimize impacts to Redside Dace (e.g., consideration of installation of bottom draw outlets). o The restoration area and removal of man-made berms will remove barriers to fish passage and create more complex habitat structures for Redside Dace and other fish. o Consultation with MECP will be completed to ensure that all requirements under the ESA are addressed prior to commencement of implementation of the proposed project. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to fish habitat via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	o NA • Redside Dace o Removal of the online ponds will assist in maintaining cooler temperatures in the watercourse, which may have benefits for the downstream Redside Dace population. o It is likely that eroded sediments from the upstream portion of the watercourse are being deposited within the ponds. This may be resulting in sediment-starved downstream reaches. Re-establishment of a more natural sediment transport regime is expected to have substantial benefits for the overall biophysical function of the watercourse and associated habitat for fish and benthic invertebrates. o Removal of the online ponds and construction of a low flow channel is also expected to significantly enhance the ability of fish to move upstream into this system. Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact SAR habitat on the Subject Lands.
Other Wetlands	• Six, non-significant, wetland communities were identified on the Subject Lands (**Figure 3, Appendix A**): o Mineral Meadow Marsh (MAM2); o Reed-canary Grass Mineral Meadow Marsh (MAM2-2); o Pondweed Mixed Shallow Aquatic (SAM1-4) o Shallow Aquatic (SA); o Mineral Shallow Marsh (MAS2); and o Willow Mineral Thicket Swamp (SWT2-2).	Direct Impacts • The proposed development plan will directly impact MAM2, MAM2-2, MAS2, SAM1-4, and SWT2-2 community types associated with the manmade ponds and HDFs • A total of 9.037 ha of wetland and associated 10 m buffer are proposed for removal. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect wetlands due to erosion and sedimentation.	Direct Impacts • Approximately 6 ha of restoration area is proposed for on-site compensation/enhancement agreements within Block 12 of the Subject Lands. During the detailed design phase, a Wetland Implementation Plan will be prepared. • A 10 m vegetated wetland buffer will be incorporated into the design. • Wetland compensation via cash-in-lieu is proposed for 1.57 ha of removals within Block 1 (see **Appendix D**).	Direct Impacts • Wetland restoration and cash-in-lieu provided to the conservation authority will ensure that wetlands and their associated functions are replicated on the landscape. • In general, buffers are expected to provide the following ecological benefits to existing natural heritage features: o Reduction of encroachment; o Reduction of light and noise; o Space for tree-fall; o Protection of root zones; o Enhancement of woodland interior; o Location of trails; and o Attenuation of runoff.

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
		• Accidental spills associated with construction could indirectly affect wetlands on site. • Increased contributions of road salts during the winter months are expected as a result of site development.	• Further cash-in-lieu memorandums will be prepared and included in the final submission of the CEISMP as required to address proposed removals. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to wetlands via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	o Increase in primary linkage function o Increase in habitat availability o Prevention of erosion and sedimentation Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact wetlands on the Subject Lands.
Other Valleylands	• The East Tributary has not been identified as significant due to the significant anthropogenic alteration that has occurred within the feature and its poor linkage function due to the two man-made berm structures and created ponds (Upper and Lower Ponds).	Direct Impacts • No long-term impacts are predicted as a result of disturbance within the valleylands. • Some short-term disturbance within the valleylands of the East Tributary may occur (e.g., removal of berms and Upper and Lower Ponds) during construction. Indirect Impacts • Construction activities within the Subject Lands could indirectly affect valleylands due to erosion and sedimentation. • Accidental spills associated with construction could indirectly affect valleylands on site. • Increased contributions of road salts during the winter months are expected as a result of site development	Direct Impacts • Any alterations within the valleylands will be restored using ecological restoration principles. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to valleylands via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	Direct Impacts • These necessary disturbances would result in increased ecological connectivity while addressing stability concerns associated with the failing berms. Indirect Impacts • Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact wetlands on the Subject Lands.
Regionally and Locally Important Species	• Nine regionally rare plants were observed, as per the Peel Region rarity rankings (Varga et al. 2005): o Old Field Aster (Symphyotrichum pilosum var. pilosum); R1 o Common Hornwort (Ceratophyllum demersum); R3 o Peach-leaved Willow (Salix amygdaloides); R6 o Sandbar Willow (Salix interior); R5 o White Spruce (Picea glauca); R3	Direct Impacts • Five of the nine identified regionally rare plants were exclusively found in the two ponds proposed for removal (mapped as MAS2/SA and SAM1-4 – Upper and Lower Ponds, respectively) Indirect Impacts	Direct Impacts • 6 ha of restoration area is proposed for on-site compensation/enhancement agreements within the Subject Lands. During the detailed design phase, a Wetland Implementation Plan will be prepared. • Opportunities for flora salvage and transplant of regionally rare species will be considered as part of restoration plans for the Salt Creek corridor, as	Direct Impacts • Created wetland habitat on the Subject Lands is expected to be suitable for the five regionally rare species found in the Upper and Lower Ponds, consequently, no net negative impacts to these species are anticipated. Indirect Impacts

Table 10: Impact Assessment Summary

NATURAL HERITAGE FEATURES	SIGNIFICANT CHARACTERISTICS & SENSITIVITY	PREDICTED IMPACTS	AVOIDANCE, MITIGATION, AND/OR RESTORATION MEASURES	NET EFFECTS
KEY NATURAL HERITAGE FEATURES				
	o Northern Watermeal (Wolffia borealis); R2 o Columbia Watermeal (Wolffia columbiana); R3 o Leafy Pondweed (Potamogeton foliosus ssp. foliosus); R7 o Small Pondweed (Potamogeton pusillus); R3	• Construction activities within the Subject Lands could indirectly affect regionally/locally rare species due to erosion and sedimentation. • Accidental spills associated with construction could indirectly affect regionally/locally rare species on site. • Increased contributions of road salts during the winter months are expected as a result of site development	appropriate, noting that shallow aquatic species are not suitable for flora salvage. Indirect Impacts • An ESC plan will be developed to avoid indirect impacts to regionally/locally rare species via erosion and sedimentation. • Spill prevention and response measures will be implemented to mitigate indirect impacts, including, but not limited to appropriate material handling and storage protocols. • It will be communicated to the end user that road salts should be stored away from Environmental Protection blocks. A salt management plan will also be prepared.	• Indirect effects will be mitigated through spill prevention and response planning and ESC planning and are not expected to negatively impact regionally/locally rare species on the Subject Lands.
KEY HYDROLOGIC HERITAGE FEATURES				
Permanent Streams	• The West Tributary and Salt Creek are considered permanent streams. • Portions of the East Tributary are considered permanent streams.	• The West Tributary and Salt Creek will be retained in place and setback from the development; therefore, no direct impacts are anticipated. • The East Tributary is proposed for realignment and restoration through removal of two manmade berms. • Construction activities within the Subject Lands could indirectly affect permanent streams due to erosion and sedimentation. • Accidental spills associated with construction could indirectly affect permanent streams on site. • Increased contributions of road salts during the winter months are expected as a result of site development	• Restoration and enhancement activities along the East and West Tributaries will work to create, protect and/or enhance hydrologic functions. • Hydrologic function of the stream will be maintained through SWM infrastructure on site. • Various phasing opportunities and mitigation measures (e.g., ESC plan, spill action plan, salt management plan) will be explored in detailed design to minimize short-term impacts during construction.	• No net negative impacts to permanent streams are anticipated provided restoration and mitigation measures are enacted as described in text.
Seepage Areas and Springs	• Not present/not applicable.	N/A	N/A	N/A
Wetlands	• See 'Other Wetlands' section above.	• See 'Other Wetlands' section above.	• See 'Other Wetlands' section above.	• See 'Other Wetlands' section above.

Appendix C

Fluvial Geomorphic Assessment of Salt Creek

GEI Consultants

Tullamore North

Fluvial Geomorphic Assessment of Salt Creek

Caledon, Ontario

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Project 2201151

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1. Introduction

GEI Consultants Ltd. (GEI) has been retained by Rice Commercial Group Limited to complete a geomorphic assessment within and adjacent to the property generally located north of Mayfield Road, west of Airport Road, and east of Torbram Road (herein referred to as the Study Area; **Figure 1, Appendix A**). The study area is located within the Town of Caledon, Ontario. Salt Creek, a tributary of the Humber River traverses the central portion of the property. This watercourse falls under the jurisdiction of the Toronto and Region Conservation Authority (TRCA).

Presently, land use within the study area consists of agricultural fields on the western portion of the site, an old residential dwelling with several shed structures on the eastern portion of the site, and Salt Creek separating the eastern and western portions of the property. It is understood that the western portion of the property, currently occupied by agricultural fields, is proposed to be developed.

Salt Creek was identified as occupied Redside Dace (*Clinostomus elongatus*) habitat through Fisheries and Oceans Canada (DFO) mapping (DFO 2023). Under Ontario Regulation 242/08 of the Endangered Species Act (2007), the definition of regulated habitat for Redside Dace includes the meander belt width, plus vegetated areas or agricultural lands within 30 metres of the meander belt.

As such, the purpose of this fluvial geomorphic study is to assist the development of environmental constraint limits in relation to the subject property, through the delineation of the meander belt. This meander belt can then be used to delineate the regulated habitat limits for Redside Dace (i.e., 30 m from the meander belt).

The following tasks were completed for this study:

- Background review of available materials, including topographic, soil, and geology mapping, as well as a review of pertinent watershed reports, and historic aerial imagery;
- A desktop approach to delineating reaches based on geomorphic form and processes;
- A historic assessment to provide insight into past channel adjustments and modifications.
- A field assessment to confirm the results of the desktop assessment, as well as to characterize existing conditions and document active channel processes;
- Delineate the meander belt widths on a reach basis, following applicable policies and guidelines; and
- Delineate regulated habitat limits of Redside Dace, following Ontario Regulation 242/08 (i.e., 30 m from the meander belt).

2. Natural Heritage Planning Considerations

2.1 Endangered Species Act

Ontario’s *Endangered Species Act*, *2007* (ESA; July 2020 Consolidation) was developed to:

- Identify Species at Risk (SAR), based upon best available science;
- Protect SAR and their habitats and to promote the recovery of the SAR; and
- Promote stewardship activities that would support those protection and recovery efforts.

The ESA protects all threatened, endangered, and extirpated species listed on the Species at Risk in Ontario (SARO) list. These species are legally protected from harm or harassment, and their associated habitats are also protected from damage or destruction, as defined under the ESA.

2.2 Provincial Policy Statement

The Provincial Policy Statement (PPS; MMAH 2020) provides guidance on matters of provincial interest surrounding land-use planning and development. One principle behind the policy statement is the reduction of public cost and risk to Ontario’s residents by directing development away from areas where there is a risk to public health or safety or risk of property damage. The *Technical Guide – Rivers and Streams: Erosion Hazard Limit* (MNR 2002) was developed in support of the PPS, to assist members of the public and planning authorities in understanding the PPS, particularly, Section 3.1, relating to natural hazards. The guide is based on a standard and simplistic methodology, intended to be applied to two generalized landform systems through which river and stream systems flow: confined and unconfined systems. In the case of unconfined systems, the erosion hazard allowance consists of the meander belt and an access allowance. In the case of confined systems, the erosion hazard allowance consists of the stable slope allowance, toe erosion allowance, in addition to the access allowance.

2.3 Town of Caledon Official Plan

The Study Area is designated within the Prime Agricultural Area of the Town of Caledon Official Plan (OP; Town of Caledon 2018).

The area surrounding Salt Creek on the Study Area is designated as an Environmental Policy Area (EPA) (Schedule A; Land Use Plan). As discussed within section 5.7 of the Town of Caledon OP, EPAs are all Natural Core Areas and Natural Corridors, including:

- All Woodland Core Areas;
- All Wetland Core Areas;
- All Niagara Escarpment Natural Areas;

- Oak Ridges Moraine Key Natural Heritage Features (as defined by the Oak Ridges Moraine Conservation Plan (ORMCP));
- Oak Ridges Moraine Hydrologically Sensitive Features (as defined by the ORMCP);
- Greenbelt Key Natural Heritage Features (as defined by the Greenbelt Plan);
- Greenbelt Key Hydrologic Features (as defined by the Greenbelt Plan);
- All Environmentally Significant Areas;
- All Life Science Areas of Natural and Scientific Interest (ANSIs);
- All Significant Habitats of Threatened and Endangered Species;
- All Significant Wildlife Habitat;
- All Core Fishery Resource Areas; and
- All Valley and Stream Corridors.

New development is prohibited within areas designated EPA. Proposed new development adjacent to an EPA will be required to complete a Comprehensive Environmental Impact Study and Management Plan to the satisfaction of the Town and other relevant agencies.

2.4 Peel Region Official Plan

Like the Town of Caledon OP, the Region of Peel OP has certain policies and designations that can affect land-uses permitted within the Subject Land boundaries (Peel Region 2018).

The Study Area is also shown as being part of the Prime Agricultural Area on Schedule B (Prime Agricultural Area), as mentioned in the Town of Caledon OP, and the Rural System on Schedule D (Regional Structure). The Rural System has diverse natural and rural landscapes, contains attractive and dynamic rural communities, and contributes toward overall social qualities and economic viability of the region. The Rural System included land identified as Core Areas of the Greenlands System and Prime Agricultural Areas.

Salt Creek is designated as a Core Area of the Greenlands System on Schedule A (Core Areas of the Greenlands System in Peel). The Greenland System consists of Core Areas, Natural Areas and Corridors, and includes similar natural heritage feature types as the Town of Caledon OP Environmental Policy Areas (e.g., ANSIs, Environmentally Significant Areas, fish and wildlife habitat, wetlands, etc.).

The municipalities are directed to adopt appropriate policies to demonstrate that development or site alteration is directed away from the Core Area features, any impact is minimized and if its functions cannot be avoided then mitigation through restoration and enhancement is done to the greatest extent possible.

2.5 Toronto and Region Conservation Authority

The Toronto and Region Conservation Authority (TRCA) conducts reviews of planning processes associated with future development of properties within its jurisdictional boundaries. TRCA provides planning and technical advice to planning authorities to assist them in fulfilling their responsibilities regarding natural hazards, natural heritage and other relevant policy areas pursuant to the Planning Act. In addition to their regulatory responsibilities, TRCA provides advice as both a watershed-based resource management agency and through planning advisory services.

TRCA administers the Development, Interference with Wetlands, Alterations to Shorelines and Watercourses Regulation, Ontario Regulation (O. Reg.) 166/06, which defines the areas of interest that allow TRCA to:

- Prohibit, regulate, or provide permission for straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream, watercourse or changing or interfering with a wetland; and
- Prohibit, regulate, or provide permission for development if the control of flooding, erosion, dynamic beaches, pollution or the conservation of land may be affected by the development.

The Regulation Limit delineates hazardous lands, wetlands, shorelines and areas susceptible to flooding and associated allowances. A Tributary of the West Humber River (Salt Creek) is found on the Study Area and is identified by the TRCA as a regulated area. The regulated area also contains unevaluated wetlands, locally significant wetlands, meander belt, flooding hazards and crest of slope.

Pursuant to the Development, Interference with Wetland and Alterations to Shorelines and Watercourse Regulation (TRCA; O. Reg. 166/06), any development in or on areas defined in the Regulation (e.g., river or stream valleys, hazardous land, wetlands) requires permission from the Conservation Authority. The Conservation Authority may grant permission for development in or on these areas if, in its opinion, the control of flooding, erosion, dynamic beaches, pollution or the conservation of land will not be affected by the development.

The TRCA's Living Cities Policies (2014) contains the principles, goals, objectives, and policies approved by the TRCA for their planning and development approvals process. This document outlines policies related to the determination of the Natural System and recommends buffer widths for natural heritage features such as woodlands, wetlands, and valley and stream corridors.

The erosion hazard within River or Stream Valleys includes both the erosion potential of the actual river or stream bank, as well as the potential for erosion or slope stability issues associated with the valley walls. Ultimately, the identification of the hazard depends on whether there is a well-defined valley corridor that is part of a confined system or a relatively flat landscape that is not bounded by valley walls and is part of an unconfined system.

The TRCA's Living Cities Policies (2014) document states that for purposes of implementing TRCA's Environmental Planning policies:

- Confined River or Stream Valleys are considered Valley Corridors
- Unconfined River or Stream Valleys are considered Stream Corridors.

The limits of Valley and Stream Corridors shall be defined by the greater of the long-term stable top of slope/bank, toe of slope, Regulatory flood plain, meander belt, and any contiguous natural features and areas plus an applicable buffer. Development within a regulated area shall be set back a further 10 m from this limit of Valley and Stream Corridor.

3. Background Review

A background review was completed for the study area to gain an understanding of the watercourse in the study area and a general context of the study area. Under existing conditions, land use generally consists of agricultural lands on the west side of the property, and some old residential buildings to the east.

3.1 Watershed Characteristics

Salt Creek traverses the study area, which is a tributary of the Humber River, and is located within the jurisdiction of the TRCA. The Humber River watershed is the largest in the TRCA's jurisdiction, spanning over 900 km^2 and includes portions of local municipalities within the Regional Municipality of York, the Regional Municipality of Peel, the City of Toronto, and Simcoe County (TRCA 2008a). Salt Creek, at the downstream extent of the study area, has an upstream drainage area of 17.7 km^2 (OWIT 2022). Climate and geology play an important role to influence the form and processes of the watercourse. Geological influences on patterns and rates of river change include landscape configuration, material availability, and erodibility of the substrate. Climatic fluctuations influence water balance and vegetation patterns, which impact flow regimes and the production, supply, and transport of sediment. The following sections provide an understanding of the physical setting of Salt Creek and provide context to the active fluvial geomorphological processes in the study area.

3.1.1 Geology

The study area lies within the South Slope physiographic region (Chapman & Putnam 2007). This is a sloping plain that extends from the boundary with the Oak Ridges Moraine, southwards, and is underlain by glacial till. The soil types in this physiographic region are predominantly clay with some clay loam, and loam. The topography is relatively smooth, and infiltration is low due to the clay content. As a result, runoff rates are high. Surficial geology consists of clay to silt-textured till. Within the channel corridor, the surficial materials consist of modern alluvial deposits (OGS 2010).

3.1.2 Climate

Precipitation was calculated from climate normals (1981-2010) recorded at the Albion Field Centre (Environment Canada Climate ID 6150103), approximately 13 km northeast of the study area. Precipitation averaged 63 mm in the winter (November to February, inclusive) and 78 mm in summer (June to August, inclusive; Environment Canada 2023). For most streams in Southern Ontario, the highest instream flows typically occur during the spring freshet due to snowmelt, as well as rain-on-snow events. Convective thunderstorms are likely to be the cause of higher amounts of precipitation in the summer. Typically, these events do not result in extreme flow events, unless when sustained intense rainstorms occur.

3.2 Summary of Relevant Studies

The TRCA prepared a State of the Watershed Report (TRCA 2008b) for the Humber River to provide a summary of available information on current conditions within the watershed, establishing baseline conditions for a number or reaches. The report also described emerging trends and identified potential watershed management issues and opportunities in the Humber River relating to fluvial geomorphology. This study divided the Humber River watershed into five subwatersheds: Main Humber, East Humber, West Humber, Lower Humber, and Black Creek. The study area lies within the West Humber subwatershed (TRCA, 2008b).

Salt Creek within the study area was classified as a third order stream. While there were no monitoring stations near the study area, the TRCA established Station GHU-15 on Salt Creek several kilometres downstream, near McVean Drive. Additionally, the State of the Watershed Report (TRCA 2008b) noted that the reaches of the West Humber watershed upstream of Mayfield Road were dominated by local disturbances in riparian vegetation and channel hydraulics from livestock, agricultural processes and drainage works.

A Humber River Fisheries Management Plan was developed by the Ontario Ministry of Natural Resources and TRCA (2005) and was intended to characterize the existing conditions of seven aquatic habitat types found in the watershed and assess their habitat potential. Specific management directions and rehabilitation priorities are provided for the five subwatersheds. The Humber River Fisheries Management Plan identifies target fish species for management: Brook Trout, Redside Dace, Rainbow Trout, Brown Trout, Atlantic Salmon, and Darters. Management in support of these species will provide conditions that are suitable for other species that require stable, cold, or cool water habitats (TRCA 2008a).

The TRCA delineated twelve Fish Management Zones (FMZs) within the Humber River watershed, evaluating fish communities in the context of a river continuum, where similar physiographic and hydrologic conditions give rise to habitats that support similar fish communities in a specific zone. The study area falls within Fish Management Zone 7, where target species are Redside Dace, Rainbow Darter, and Smallmouth Bass (TRCA 2008a).

3.3 Historical Assessment

Historical aerial photographs of the watercourse in the vicinity of the study area were reviewed, to determine changes to the channel and surrounding land use and land cover. Historic analyses provide insight into how past channel adjustments and modifications have contributed to current channel form and processes.

Aerial photographs from 1946, 1964, 1974, and 1988, obtained from the National Air Photo Library, were compared with digital imagery from 2002, 2011, and 2022, obtained from First Base Solutions (**Appendix B**).

Land use in 1946 was predominantly agricultural with some rural residences noted along Airport Road in the vicinity of the study area. Salt Creek could be discerned as a single-thread, meandering channel within the study area. An informal crossing could be seen within the study area, approximately 140 m west of Airport Road. A bypass channel was visible immediately upstream of this crossing. Riparian vegetation appeared to be mainly non-woody vegetation, with trees observed within hedgerows and a small, isolated pocket of tree cover along the banks of Salt Creek approximately 200 m upstream of the study area.

Land use remained unchanged by 1964. Salt Creek was noted to be a single thread meandering channel, with some areas of ponding water within the channel. The informal crossing remained in place, but the bypass channel did not appear to be active in the aerial image.

Land use in 1974 remained predominantly agricultural, with some rural residential dwellings along the main roads near the study area (i.e., Airport Road and Mayfield Road). Salt Creek had been straightened within the study area, with flow directed through the former bypass channel. The sinuous section of Salt Creek in this area was not observed, with a dug pond noted in the space formerly occupied by the creek. Another pond was noted south of the creek, immediately west of Airport Road. Tree cover remained sparse, generally limited to hedgerows. However, an increase in tree cover was noted along the banks of Salt Creek, upstream of the study area.

Minimal changes were observed in land use and channel planform between 1974 and 1988. However, the amount of tree cover north of the study area had increased significantly, with a well-defined woodlot observed in the area.

Changes in land use in the surrounding area had started to occur by 2002. The commercial and industrial buildings that currently exist along Airport Road were starting to be constructed. The residential subdivision south of Countryside Drive was noted to be under construction. Land use within the study area remained unchanged, however. The channel planform also remained largely unchanged. Evidence of multiple flow paths and cutoff channels could be seen. The two previously dug ponds remained, as did the woodlot to the north of the study area. The former informal crossing could not be discerned and had likely been decommissioned at some point in the past.

By 2011, the residential subdivision south of Mayfield Road had been constructed. The industrial and commercial development along Airport Road had also expanded, with additional warehouses and structures observed. Minimal changes in land use and channel planform were observed between 2002 and 2011.

The commercial and industrial development along Airport Road continued to expand by 2022, as did the residential development to the south. Land use and channel planform within the study area remained unchanged.

4. Existing Conditions

4.1 Reach Delineation

Reaches are defined as sections of river along which boundary conditions are sufficiently uniform such that the river maintains a near consistent structure (Brierley and Fryirs 2005). Reaches are typically delineated based on changes in channel planform, gradient, valley form, physiography, land cover, flow inputs, channel disturbances, and past channel modifications. Due to spatial variability in the modifying and controlling influences of channel form, two reaches situated immediately upstream or downstream of each other could show a marked difference in planform (TRCA 2004).

Based on a desktop assessment, there was limited change in channel geometry, planform, valley form, gradient, and vegetation cover within the study area. As a result, a single reach was delineated for Salt Creek within the study area – SC-1 (**Figure 2, Appendix A**). The reach delineation was subsequently verified during the field investigation (noted below).

4.2 Field Investigation

4.2.1 Methods

A field assessment was completed for reach SC-1 of Salt Creek on December 9, 2022 and consisted of a Rapid Geomorphic Assessment (RGA), a modified Rapid Stream Assessment Technique (RSAT) and classification of the reach using the Downs method.

The RGA (MOE, 2003) documents observed indicators of channel instability. Observations made during the field investigation are quantified using an index that identifies channel sensitivity based on evidence of aggradation, degradation, channel widening, and planform adjustment. The index produces values that indicate whether the channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40), or adjusting (score >0.41).

The RSAT (Galli, 1996) provides an assessment of the channel by also considering the ecological function of the stream. Observations under the modified RSAT include channel stability, channel scouring/sediment deposition, physical instream habitat, water quality, and riparian habitat condition. The RSAT scores rank the channel as maintaining a poor (<13), fair (13-24), good (25-34), or excellent (35-42) degree of stream health.

The Downs method, as outlined in Thorne et al. (1997), was developed based on adjustment processes and trends of channel change and links these processes and trends to the fluvial and sediment processes responsible for driving channel change. This system classifies streams as stable, depositional, laterally migrating, enlarging, compound, recovering, or undercutting.

4.2.2 Results

Reach SC-1 was an intermittently defined watercourse, with low gradient and moderate sinuosity, situated in a confined valley setting. Channel geometry was found to vary within the assessed length of the reach, due to the presence of flow obstructions like wood debris. Occasionally, multiple flow paths were present, as well as cut-off channels. Adjacent land use consisted of agricultural uses, with old residential buildings and shed structures present. An old crossing was noted within the property. The structure was in poor condition, with wood paneling on the deck absent and the metal frame was rusted. The abutments of the structure remained in place, but the structure was not impeding flow. Riparian vegetation consisted of mainly grasses and herbaceous species, with occasional trees present. The riparian buffer extended >5 channel widths in dimension.

Distinct riffles, pools and runs could be discerned, but the dominant habitat type consisted of runs. Where defined, bankfull widths ranged between 2.5-3.0 m for the riffles and 3.0-4.0 m for the pools. Bankfull depths ranged between 0.7-0.9 m for the riffles and 0.9-1.2 m for the pools. Observed bank materials consisted of clay, silt and sand. Pool substrate was composed of clay, silt, sand, and gravel, with occasional small boulders. Riffles consisted of sand, gravel, cobbles, and occasional boulders. Undercuts averaging 0.1 m were noted on the outer bends of some meanders. Bank angles were steep, ranging between 60-90° and erosion was noted on approximately 5-30% of banks.

The RGA produced a score of 0.23, which indicated that the reach was in transition/stressed. Widening was the dominant geomorphic process, with evidence of planform adjustment also observed. The RSAT score of 29 indicated that this reach was in a good state of ecological health. Riparian habitat conditions were noted to be the main limiting factor, due to the absence of mature trees. The Downs method classified this reach as M – lateral migration, which is characterized by migration of most bends, but the cross-sectional dimensions are preserved.

Rapid assessment results are summarized in Table 1 below. A photographic record of existing conditions is provided in **Appendix C**.

Table 1 – Summary of Rapid Assessment Results for Salt Creek

Reach	RGA Score and Condition	Dominant Mode of Adjustment	RSAT Score and Condition	Limiting Factor	Downs Method
SC-1	0.23 In Transition	Widening and Planform Adjustment	29 Good	Riparian Habitat Conditions	M – Lateral Migration

5. Meander Belt Delineation

Streams and rivers are dynamic features on the landscape, and their configuration and position on the floodplain changes as part of meander evolution, development and migration processes. When development or other activities are contemplated near a watercourse, it is desirable to designate a corridor that is intended to contain all of the natural meander and migration tendencies of the channel. The space that a meandering watercourse occupies on its floodplain, and in which all of these natural processes occur, is referred to as the meander belt (TRCA 2004). In the case of unconfined systems, the erosion hazard allowance consists of the meander belt and an access allowance. In the case of confined systems, the erosion hazard allowance consists of the stable slope allowance and toe erosion allowance, in addition to the access allowance.

As Salt Creek in the study area was situated in a confined valley, the meander belt width cannot be used to delineate the erosion hazard, which would be governed by geotechnical considerations. However, Ontario Regulation 242/08 of the Endangered Species Act defines Redside Dace habitat to be the meander belt width, plus vegetated areas or agricultural lands within 30 metres of the meander belt. Therefore, the belt width was delineated to identify the limits of Redside Dace habitat.

The TRCA (2004) *Belt Width Delineation Procedures* document was created to recommend a protocol for delineation of meander belt for river systems within the TRCA's jurisdiction but is accepted by Conservation Authorities throughout Ontario as a primary method for delineating the belt width. As Salt Creek within the study area is classified as a confined system, the method involves drawing lines tangential to the outside meander bends of the planform, following the valley trend. The perpendicular distance between these two lines represents the meander belt width. The meander belt width obtained through this method was 56 m, and the limits of the meander belt are shown in **Figure 2, Appendix A**.

5.1 Redside Dace Habitat

Figure 2 illustrates the extents of regulated Redside Dace habitat, i.e., vegetated or agricultural lands within 30 m of the meander belt.

6. Conclusions and Recommendations

GEI Consultants Inc. (GEI) was retained by Rice Commercial Group to undertake a geomorphic assessment for the property generally located north of Mayfield Road, west of Airport Road and east of Torbram Road. The purpose of the geomorphic assessment was to assist the development of environmental constraint limits in relation to the subject property, through the delineation of the meander belt. A portion of Salt Creek traverses the study area, which was identified as occupied Redside Dace habitat. As such, the meander belt would be used to delineate the limits of habitat (i.e., 30 m from the meander belt).

The following summarizes the key findings of the geomorphic assessment:

- Reach SC-1 of Salt Creek was characterized as an intermittently defined channel within a confined valley setting. Channel geometry was found to vary within the assessed length of the reach, due to the presence of flow obstructions like wood debris. Occasionally, multiple flow paths were present, as well as cut-off channels.
- The RGA classified the reach as transitional, with a score of 0.23. The RSAT characterized this reach as displaying a good degree of ecological health. The Downs method classified this reach as M – lateral migration.
- The TRCA (2004) belt width delineation procedures were followed to delineate the meander belt width for this reach, and resulted in a meander belt width of 56 m. Given the confined nature of this reach, the meander belt does not define the erosion hazard limits.
- The meander belt was used to delineate habitat limits for Redside Dace, defined as the meander belt width, plus vegetated areas or agricultural lands within 30 metres of the meander belt.

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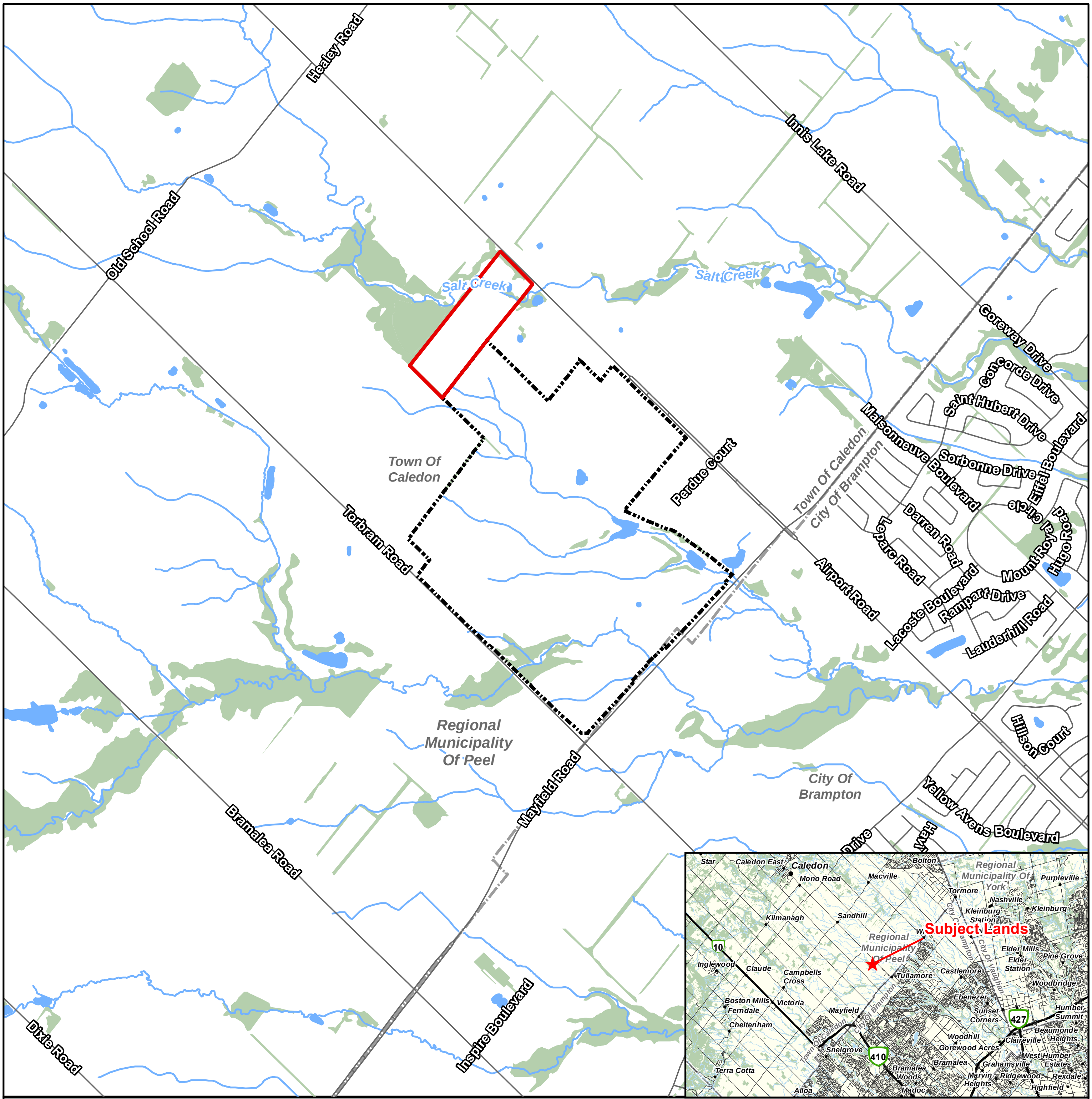
Appendix A

Figures



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, 2023.

Legend

▭	Subject Property
▭	Tullamore Employment Lands (Current)
—	Road
▭	Municipal Boundary, Lower/Single Tier
▭	Municipal Boundary, Upper Tier
—	Watercourse (LIO)
🟦	Waterbody (LIO)
🟩	Wooded Area (LIO)

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

Figure 1
Location of Subject Lands

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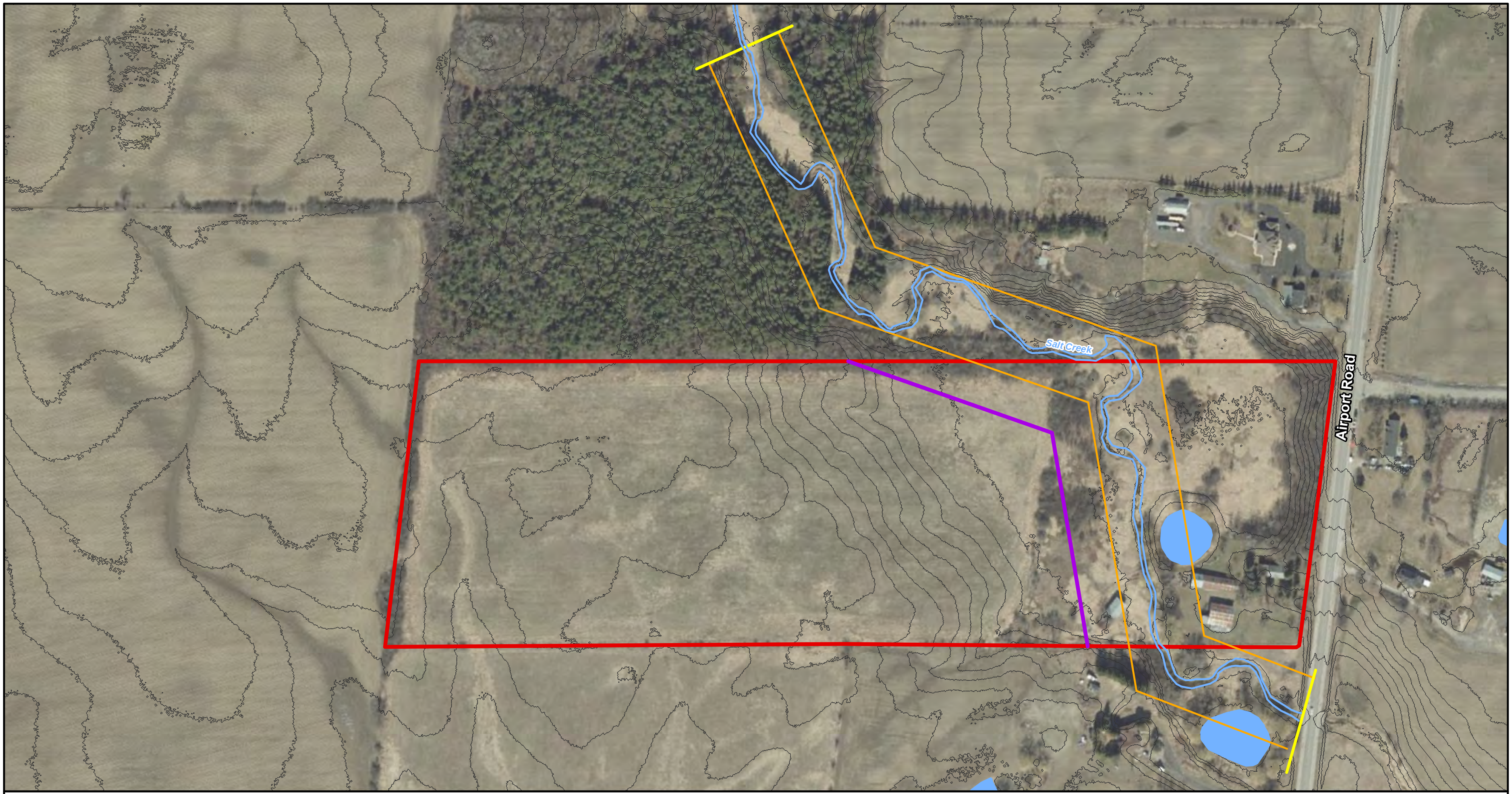

NOTES:

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3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2021.

Legend

- 🟥 Subject Property
- 🟦 Waterbody (LIO)
- — Watercourse Trace - 2022
- — Reach Break
- — Meander Belt (56 m)
- — Redside Dace Habitat Limits (Meander Belt + 30 m)
- — Contour (LIO, 1m)

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

Figure 2
Reach Delineation, Meander Belt, and Redside Dace Habitat Limits

0 50 m
1:4,200

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Appendix B

Historical Aerial Imagery

NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

Legend

🟥 Subject Property

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1946 Aerial Photo

0 50 m
1:4,000

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GEI Consultants

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

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🟥 Subject Property

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1951 Aerial Photo

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

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🟥 Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1960 Aerial Photo

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GEI Consultants

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

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🟥 Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1964 Aerial Photo

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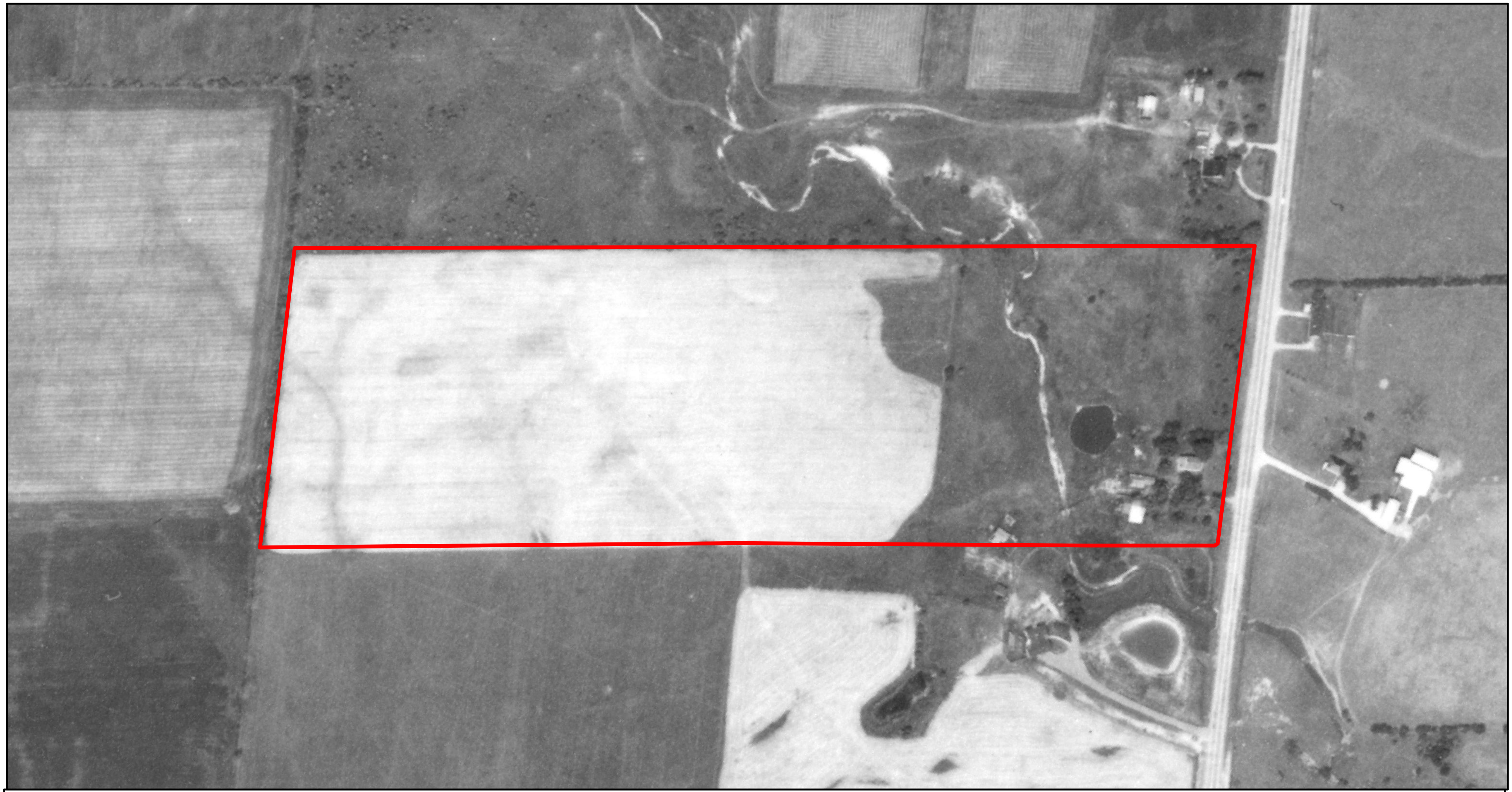

NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

Legend

🟥 Subject Property

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1970 Aerial Photo

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

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▭ Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

1974 Aerial Photo

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NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: National Airphoto Library

Legend

🟥 Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
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1988 Aerial Photo

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: First Base Solutions

Legend

🟥 Subject Property

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Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

2002 Aerial Photo

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Project 2101151

NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: First Base Solutions

Legend

🟥 Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

2011 Aerial Photo

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NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Airphoto Source: First Base Solutions

Legend

🟥 Subject Property

Fluvial Geomorphic Assessment for Salt Creek, Tullamore North
Rice Group

2021 Aerial Photo

0 50 m
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Appendix C

Photographic Record

Photographic Record

Photo 1 – Downstream view of Salt Creek, under the Airport Road crossing.

Photo 2 – General channel conditions, upstream of Airport Road. Photo taken facing upstream.

Photo 3 – Wide and deep pools were occasionally noted within the reach. Photo taken facing upstream.

Photo 4 – An old crossing was noted within the property, which was in poor condition. The structure does not impede flow. Photo taken facing upstream.

APPENDIX C

Fluvial Geomorphic Assessment of Salt Creek

Tullamore North

PHOTOGRAPHIC RECORD

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Photo 5 – General conditions of the channel, showing dense non-woody vegetation cover.

Photo 6 – Occasionally, multiple flow paths were present.

Photo 7 – The channel was found to be wide and shallow in some areas. Photo facing downstream.

Photo 8 – General conditions at the upstream extent of the reach assessed.

APPENDIX C

Fluvial Geomorphic Assessment of Salt Creek

Tullamore North

PHOTOGRAPHIC RECORD

GEI Consultants

Appendix D

Ecological Compensation Memorandum, Block 1, Tullamore Employment Lands

June 15, 2023

Jason Wagler
Development and Engineering Services
Toronto and Region Conservation Authority

Attention: Jason Wagler

RE: Ecological Compensation Memorandum
Block 1, Tullamore Employment Lands, Caledon, ON

GEI Consultants Ltd. (GEI) has been retained by Rice Group to prepare a memorandum to address wetland compensation requirements associated with the proposed Tullamore Employment Lands in Caledon, Ontario (**Figure 1**). The Tullamore Employment Lands (herein referred to as the Subject Lands) are generally located north of Mayfield Road, west of Airport Road and east of Torbram Road. The focus of this memorandum is to discuss the wetland features associated with Block 1, located on the West Half of Lot 19, Concession 6 East of Centre Road, Chinguacousy (**Figure 2**).

The wetland compensation efforts discussed in this 2023 Memorandum are in accordance with TRCA's Guideline for Determining Ecosystem Compensation (2018).

1. DESCRIPTION OF PROPOSED DEVELOPMENT

Block 1 of the Subject Lands includes the development of 36.409 ha. Block 1 currently consists primarily of anthropogenic vegetation cover, such as agricultural fields and old field meadows. It also contains approximately 1.57 ha of meadow marsh, described further in **Section 2**.

The proposed development includes a large industrial warehouse, maintenance shop, car and trailer parking, roads, and small buildings associated with truck ticketing.

2. ENVIRONMENTAL IMPACT STUDY AND MANAGEMENT PLAN

The April 2023 Comprehensive Environmental Impact Study and Management Plan (CEISMP) and Scoped Subwatershed Study (SWS) outlines the existing vegetation communities present within the Subject Lands boundary (GEI 2023b). Based on the most recent ELC surveys conducted on the Subject Lands, the only ecological community type present within Block 1 is:

- Reed Canary Grass Mineral Meadow Marsh (MAM2-2): A disturbed community, dominated by Reed-canary Grass and associated native and non-native species.

This vegetation community is culturally influenced and on the Subject Lands it includes a mixture of primarily non-native vegetation; containing numerous invasive and non-desirable species including Hybrid Crack Willow (*Salix X fragilis*), Narrow-Leaved Cattail (*Typha angustifolia*), Purple Loosestrife (*Lythrum salicaria*) and Reed Canary Grass (*Phalaris arundinacea*).

An Arborist Report and Tree Protection Plan (TPP) was drafted in May 2023 as part of a series of Technical Submissions by GEI to the TRCA to address concerns related to the proposed Ministerial Zoning Order (MZO) (GEI 2023a). This report was completed to inventory all trees with a DBH of at least 10 cm. Compensation requirements related to the removal of healthy trees within the Subject Lands are outlined in the Arborist Report and TPP previously submitted under separate cover.

2.1 Wetland Removals

The proposed removals include two unevaluated wetlands totaling 1.57 ha (**Figure 2**). As outlined above, the CEISMP identified both of these wetlands as Reed-canary Grass Mineral Meadow Marshes (MAM2-2).

The larger of the two wetlands proposed for removal is associated with the watercourse on the Subject Lands (**Figure 2**). The CEISMP determined this watercourse was flowing in early spring, isolated standing pockets were noted by late spring, and by summer this reach was fully dry. The other wetland proposed for removal is an isolated pocket along the northern boundary of the Subject Lands.

2.2 Habitat of Endangered and Threatened Species

Based on breeding bird studies conducted through the CEISMP, two threatened species were found within the Subject Lands' boundary; Bobolink and Eastern Meadowlark. Habitat use for these two bird species includes agricultural fields with hay and pasture used to support the farm cattle. Since 2021, the agricultural use on-site has transitioned from cattle to row crop agriculture. As a result, the hay and pasture lands formerly used by these species are no longer present.

While occupied Redside Dace habitat is present within Salt Creek northeast of the Subject Lands and the West Tributary of the Humber River south of the Subject Lands, the watercourse on the Subject Lands was found to be completely dry by summer assessments conducted through the CEISMP. No fish were captured in this reach during the fish community assessment, and this reach does not generally appear capable of providing direct fish habitat. Consequently, the watercourse on the Subject Lands was determined to provide indirect fish habitat.

All potential impacts to SAR and SAR habitat will be addressed directly with the MECP through the ESA review process and will not be discussed further within this Addendum.

2.3 Headwater Drainage Features

The proposed wetland removals may have some implications for drainage and surface water flow on the Subject Lands. The CEISMP noted that several tributary HDFs flow into the watercourse associated with the wetland removals outlined in **Section 2.1** (**Figure 2**). These HDFs generally consist of poorly defined swales or undefined features, and they were found to be flowing in early spring but were dry by late spring. Consequently, these HDFs were determined to provide indirect fish habitat.

These impacts will be addressed through the stormwater management strategy for the Subject Lands, as outlined in the Functional Servicing and Stormwater Management Report (FSSR, 2023) prepared by C.F. Crozier & Associates (Crozier). Quantity and quality control will be provided for the Subject Lands through two stormwater management facilities in the form of wetlands. For further details, see the FSSR prepared by Crozier and submitted under separate cover.

2.4 Avoidance

As previously discussed in **Section 2**, it is not feasible to revise the Draft Plan of Subdivision to avoid the existing degraded and non-native characterized features.

Avoidance for Birds and Bats

The Migratory Birds Convention Act protects migratory birds and their nests. Any vegetation clearing should be undertaken outside of the core breeding period, which is May 1 to August 31. The Migratory Birds Convention Act applies at all times, even outside of the peak breeding period. Abiding by this timeframe will also reduce the risk of impact on bats.

3. ECOLOGICAL COMPENSATION

TRCA’s (2018) Guideline for Determining Ecosystem Compensation requires both:

1. Ecosystem structure compensation - to ensure that removed habitats are replaced with the same or similar ecosystem structure and habitat type; and
2. Land-base compensation - to ensure that the removal of any natural systems is replaced with an equal amount of land for natural systems.

Compensation can be provided on-site or at an off-site location if sufficient compensation areas are not available on the Subject Lands to meet the area compensation requirements. Cash-in-lieu is also an option under TRCA’s Guideline if compensation areas are not available to land development proponents.

Wetland compensation efforts will be required as a result of the proposed removals outlined in **Section 2**. Due to site constraints, compensation will be provided through cash-in-lieu, as outlined in the forthcoming sections. Cash-in-lieu and the associated calculations involve a proponent providing funds to the TRCA to implement compensation efforts, in lieu of the proponent undertaking the compensation themselves. The amount of the cash-in-lieu is based on the cost to restore the impacted ecosystem’s structure and the cost of replacing its land base. These calculations are outlined in Sections 2.1 and 2.2 of TRCA’s *Guideline for Determining Ecosystem Compensation* (2018).

The cash-in-lieu required for the proposed removals will be finalized at the detailed design stage, but initial calculation efforts are summarized below.

3.1 Wetland Compensation Calculations

3.1.1 Land Base Compensation

TRCA’s compensation guidelines require land-base (natural system) compensation at a 1:1 ratio. Where natural systems are removed from the land for development, new lands are to be added into the natural system. A total of 1.57 ha of wetland communities are proposed for removal, and therefore 1.57 ha is required to be compensated for based on the land base wetland compensation alone.

The Guideline outlines that to compensate for the lost land base associated with the proposed impacts, the proponent is responsible for providing cash-in-lieu that reflects the market value of the developable land being gained. The market value of the development site can be determined either through recent comparable sales data or by an appraisal, which is preferred by the TRCA (TRCA 2018).

Two options for determining the cash-in-lieu cost to be conveyed are as follows (TRCA 2018):

- Applying the per hectare market value of the development site to the area of land being removed from the natural system; or
- Calculating the difference between the pre-existing market value of the development site and the market value of the development site after the ecosystem has been removed.

Based on the purchase price of the Tullamore Employment Lands in 2021, the market value of the Subject Lands is estimated to be $555,225 per hectare. Therefore, cash-in-lieu value to address land base compensation for removal of 1.57 ha of wetland is $871,703.25.

3.1.2 Ecosystem Structure Compensation

Basal area surveys are not applicable for non-treed wetlands to inform ecosystem structure compensation ratios required. **Table 1** summarizes the proposed wetland feature removals, ecosystem structure compensation ratios, and the total compensation area required to address ecosystem structure for wetland removals.

As previously outlined, a total of 1.57 ha of wetland community is proposed for removal and subsequent compensation. As wetland and thicket communities do not have the same lag time associated with woodlands, the ecosystem structure compensation ratio remains at 1:1. The compensation measures required for these communities are summarized within **Table 1**.

Table 1: Summary of Ecosystem Structure Compensation Requirements

Community	Area Removed (ha)	Ecosystem Structure Compensation Ratio	Total Ecosystem Structure Compensation Required (ha)	TRCA Typical Cash-in-Lieu ($/ha)	Cash-In-Lieu Requirement for Ecosystem Structure ($)
MAM2-2	1.57	1:1	1.57	186,256.75	292,423.10
Total	1.57	-	1.57	-	292,423.10

Based on the above calculations, the cash-in-lieu value to address ecosystem structure for removal of 1.57 ha of wetland is $292,423.10.

3.2 Total Compensation Requirements

Based on the calculations outlined in the sections above, the total amount required for cash-in-lieu to address both land base and ecosystem structure compensation is $159,000.31. See **Table 2** for a breakdown of costs.

Table 2: Cost breakdown of cash-in-lieu requirements.

Component	Cost ($)
Land Base Compensation – Wetland	$871,703.25
Ecosystem Structure Compensation - Wetland	$292,423.10
Total	$1,164,126.35

4. CONCLUDING REMARKS

This Ecological Compensation Memorandum has been prepared to outline cash-in-lieu requirements associated with the proposed development on Block 1 of the Tullamore Employment Lands. In total, $1,164,126.35 is estimated to be required as cash-in-lieu for the proposed wetland removals.

Should you have any questions about the information presented within this memorandum, please contact one of the undersigned.

Yours truly,
GEI Consultants

S.mcdonald

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REFERENCES

C.F. Crozier & Associates Inc. 2023. Functional Servicing & Stormwater Management Report: Tullamore Lands, Town of Caledon, Region of Peel.

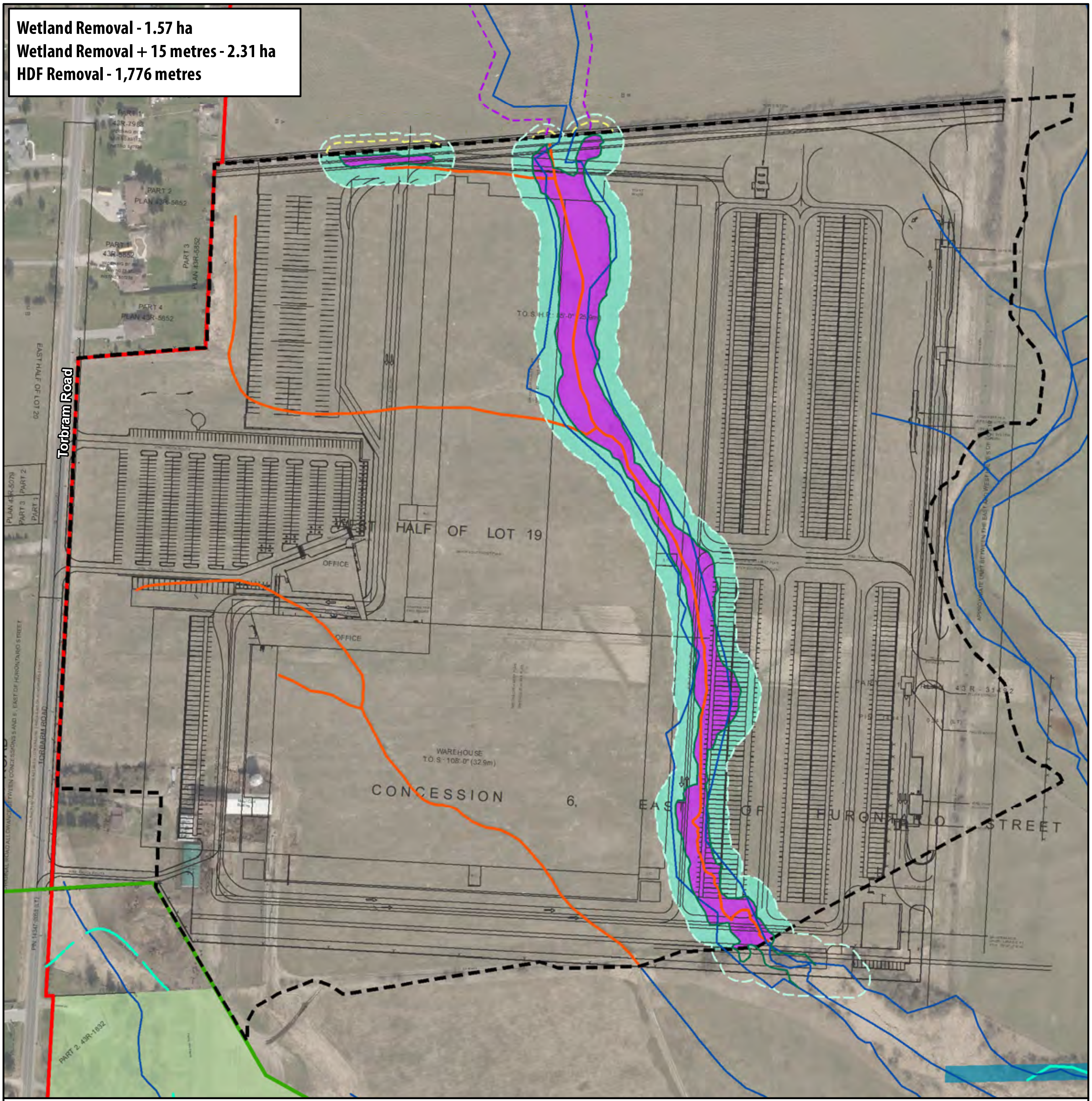
GEI 2023a. Arborist Report and Tree Preservation Plan: Tullamore Employment Lands. May 2023.

GEI 2023b. Comprehensive Environmental Impact Study and Management Plan & Scoped Subwatershed Study. April 2023.

Government of Canada 1994. Migratory Birds Convention Act (S.C. 1994, c. 22). (Last Amended December 2017)

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological land classification for Southern Ontario: first approximation and its application. Ontario Ministry of Natural Resources, South Central Region, Science Development and Transfer Branch. Technical Manual ELC-005

Toronto and Region Conservation Authority 2018. Guideline for Determining Ecosystem Compensation (After the Decision to Compensate Has Been Made). Available online: https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2019/11/27105627/TRCA-Guideline-for-Determining-Ecosystem-Compensation-June-2018_v2.pdf.



NOTES:
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Legend

- 🟥 Subject Lands
- ╍ Block 1 Work Limit
- 🟩 Natural Heritage System
- 🟦 Landscaped Stormwater Management Blocks
- 🟩 Greenbelt Plan
- ─ Long Term Stable Top of Slope (LTSTOS; GEI 2022)
- ─ ELC Wetlands (Ground-Truthed, Not Staked)
- ─ Regional Floodline (Croziers 2022)
- ─ Headwater Drainage Feature
- ─ Headwater Drainage Feature - Removal
- ╍ Wetland + 15 metres
- 🟪 Wetland Removal
- 🟦 Wetland Removal + 15 metres

Project 2100975

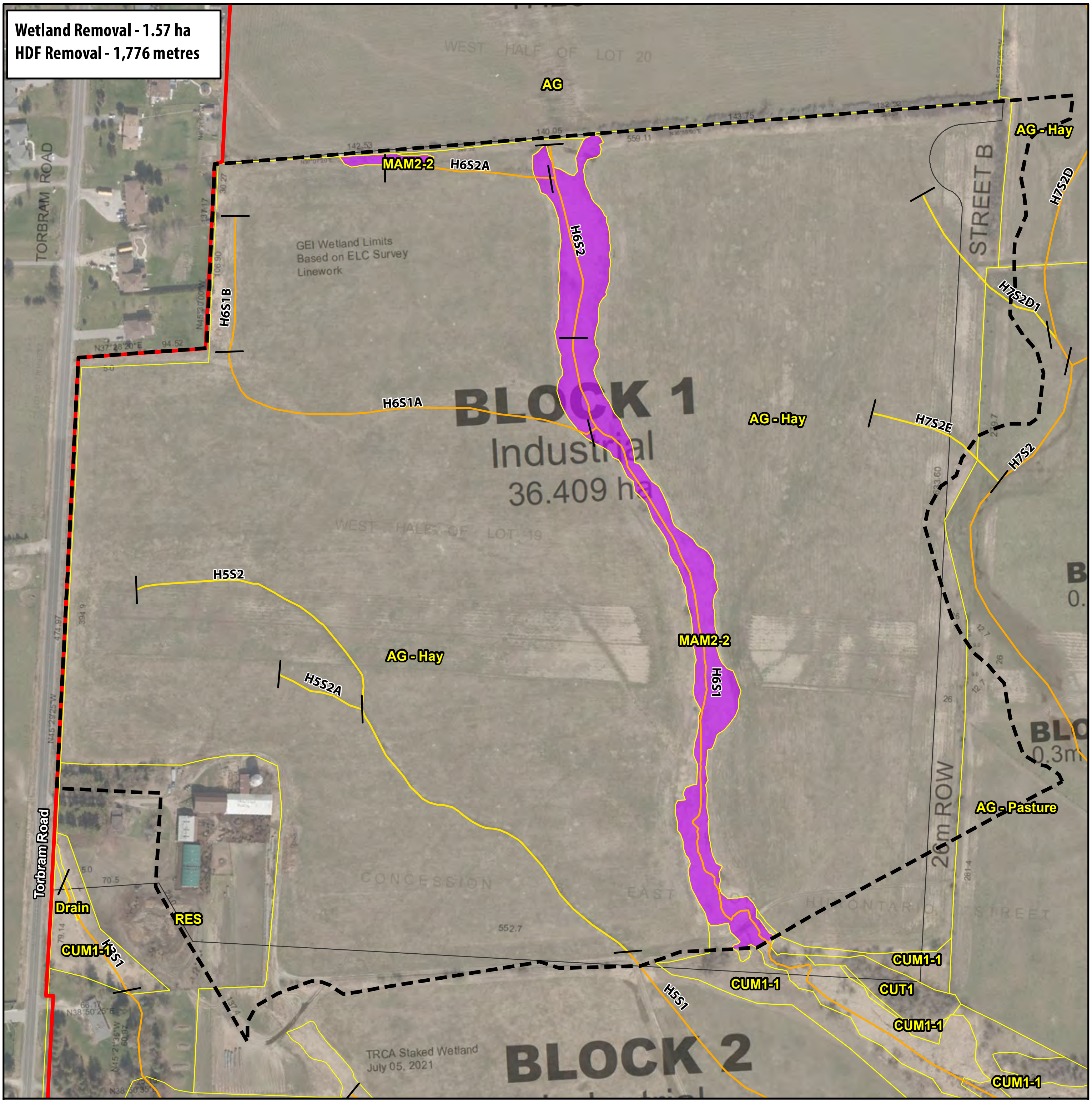
Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 1
Block 1

0 50 m
1:4,000

GEI Consultants

Wetland Removal - 1.57 ha
HDF Removal - 1,776 metres



NOTES:
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Legend

- 🟥 Subject Lands (approximate)
- ▬ ▬ Block 1 Work Limit
- ☐ Ecological Land Classification
- 🟪 Wetland Removal

Headwater Drainage Feature

- ― Indirect Fish Habitat
- ― No Fish Habitat

ELC Legend

AG, Agricultural
CUM1-1, Dry - Moist Old Field Meadow
CUT1, Mineral Cultural Thicket
FOD5, Dry – Fresh Sugar Maple Deciduous Forest
MAM2-2, Reed-canary Grass Mineral Meadow Marsh
MAS2, Mineral Shallow Marsh
RES, Residential

Project 2100975

Comprehensive Environmental Impact Study
and Management Plan, Tullamore Employment Lands
Tullamore Industrial LP

Figure 2
Compensation Calculation

0 50 m
1:4,000

N

GEI Consultants

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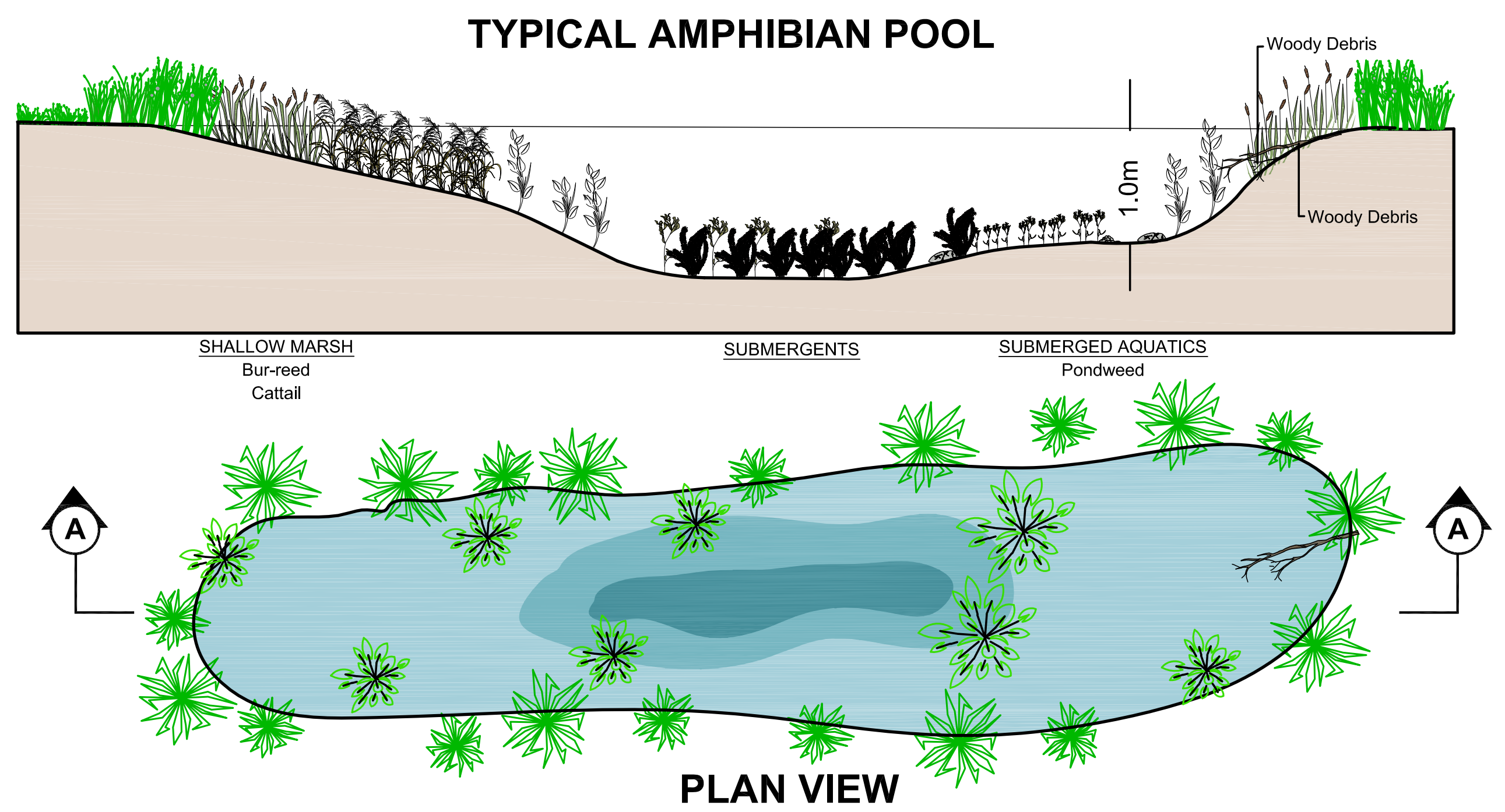
Appendix E

Example Restoration Design Typicals for Habitat Structures

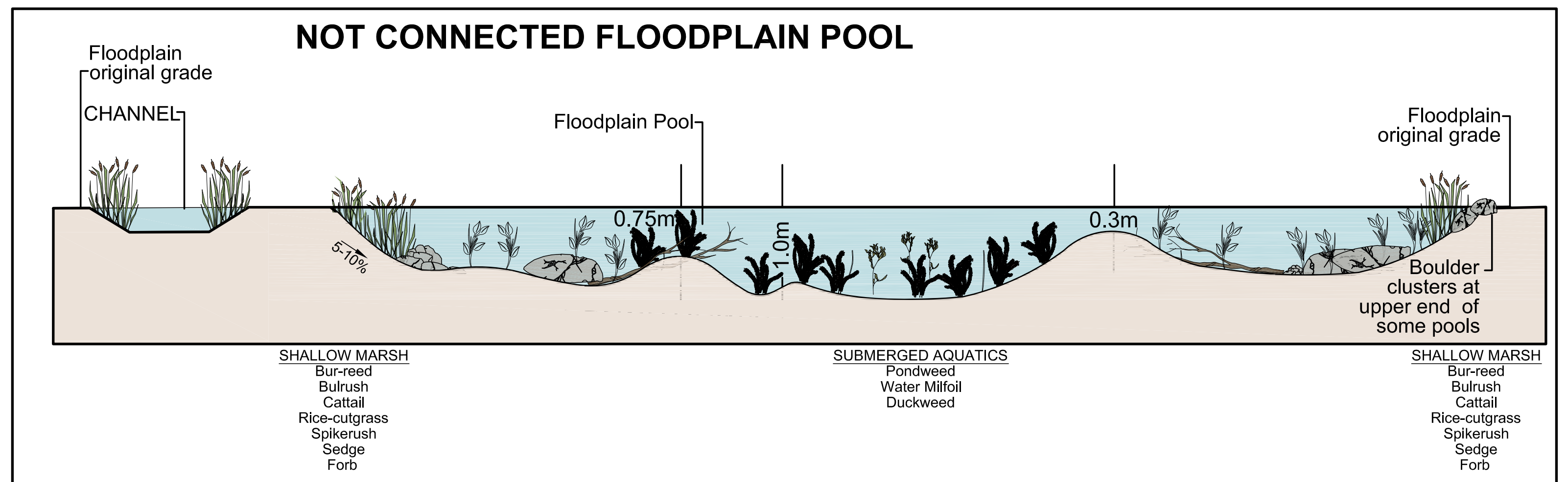
DESIGN A

TYPICAL AMPHIBIAN POOL



PLAN VIEW
N.T.S.

NOT CONNECTED FLOODPLAIN POOL



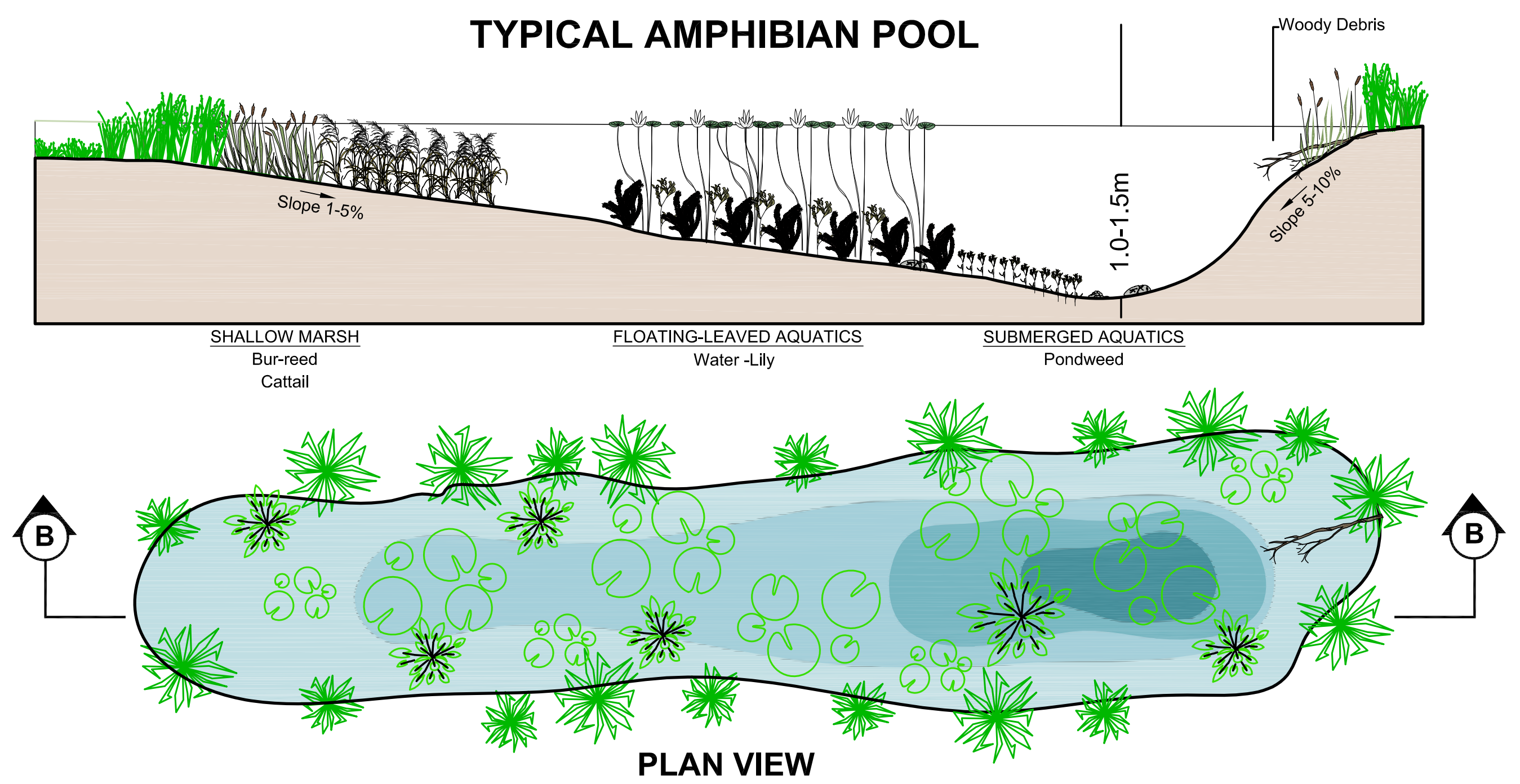
LONGITUDINAL CROSS-SECTION A-A

NOTE:

* TYPICAL POOL DETAIL SUBSTRATE CONSISTS OF NATIVE TILL MATERIAL COVERED WITH 300mm OF TOPSOIL. REFER TO LANDSCAPE DRAWING 'D1" FOR TOPSOIL SPECIFICATION

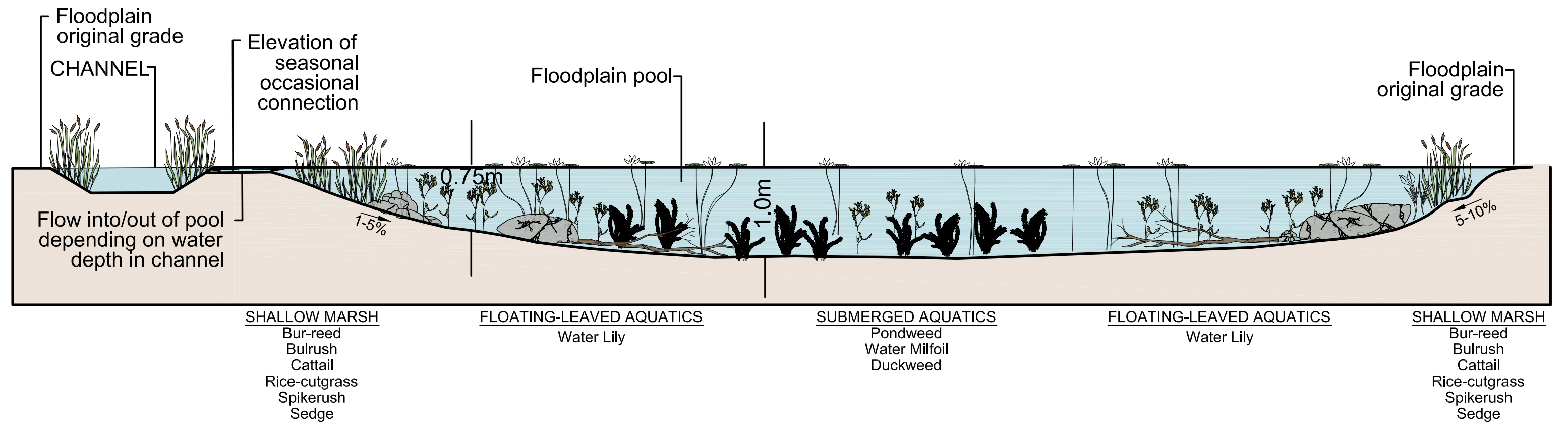
DESIGN B

TYPICAL AMPHIBIAN POOL



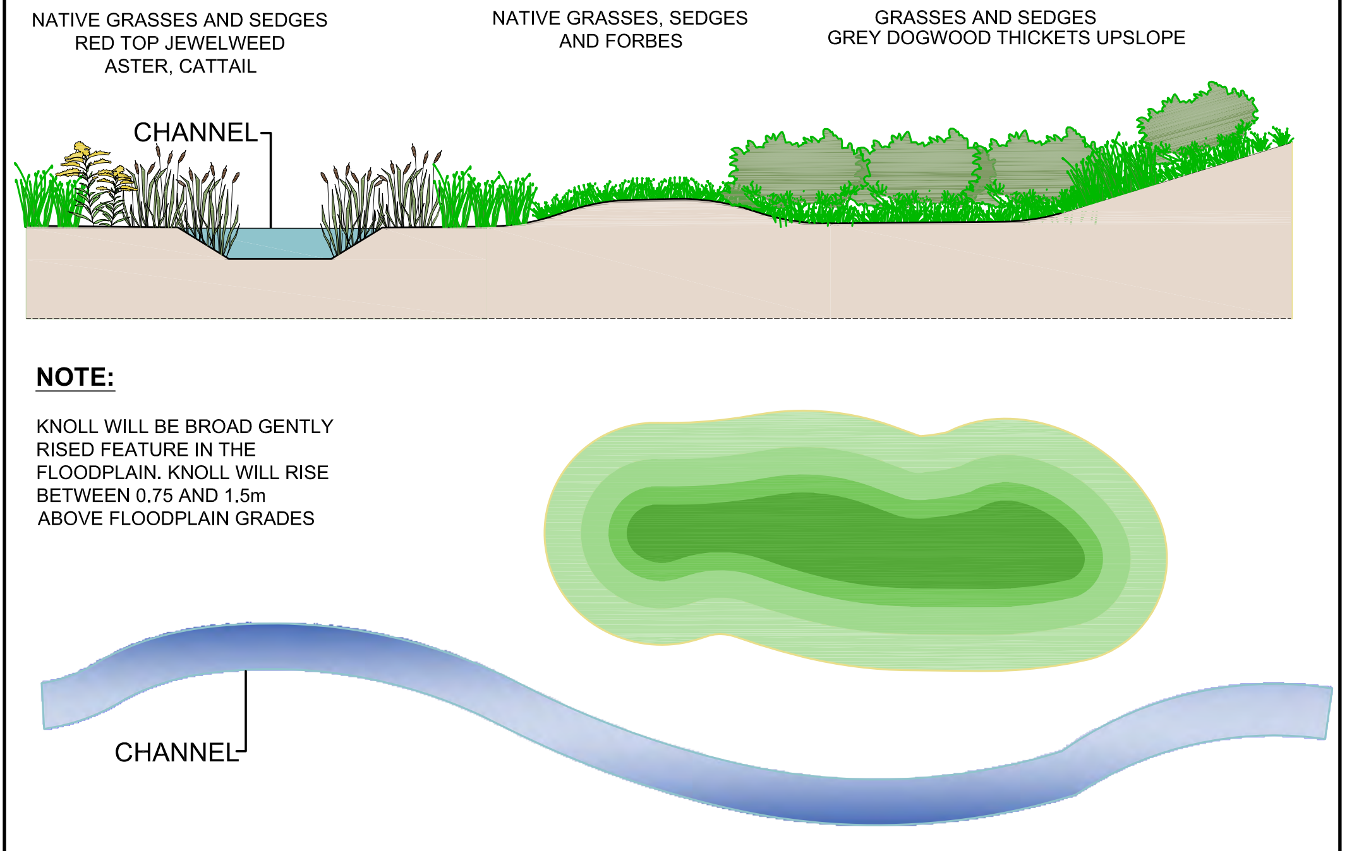
PLAN VIEW
N.T.S.

CONNECTED FLOODPLAIN POOL



LONGITUDINAL CROSS-SECTION B-B

KNOLL

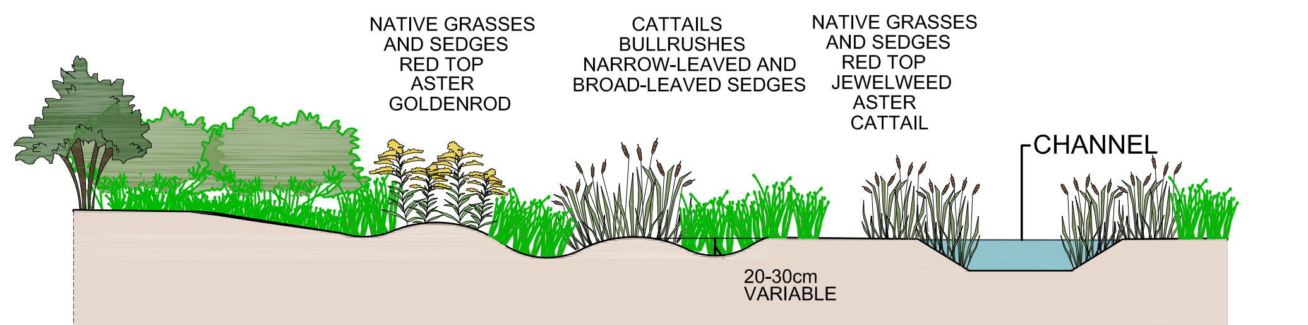


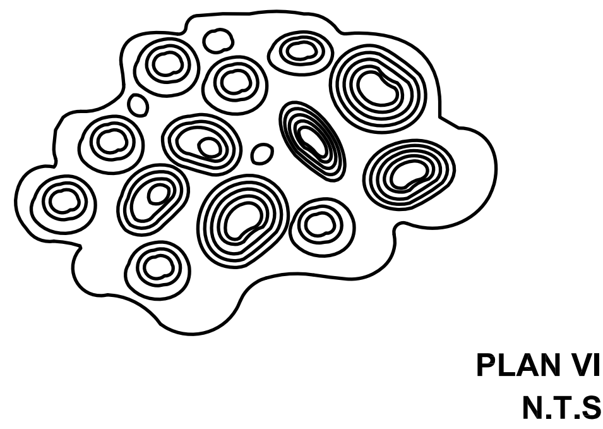
NOTE:

KNOLL WILL BE BROAD GENTLY RISED FEATURE IN THE FLOODPLAIN. KNOLL WILL RISE BETWEEN 0.75 AND 1.5m ABOVE FLOODPLAIN GRADES

PLAN VIEW
N.T.S.

TYPICAL FLOODPLAIN HUMMOCKY TOPOGRAPHY



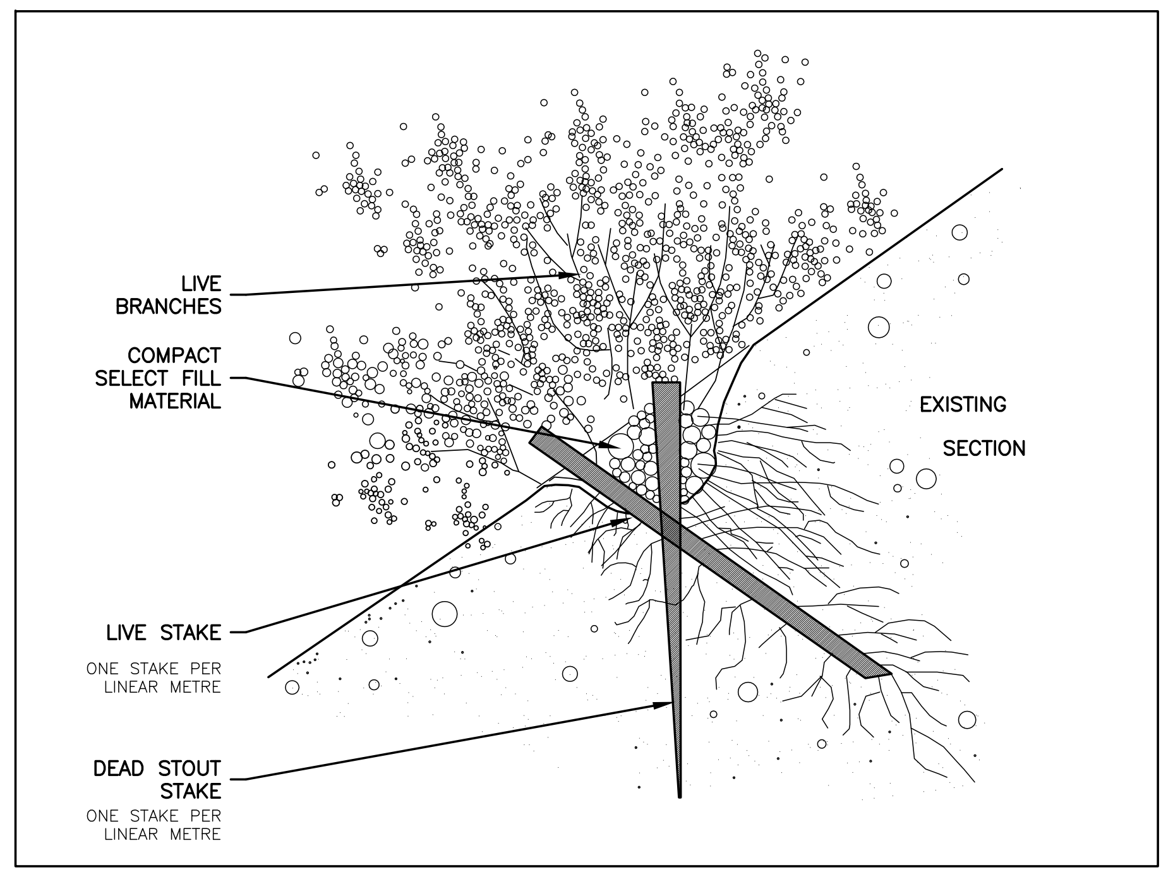


NOTE:

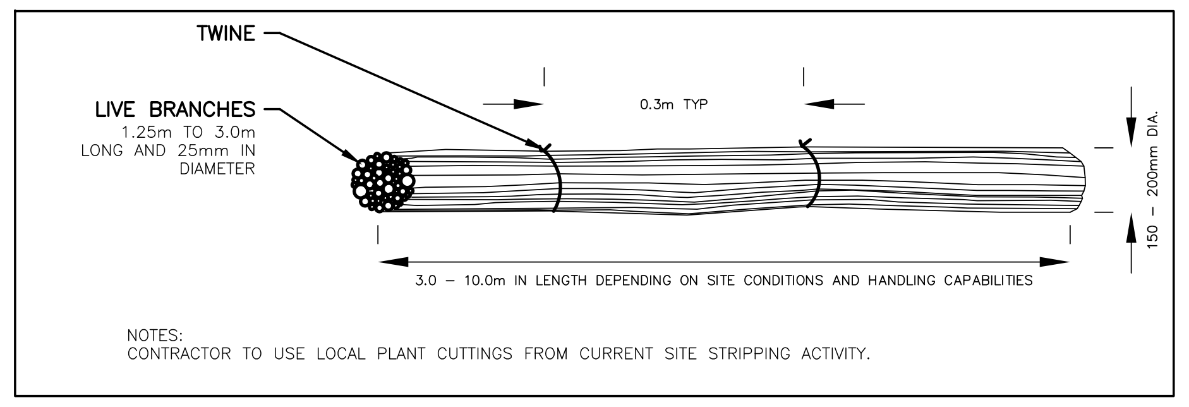
TYPICAL OF HUMMOCKY AREA. UNDULATIONS WILL VARY BETWEEN 0.3cm AND 0.5cm ABOVE FLOODPLANE GRADE. THE NUMBER AND SIZE OF THE HUMMOCKY WILL VARY DEPEND ON AVALIABLE AREA

PLAN VIEW
N.T.S.

LIVE FASCINES

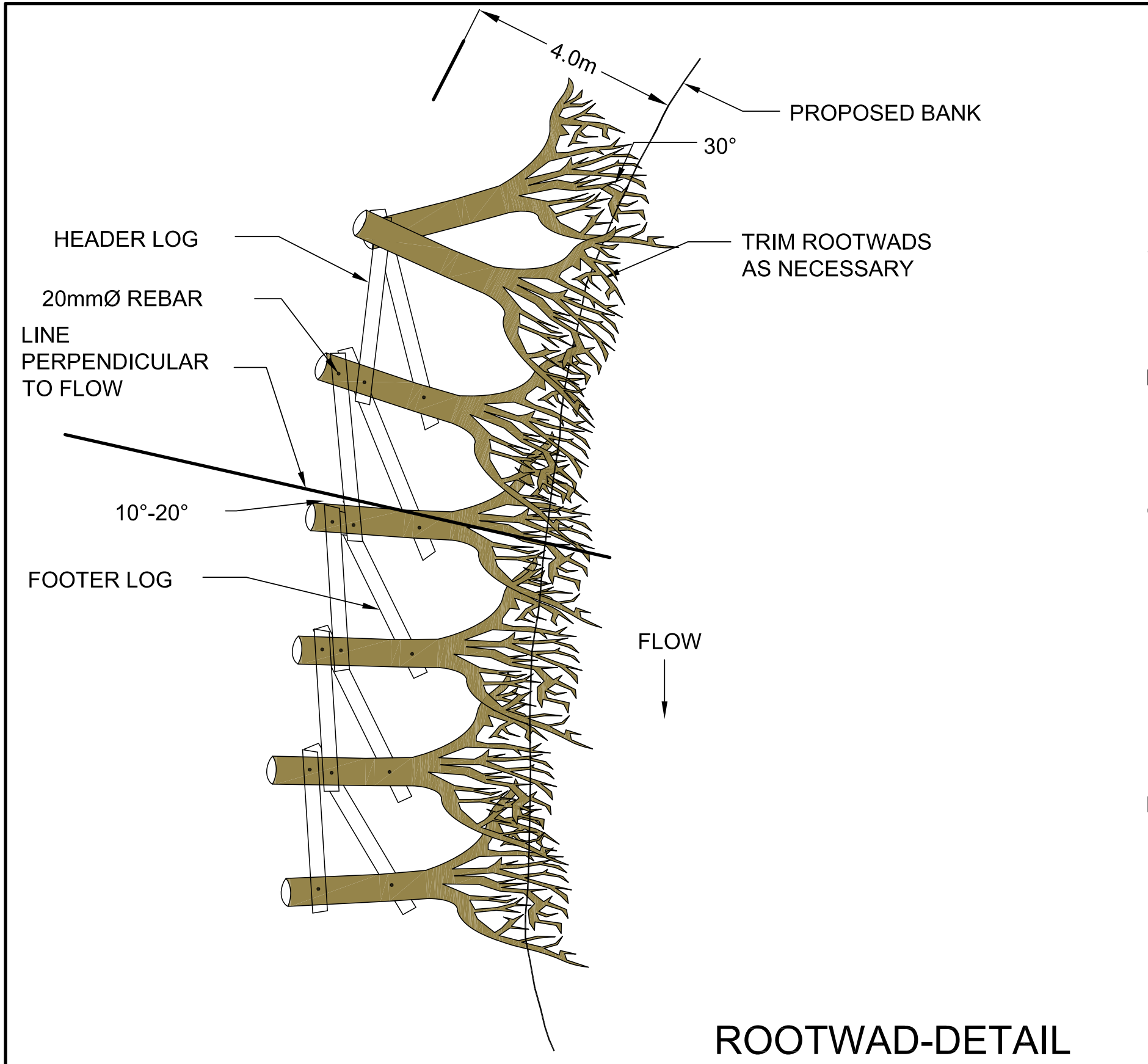


LIVE FASCINE INSTALLATION AND METHOD OF PLACEMENT IN A SLOPE
N.T.S.



NOTES:
CONTRACTOR TO USE LOCAL PLANT CUTTINGS FROM CURRENT SITE STRIPPING ACTIVITY.

LIVE FASCINE BUNDLE
N.T.S.



NOTES:

A) FOOTER LOGS

1) MINIMUM LENGTH=4.0m
2) DIAMETER=300mm

B) HEADER LOGS

1) LENGTH=6.0m
2) MIN. DIA.=200mm

C) ROOTWADS

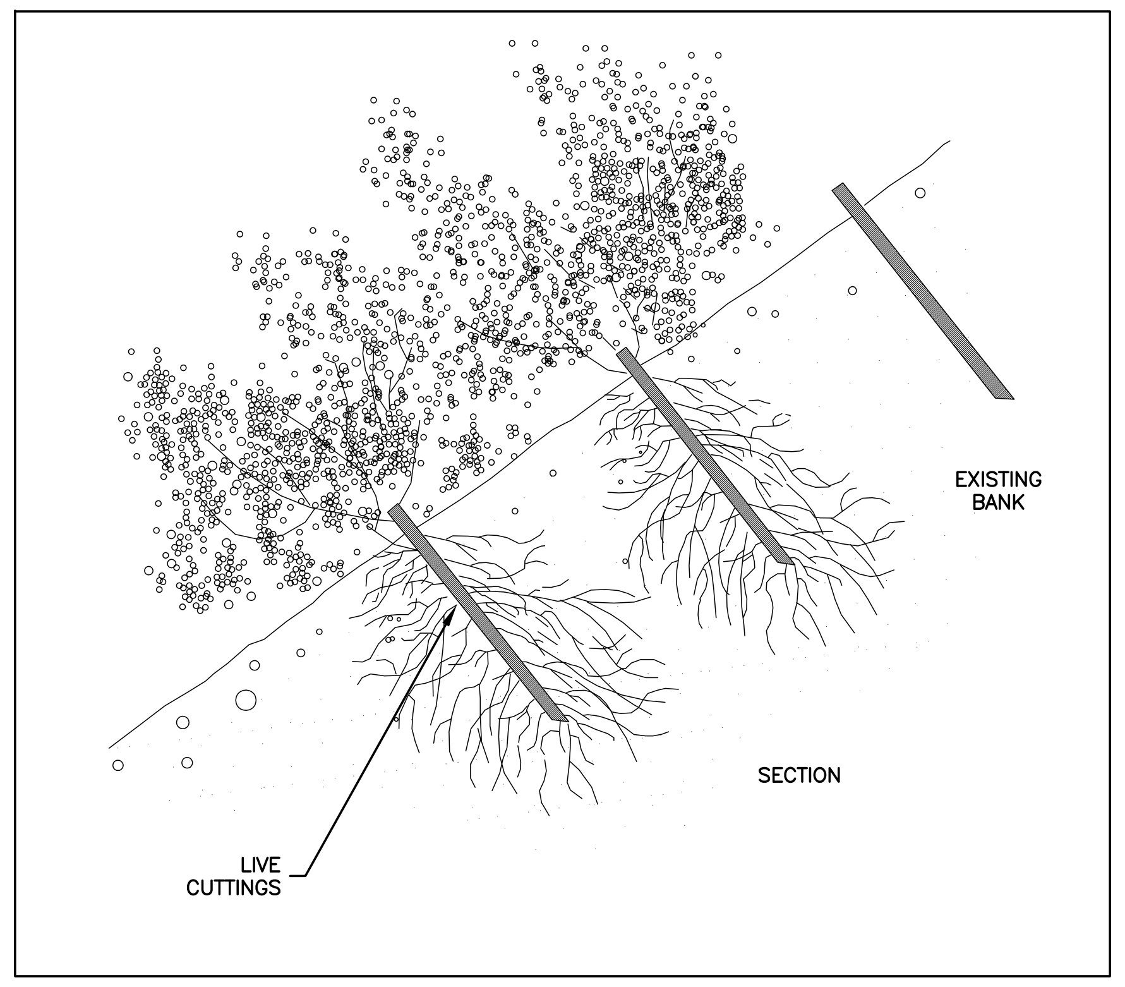
1) LENGTH=4.0m (min.)
2) DIAMETER OF ROOTWAD 0.50m TO 0.80m
(TYPICAL TOP TO MATCH TOP OF BANK GRADE)
3) INDIVIDUAL ROOTS MAY EXTEND BEYOND PROPOSED BANK
4) ANGLE ROOTWADS 10°-20° FROM LINE PERPENDICULAR TO FLOW
5) ROOTWADS TO OVERLAP EACH OTHER BY 25 PERCENT
6) UPSTREAM ROOTWAD TO BE ANGLED 30°

D) REBAR

1) LENGTH=2.5m, WITH TOP 0.3m BENT 90°
2) REBAR HOLES DRILLED WITH ANGLES VARYING 30° FROM VERTICAL
3) REBAR PLACED THROUGH DRILLED HOLES ATTACHING ROOTWADS TO FOOTER AND HEADER LOGS

ROOTWAD-DETAIL
N.T.S.

LIVE STAKES



ESTABLISHED LIVE STAKE INSTALLATION
N.T.S.

LIVE STAKE NOTES

DEFINITION

LIVE STAKE PLANTING INVOLVES THE INSERTION AND TAMPING OF LIVE, VEGETATIVE, WOODY CUTTINGS INTO THE GROUND IN A MANNER THAT ALLOWS THE LIVE STAKE TO TAKE ROOT AND GROW.

PURPOSE

USING A SYSTEM OF LIVE STAKES CREATES A ROOT MAT THAT STABILIZES THE SOIL BY REINFORCING AND BINDING SOIL PARTICLES TOGETHER AND BY EXTRACTING EXCESS SOIL MOISTURE. OVER TIME TOP GROWTH FORMS TO PROTECT THE SOIL SURFACE AND FURTHER ENHANCE THE SYSTEM.
THIS METHOD IS COMMONLY USED IN CONJUNCTION WITH OTHER PRACTICES TO PROVIDE FOR ADDITIONAL STABILITY AND ENVIRONMENTALLY SOUND SITE CONDITIONS (IE: USED TO ANCHOR TURF REINFORCEMENT MATS).

APPLICATIONS

REPAIR OF SMALL, SIMPLE, SHALLOW LOCAL EARTH SLIPS AND SLUMPS.
AREAS BEST SUITED FOR LIVE STAKING ARE THE BOTTOMS AND BANKS OF SMALL INCIPIENT GULLIES; SEDIMENT FILLS BEHIND CHECK DAMS AND BARE GULLY BANKS.
LIVE STAKES CAN BE TAMPED THROUGH INTERSTICES OR OPENINGS IN ECO–GABIONS, ECO–LOGS, RIPRAP OR CELLULAR CONFINEMENT SYSTEMS, OFFERING ADDITIONAL ENVIRONMENTAL, MECHANICAL AND AESTHETIC BENEFITS. LIVE STAKES CAN BE USED TO ANCHOR AND ENHANCE THE EFFECTIVENESS OF LIVE FASCINES, COIR ROLLS, GEOSYNTHETIC BLANKETS, COIR MATS AND OTHER EROSION CONTROL MATERIALS. LIVE STAKING IMPROVES CONDITIONS FOR THE NATURAL INVASION OF THE SURROUNDING PLANT COMMUNITY. AS A TEMPORARY MEASURE, LIVE STAKING PERFORMS AN IMPORTANT FUNCTION IN STABILIZING AND MODIFYING THE SOIL, SERVING AS A PIONEER SPECIES UNITL OTHER PLANTS BECOME ESTABLISHED. LIVE STAKES ARE USEFUL WHEN A QUICK AND INEXPENSIVE REPAIR IS NEEDED AND IS APPROPRIATE.

DESIGN CONSIDERATIONS

ON SMALL SYSTEMS, PLANTINGS CAN ADVERSELY AFFECT WATER HYDRAULICS AND CAUSE BLOCKING OR CURRENT DEFLECTION. LIVE CUT STAKES SHOULD BE 0.75m TO 1.0m LONG AND 15–50mm IN DIAMETER. THEY SHOULD BE STRAIGHT FOR EASY INSERTION INTO THE GROUND, AND BE LONG ENOUGH TO REACH THE MIDSUMMER WATERTABLE. LIVE CUT BRANCHES SHOULD HAVE ONE OR TWO TERMINAL BUDS EXPOSED ABOVE THE GROUND LEVEL.

INSTALLATION

INSTALL LIVE STAKES WITH BASAL ENDS IN THE GROUND. LEAF BUD SCARS OR EMERGING BUDS ARE ORIENTED UP. LIVE STAKES MUST NOT BE ALLOWED TO DRY OUT. LIVE CUTTINGS MAY BE SOAKED IN WATER FOR 10 DAYS BEFORE INSTALLATION, SOAKING INCREASES THE SURVIVAL RATE. CUTTINGS INSTALLED THE SAME DAY ARE TYPICALLY HIGHLY SUCCESSFUL. INSTALL LIVE STAKES 0.5m–1.5m APART. SET THE LIVE STAKE AS DEEP AS POSSIBLE INTO THE SOIL, PREFERABLY WITH 75% OF ITS LENGTH IN THE SOIL AND IF POSSIBLE, IN CONTACT WITH THE MID–SUMMER WATER TABLE. LIVE CUT STAKES SHOULD HAVE ONE TO TWO TERMINAL BUDS EXPOSED ABOVE THE GROUND AFTER INSTALLATION IS COMPLETE. USE AN IRON STAKE OR BAR TO MAKE A PILOT HOLE IN FIRM SOIL BY DRIVING IT INTO THE GROUND AND CAREFULLY EXTRUDING IT. DO NOT ROTATE THE BAR TO ENLARGE THE HOLE. IT IS ESSENTIAL TO HAVE GOOD SOIL CONTACT ALONG THE LENGTH OF THE STAKE FOR THE ROOTS TO DEVELOP. TAMP THE SOIL AROUND THE CUTTING AFTER IT HAS BEEN INSTALLED. DO NOT DAMAGE THE BUDS, STRIP THE BARK OR SPLIT THE LIVE STAKE DURING INSTALLATION. CUT, REMOVE AND REPLACE SPLIT OR DAMAGED STAKES.

NOTES:

* REFER TO LANDSCAPE DRAWINGS BY NAK FOR ACCEPTABLE LIVE STAKE AND FASCINE SPECIES

LIVE FASCINE NOTES

DEFINITION

LIVE FASCINES ARE STEMS AND BRANCHES OF ROOTABLE MATERIAL BOUND TOGETHER INTO LONG, SAUSAGE–LIKE SHAPED BUNDLES USED TO STABILIZE CUT SLOPES AND STREAMBANKS.

PURPOSE

THE LIVE FASCINE BUNDLES AND LIVE STAKES ARE ALL STRUCTURAL COMPONENTS THAT COMBINE TO STABILIZE THE SURFACE LAYERS BY RESISTING HYDRAULIC FORCES.
LIVE FASCINES ARE USEFUL IN THE REPAIR AND PREVENTION OF RILLS AND GULLIES BY REDUCING THE EFFECTIVE SLOPE LENGTH AND THEREBY DISSIPATING THE ENERGY OF WATER MOVING DOWN SLOPE. LIVE FASCINES CONTROL SURFACE EROSION FROM OCCURRING IMMEDIATELY AFTER INSTALLATION.
THE TERRACES FORMED BY A SERIES OF LIVE FASCINES TRAP SEDIMENT AND DEBRIS. INFILTRATION IS INCREASED AS RUNOFF IS SLOWED. ON DRY SITES THIS INCREASES THE AVAILABLE WATER FOR ESTABLISHMENT OF VEGETATION. ON MOIST SLOPES THE LIVE FASCINES MAY BE INSTALLED ON ANGLE TO COLLECT AND DIRECT WATER ACROSS AND DOWN THE SLOPE.
VEGETATION ESTABLISHMENT IS ENHANCED BECAUSE LIVE FASCINES PROVIDE A SUITABLE ENVIRONMENT FOR PLANTS TO ESTABLISH ON THE TERRACES.

APPLICATIONS

LIVE FASCINES MAY BE USED FOR ROAD CUTS, GULLIES OR SLUMPED AREAS, SURFACE EROSION SITES ON UPLAND SLOPES, SHORELINES, STREAMBANKS AND ALONG WETLAND BUFFERS.
USEFUL FOR THE REPAIR OF SMALL EARTH SLIPS OR TO PROTECT SLOPES FROM SHALLOW SLIDES THAT ARE 0.2m–0.3m DEEP.
LIVE FASCINES ARE USEFUL ON SLOPES REQUIRING OTHER PLANTING MATERIALS SUCH AS CONTAINER PLANTS, LIVE STAKES, GRASSES, LEGUMES AND FORDS.
LIVE FASCINES ENHANCE CONDITIONS FOR NATURAL INVASION AND IMPROVES THE ESTABLISHMENT OF PLANTS FROM THE SURROUNDING PLANT COMMUNITY.
ASSISTS IN DRYING WET SITES THROUGH ANGULAR PLACEMENT AND AUGMENTED BY TRANSPIRATION AS THEY ROOT AND PRODUCE TOP GROWTH.

DESIGN CONSIDERATIONS

FOR BEST RESULTS, HARVEST AND INSTALL PLANT MATERIAL DURING ITS DORMANT SEASON.
PLANTINGS ON SMALL STREAM SYSTEMS CAN ADVERSELY AFFECT WATER HYDRAULICS BY PARTIALLY BLOCKING OR DEFLECTING CURRENTS. TAKE STREAM SIZE AND ELEVATION OF THE INSTALLATION INTO ACCOUNT.
COIR MATS OR NETTING CAN BE USED UNDER AND BETWEEN EACH ROW OF LIVE FASCINES TO ENHANCE SURFACE PROTECTION.

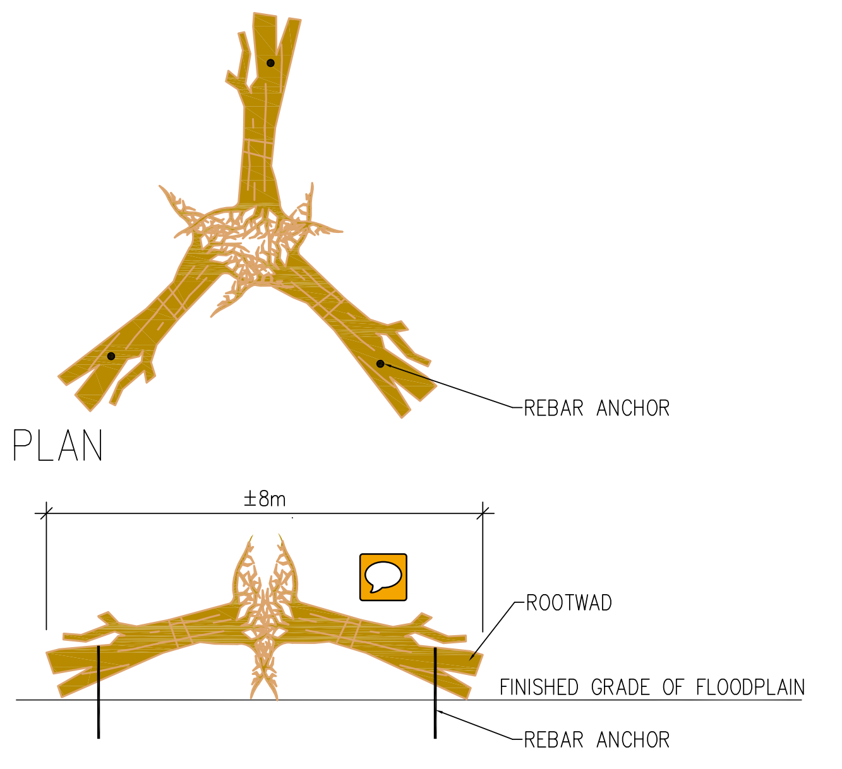
LIVE FASCINE PREPARATION

CHOOSE PLANT MATERIALS THAT ARE ADAPTED TO THE SITE CONDITIONS FROM SPECIES THAT ROOT EASILY FROM CUTTINGS.
USE LONG, STRAIGHT AND FLEXIBLE BRANCHES THAT ARE 1.25m TO 3.0m LONG AND 25mm IN DIAMETER. THE NUMBER OF STEMS VARIES WITH THE SIZE AND KIND OF PLANT MATERIAL.
TIE CUTTINGS TOGETHER TO FORM BUNDLES, 3–10m IN LENGTH, DEPENDING ON SITE CONDITIONS AND HANDLING CAPABILITIES.
THE COMPLETED BUNDLES ARE TYPICALLY 150–200mm IN DIAMETER, BUT MAY BE AS LARGE AS 300mm, WHEN USED FOR SPECIFIC DRAINAGE PURPOSES.
STAGGER THE CUTTINGS IN THE BUNDLES SO THAT THE TIPS AND BASAL ENDS ARE EVENLY DISTRIBUTED THROUGHOUT THE LENGTH OF THE BUNDLE.
COMPRESS THE LIVE FASCINE BUNDLES AND TIE TIGHTLY WITH TWINE OF SUFFICIENT STRENGTH AND DURABILITY.
TIE THE LIVE FASCINE BUNDLES 0.3m APART.
FOR OPTIMUM SUCCESS, INSTALL THE UNITS ON THE SAME DAY THEY ARE HARVESTED AND PREPARED. LIVE FASCINES MUST BE STORED IN THE SHADE OR IN WATER. LIVE FASCINE BUNDLES MAY BE SOAKED OVER NIGHT TO IMPROVE SUCCESS.

INSTALLATION

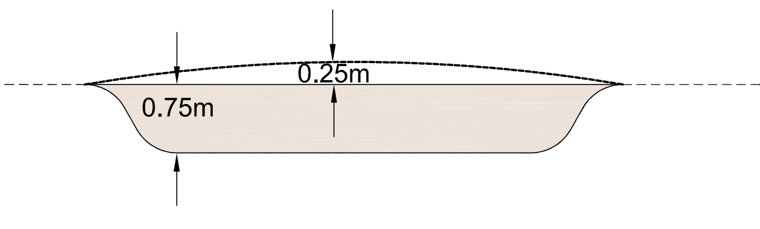
WORK PROGRESSES FROM THE BOTTOM TO THE TOP OF THE SLOPE.
PERFORM ANY SLOPE REPAIRS, SUCH AS GULLY REPAIR, SLOPE SCALING, DIVERSION DIKE, OR TOE WALL CONSTRUCTION, PRIOR TO LIVE FASCINE INSTALLATION.
STARTING AT THE BASE OF A DRY SLOPE, DIG A TRENCH ON CONTOUR. STARTING AT ONE END OF A MOIST SLOPE, DIG A TRENCH THAT ANGLES FROM THE BASE UP THE FACE OF THE SLOPE AT AN ANGLE.
THE TRENCH DEPTH IS ABOUT 7/8ths OF THE DIAMETER OF THE LIVE FASCINE AND THE SAME WIDTH OR A LITTLE WIDER, WHEN USED ALONE. DIG IT DEEPER WHEN FABRICS ARE EMBEDDED IN THE TRENCH.
PLACE THE LIVE FASCINES INTO THE TRENCH IMMEDIATELY AFTER DIGGING TO REDUCE DESICCATION OF THE SOIL, AND THE LOSS OF MICRO–ORGANISMS.
FIRMLY INSTALL THE LIVE FASCINES WITH ONE ROW OF DEAD STOUT STAKES DRIVEN DIRECTLY THROUGH THE BUNDLE ON THE TOP EXPOSED SIDE OF THE LIVE FASCINE BUNDLE EVERY METRE. INSTALL A LIVE STAKE 0.75m LONG 1.0m APART IN BETWEEN THE PREVIOUSLY INSTALLED DEAD STOUT STAKES.
OVERLAP THE TAPERED GROWING TIPS OF ADJACENT LIVE FASCINES ON TOP OF THE BASAL ENDS AND STAKE DOWN. USE TWO STAKES AT EACH BUNDLE OVERLAP.
LIVE STAKES ARE TYPICALLY 0.75m LONG AND DEAD STOUT STAKES ARE TYPICALLY 1.0m LONG IN UNCONSOLIDATED SOILS AND 0.75m LONG IN COHESIVE SOILS.
PROPER BACKFILLING IS ESSENTIAL TO THE SUCCESSFUL ROOTING OF THE LIVE FASCINES. BACKFILL LIVE FASCINES WITH SOIL FROM THE TRENCH. WORK THE MOIST BACKFILL INTO THE LIVE FASCINE BUNDLE BETWEEN THE BRANCHES AND AT EACH DEAD STOUT STAKE, A PRACTICAL METHOD TO COMPACT BEHIND AND BELOW THE BUNDLE IS BY WALKING ON IT.
AMELIORATE THE EXCAVATED/BACKFILL SOIL AS NECESSARY TO PROMOTE PLANT GROWTH.
REPEAT THE PRECEEDING STEPS TO THE TOP OF THE SLOPE ON THE SLOPE FACE.
THE TOP OF THE BUNDLE SHOULD BE SLIGHTLY VISIBLE WHEN THE INSTALLATION IS COMPLETED.
SEED AND MULCH SLOPE AS SPECIFIED BY HAND IN BETWEEN THE LIVE FASCINE BUNDLES. EROSION CONTROL BLANKETS ARE TYPICALLY USED TO PROTECT THE SLOPE IN BETWEEN THE LIVE FASCINE BUNDLES FROM EROSION UNTIL THE VEGETATION IS ESTABLISHED. DO NOT SEED ON TOP OF THE LIVE FASCINE BUNDLES AS THE COMPETITION WITH THE GRASS MAY CAUSE THE LIVE FASCINES TO PERFORM POORLY.

NOTE:
1. REFER TO LANDSCAPE PLANS FOR HABITAT LOCATIONS WITHIN THE FLOODPLAIN.
2. ROOTWADS SHALL BE 4M MIN. LENGTH, WIDTH 0.5–0.8M IN DIAMETER
3. REBAR ANCHORS SHALL BE 2.5M IN LENGTH WITH TOP 0.3M BENT 90°.



ELEVATION OF BRUSH HABITAT

TYPICAL ALLUVIAL DEPOSITS



NOTE:

* **TYPICAL ALLUVIAL DEPOSITS WILL HAVE SEDIMENT ALONG THE FINER SIDE OF THE IN-CHANNEL MATRIX SO IT CAN BE ENTRAINED UNDER FLOODPLAIN FLOW. THE MIX WILL RANGE BETWEEN 2mm AND 10mm WITH A MEDIAN DIAMETER OF 5mm**

BENCHMARK NOTE

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO MTO BENCHMARK 00819668355. LARGE CONCRETE CULVERT CARRYING HWY 7 OVER SMALL CREEK, 5.4 KM WEST OF THE NORTH JCT OF HWYS 7 AND 10 AND 27 M EAST OF PEEL REG RD 1. TABLET IS SET VERTICALLY IN THE TOP OF THE NORTH END, 37 CM SOUTH 15 CM EAST OF THE N.W. CORNER AND 16.8 M NORTH OF CENTRELINE OF PAVEMENT.

No.	REVISION	DATE	BY
3			
2			
1			

FLOWER CITY
BRAMPTON.CA
CITY OF BRAMPTON
PLANNING, DESIGN & DEVELOPMENT
MICHAEL WON, P. Eng., DIRECTOR OF DEVELOPMENT ENGINEERING SERVICES

CITY FILE No. P20.BP51-1.003

D. Zec
D. ZEC
MAY, 2014

PROJECT **11-366**

urbantech
Urbantech Consulting, A Division of Leighton-Zec Ltd.
25 Royal Crest Court, Suite 201, Markham, Ontario L3R 9X4
tel: 905.946.9461 fax: 905.946.9595
www.urbantech.com

MOUNT PLEASANT SUB AREA 51-1
NATURAL HERITAGE SYSTEM
STAGE 3

TYPICAL AQUATIC FEATURE DETAILS

SURVEYED BY: R.P.E.	DATE:	CONTRACT NO.			
DRAWN BY: M.Z.	CHECKED BY: D.Z.	DRAWING NO. 438	SHEET NO.		
DESIGNED BY: D.Z.	CHECKED BY: D.Z.				
SCALE: AS SHOWN	DATE: MAY, 2014				

File: P:\Projects\11-366\Drawings\04_Channel Profiles and Sections\03_BUICK TO MAYFIELD\438-Aquatic Features Details.dwg - Revised by <JBLANUSA> : Mon, Apr 28 2014 - 4:20pm

Implementation Notes - Specific to the Sixteen Mile Creek Ecological Restoration Master Plan:

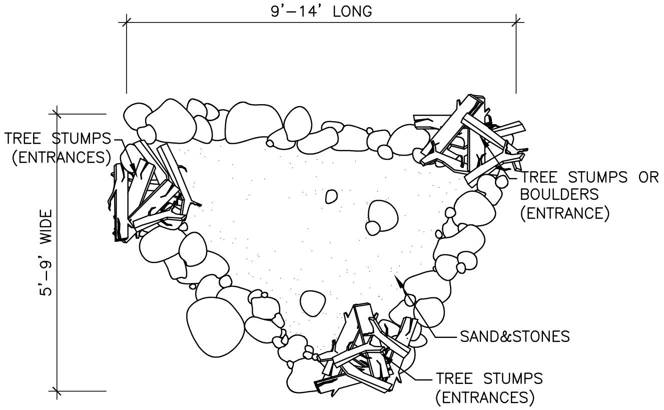
These notes and detailed text in Appendix 4 supercede details shown on Drawing SK-1 (Toronto Zoo figure cannot be directly edited). Refer to Appendix 4 for exact design commitments.

Pea gravel and sand and a French Drain will be added to the bottom of the snake hibernacula feature to improve drainage.

PVC pipe will be installed to ensure entrance / exit points to the hibernacula are kept open after the materials "settle" in place (potentially compressing natural openings that are not reinforced).

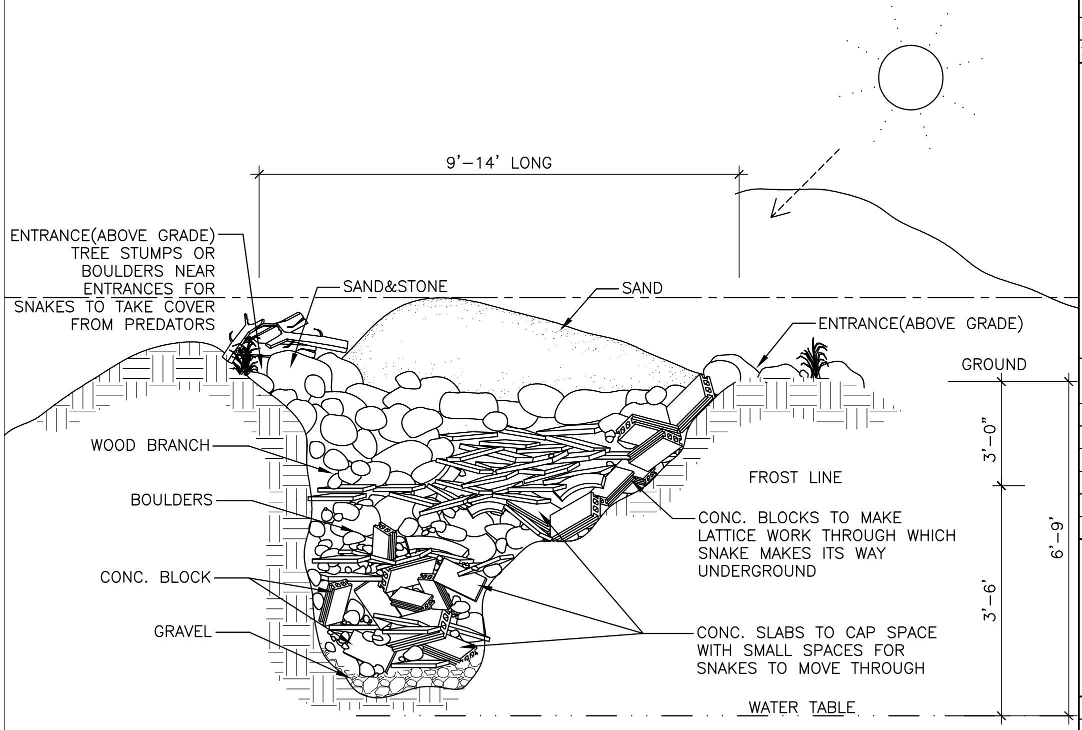
A lip will be added to the design to direct surface runoff flows around rather than into the hibernaculum.

The top of the of the hibernaculum will be covered with soil and planted with *Elymus Canadensis* or *Elymus Virginicus* to provide insulation value.



1 SK1 TOP VIEW

SCALE : NTS



2 SK1 CROSS SECTION

SCALE : NTS

toronto zoo

361A OLD FINCH AVE.
TORONTO, ON
M1B 5K7

NO.	DESCRIPTION	DATE
NO.	REVISION	DATE

SNAKE HIBERNACULUM

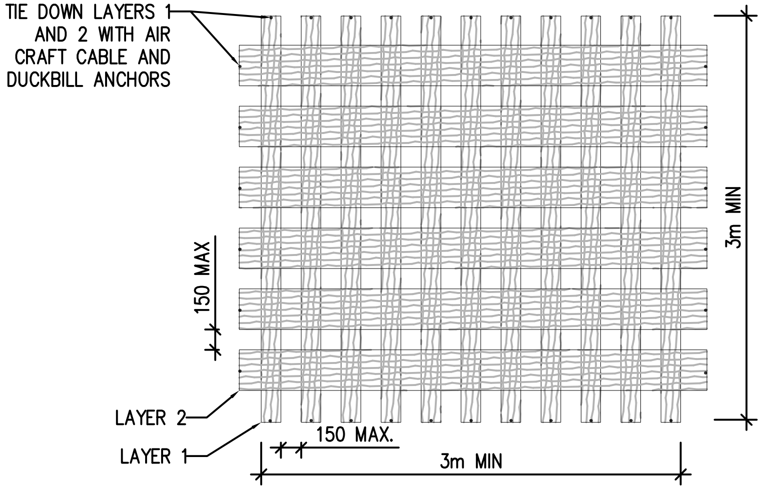
	APPROVED BY	
NO.	NAME	DATE

TOP VIEW
&
CROSS SECTION

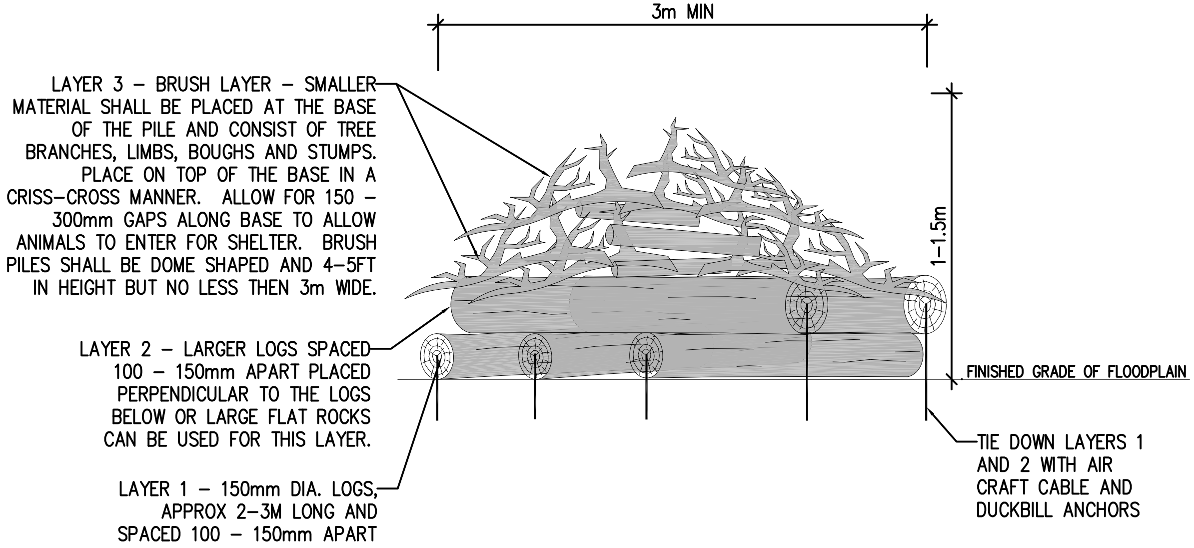
PROJECT NO: -
DRAWN BY:JC
CHECKED BY:
LAST UPDATED: 2010-11-12
SCALE: NTS
DRAWING #:
SK-1

S:\8184 - SAV 7040 Milton NHS\corel\2018 01 29\SK-2 turtle nesting beach design - TorontoZoo.cdr Date Save: January 30, 2018

NOTE:
1. REFER TO LANDSCAPE PLANS FOR HABITAT LOCATIONS WITHIN THE FLOODPLAIN AND WETLAND.

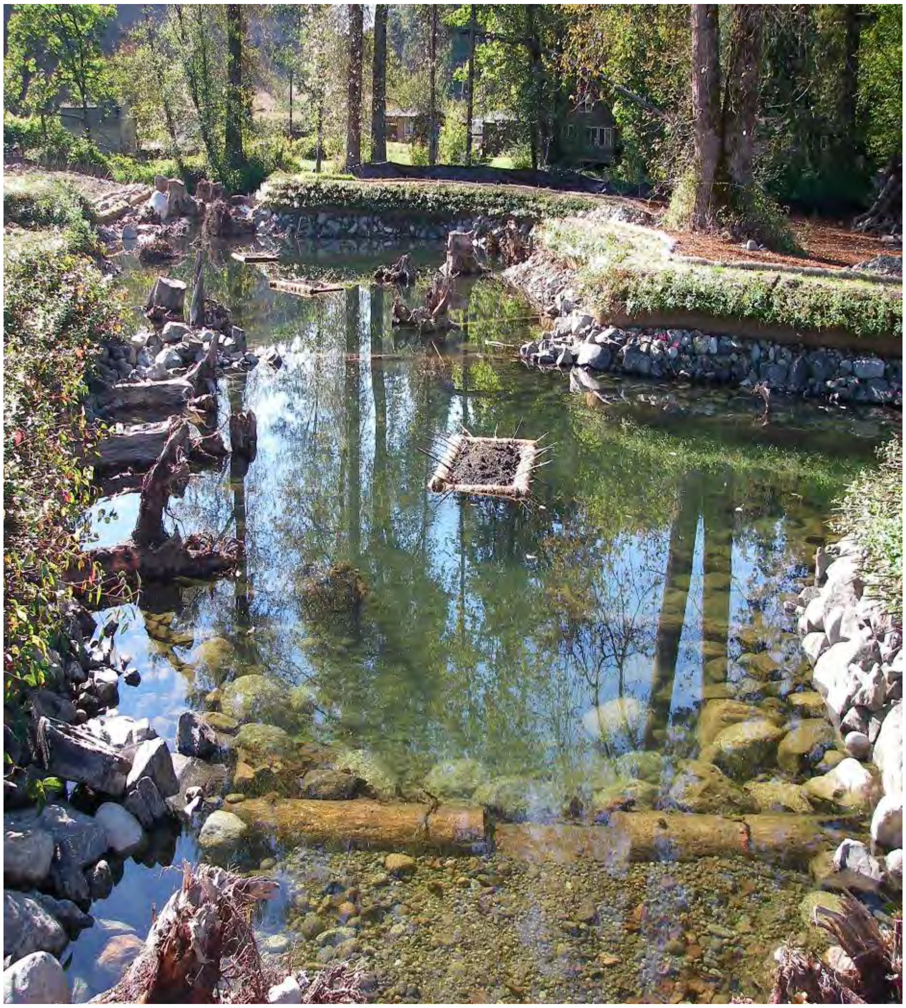


PLAN



ELEVATION OF BRUSH PILE

WSDOT Guidance on Wildlife Habitat Structures In Wetland Mitigation Sites



Washington Department of Transportation

Environmental Services

Washington State
Department of Transportation

WSDOT Guidance on Wildlife Habitat Structures in Wetland Mitigation Sites

July 2008

By

Michael MacDonald
Wildlife Biologist

Washington State Department of Transportation
Northwest Region Biology

With contributions from the following people:

Terry Sullivan – Wetland Mitigation Specialist
Kelly McAllister – Habitat Connectivity Biologist
Gary Davis - Northwest Region Biology Program Manager
Brian Bigler – Northwest Region Biology Program Assistant Manager
David Peterson - Northwest Region Assistant Landscape Architect
Beth MacLaren – Northwest Region Landscape Architect
Deborah Peters - Northwest Region Landscape Architect
Alisa Sawich – Northwest Region Landscape Designer

WSDOT Guidance on
Wildlife Habitat in Wetland Mitigation Sites

Wetlands and adjacent uplands provide numerous habitat niches for wildlife. Wildlife habitat structures added to wetland mitigation sites are intended to jump start habitat complexity and species richness functions until natural conditions and environmental forces mature and shape the site to create self-sustaining wildlife habitat. The wildlife habitat also adds “functional lift” to the assessed value of a created site; thereby, providing a higher quality site within a constrained area. Wildlife may use these structures to locate mates, nest, and forage, as well as protection from the weather and predators. The reader should keep in mind that the basic goal for creating wetlands and habitat structures is to promote a self-sustaining food web.

This document provides guidance on habitat structure and site design in Western Washington with suggestions for experimental designs based on best professional judgment. Aspects of this document may be applicable to other roadside restoration projects such as stream relocation and restoration. A wetland mitigation site can include a few or all of the structural elements, depending on the need, size, location, and functions of the impacted wetlands. Project budget, wetland mitigation rating (category), and buffer widths may also influence the number and type of habitat structures for any given mitigation site.

Mitigation Site Location:

1. Select a site that will connect to existing habitat corridors and/or quality habitat areas. It is undesirable to create isolated habitat “islands”. The site should augment wildlife movement and contribute to their life history and survival.
2. Select a mitigation site that will maximize adjacent land features. Expand existing wildlife corridors and functions by increasing the corridor width and habitat complexity.
3. Be cognizant of existing and future development within the mitigation site area which could fragment habitat corridors or diminish the effectiveness of the proposed habitat structures.
4. Some sites which fulfill wetland mitigation requirements may not always be appropriate for some species that cannot successfully and safely use the site. Site selection intended to purposefully attract wildlife should be located to avoid creating hazards to animals drawn in by the habitats.

General Guidance for Habitat Structures:

1. Salvage, recycle, and incorporate materials made available by construction and import foreign materials only when necessary. Identify and mark existing on-site material for salvage and coordinate with the design and construction offices to appropriately stockpile supplies and storage sites.
2. Each habitat feature should require little or no maintenance. This design recommendation reduces costs and human presence in the site.

3. Work with the region wildlife biologist to identify target species and appropriate habitat structures.
4. Assess the surrounding land use to determine what structures are appropriate for the desired species:
    a. A site that is surrounded by roadways may be deleterious to ground dwelling species such as small and large mammals. Therefore, in this situation, avoid habitats that may be particularly attractive to these animals.
    b. Augment existing habitat that surrounds the site rather than replicating existing features. If several perch trees are expected to be retained near the project then it would be redundant to add perch posts. However, if the adjacent property is slated for development, then temporary redundancy in structures may be desirable.
    c. Grade the site to mimic natural conditions, including ephemeral pools, but minimize fish entrapment and bull frog use. High flows encroaching into the site from nearby streams and lakes should drain out as the water recedes.
    d. Locate the site to complement adjacent land use features. It is inefficient and inappropriate to create habitat “islands” rather the site should facilitate wildlife movement and contribute to their life history and survival by contributing to existing habitats.
    e. Be cognizant of future development within the project area that could fragment habitat corridors or diminish the effectiveness of the proposed habitat structures.
5. Increase habitat functions by combining structures for multiple species, such as incorporating a perch log with branches into rock piles. Rocks should completely surround the log which is securely held in place at approximately 45 degrees.
6. Create perch points for song birds. These are prominent twigs or log ends above the supporting piles that provide the bird with a view of the surrounding area from which they can vocalize territorial bounds, attract mates, and avoid predation.
7. Secure structures that may be subject to intermittent inundation to minimize movement.
8. Generally, the bigger the structure, the better. This may have diminishing returns on extraordinarily sized structures. Keep in mind that structures are meant to resemble naturally occurring sizes, shapes, and distributions. Cost and material availability should be considered when exceeding the recommended minimum. If additional material is available from project construction, then coordinate with the region wildlife biologist and design office for guidance on increasing the habitat size or quantities.
9. Inspect habitat structures during construction to verify appropriate locations and construction methods. Early coordination with the construction office may be useful to catch design and construction problems.

Habitat Structures:

Brush piles:

1. *Intent*: Brush piles are meant to mimic dense thickets where a tree in a forest has fallen and created clumped, horizontal structures with understory vegetation.
2. *Target species*: Small mammals, amphibians, reptiles, predatory species, and passerine-sized birds.
3. *Location*: In upland sites with little or no chance of being surrounded by water.
4. *Quantity*: At least six brush piles per acre.
5. *Construction*: Wood accumulated by clearing live vegetation and downed trees should be salvaged and incorporated into piles. The center of the pile should be supported with substantial woody material (e.g. rootwads) to create and maintain loft. Stem sizes should be randomly mixed from twigs to large logs using any woody species available; however, conifers will likely last longer than other species. Branch tips or log ends should be directed skyward to create perch points. The piles should be approximately 20 feet wide by 10 feet high. Larger piles may have diminishing returns. There should be interstitial spaces in the brush pile unless stated otherwise on the plan sheets. Brush piles should be constructed by stacking the material and not dumped from a truck.
6. *Suitable example*:

Rock piles:

1. *Intent*: To mimic accumulations as might occur in rocky areas along streams, outcrops, and talus fields. The rocks absorb daytime heat and slowly release it during the cooler night.
2. *Target species*: The heated rocks provide a relatively stable thermal source and will attract ectothermic reptiles for nesting and foraging. Rock piles with sufficient mass may serve as reptile overwintering sites. Small mammals, particularly rodents, will forage, nest, and receive some protection from predators in rock piles. Rodents in turn may also serve as a food source for predatory species such as weasels, mink, snakes, and coyotes.
3. *Location*: Rock piles should be placed in upland sites with little or no chance of being inundated by water. If there are slopes in the site it may be beneficial to bury half the pile into them, particularly south facing slopes.
4. *Quantity*: It is recommended to have at least five rock piles per acre.
5. *Construction*: Rocks should be cleaned and sized from two inch diameter to two man rock (approximately two square feet) with some jagged edges. Jagged edges are used by molting reptiles and provide secure footing for small mammals. It is important to maintain a variety of interstitial spaces not exceeding six inches. The piles should be at least five feet diameter and four feet tall. Partially bury piles below the ground surface in upland areas. A perch log can be added to expand habitat opportunities for birds. If large rocks are encountered on site they may be grouped and partially buried to create burrows (approximately one square foot or greater) for larger species such as coyotes.
6. *Suitable example*:

Raptor perch poles:

1. *Intent*: To replace or augment vertical structures.
2. *Target species*: Large bodied birds, such as hawks, eagles, and osprey, as well as bats and invertebrates. As the poles deteriorate they become attractive to primary excavating species such as pileated woodpeckers. Exfoliating bark may provide day roosts for bats. Eventually the rotting wood becomes attractive to insects which in turn provide forage opportunities to birds and bats. When the poles topple they then become habitat for ground dwelling species.
3. *Location*: Uplands to provide alternate perch sites and viewing opportunities.
4. *Quantity*: There should be a minimum of three per acre; however, consideration must be give to existing perch structures. If suitable perch trees have been retained in the site or remain adjacent to the mitigation site then it may be unnecessary to provide perch poles.
5. *Construction*: The poles should be conifer tree trunks and have at least three naturally occurring side branches, at least two of which should be near the top. Manufactured side branches are not appropriate due to the varying construction techniques and insufficient results at replicating the intended habitat need. Ensure that at least 30 feet of the stem is above ground, at least 75 percent of the bark intact, and predator guard encircling the stem. Bat and bird houses can be attached to the upper third of the stem to provide cavities immediately.
6. *Suitable example*:

Nest platform:

1. *Intent*: To provide a base upon which birds can build nests and perch.
2. *Target species*: These are most attractive to osprey, which are a long-lived species and, once established, often return to nest in the same site for many years.
3. *Location*: The platform should be exposed (e.g. not under or within the canopy of a tree) and within 0.5 miles of large fresh or marine water; preferably with a commanding view of the water.
4. *Quantity*: One platform per site due to large home ranges for the target species.
5. *Construction*: Flat, either circular or square constructed of untreated plywood or cedar boards and stoutly supported and offset near the top of a tall pole or topped tree. The plywood should be marine grade or exterior and all other wood should be cedar. It should be capable of supporting at least 200 pounds of accumulated nest material. Square platforms should be four-foot square dimensions (e.g. hardwood pallets). Circular platforms should have a diameter of at least four feet. The platform edges must have a three-inch tall rim with gaps to help contain nest material but allow water to flow off. Prep the platforms with attractant sticks to simulate old nest material. The platform should be at least 30 feet above the surrounding ground but taller is preferred. Try to keep the underground portion of the support pole above the water table to reduce premature rotting. Bat houses may be attached to the upper third of the pole to double up the usage and encircle the lower stem with a predator guard. Attach an offset perch board opposite and above the platform for attending adults.
6. *Suitable example*:

Photo by James Kaiser

Snags:

1. *Intent*: To provide decadent vertical wood elements typical of a mature forest.
2. *Target species*: A variety of insects and smaller birds, particularly woodpeckers and other cavity nesters. These structures will benefit a number of insectivorous surface feeding species.
3. *Location*: Uplands, wetlands, and riparian zones. Snags may help provide erosion and debris control in riparian embankments.
4. *Quantity*: It is recommended to install as many as possible. There should be at least two stems with multiple branches of varying length, 16-inch diameter, and 20 feet tall or greater per acre, which could serve the functions of the raptor perch.
5. *Construction*: Upland and wetland snags: Snags should have at least 75 percent of the bark attached. Conifer species and larger diameter stems may last longer but any species and diameter is appropriate. Stem heights above ground can vary between 5 to 30 feet, or greater. These may double as perch poles, depending on the need and site conditions. Straight-up vertical installation is not necessary but the log should be sufficiently supported to avoid easily tipping over. Freshly cut black cottonwood can be placed in riparian areas to provide habitat for water-associated birds and small mammals. These may also serve a dual function of bank stabilization and LWD recruitment when placed in parallel rows along river banks.
6. *Suitable examples*:

Coarse woody debris (CWD):

1. *Intent*: To mimic toppled trees which create structure, water retention, and organic soil inputs as well as the habitat complexity usually present in upland sites.
2. *Target species*: Most small mammals, particularly mice, voles, and shrews, as well as amphibians, and ground nesting birds. As the structures decay they are colonized by fungi and insects which, in turn, provide food for larger animals.
3. *Location*: Primarily in uplands but these also provide habitat functionality in wetlands. As a rule of thumb CWD should be randomly scattered throughout a site. Install habitat structures close to each other so small mammals will be less exposed to predators as they travel between structures.
4. *Quantity*: As many as possible.
5. *Construction*: Can be quite varied for their size, shape, and arrangement and may include log stems, logs with rootwads, and rootwads. Log stems should have 75 percent tightly adhered bark and lie roughly horizontal on the ground. The portion of the log that lies on the soil should be longitudinally V-notched three inches deep to create small mammal tunnels and promote fungal growth. Lateral V-notches will allow additional access. Longitudinal slices into the ends will create amphibian and insect habitat niches. Larger diameter stems and conifer species will last longer but all species greater than six inches diameter may be used. Several stems with or without rootwads may be crisscrossed. Create depressions in the soil next to the rootwads to temporarily pond stormwater (i.e. to mimic lifted soil where the roots of the tree once were embedded.) and use logs that are as long as possible. Short pieces should be combined into piles or incorporated into bush piles. Distribute the logs throughout the site to minimize travel distances between structures for small mammals. Single stems without rootwads should be associated with other habitat structures (such as crisscrossed or incorporated into a rock pile) rather than individually distributed.
6. *Suitable examples*: (Log with bark attached and Rootwad with soil depression)

Large woody debris (LWD):

1. *Intent*: In aquatic environments logs in the stream bed create channel complexity, direct water flow, control erosion, and provide forage and cover for aquatic species.
2. *Target species*: Most aquatic species, including amphibians and fish, will be attracted to the diverse habitat provided by adding wood to a stream channel.
3. *Location*: A hydrologist should be consulted for constructability. Logs may be cross-laced in mid-channel while rootwads with stems are often used to create a complex bank armoring. Generally, at least a portion of the wood should be in the water during low flow and securely held into position. An occasional long stem can span the water providing a dry path between banks.
4. *Quantity*: Each site is unique and it is recommended to consult a hydrologist and stream ecologist. Streams with high energy may require larger key pieces.
5. *Construction*: All key LWD should be secured to avoid drifting and be able to recruit smaller pieces of wood. The bark should be tightly intact on at least 75 percent of each log. There are numerous options for placing wood in the stream channel. There are also several information guidelines for the preferred quantities, installation, and sizes and this document will refer the reader to these sources:
    a. Stream Habitat Restoration Guidelines – Washington Department of Fish and Wildlife: http://wdfw.wa.gov/hab/ahg/shrg/index.htm
    b. A Guide to Placing Large Wood in Streams http://www.nww.usace.army.mil/html/offices/op/rf/SLOPES/WoodPlacmntGuide1995%5B1%5D.pdf
    c. Method Manual for the Large Woody Debris Survey – Timber Fish and Wildlife Program: http://www.nwifc.wa.gov/tfw/documents/TFW_Large_Woody_Debris.pdf
6. *Suitable example*:

Bat houses:

1. *Intent*: To replace and augment seasonal use roost sites for colonies and solitary bats.
2. *Target species*: There are potentially 11 species of bats in Western Washington that may use artificial structures for day or night roosts. Colonies rarely exceed a few hundred animals and occupied sites typically range from 1-100 individuals. During the winter months, bats in Washington hibernate or migrate out of the state and no bats are expected to use the habitats from October to March.
3. *Location*: Consult a biologist familiar with bat roost requirements for proper bat box placement. Bark on raptor perches and a snag is expected to provide foraging opportunities for birds as well as roosting opportunities for bats. Bat chamber-houses may be attached to the upper third of the perch and snag. Rocket style bat house are supported on their own posts and may be located in uplands or wetlands. The following applies to the proper placement of any style of bat house;
    a. The site should be sunny for approximately six hours. It is important for the house to receive the first sun light of the morning to warm up as soon as possible but not overheat in the late afternoon. The house should be large enough to allow the animals to adjust positions with the changing thermal conditions.
    b. Be a minimum of 15 feet above the ground.
    c. Clear of vegetation below the house for an unhindered flight path.
    d. Be within 0.5 miles of, and preferably adjacent to, water for nourishment and foraging on insects.
    e. Attach directly to large thermally stable structures such as concrete bridges. Check with the appropriate personnel before doing so.
    f. It is recommended to place predator shields around the supporting poles below the houses, particularly where there may be free-ranging domestic cats. Placing the houses over water may reduce predators.
4. *Quantity*: Two per acre may be sufficient. Two chamber houses can be placed on opposing sides of bird perch poles. Having a combination of rocket and chamber houses distributed throughout the site may yield the best results.
5. *Construction*: There are numerous sources of commercially constructed bat houses ranging from single to multiple chambers in a variety of designs and sizes. Constructing a bat house is not difficult but requires specific design and installation guidelines to be attractive to bats. Three commonly used designs include: chamber, rocket box, and Oregon wedge. Regardless of design, it is recommended that they be water tight and a dark color to absorb heat. Bats in Washington are not particularly numerous; therefore, two smaller structures per acre may be most appropriate. There are several information sources for the preferred installations and this document will refer the reader to these.
    a. Bat Conservation International http://www.batcon.org/home/default.asp
    b. Bats Northwest http://www.batsnorthwest.org/

6. *Suitable examples*:

Chamber house

Rocket box

Photo by Russell Link

Bird houses:

1. *Intent*: To create or replace lost nesting habitat.
2. *Target species*: Native birds
3. *Location*: Generally, bird houses and nest platforms are mounted on individual poles but may also be attached to trees, snags, or perch poles. These may be in upland, wetlands, or estuarine environments. Holes may be drilled near the top of snags. Open boxes or improved ledges should be located on the upper quarter of an open cliff face, shear surface, or bridge but not over water or on top of large flat surfaces, such as a tower roof.
4. *Quantity*: The quantity and style of bird houses depends on the target species. Designs vary considerably; therefore a biologist should be consulted on the appropriate design for the site.
5. *Construction*: Bird houses requiring annual maintenance are generally not recommended; however, several bird nest designs require little or no maintenance. Holes drilled in snags are attractive to several bird species; however, the hole should not compromise the structural integrity of the stem. Wire nest platforms are bowl-shaped and secured in a tree crotch. Snag holes, houses, and platform sizes and shapes are highly variable and are often species specific. The entrances, color, and design should be optimized to minimize use by invasive species such as English house sparrows, European starlings, and rock pigeons. There are numerous information sources for appropriate efforts on bird houses and species specific designs. Regional biologists and local special interest birding groups should be consulted to provide detailed assistance.
    a. Seattle Audubon: http://www.seattleaudubon.org/
    b. Falcon Research Group: http://www.frg.org/frg/index.html
    c. The Purple Martin Conservation Association: http://www.purplemartin.org/
6. *Suitable example*:

Peregrine nest box
Photo by Martin Muller

Ponds:

1. *Intent*: To provide pools for all wildlife, particularly aquatic-dependant species. Riparian edges will attract passerine birds and waterfowl.
2. *Target species*: Native amphibian, turtle, and bird (cedar waxwing, flycatchers, common yellowthroat, black-head grosbeak, and pond ducks) species. Snakes may forage on prey species attracted to ponds. It is assumed that invertebrate species will colonize the pond as the site matures.
3. *Location*: The ponds can be isolated or hydrologically connected to streams; however, keep in mind to grade the pond to avoid fish entrapment. Stream side channel pockets resembling a small pond are a variation of the intended purpose. Avoid creating suitable habitat in areas dominated by invasive species such as non-native turtle species (including snapping turtles and sliders) and bullfrogs.
4. *Quantity*: The number and sizes of ponds is often dictated by the wetland mitigation requirements therefore it is not appropriate for this document to provide guidance for this feature. If the number of ponds is an option then it is recommended to provide a mosaic of smaller ponds rather than a single large one.
5. *Construction*: Ponds may have a complexity of woody debris and live thin-stemmed vegetation. The ponds should dry out for at least two weeks during late July and August to reduce the establishment of a bullfrog population. In urban areas, persistent year round water should be avoided to reduce pestilent waterfowl; however, in rural areas year round water may be desirable where the likelihood of bull frogs is less likely. Isolated ponds should have a variety of depths whereas ponds hydrologically connected to fish bearing streams should be graded to drain as flood waters recede. Ponds should be shaded as much as possible to keep the water cool and minimize water temperature variation. Sandy soils surrounding the pond or used to construct islands within the pond may provide turtle egg laying habitat. Flowering and fruit bearing vegetation should be within sight of the pond and preferable at the waters edge.
6. *Suitable example*:

Site managers should expect alteration to plantings and structures by wildlife. Pestilent and invasive species are often attracted to wetland mitigation sites. Design considerations may limit problems with unwanted species, but seldom will an enhanced habitat be free of them. Occasionally, it may be necessary to dissuade, exclude, and perhaps eliminate destructive species. Wildlife can create unexpected changes to the intended design, but these conditions are not necessarily unwanted.

For example, native species like beaver are well-recognized for their role in building and maintaining a species-rich wetland plant and animal community. Their activities contribute to diverse habitat conditions that attract many species and provide an aesthetic quality. In these cases, it may be necessary to implement contingency actions or modify performance criteria for these unexpected, but desirable, conditions.

1. Select a well-drained site protected from cold winds, with good sun exposure (south-facing). Ensure that surface and ground water flows away from the site (i.e. build on upland areas). If not, drainage pipes below the frost line may be required to prevent flooding.

2. Your snake hibernaculum can be sized to fit the available space, but it must be deeper than the frost line (at least 2 meters deep). Snakes prefer an overwintering site that is close to the water table, but not flooded. Moist air ensures that snakes do not dehydrate over the dry winter months.

3. Place rubble in the bottom to create chambers for the snakes. Chambers created at different depths allow the snakes to move vertically and horizontally to select a preferred temperature/humidity microhabitat.

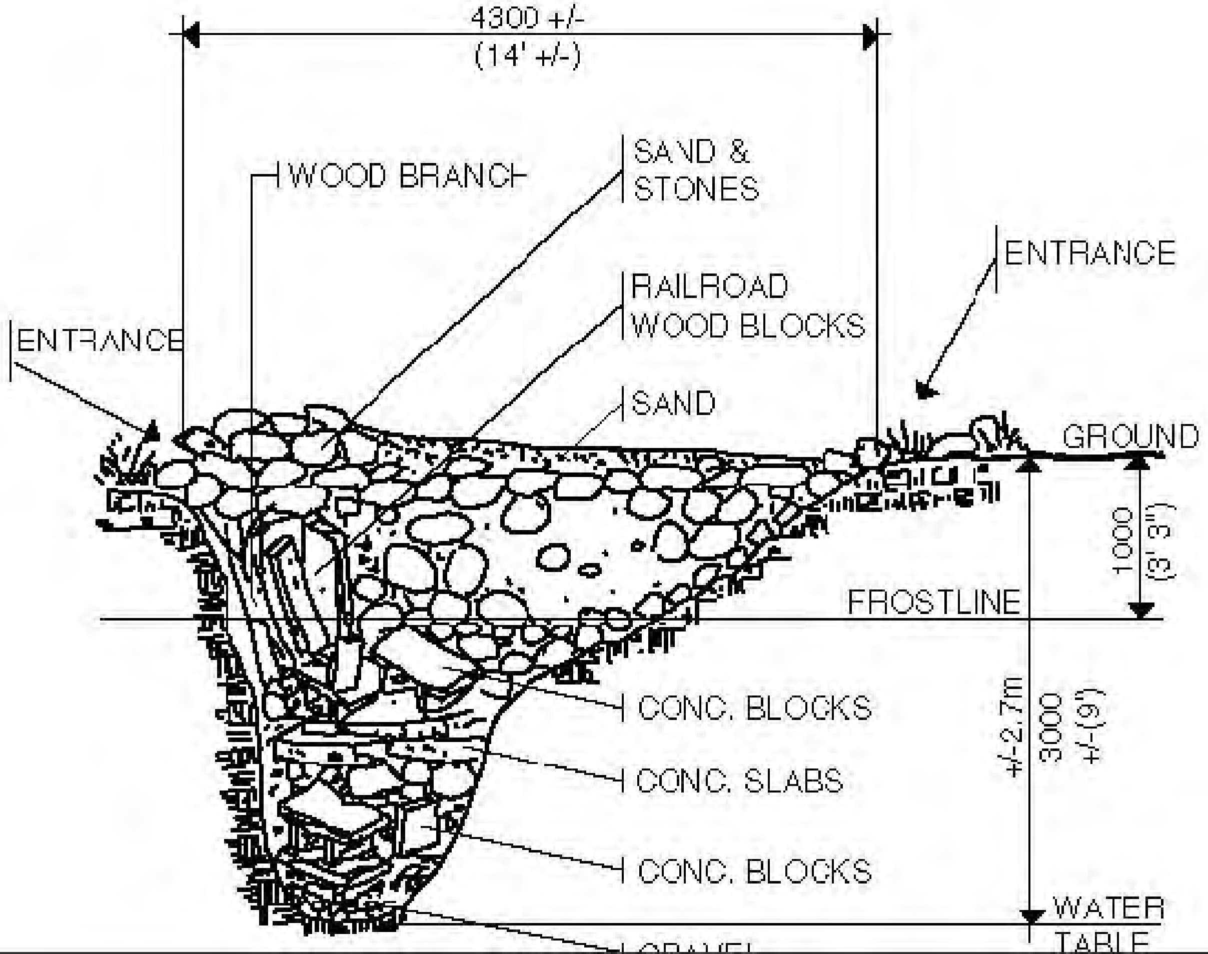
4. Concrete blocks or PVC drain pipes (with holes cut into the sides along the length of the pipe) can be used for entrances and passages to allow the snakes multi-level access. Snakes use these passage ways to move to the bottom of the pit and into the underground chambers. It is necessary to hand place the concrete blocks to ensure that a space or tunnel extends down into the bottom of the pit at each of the corners. Continue to fill the pit with larger rocks, old concrete blocks and slabs, maintaining as many openings and chambers as possible.

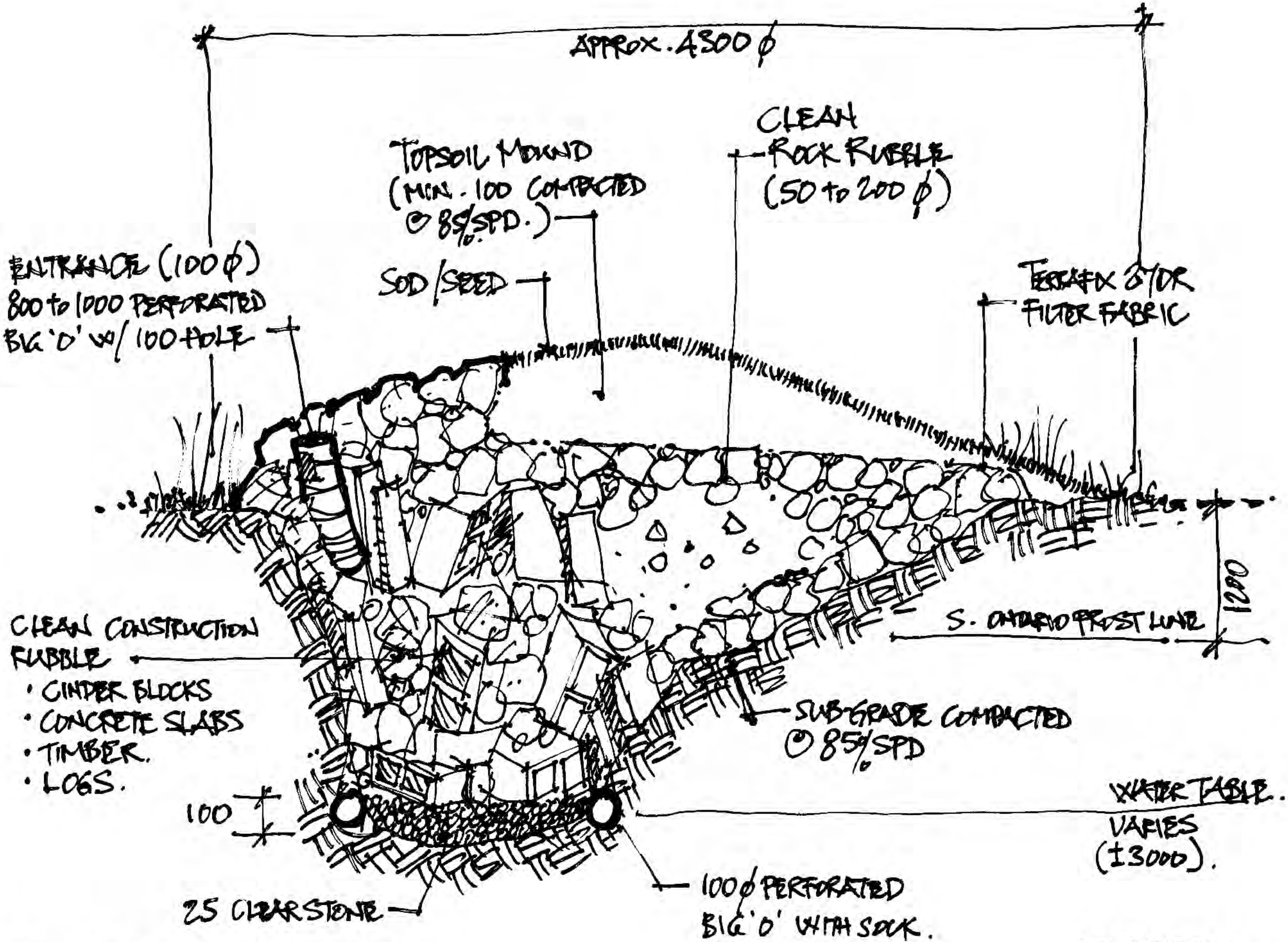
5. Cap with an insulating layer of smaller rock rubble. Be sure to leave the entrances open and keep the top clear of shrubs that may grow as the site matures.

6. Protect emerging snakes from predators by having cover objects such as logs, rock piles, brush and uncut grass nearby.

7. In the spring (mid April to late May), monitor your site to determine if wildlife are using the hibernaculum. Don�t get discouraged, it may take several years before snakes �discover� your hibernaculum.

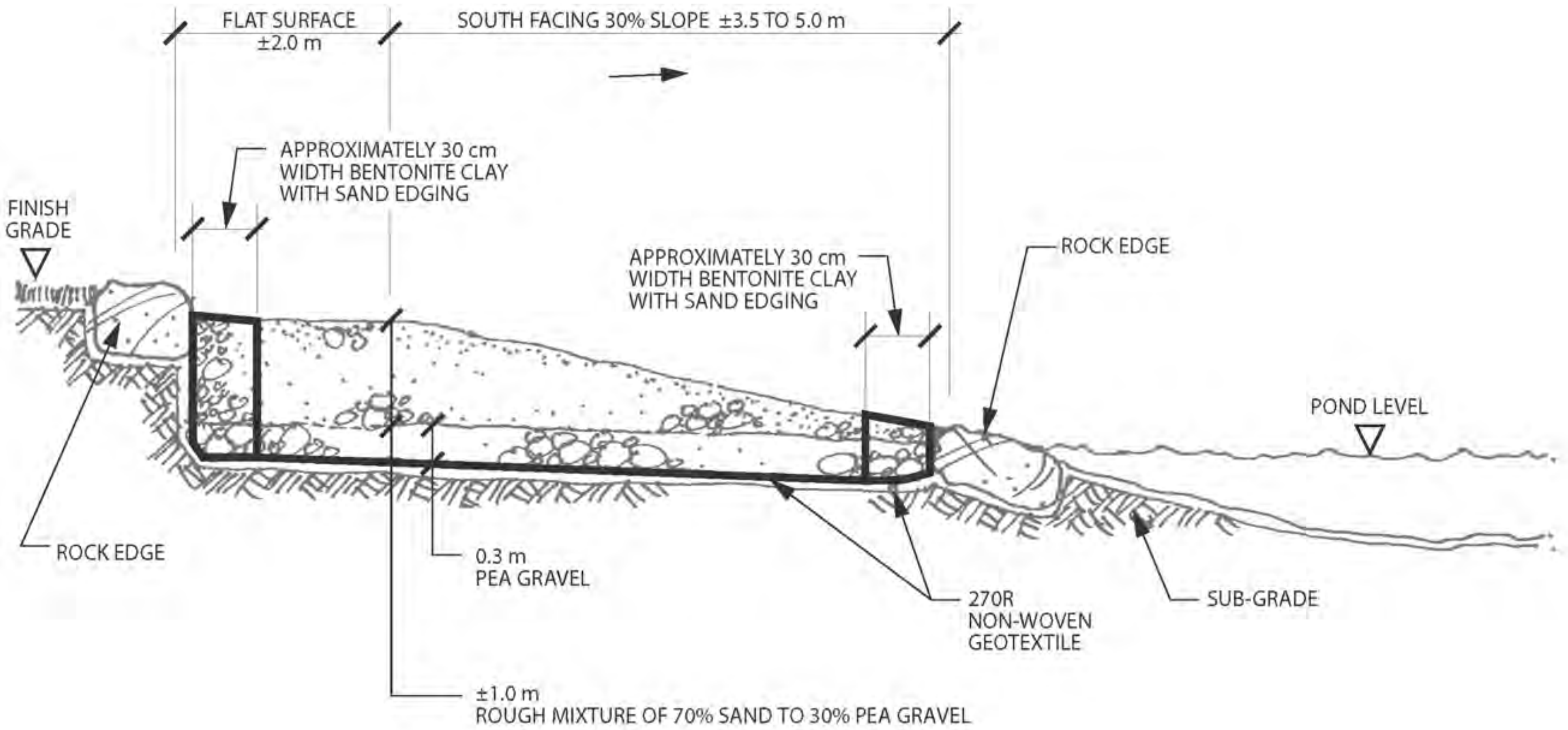
How to build a snake hibernaculum





SNAKE HIBERNACULUM

SAVANTA inc.



TURTLE NESTING BEACH

SECTION (Not to Scale)

SAVANTA

Structures for Wildlife & Upland Wildlife Habitat Management: NRCS Practice Code 649-645

Refer to:
https://efotg.sc.egov.usda.gov/references/public/IL/649IL.pdf
https://efotg.sc.egov.usda.gov/references/public/IL/645il.pdf

Structures for wildlife provide loafing, escape, nesting, rearing, roosting, perching and/or basking habitat for a multitude of different species including Bobwhite quail, rabbits, song birds, and others. These structures allow game species to escape predator species as well as places to survive the harsh winter. Wildlife structures can be made while doing other management, such as invasive species removal or timber stand improvement. Woody cover should be 0.1 - 1 ac for every 5 – 40 ac of suitable habitat. Nesting structures and snags can also give species additional places to produce offspring and make den sites.

Brush Piles

The most important function of a brush pile is to leave room for animals to get under it. Brush piles constructed by bulldozer or other machinery are often too large and dense for species like quail or rabbit, but provide great habitat for ground predators such coyotes, skunks, raccoons and opossums. Brush piles that are formed by hand are generally more open and better suited to a variety of wildlife species. A few small scattered brush piles (10 ft. diameter) are often more beneficial than one large one. Additional structures, such a pallets or tiles, can be incorporated into brush piles to leave open structure underneath. It is also very important to kill dense vegetation under and around the edges of the brush piles with glyphosate or another suitable herbicide. Maintaining bare ground ensures easy access for small game. This is especially important in areas with cool-season grasses like tall fescue, brome species and bluegrass species.

Follow these steps to build an effective brush pile:

1. Use glyphosate or another approved herbicide to kill grasses and other vegetation in the location you select for the brush piles.
2. Start with a base layer of parallel logs. Set these logs 8 - 12 in. apart on the ground. A pallet can also server as the base layer. Tiles can also be incorporated on the ground to help maintain structure of the cavities.
3. On top of your base layer, place logs perpendicularly, spacing the logs at 8 -12 in. apart as well. Repeat this step a few times to have several crosshatched layers. You can also stack a couple pallets together to serve as your base layer.
4. Start to cover the outside of the brush pile with smaller woody debris. Cover until there is excess small twigs and leaves built up on top of the brush pile.
5. Start to stack larger pieces of brush around the core of the brush pile. Stack the brush in a pyramid around the center. This brush will not fit tightly together, leaving some opening and structure around it.

You will want to build several brush piles across the property in this manner. Place brush piles strategically so that they will be around and functioning well into the future. Escape cover should never be more than 150 ft. apart. Brush piles will eventually break down and fall in on themselves. It is a good idea to re-build or build new brush piles periodically

Placing a firebreak around a brush pile will be useful in maintaining the brush pile, especially if prescribed burns are taking place on other parts of the property for habitat management. Excluding fire from brush piles is important in maintaining their functionality. Firebreaks should be placed around brush piles and tree plantings as well. These firebreaks can be planted with legume species such as alfalfa and clover, which will also serve as a food source for many wildlife species.

Pushing up brush with a tractor or other implement will make the brush roll up, making it too dense for wildlife to penetrate.

Brush piles can also be formed in the middle of the woods to make additional wildlife cover.

Edge Feathering

Edge feathering is a technique used to create a shrubby transitional zone between the woodland and grassland or cropland. This type of edge habitat is preferred by many wildlife species such as deer, quail, and rabbits. This also benefits the timber because the species generally selected to edge feather are less desirable species. Undesirable species will include Osage orange (hedge), locusts, elms, maples, cottonwoods, and others. An appropriate herbicide should be applied to the stumps of undesirable species and to the vegetation in the areas where the trees will fall.

Edge feathering can be completed by thinning along a forested edge. The area to be thinned should be between 60 and 90 ft. wide. This area should be split into three zones. In the first zone 75% to 100% of the trees should be cut, leaving only the best quality over story trees and any shrubs found. In the second zone 50% of the over story trees should be cut. Finally, in the third zone, 25% of the over story trees should be cut. These trees should be “hinged” or cut completely parallel to the forest edge. Hinge cutting is cutting a tree not all the way through, but leaving a part of the tree connected when it falls. The area that is still connected will sometimes live on for a couple more years creating a living brush pile. The tree will eventually die leaving all the additional woody structure along the edge until natural processes break it down. This leaves woody escape cover for wildlife, help buffer the edge during snow storms, and “soften” the edge for edge species, such as rabbit and quail, to use.

Another way to establish a feathered edge is to plant shrubs and field boarders along the forest. This area should be at least 30 ft. wide; however 50 ft. + is preferred. This area is often very unproductive for row crops and can save the landowner money by being put into field borders. The first half from the forest edge should be planted in native shrubs on 6 ft. x 6 ft. spacing. Desirable species include grey dogwood, American plum, and hazelnut. The second half should be planted native grass and wildflowers. This method provides a gradual step down from mature trees to shrubs to grasses.

A feathered edge can also be created by natural regeneration. By not mowing or cutting along a forested edge, small trees and shrubs will start to grow and expand away from the forest edge. Special care should be taken to make sure the trees and shrubs using this space are not invasive and are desirable species.

Edge feathering can create escape cover and winter cover for a variety of wildlife species by trimming and cutting undesirable species along the edge.

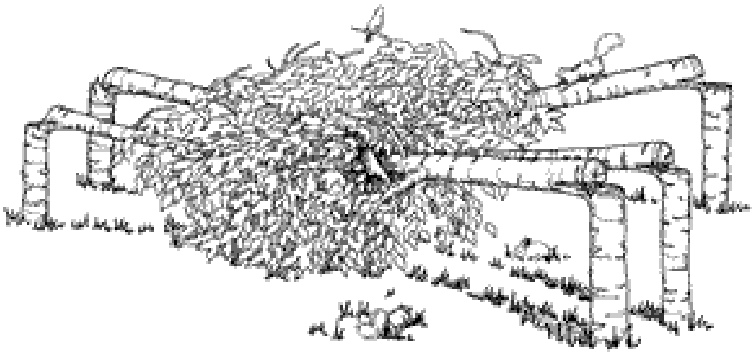
Hinge Cut Brush Piles

In an interior forest stand situation, brush piles and hinge cut brush piles can be formed. In an area where you have a surplus of trees, poor quality trees or undesirable species, you can cut/hinge cut the trees to fall on top of one another, creating a brush pile and adding light to the ground layer to stimulate herbaceous vegetation and oak/hickory regeneration. These areas will serve as escape cover while providing additional annual plant food resources.

To complete this process, identify several undesirable trees in an area that are in close proximity. No desirable trees should be in the area where you intend to drop the undesirable trees to prevent damage to those trees being left. Then you will cut/hinge cut trees so that they all fall onto the same area. Hinge cuts may be beneficial to leave some of the tree tops living for an additional time.

Undesirable species to target will include Osage orange (hedge), locusts, elms, maples, cottonwoods, and others. Herbicide should be applied to the stumps of undesirable species to prevent re sprouting. Ill formed desirable species can also be cut to form this type of brush pile, especially in areas where better formed desirable trees may be present.

It is not necessary to treat desirable species stumps unless you do not want them to re-sprout. Treating the stumps with herbicide may reduce the ability of the tree to continue to leaf out in the areas that are still connected in a hinge cut. Brush piles can also be formed from tree tops during harvest events on the property by having the logger drop the trees onto each other where possible.



(From: Landscaping for Wildlife in the Pacific Northwest. Drawing by Jenifer Rees.)

Snags and Nesting Boxes

Snags (dead trees left standing) provide an ample amount of nesting and den cavities for a variety of wildlife species to live in. Leaving snags across your property will produce additional nesting and den sites for a variety of species. Snags are provided through natural mortality of trees or through manual girdling and treating with an approved herbicide. This can be done on less desirable trees while preforming other management activities, such as timber stand improvement.

If there are not many snags in an area, it may be beneficial to build artificial nesting structures, such as wood duck nesting boxes. There are a variety of boxes that can be built for multiple species. Be sure to select a box design for a species that is going to be present in the habitat you intend to place the structure (i.e. do not put a structure for a grassland species in a forest). Links on construction of these structures are below:

http://www.illinoisraptorcenter.org/ENewsletter/WOODPROJ.pdf
http://extension.missouri.edu/p/G9413
https://www.extension.purdue.edu/extmedia/FNR/FNR-246-W.pdf
http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/birds%20and%20birding/pub419.pdf

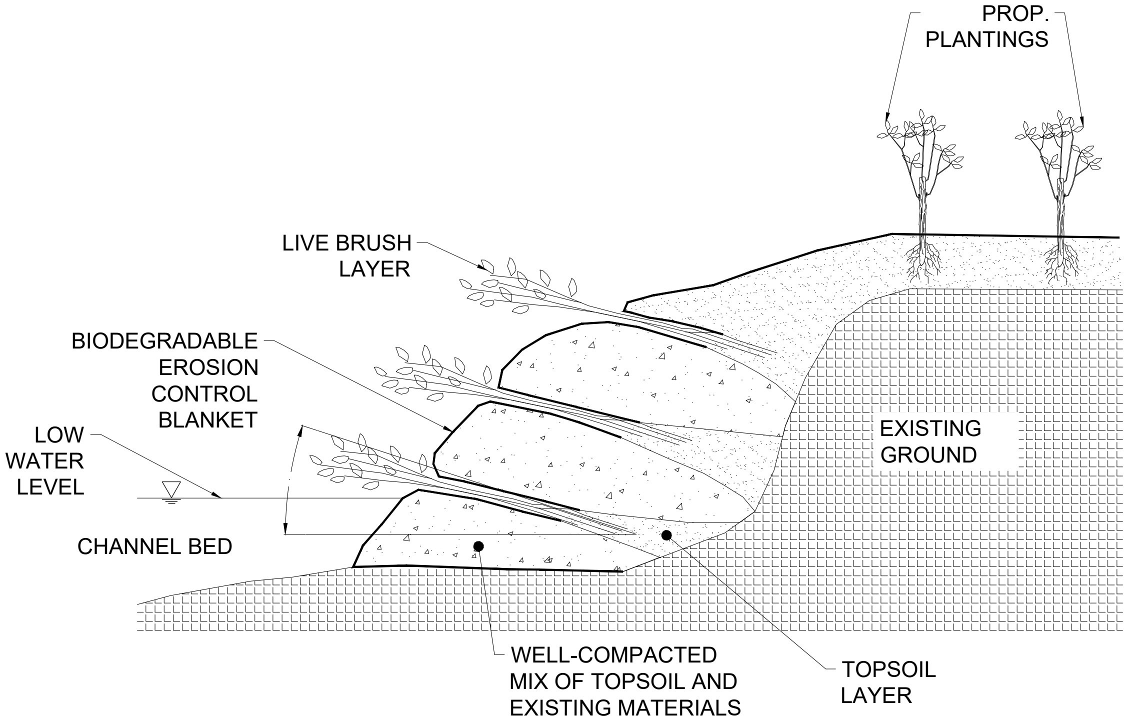
More useful information about brush piles and edge feathering is available at:

Videos:
https://www.youtube.com/watch?v=Gy6hGunlpK8
https://www.youtube.com/watch?v=ZN2OGIOD8c8

Links:
https://dnr.state.il.us/orc/wildliferesources/pubs/guide/management/tipntech.htm
http://dnr.wi.gov/files/pdf/pubs/wm/wm0221.pdf
http://www.in.gov/dnr/fishwild/files/Wildlife_Brushpile_Jobsheet.pdf
http://mdc.mo.gov/your-property/wildlife-your-property/small-game-your-property/better-rabbit-habitat
http://mdc.mo.gov/your-property/problem-plants-and-animals/invasive-plants

Appendix F

Example Restoration Design Typicals for Natural Channel Design



Notes:

1. Depending on timing of construction, live brush layers shall either consist of container grown plantings or dormant cuttings.
2. Species and quantities of plant materials to be used are specified in the table below.
3. Brush layers to be installed in lifts 0.2 m high.
4. Number of lifts depend on bank height and slope.

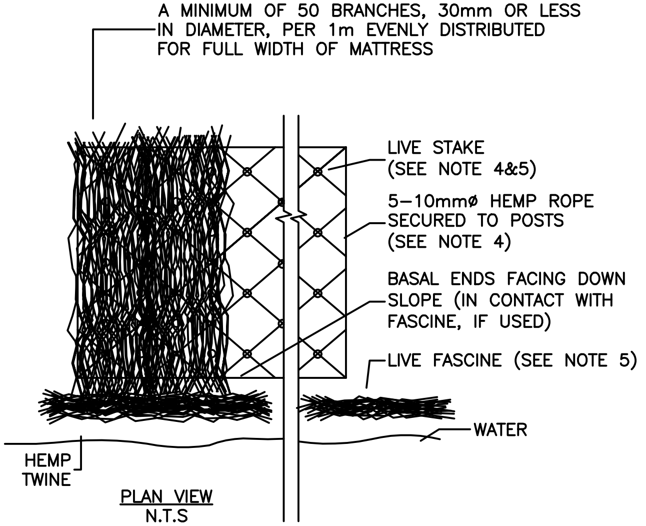
Species and Quantities

Scientific Name	Common Name	Quantity
Salix discolor	Pussy Willow	TBD
Salix interior	Sandbar Willow	TBD
Cornus sericea	Red Osier Dogwood	TBD

BRUSH LAYERING DETAIL

(NTS)

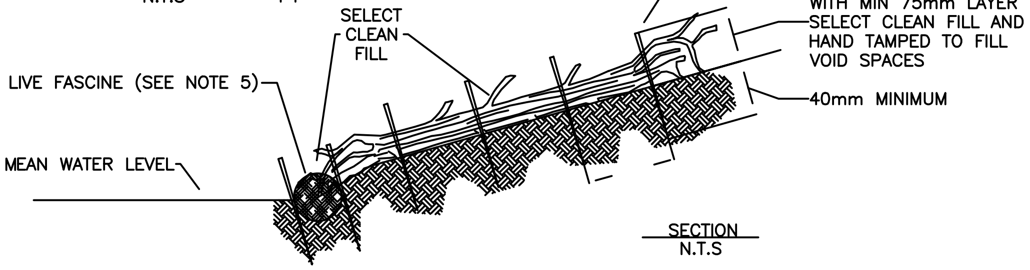
GEI Consultants



PLAN VIEW
N.T.S

NOTES:

1. LAYERS SHALL BE COMPRISED OF LIVE QUICK-ROOTING SPECIES
2. FILL MATTRESS WITH SOIL AND EVENLY DISTRIBUTE TO APPROXIMATELY 100mm IN DEPTH AND HAND TAMP
3. PLACE LIVE STAKES EVENLY OVER THE GRADED SURFACE AT 0.75 m SQUARE SPACING
4. STRETCH 5-10mm (DIAMETER) ROPE DIAGONALLY FROM ONE LIVE STAKE TO ANOTHER BY TIGHTLY WRAPPING AROUND POSTS. NO CLOSER THAN 150mm FROM THE TOP OF POST. POUND STAKES TO COMPRESS MATTRESS.
5. LIVE FASCINES AND LIVE STAKES ARE TO BE INSTALLED WHEN AND WHERE DIRECTED BY GEI.
6. PLACE LIVE FASCINES IN THE TRENCH. DRIVE WOODEN STAKES DIRECTLY THROUGH FASCINE BUNDLES APPROX. 610-914mm APART. LEAVE TOPS OF STAKES FLUSH WITH INSTALLED BUNDLES. PLACE MOIST SOIL ALONG SIDES OF BUNDLES. COMPACT SOIL BY WALKING ON IT AND THE BUNDLES. LIVE FASCINES SHOULD NOT BE COMPLETELY BURIED; A FEW TWIGS AND LEAVES SHOULD BE VISIBLE AND STICK THROUGH.



SECTION
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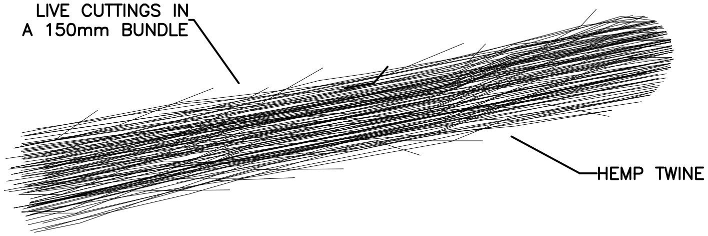
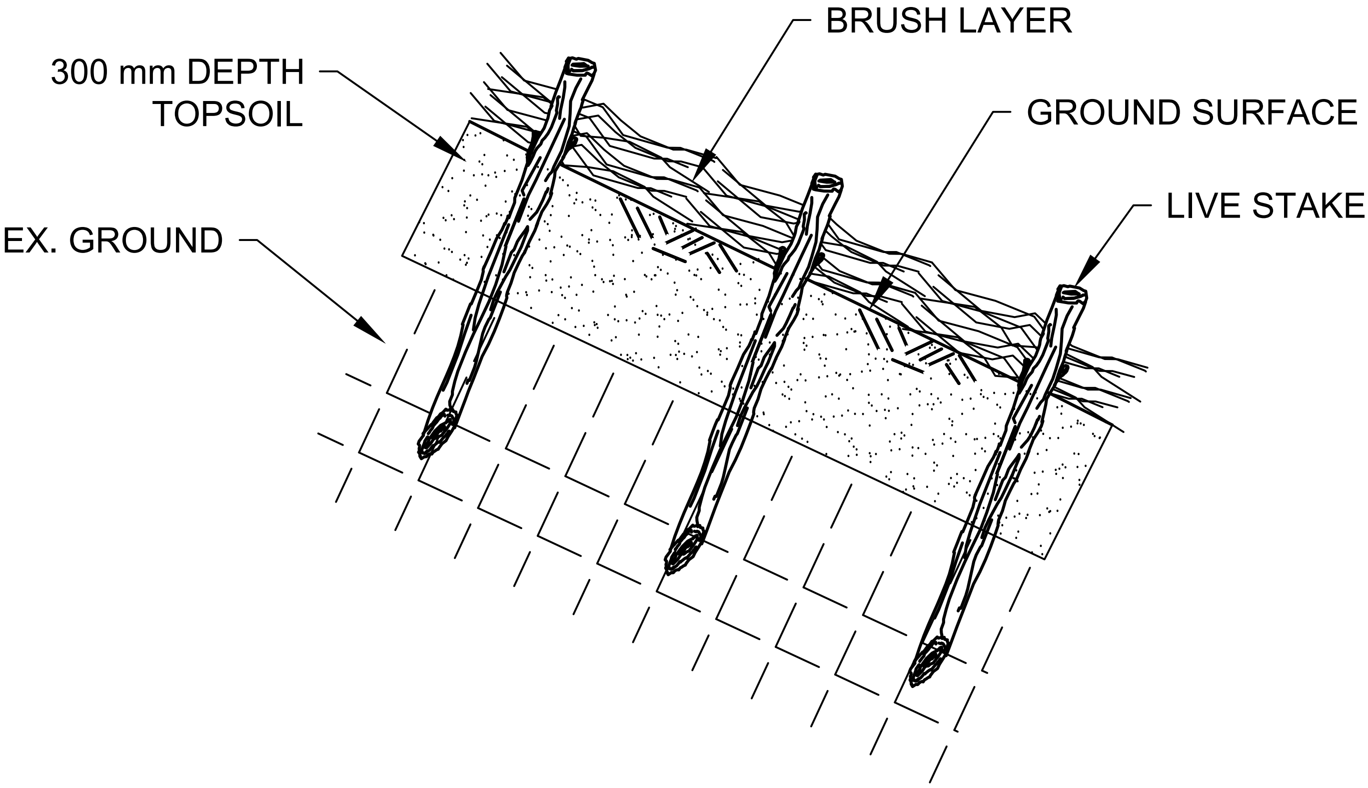


TIED BUNDLES OF LIVE CUTTINGS
PERSPECTIVE VIEW

BRUSH MATTRESS DETAIL
(NTS)

GEI Consultants



Notes:
1. Live stakes shall be cut from dormant materials
2. Live stakes shall be a diameter of 2-4 cm and a length of 1-1.5 m.
3. Make an angle cut at the bottom of the stake.
4. Trim all side branches, taking care not to damage the bark.
5. ~80% of the live stake to be below surface.
6. Gently tamp the live stake into the ground perpendicular to the ground surface.
7. If the soil is compact, a pilot hole made with a steel bar should be used.
8. If using a pilot hole, repack soil around the stake.
9. Do not plant upside down.

Species and Quantities

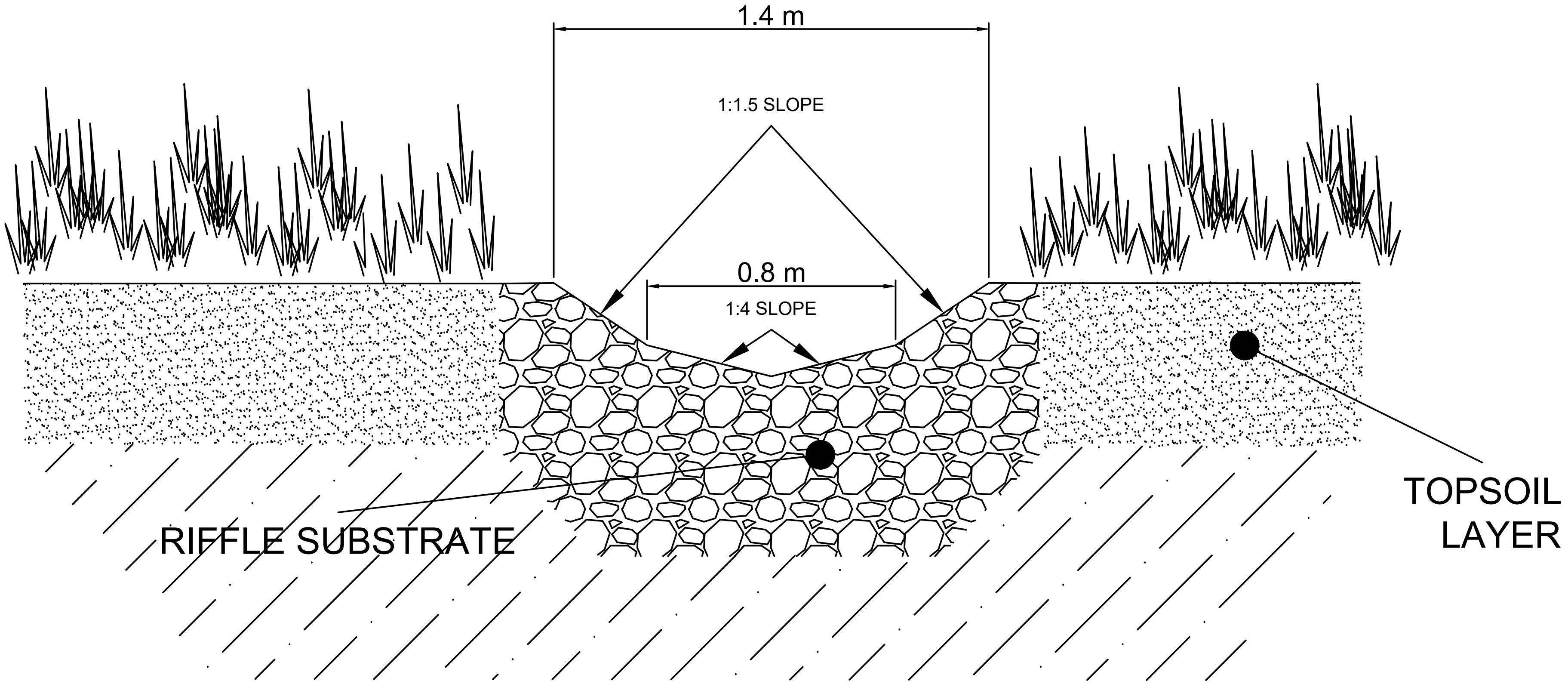
Density = 4 stakes/ m²)

Scientific Name	Common Name	Quantity
Salix discolor	Pussy Willow	TBD
Salix interior	Sandbar Willow	TBD
Cornus sericea	Red Osier Dogwood	TBD

LIVE STAKES SECTION DETAIL

(NTS)

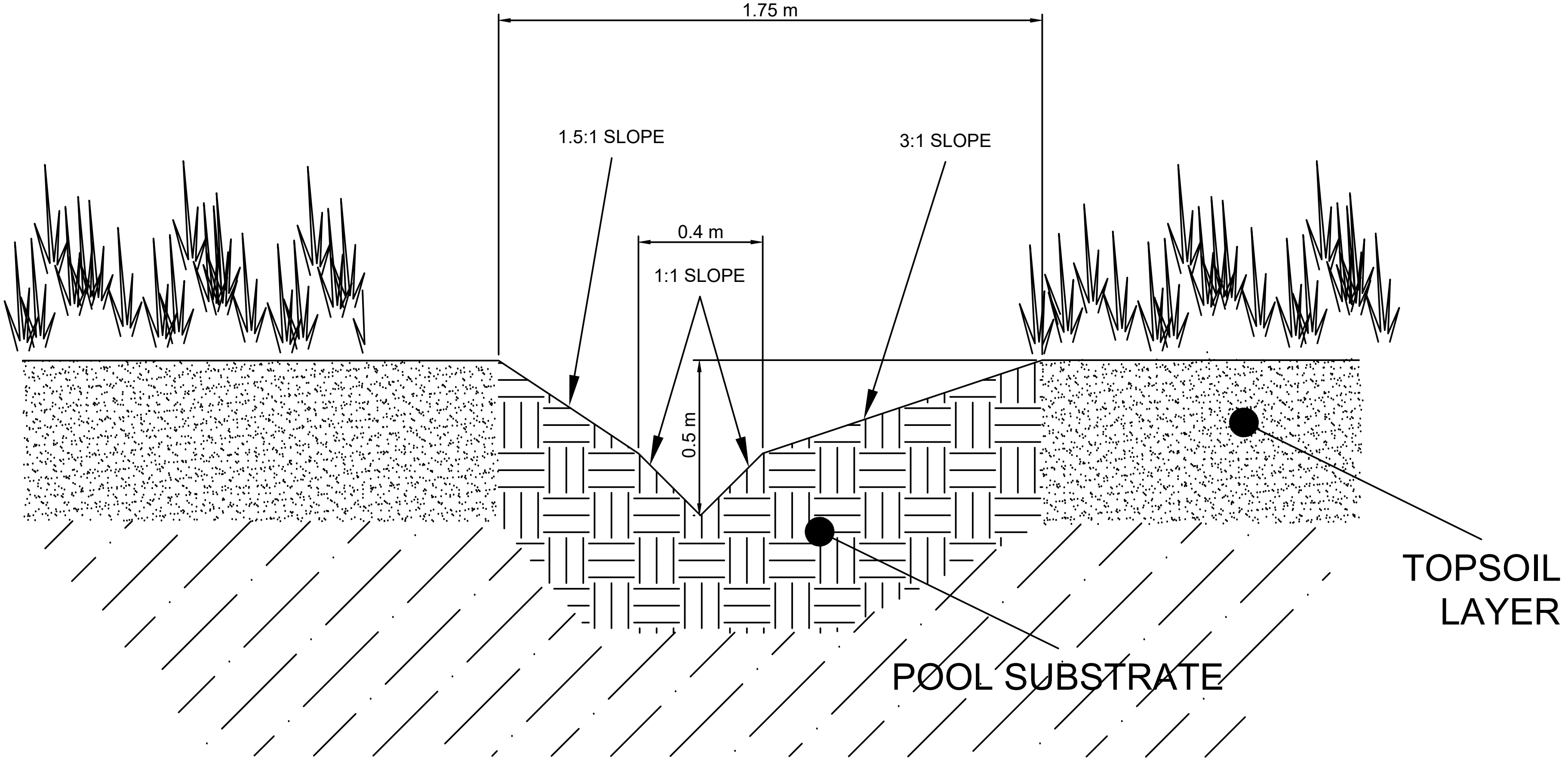
GEI Consultants



TYPICAL UPSTREAM RIFFLE CROSS SECTION DETAIL

(NTS)

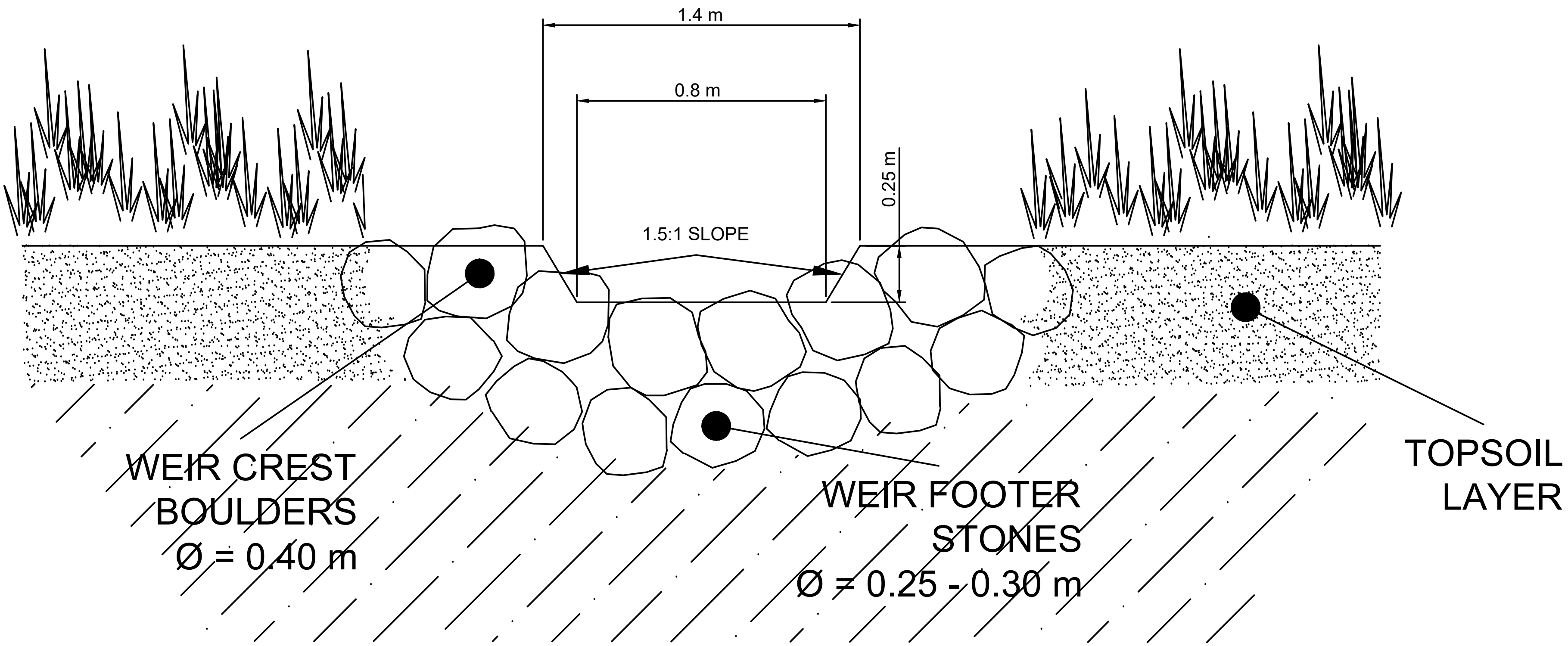
GEI Consultants



TYPICAL UPSTREAM POOL CROSS SECTION DETAIL

(NTS)

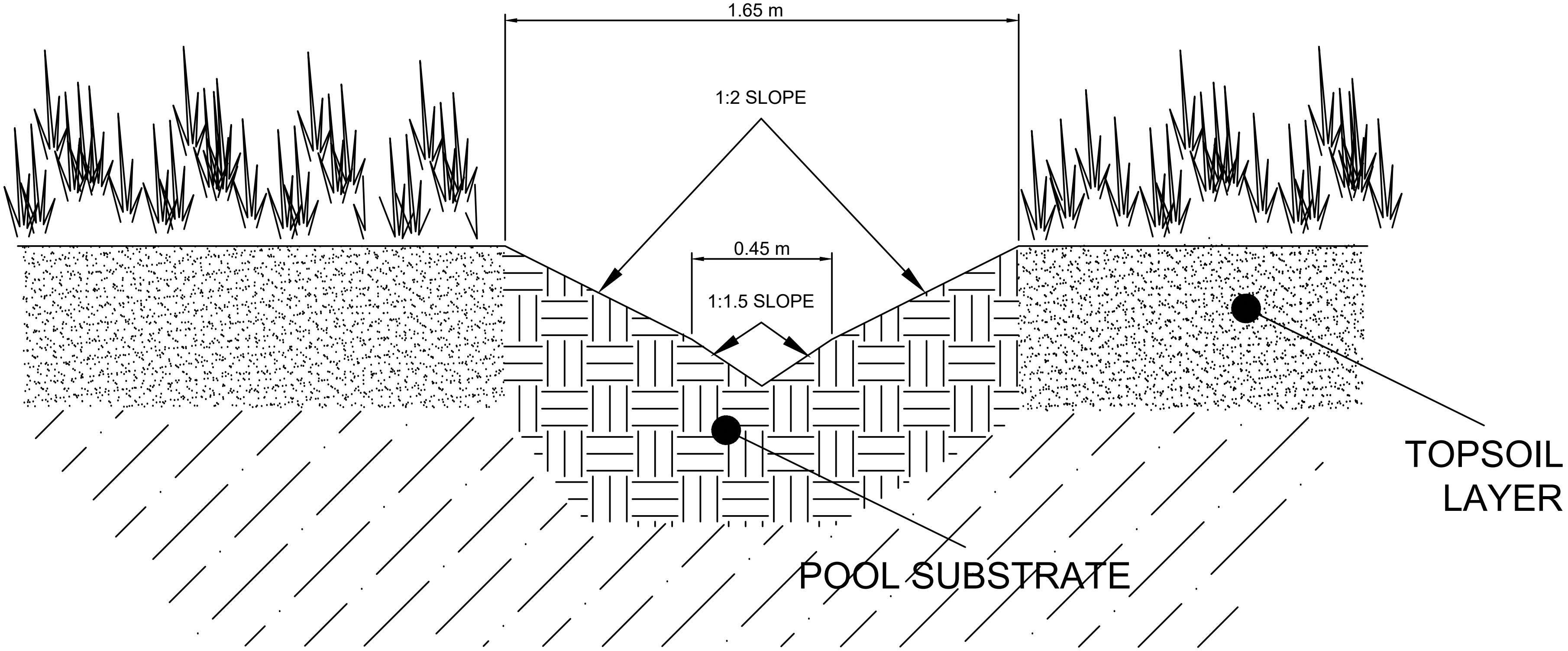
GEI Consultants



TYPICAL DOWNSTREAM ROCK WEIR CROSS SECTION DETAIL

(NTS)

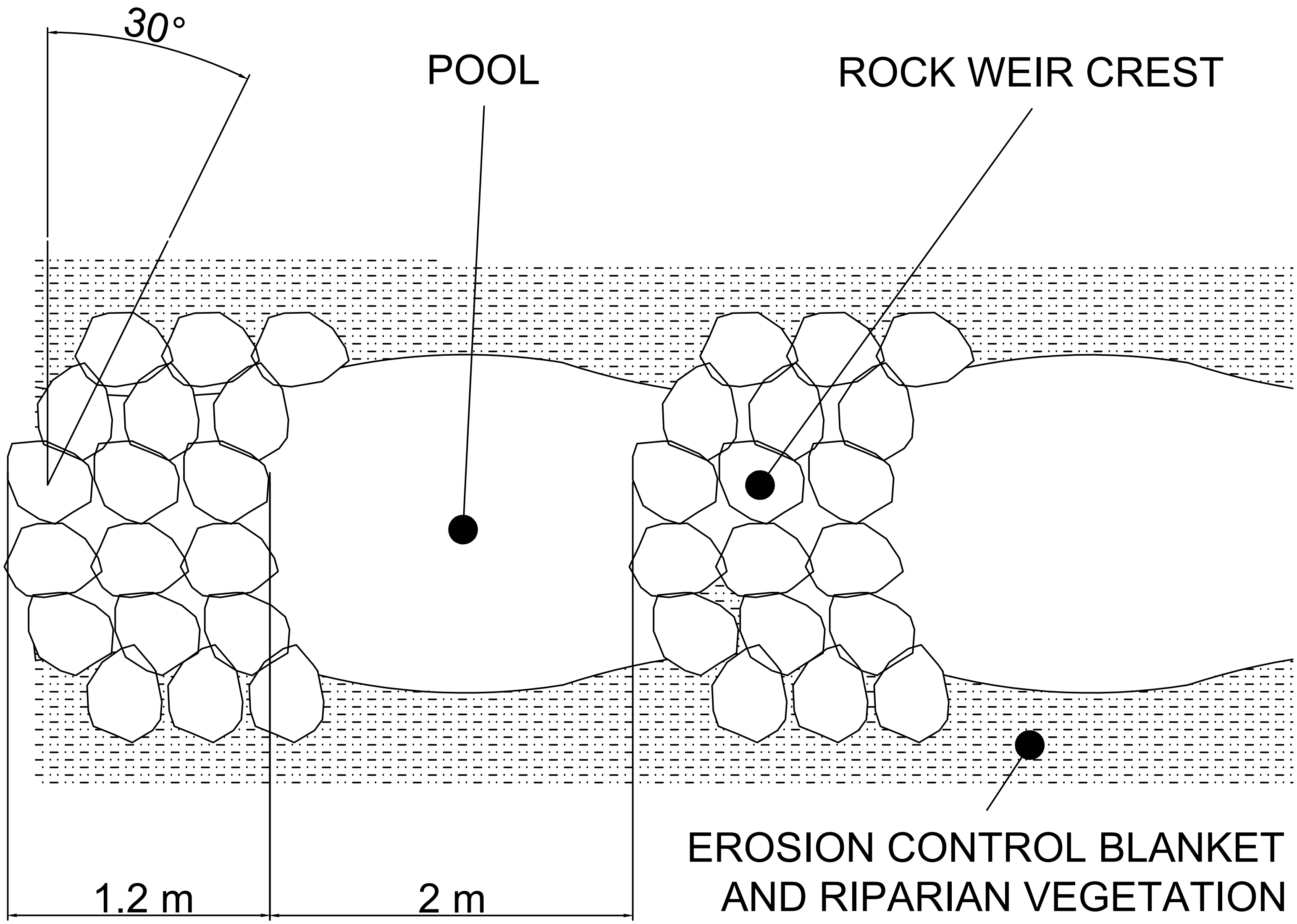
GEI Consultants



TYPICAL DOWNSTREAM POOL CROSS SECTION DETAIL

(NTS)

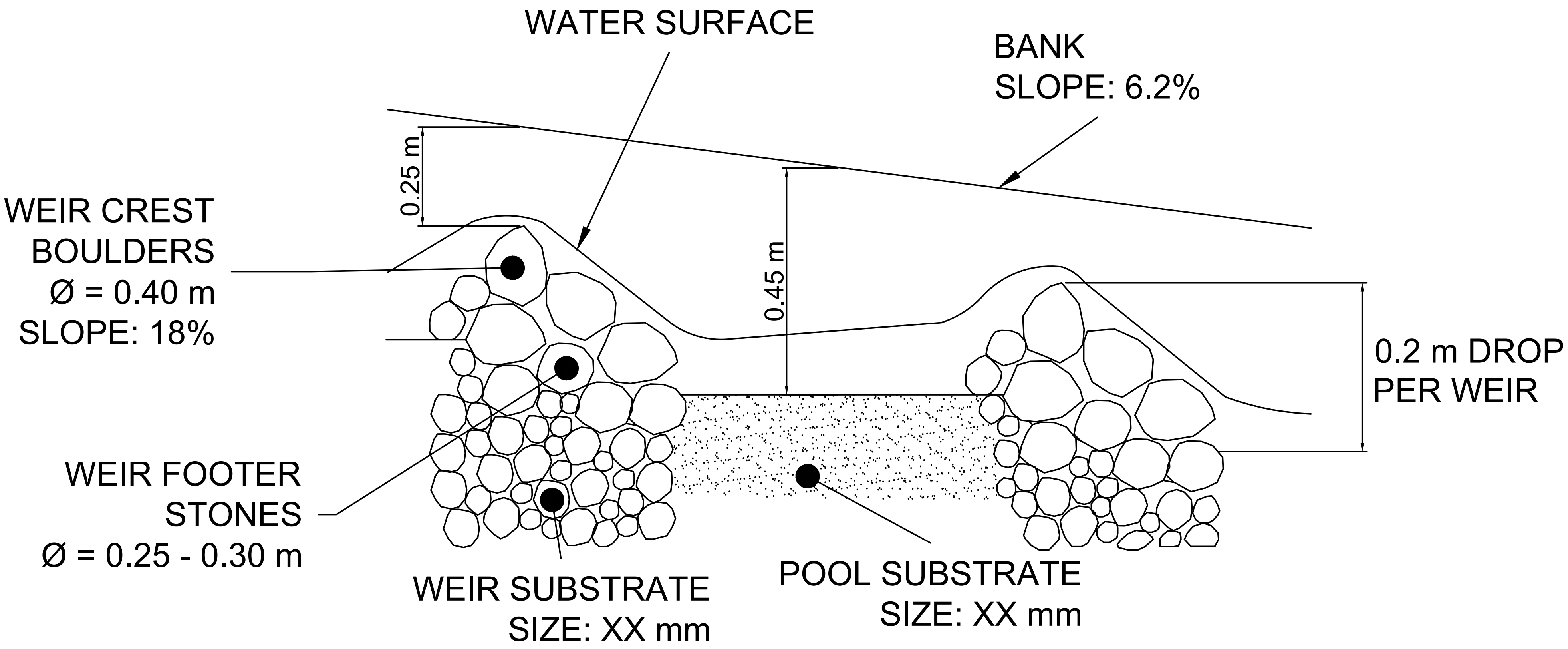
GEI Consultants



ROCK VORTEX WEIR AND POOL PLAN VIEW DETAIL

(NTS)

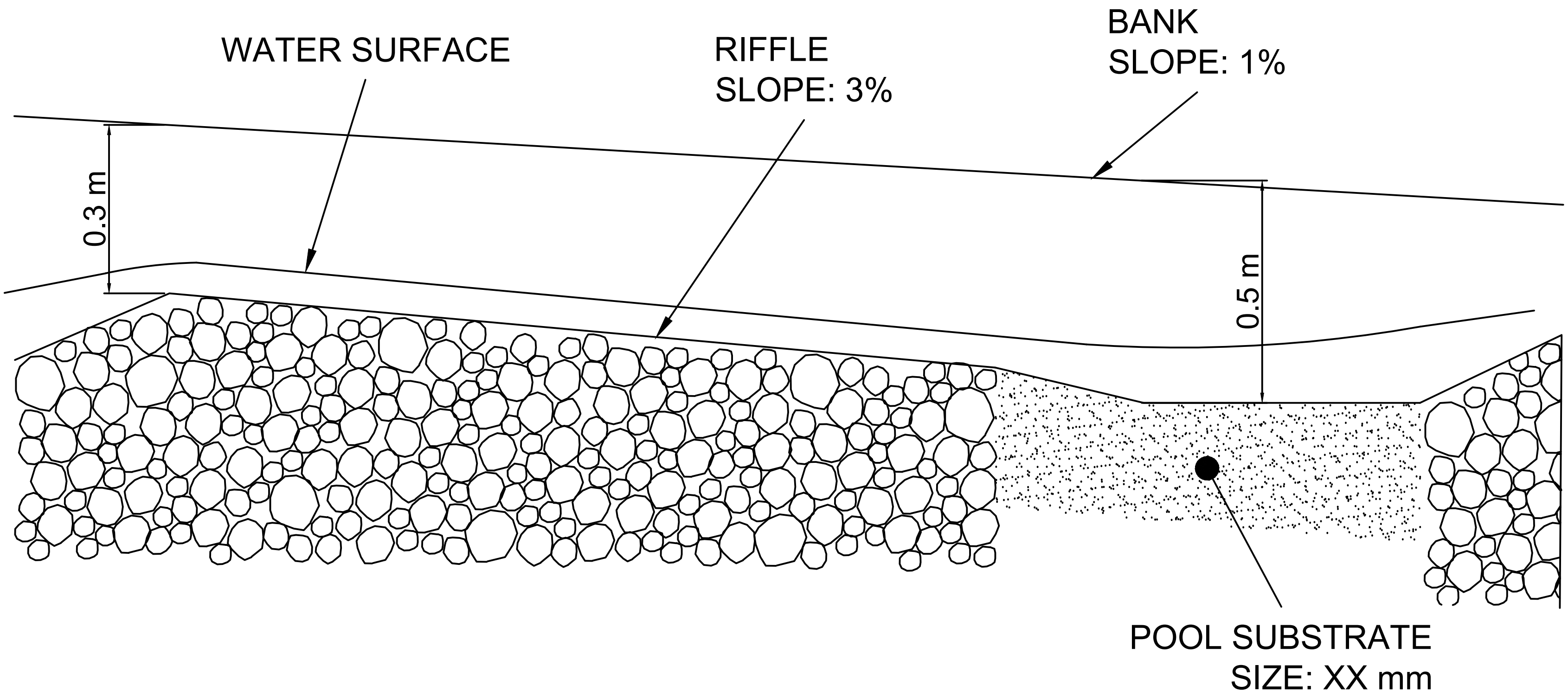
GEI Consultants



ROCK VORTEX WEIR AND POOL PROFILE DETAIL

(NTS)

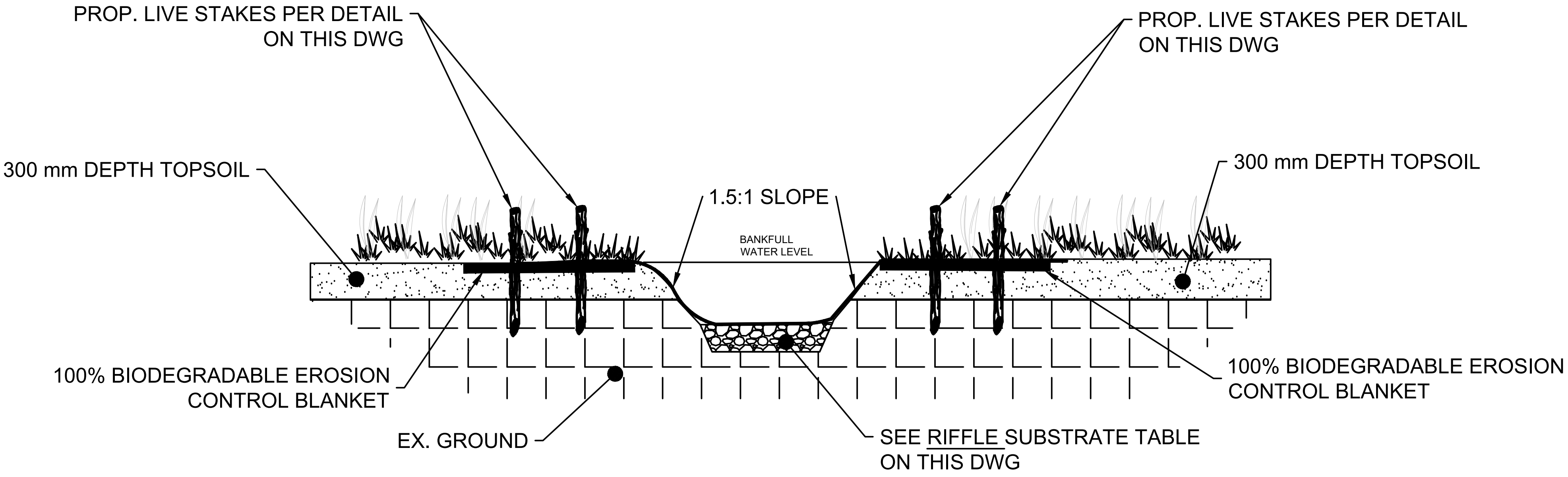
GEI Consultants



UPSTREAM RIFFLE AND POOL PROFILE DETAIL

(NTS)

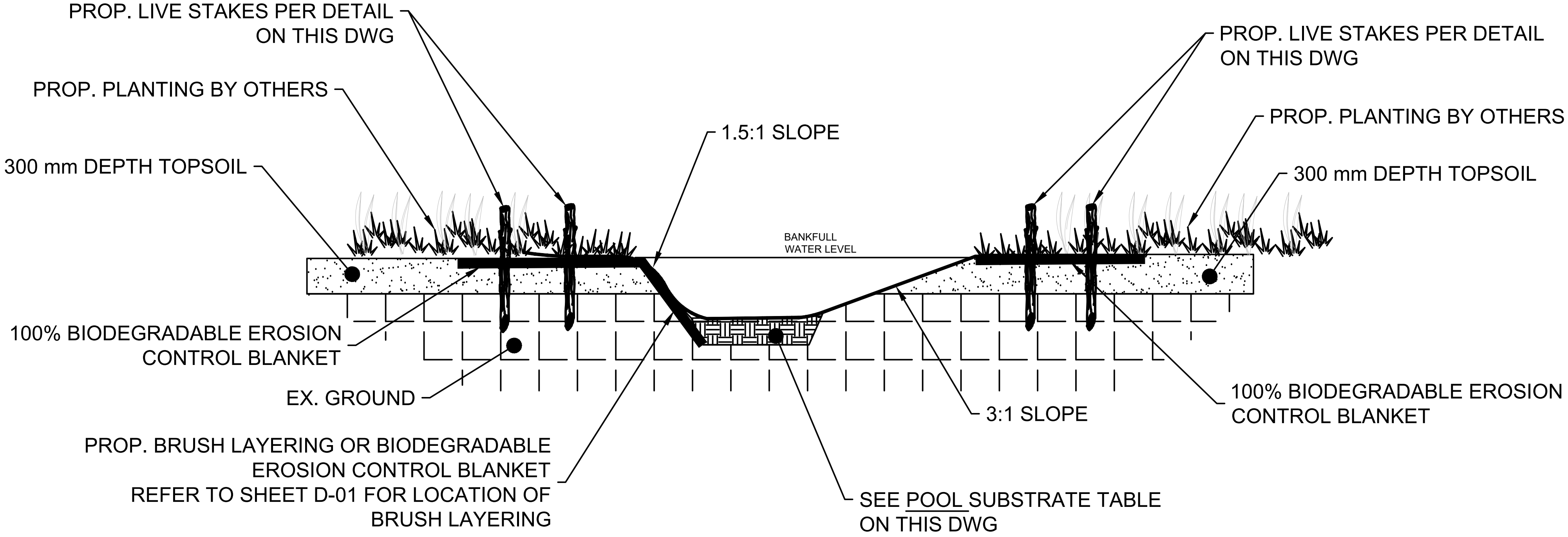
GEI Consultants



TYPICAL CHANNEL RIFFLE CROSS SECTION DETAIL (WITH LIVESTAKES)

(NTS)

GEI Consultants



TYPICAL CHANNEL POOL CROSS SECTION DETAIL (WITH LIVESTAKES)

(NTS)

GEI Consultants

Appendix G

Arborist Report

Arborist Report and Tree Preservation Plan

Tullamore Employment Lands

Town of Caledon, Ontario

Submitted to:
Tullamore Industrial LP
75 Tiverton Court
Markham, ON
L3R 4M

Prepared by:
GEI Consultants Ltd.
100-75 Tiverton Court
Markham, ON
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Revised May 24, 2023
Project # 2100975

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B. Tables

AUTHOR INITIALS:SB

Document1

1. Introduction

GEI Consultants Ltd. (GEI) was retained by Tullamore Industrial LP to prepare an Arborist Report and Tree Preservation Plan (TPP) for the Tullamore Employment Lands in the Town of Caledon, Ontario (herein referred to as the Subject Lands; **Figure 1, Appendix A**). The Subject Lands are generally located north of Mayfield Road, west of Airport Road, east of Torbram Road and south of Old School Road. The Subject Lands consist primarily of actively managed agricultural fields, with two tributaries of the West Humber River flowing through the site, and Salt Creek traversing the northeast corner of the Subject Lands. The tributary closest to Torbram Road is located within the Greenbelt Planning Area and is designated as part of the Natural Heritage System (NHS) under the *Greenbelt Plan* (2017).

The proposed commercial and industrial development for the Subject Lands is preliminary (**Figure 1, Appendix A**), and the Draft Plan does not show specific locations of buildings, internal roadways or parking lots. A primary road network running north to south and east to west through the site is shown, along with stormwater management areas (SWMP) and designated Environmental Protection zones, plus the Greenbelt Planning Areas. Preliminary site statistics are summarized below:

- Blocks 1 to 8 to be developed with a total area of 144.996 ha;
- SWMPs with an area of 9.406 ha;
- Greenbelt Plan Area and Environmental Protection Areas with an area of 30.174 ha; and
- Total site area of 202.9 ha.

GEI completed a tree inventory on the Subject Lands in June 2021. Additional lands were purchased by the owner in 2022 and will be part of the second phase of the development. These areas are shown on **Figure 1, Appendix A**. This report presents the results of the tree inventory, excluding the additional lands that will be inventoried at Site Plan, identifies opportunities for tree preservation and protection, recommends measures to protect retainable trees, and proposes compensation for tree removals. The objective of the Tree Preservation Plan is to retain existing tree cover wherever feasible and to minimize the risk of injury to trees identified for protection. The preparation of this report was guided by the Town of Caledon *Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation* (2020).

2. Methodology

GEI completed a tree inventory within the Subject Lands on June 23–25 and June 27, 2021. All live trees with a diameter-at-breast-height (DBH) of 10 cm and greater were tagged and assessed. Trees in hedgerows were tallied. The locations for all inventoried trees were recorded in UTM coordinates using a sub-meter capable GPS unit or a handheld GPS unit, and the following information was noted: species, DBH, health category (biological, structural, and overall), crown radius, and notes regarding the assigned health category.

Tree health was categorized as good, fair, or poor. Trees categorized as “good” overall had at least 80% live canopy and showed no significant structural defects (e.g., weak limbs, girdling roots, stem lean) or evidence of biological damage (e.g., insect damage, fungal growth, leaf dieback). “Fair” trees were those with 50% to 80% live canopy and showed no significant structural or biological defects, or the tree had over 80% live canopy but did show some evidence of structural defects and/or biological damage. Trees categorized as “poor” were those with less than 50% live canopy and/or had significant structural defects and/or biological damage.

3. Tree Inventory

A total of 553 individual trees were mapped and assessed during this tree inventory and 76 trees in six hedgerows were tallied (**Figure 2, Appendix A**), for a total of 629 trees inventoried. **Table 1** (**Appendix B**) outlines the results of the tree inventory, including the tree identification number, species, DBH, crown radius, health category (biological, structural, and overall), notes regarding the assigned health category, recommendations for preservation or removal, and number of compensation trees required for removals. **Table 2** (**Appendix B**) outlines the results of the hedgerow tally, including the hedgerow identification number, species, DBH range, overall health category, recommendations for preservation or removal, and number of compensation trees required for removals.

The inventoried trees included 25 different species, including two hybrids. Of the 629 inventoried trees (including hedgerow trees), 124 (20%) are native to the Greater Toronto Area (TRCA 2017). Following analysis of anticipated impacts to the inventoried trees, it was determined that 5 individual trees and 15 trees in two hedgerows are recommended for preservation (for a total of 20 preservation trees). The remaining 548 individual trees and 61 trees in four hedgerows are recommended for removal (for a total of 609 removal trees) due to anticipated construction impacts. Further detail is provided in the following subsections.

3.1 Preservation Trees

Preservation trees are those that are located outside of the proposed construction footprint and are unlikely to be impacted by the proposed construction or can likely be preserved using tree protection measures, as described in **Section 4**. Of the 629 inventoried trees, 20 are preservation trees.

3.2 Removal Trees

Removal trees are those that are located within or in proximity to the proposed construction footprint and cannot be adequately protected. Of the 629 inventoried trees, 609 are removal trees. Compensation for removal trees is discussed in **Section 5**.

The proponent should ensure that the works are in conformance with the *Migratory Birds Convention Act, 1994* and the *Endangered Species Act, 2007*. Specifically, tree removals should comply with timing window restrictions with regards to the protection of nesting birds and species at risk bats. Where these timing windows cannot be avoided, it is recommended that a qualified ecologist conduct a nest search and bat habitat assessment prior to tree removals.

It should be noted that a signed consent letter is required for any tree removals that occur along a shared lot line. However, no shared trees will be removed.

4. Tree Protection Program

GEI inventoried 629 trees within the Subject Lands. Of these, 20 are preservation trees. Preservation trees are separated from the proposed development by the Greenbelt Planning Area, and therefore do not require any additional tree protection measures.

5. Compensation Requirements

The Town of Caledon requires compensation for the removal of healthy trees 10 cm DBH and greater within tableland areas. **Table 3** below provides the ratio of tree replacements required for tree removals according to size, based on the Town of Caledon Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation (2020). Healthy trees were defined as those trees which were not assessed to be in poor condition for any of the biological, structural, and overall health categories.

Table 3 – Ratio of Tree Replacement for Private Trees

DBH of Tree to be Cut or Removed	Number of Replacement Trees Required	Number of Tree Removals	Number of Removal Trees Requiring Compensation	Number of Proposed Replacement Trees
10 – 20 cm	1	234	226	226
21 – 35 cm	2	177	166	332
36 – 50 cm	3	83	74	222
51 – 65 cm	4	23	17	68
> 65 cm	5	31	14	70
10 – 20 cm	1	234	226	226

Accordingly, a total of 918 trees are proposed to be planted as compensation for those removed through the construction of the proposed development.

Should it be determined that the compensation plantings will occur on site, a Landscape Plan showing compensation planting will be prepared by a Landscape Architect registered as a full member in good standing with the Ontario Association of Landscape Architects and submitted to the Town of Caledon. Compensation trees shall be native species to the TRCA watershed (TRCA 2017). If compensation plantings are unable to meet the required tree compensation numbers within the Subject Lands, compensation through cash-in-lieu may be considered at a rate as determined by the Town of Caledon.

6. Summary

GEI inventoried 629 trees within the Subject Lands, including 553 individual trees and 76 trees in six hedgerows. Through the preparation of this Arborist Report, it was determined that 5 individual trees and 15 trees in two hedgerows are recommended for preservation (for a total of 20 preservation trees). The remaining 548 individual trees and 61 trees in four hedgerows are recommended for removal (for a total of 609 removal trees) due to anticipated construction impacts. A total of 918 trees are proposed to be planted as compensation for those removed through the construction of the proposed development. Alternatively, compensation through cash-in-lieu may be considered at a rate as determined by the Town of Caledon.

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REFERENCES AND BACKGROUND MATERIALS

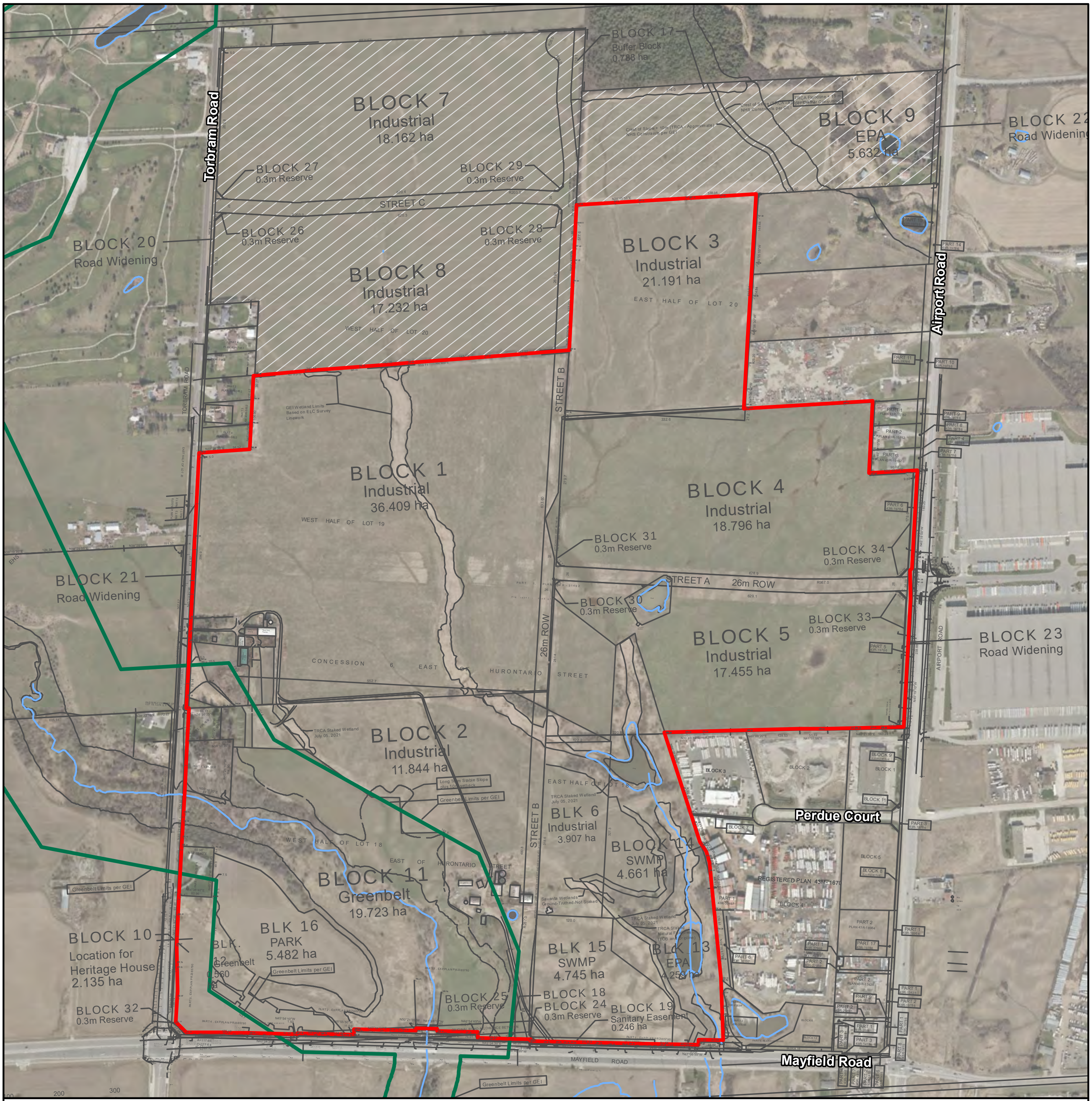
Town of Caledon 2020. Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation, Version 1.0. Caledon, Town of Caledon ON: City of Oshawa. 7 pp.

TRCA 2017. Appendix 2: Flora Species for Entire TRCA Jurisdiction (2017). Toronto, ON: Toronto and Region Conservation Authority.

Appendix A

Figures

Figure 1: Proposed Development
Figure 2: Tree Inventory



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Legend

🟥 Subject Lands (approximate)
▨ Phase 2 Lands
🟩 Greenbelt Planning Area
— Watercourse (TRCA)
☐ Waterbody (LIO)

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 01
Proposed Development

0 100 m
1:10,000

N

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Savanta Division

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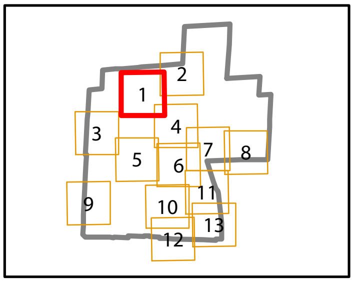
* Subject Lands aligned by georeferenced survey received from Young and Young Surveying Inc.

Legend

🟥 Subject Lands *

Tree Inventory

● Removal (Private)



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.1
Tree Inventory

0 25 m
1:1,700

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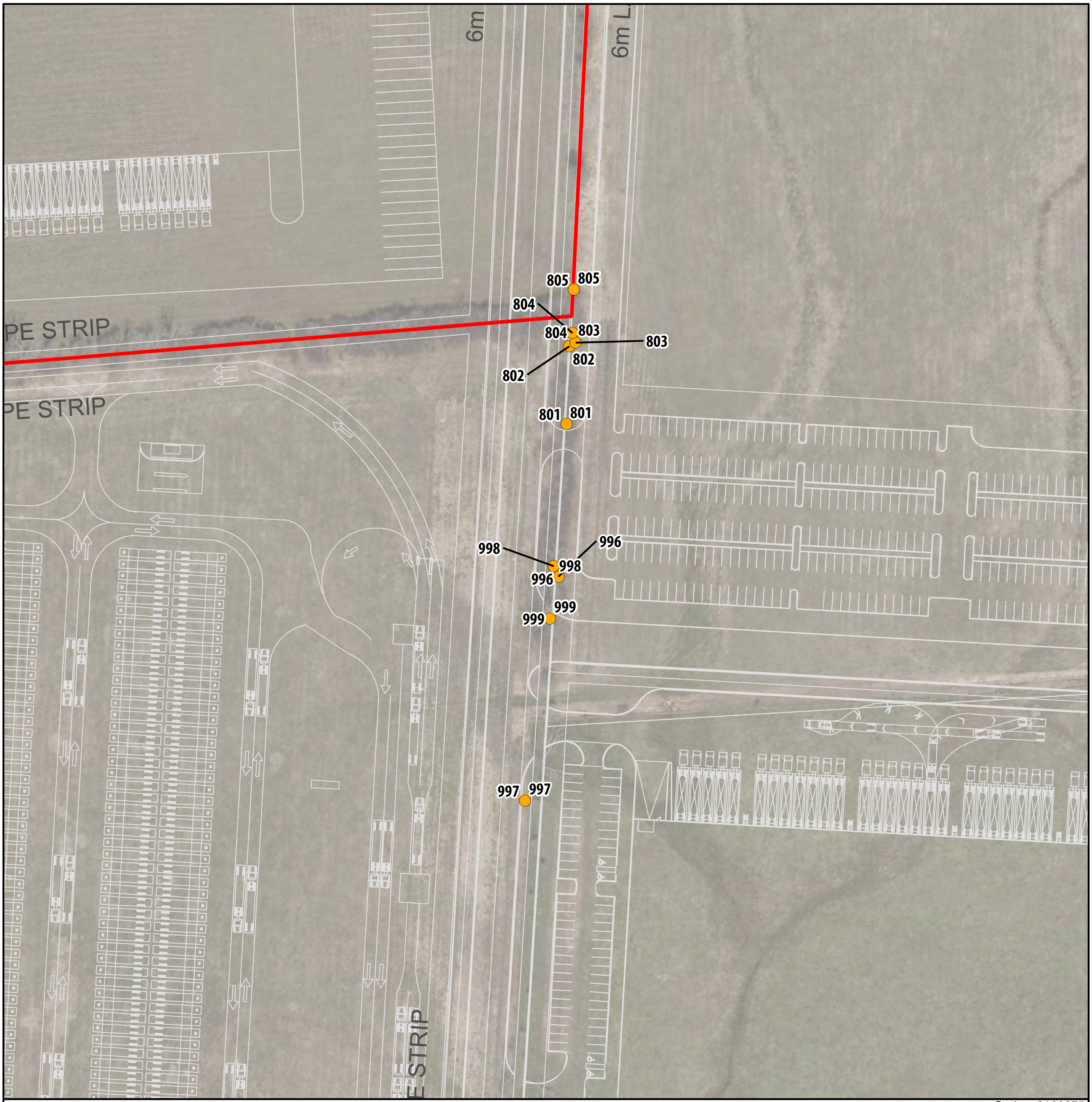

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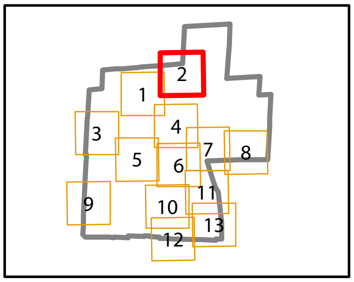
Legend

🟥 Subject Lands *

Tree Inventory

● Removal (Private)



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.2
Tree Inventory

0 25 m

1:1,700

N

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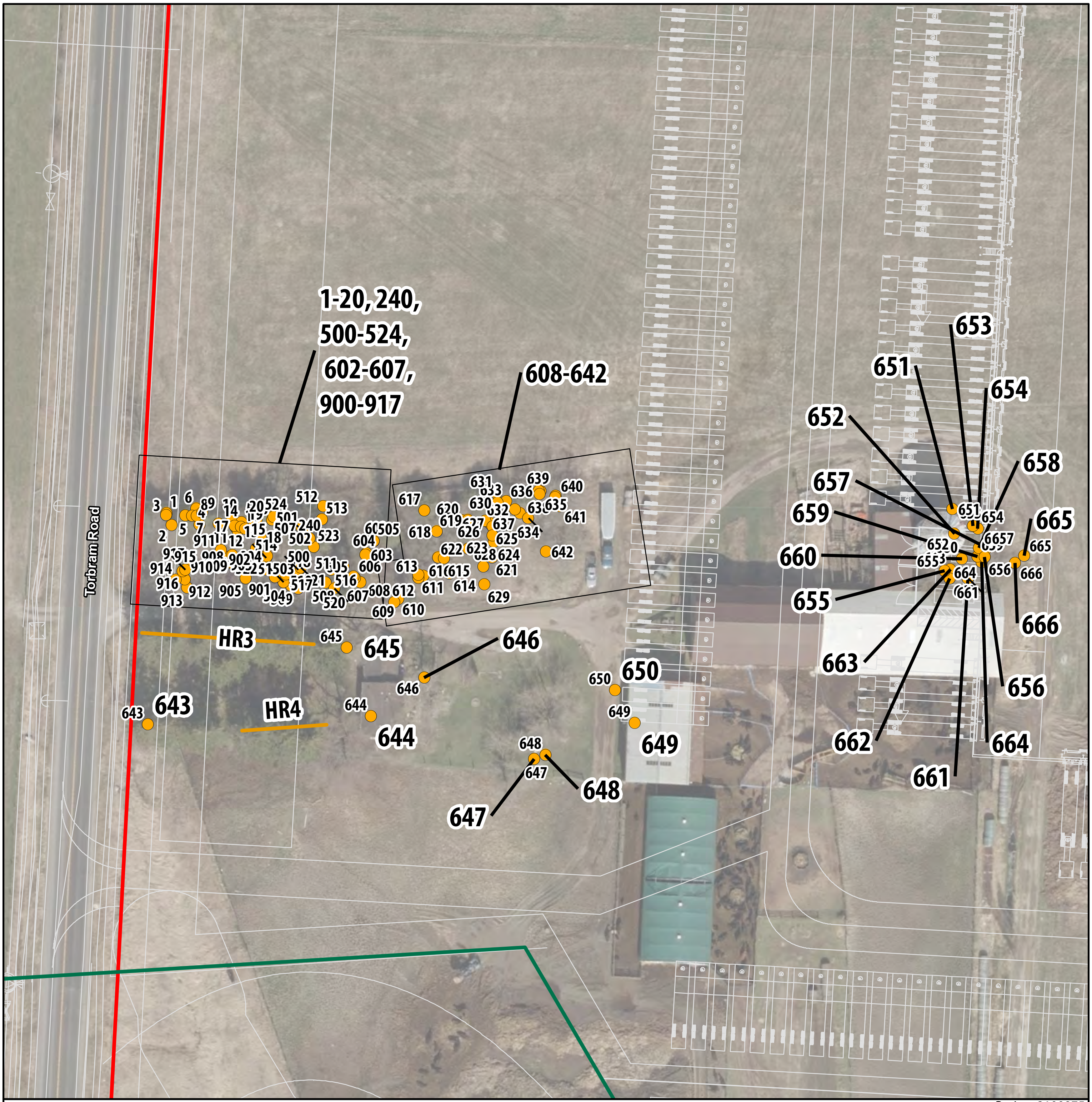

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Legend

🟥 Subject Lands *

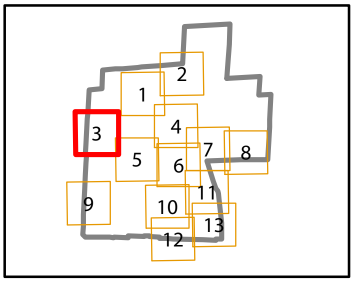
🟩 Greenbelt Planning Area

Tree Inventory

● Removal (Private)

Hedgerow Inventory

— Removal



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.3
Tree Inventory

0 25 m
1:1,000

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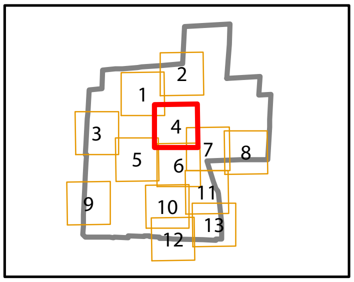
Legend

▭ Subject Lands *

Tree Inventory

● Removal (Private)



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.4
Tree Inventory

0 25 m

1:1,700

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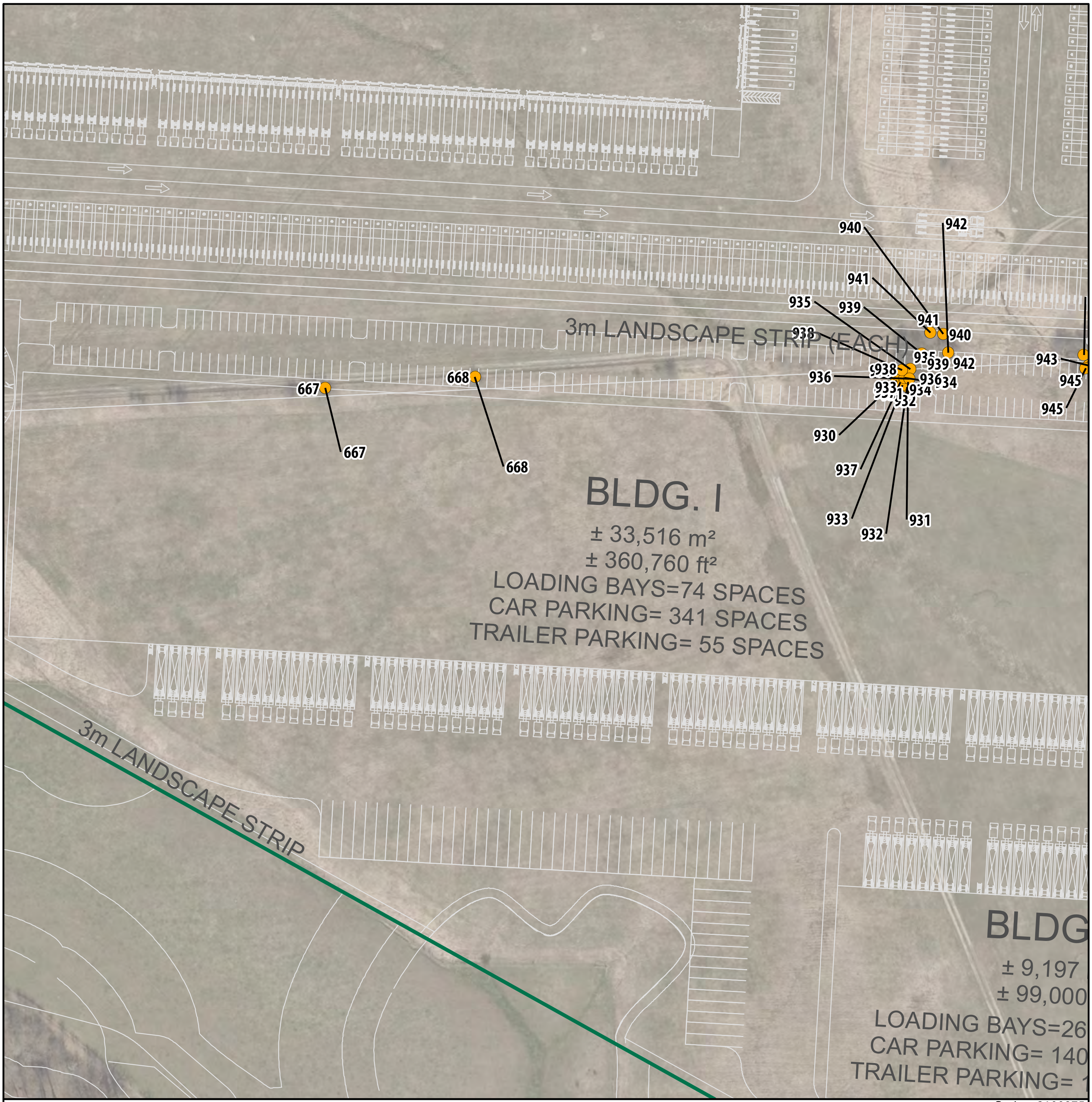

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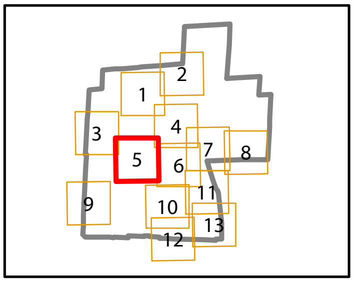
Legend

🟥 Subject Lands *
🟩 Greenbelt Planning Area

Tree Inventory

● Removal (Private)



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.5
Tree Inventory

0 25 m
1:1,700

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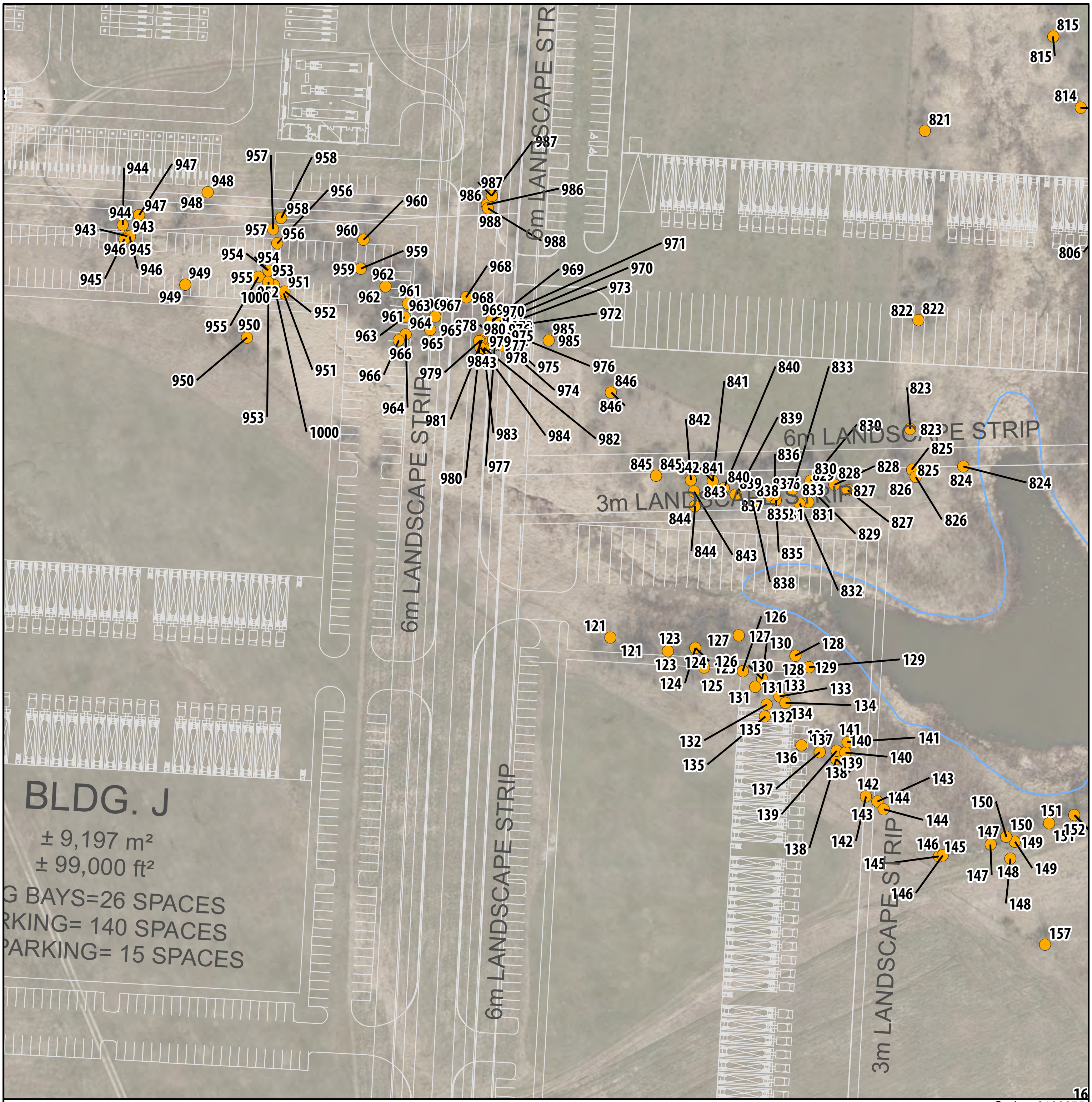

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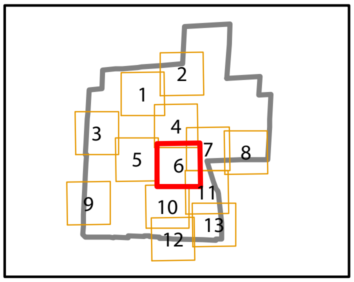
Legend

🟥 Subject Lands *

▭ Waterbody (LIO)

Tree Inventory

● Removal (Private)



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.6
Tree Inventory

0 25 m
1:1,700

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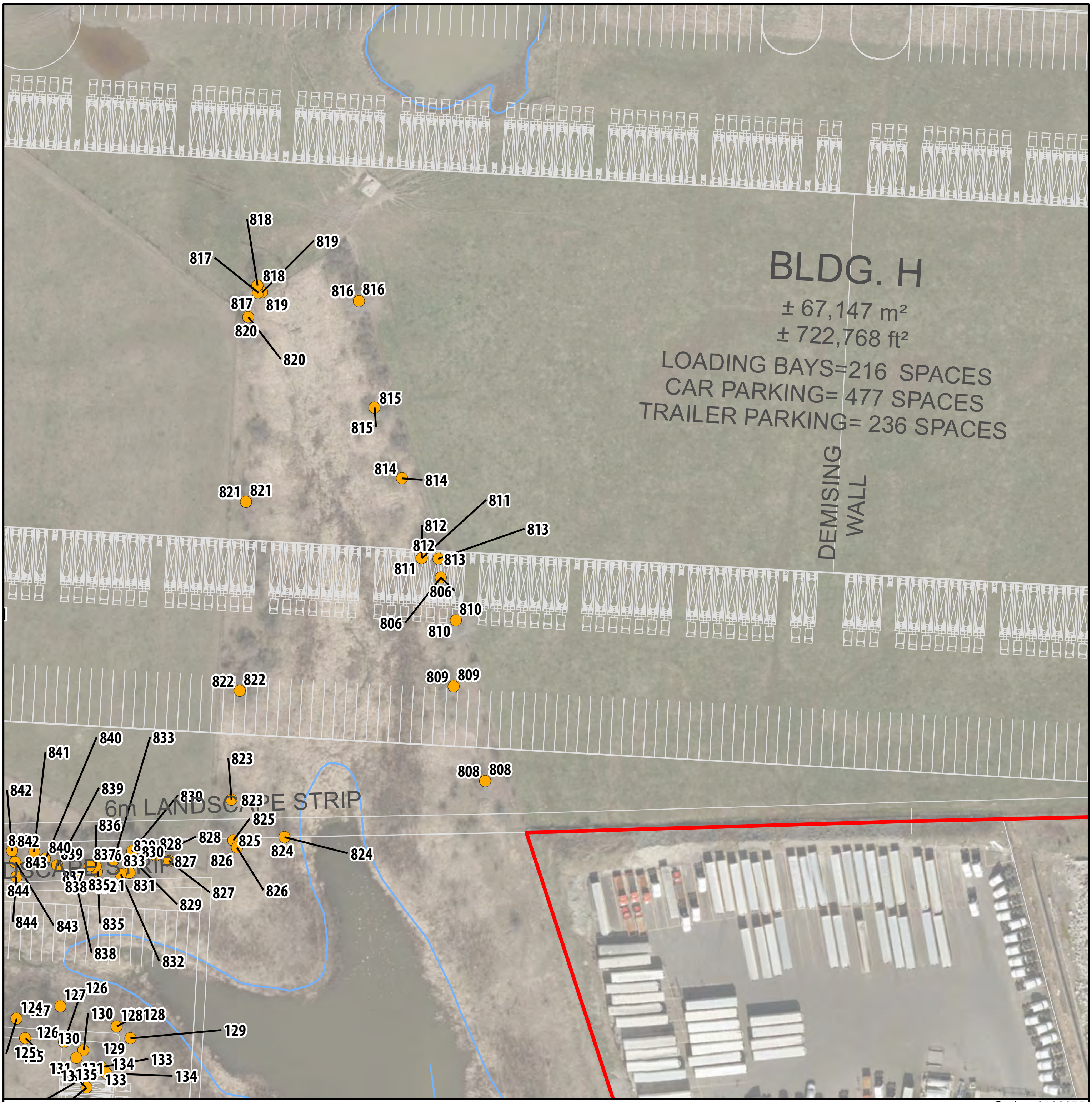

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Legend

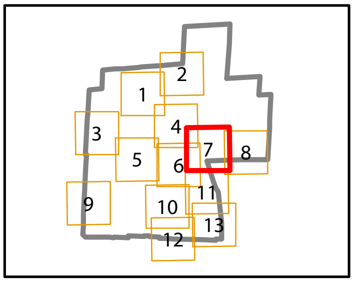
🟥 Subject Lands *

Watercourse (TRCA)

Waterbody (LIO)

Tree Inventory

● Removal (Private)



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.7
Tree Inventory

0 25 m

1:1,700

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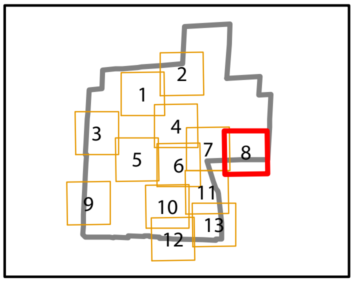
Legend

🟥 Subject Lands *

Tree Inventory

● Removal (Private)



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.8
Tree Inventory

0 25 m

1:1,700

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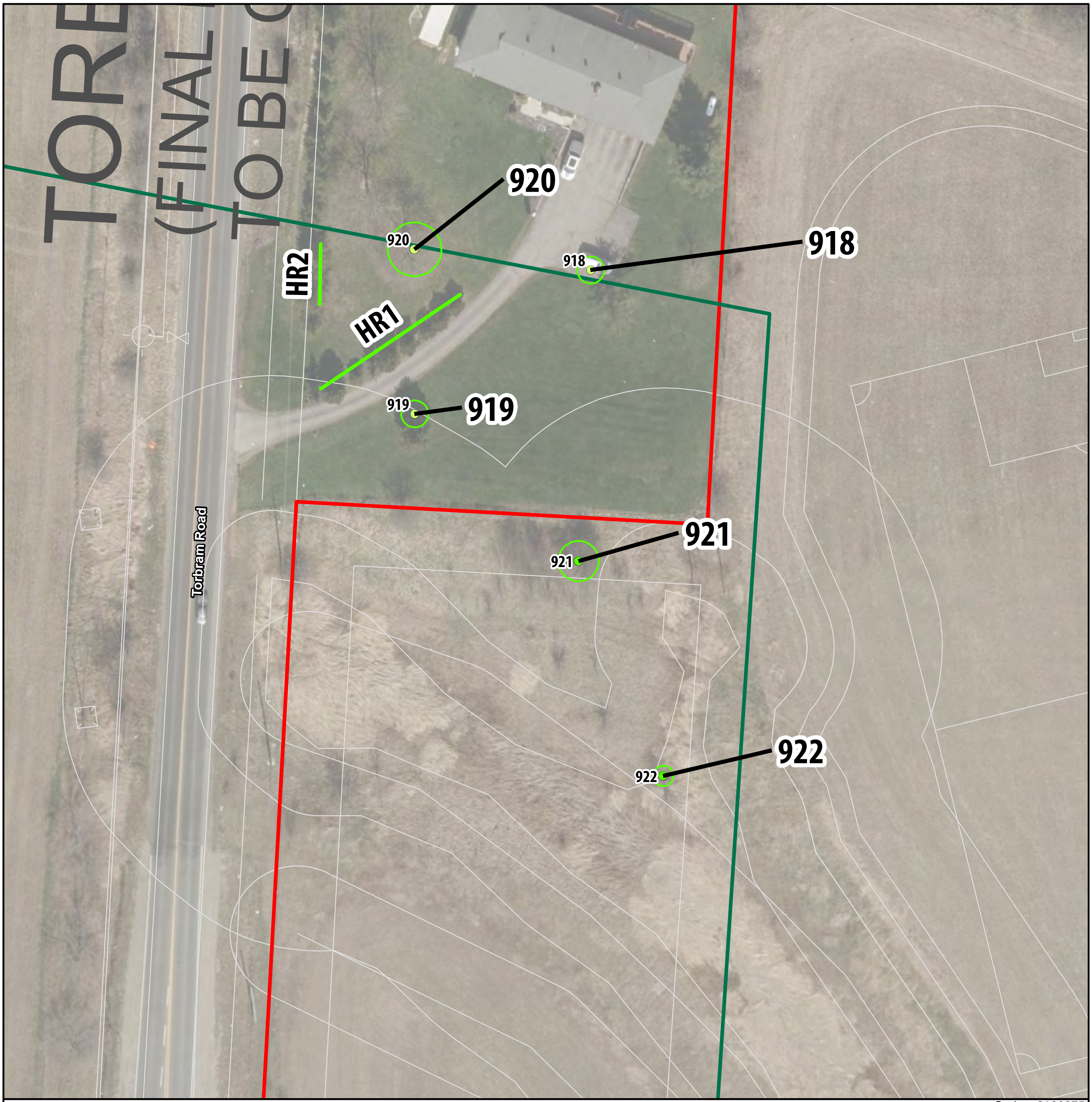

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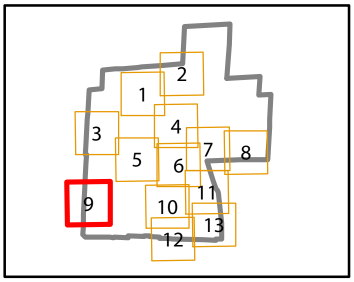
* Subject Lands aligned by georeferenced survey received from Young and Young Surveying Inc.

Legend

🟥 Subject Lands *
🟩 Greenbelt Planning Area
▢ Tree Protection Zone
Tree Inventory
● Preservation (Private)
● Preservation (Neighbour)
Hedgerow Inventory
— Preservation



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.9
Tree Inventory

0 25 m
1:800

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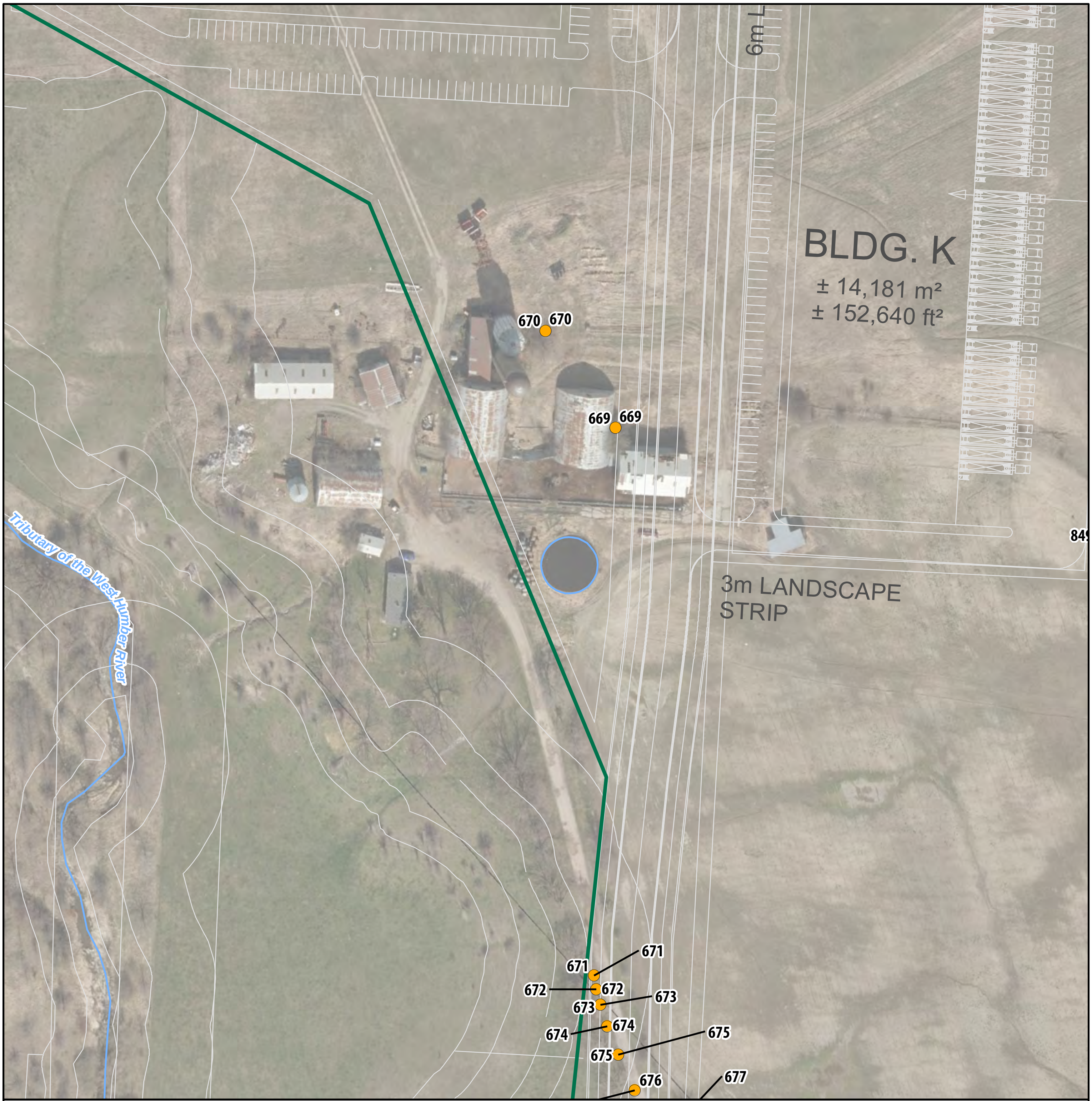

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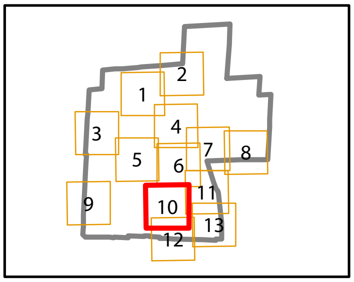
Legend

🟥 Subject Lands *
🟩 Greenbelt Planning Area
— Watercourse (TRCA)
☐ Waterbody (LIO)

Tree Inventory

● Removal (Private)



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.10
Tree Inventory

0 25 m
1:1,700

N

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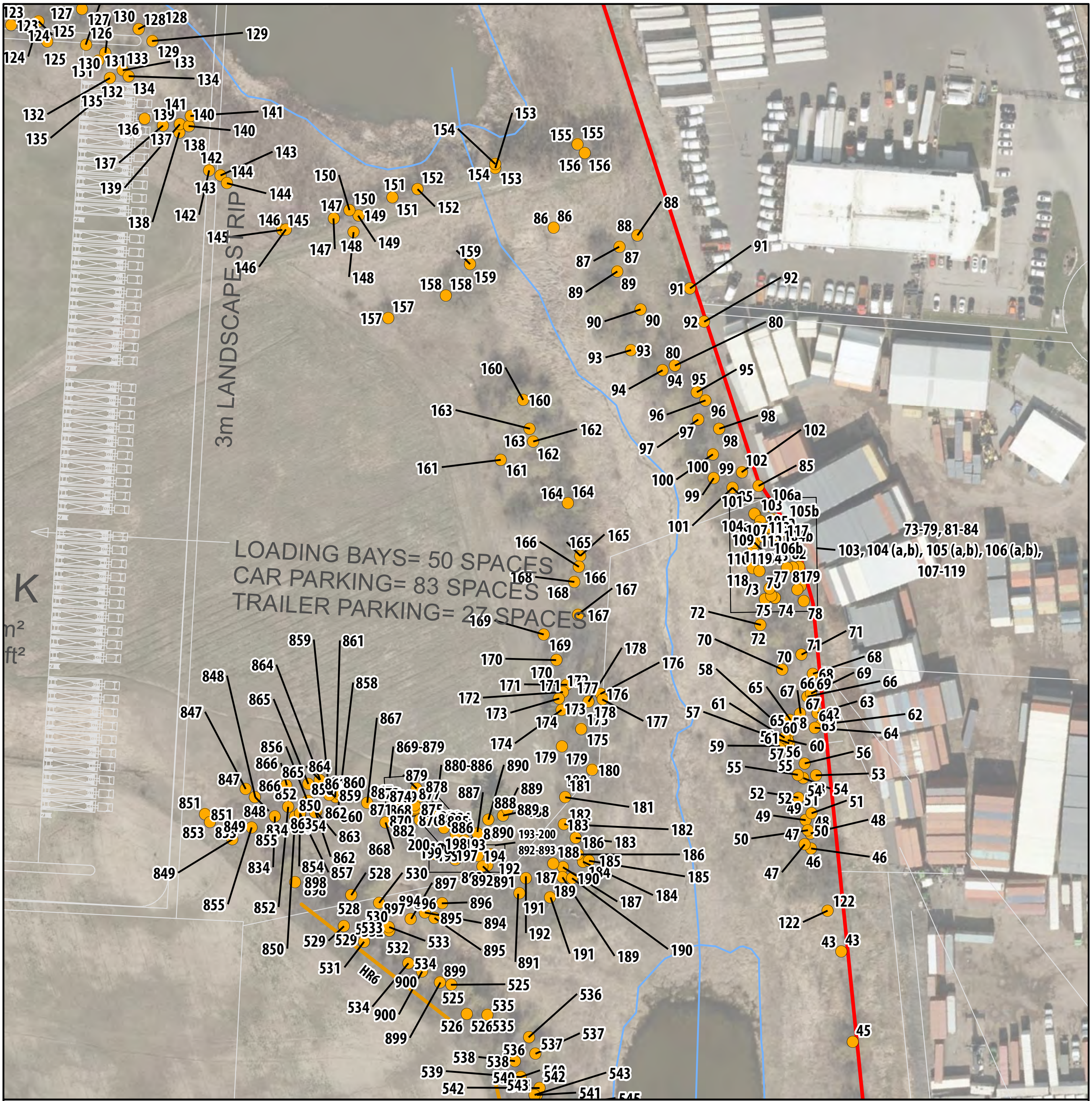

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Legend

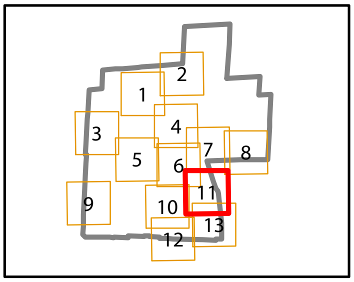
🟥 Subject Lands *
— Watercourse (TRCA)
☐ Waterbody (LIO)

Tree Inventory

● Removal (Private)
● Removal (Shared)

Hedgerow Inventory

— Removal



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.11
Tree Inventory

0 25 m
1:1,700

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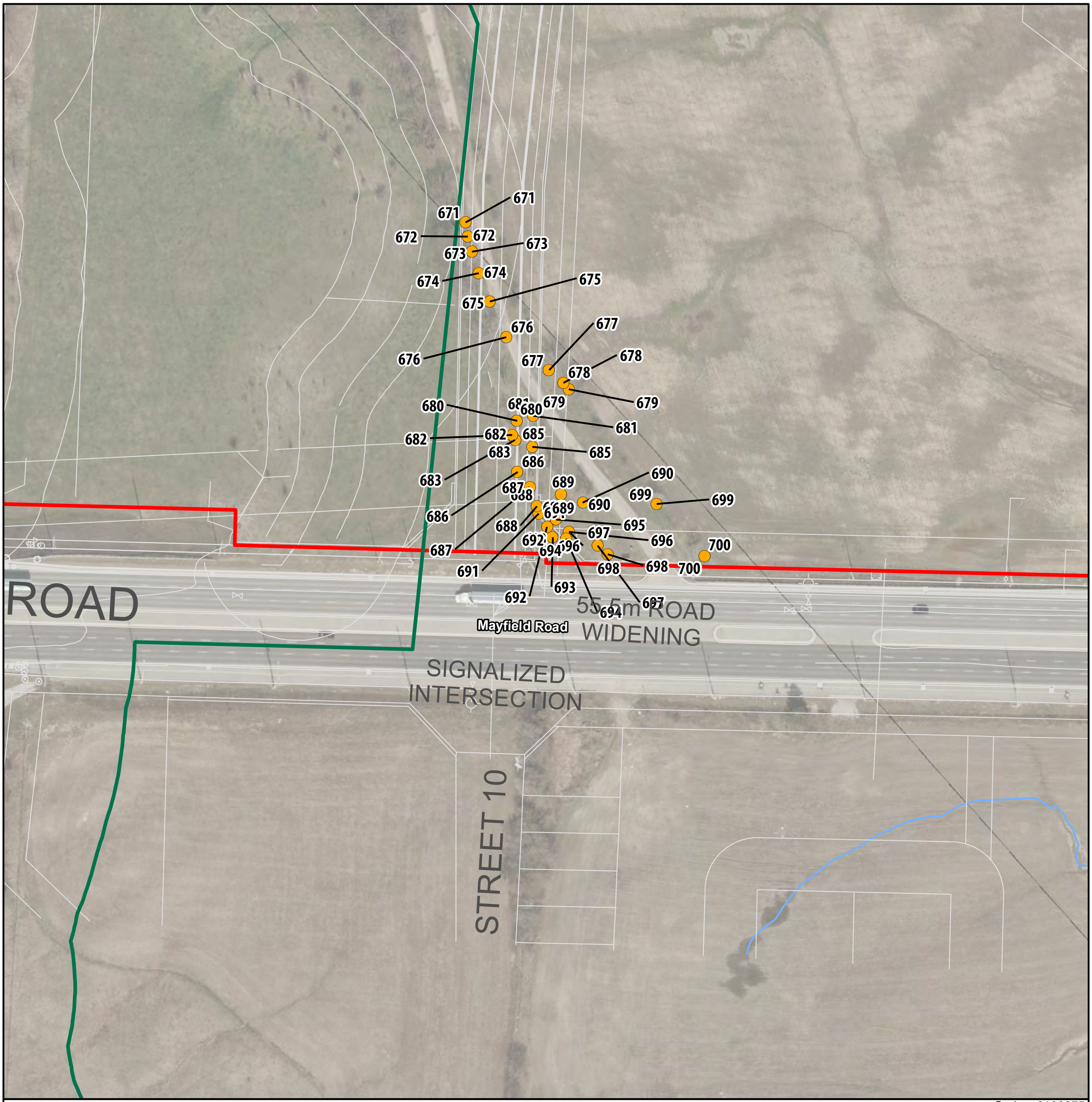

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4. Site plan from 20302SD-SITE-TF-ZZ-CONCEPT-A1-93_SUBDIVISION-A100.dwg.

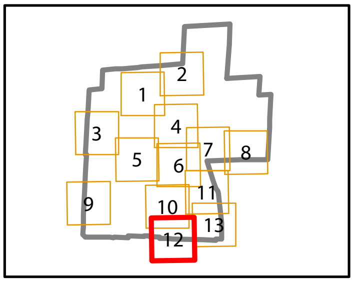
* Subject Lands aligned by georeferenced survey received from Young and Young Surveying Inc.

Legend

🟥 Subject Lands *
🟩 Greenbelt Planning Area
— Watercourse (TRCA)

Tree Inventory

● Removal (Private)



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.12
Tree Inventory

0 25 m
1:1,700

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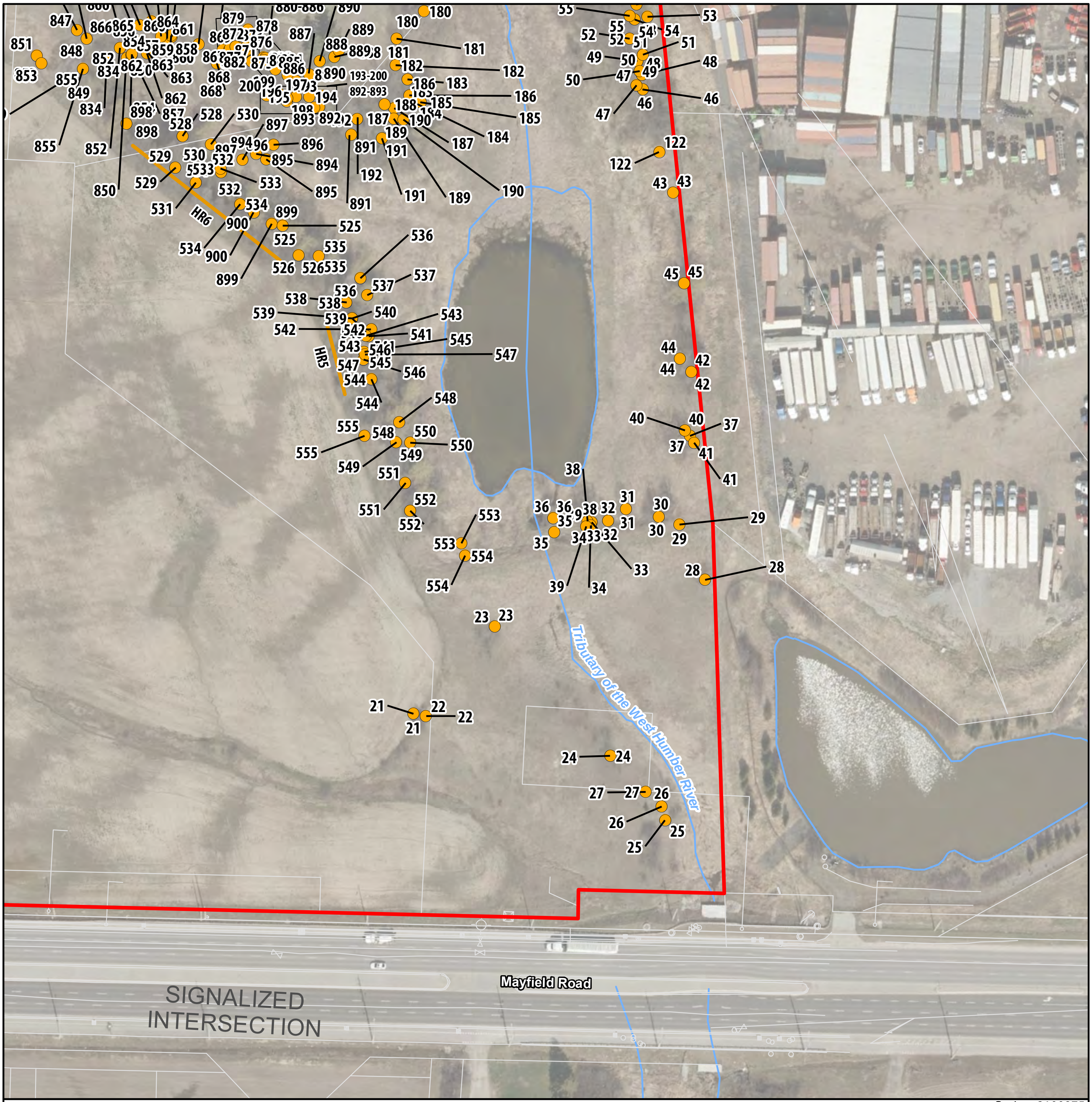

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* Subject Lands aligned by georeferenced survey received from Young and Young Surveying Inc.

Legend

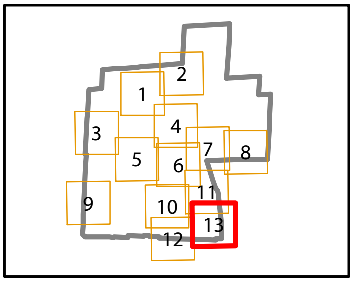
▭ Subject Lands *
— Watercourse (TRCA)
▭ Waterbody (LIO)

Tree Inventory

● Removal (Private)

Hedgerow Inventory

— Removal



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.13
Tree Inventory

0 25 m
1:1,700

N

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Savanta Division

Appendix B

Tables

Table 1: Tree Inventory
Table 2: Hedgerow Inventory

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
1	Eastern White Cedar	*Thuja occidentalis*	29	23	18	0	0	0	1	Good	Good	Good	Removal	Private	2	
2	Black Locust	*Robinia pseudoacacia*	32	32	0	0	0	0	3	Good	Good	Good	Removal	Private	2	
3	Black Locust	*Robinia pseudoacacia*	20	20	0	0	0	0	3	Good	Good	Good	Removal	Private	1	
4	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
5	Eastern White Cedar	*Thuja occidentalis*	32	28	10	12	0	0	1.5	Good	Good	Good	Removal	Private	2	
6	Manitoba Maple	*Acer negundo*	14	14	0	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
7	Eastern White Cedar	*Thuja occidentalis*	17	17	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
8	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
9	Eastern White Cedar	*Thuja occidentalis*	37	27	25	0	0	0	3	Good	Good	Good	Removal	Private	3	
10	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
11	Manitoba Maple	*Acer negundo*	14	14	0	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	
12	Manitoba Maple	*Acer negundo*	21	17	12	0	0	0	2	Good	Good	Good	Removal	Private	2	
13	Manitoba Maple	*Acer negundo*	32	22	18	15	0	0	2.5	Good	Good	Good	Removal	Private	2	
14	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
15	Black Locust	*Robinia pseudoacacia*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
16	Black Locust	*Robinia pseudoacacia*	25	23	11	0	0	0	4	Good	Good	Good	Removal	Private	2	
17	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
18	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
19	Eastern White Cedar	*Thuja occidentalis*	15	15	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
20	Eastern White Cedar	*Thuja occidentalis*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
21	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
22	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
23	Common Apple	*Malus pumila*	19	15	12	0	0	0	2	Good	Good	Good	Removal	Private	1	
24	Crack Willow	*Salix euxina*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
25	White Spruce	*Picea glauca*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	Planted
26	White Spruce	*Picea glauca*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	Planted
27	White Spruce	*Picea glauca*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	Planted
28	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
29	Crack Willow	*Salix euxina*	47	34	33	0	0	0	2.5	Good	Fair	Fair	Removal	Private	3	Snags and few cavities
30	Crack Willow	*Salix euxina*	43	43	0	0	0	0	3	Good	Good	Good	Removal	Private	3	
31	Siberian Elm	*Ulmus pumila*	19	19	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
32	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
33	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
34	Manitoba Maple	*Acer negundo*	34	19	17	22	0	0	4	Good	Good	Good	Removal	Private	2	
35	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	1	Good	Fair	Good	Removal	Private	1	2nd stem split off at base and died
36	Siberian Elm	*Ulmus pumila*	33	33	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
37	Crack Willow	*Salix euxina*	16	16	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
38	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
39	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
40	Crack Willow	*Salix euxina*	52	30	32	27	0	0	2	Good	Fair	Good	Removal	Private	4	
41	Crack Willow	*Salix euxina*	23	17	16	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
42	Crack Willow	*Salix euxina*	64	64	0	0	0	0	2.5	Good	Fair	Good	Removal	Private	4	Middle of Buckthorn thicket
43	Carolina Poplar	*Populus xcanadensis*	16	16	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
44	Crack Willow	*Salix euxina*	37	37	0	0	0	0	1.5	Good	Good	Good	Removal	Private	3	Middle of Buckthorn thicket
45	Crack Willow	*Salix euxina*	37	32	12	15	0	0	2.5	Fair	Poor	Fair	Removal	Private	0	
46	Crack Willow	*Salix euxina*	57	42	39	0	0	0	3	Fair	Poor	Fair	Removal	Private	0	Huge crack at base. One stem dead and breaking away.
47	Silver Maple	*Acer saccharinum*	19	15	11	0	0	0	1	Good	Good	Good	Removal	Private	1	
48	Silver Maple	*Acer saccharinum*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
49	Crack Willow	*Salix euxina*	45	40	20	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
50	Silver Maple	*Acer saccharinum*	17	14	10	0	0	0	2	Good	Good	Good	Removal	Private	1	
51	Crack Willow	*Salix euxina*	52	38	36	0	0	0	5	Good	Good	Good	Removal	Private	4	
52	Silver Maple	*Acer saccharinum*	39	28	27	0	0	0	5	Good	Good	Good	Removal	Private	3	
53	Crack Willow	*Salix euxina*	69	69	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Splits just above DBH. Most lateral branches broken. Little green growth.
54	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	0.5	Fair	Poor	Poor	Removal	Private	0	Bent and cracked from large Crack Willow falling on it.
55	Crack Willow	*Salix euxina*	39	32	23	0	0	0	1.5	Fair	Good	Good	Removal	Private	3	
56	Norway Maple	*Acer platanoides*	20	15	13	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
57	Crack Willow	*Salix euxina*	27	27	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
58	Crack Willow	*Salix euxina*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
59	Crack Willow	*Salix euxina*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
60	Crack Willow	*Salix euxina*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
61	Crack Willow	*Salix euxina*	62	52	34	0	0	0	3	Good	Good	Good	Removal	Private	4	
62	Siberian Elm	*Ulmus pumila*	32	32	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
63	Siberian Elm	*Ulmus pumila*	39	28	22	16	0	0	4	Good	Good	Good	Removal	Private	3	
64	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
65	Norway Maple	*Acer platanoides*	14	14	0	0	0	0	2	Good	Fair	Good	Removal	Private	1	Bent and misshapen from large Crack Willow falling on it when young.
66	Siberian Elm	*Ulmus pumila*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
67	Siberian Elm	*Ulmus pumila*	42	42	0	0	0	0	3.5	Good	Good	Good	Removal	Private	3	
68	Siberian Elm	*Ulmus pumila*	43	40	16	0	0	0	1	Fair	Poor	Poor	Removal	Private	0	
69	Norway Maple	*Acer platanoides*	28	28	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
70	Common Apple	*Malus pumila*	18	18	0	0	0	0	3	Good	Good	Good	Removal	Private	1	
71	Siberian Elm	*Ulmus pumila*	28	28	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
72	Crack Willow	*Salix euxina*	99	68	52	49	0	0	4	Poor	Poor	Poor	Removal	Private	0	Many broken twisted boles and limbs, snags, cavities, and damage
73	Silver Maple	*Acer saccharinum*	32	24	13	13	10	0	2.5	Good	Good	Good	Removal	Private	2	
74	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
75	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
76	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
77	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
78	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
79	Siberian Elm	*Ulmus pumila*	43	27	24	23	0	0	4	Good	Good	Good	Removal	Private	3	
80	Common Apple	*Malus pumila*	17	13	11	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
81	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
82	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
83	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
84	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
85	Siberian Elm	*Ulmus pumila*	34	34	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
86	Crack Willow	*Salix euxina*	25	23	10	0	0	0	1	Fair	Fair	Fair	Removal	Private	2	
87	Common Apple	*Malus pumila*	24	24	0	0	0	0	3	Good	Good	Good	Removal	Private	2	
88	White Elm	*Ulmus americana*	30	30	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
89	Crack Willow	*Salix euxina*	68	53	42	0	0	0	3.5	Fair	Poor	Poor	Removal	Private	0	Snags, rot, cracks
90	Crack Willow	*Salix euxina*	33	13	18	20	14	0	3	Fair	Poor	Poor	Removal	Private	0	Snags, rot, cracks, main boles have fallen. Current growth from lateral branc
91	Siberian Elm	*Ulmus pumila*	40	22	20	13	15	18	4	Good	Good	Good	Removal	Private	3	
92	Red Oak	*Quercus rubra*	29	29	0	0	0	0	3	Good	Good	Good	Removal	Private	2	
93	Crack Willow	*Salix euxina*	19	19	0	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	
94	Crack Willow	*Salix euxina*	37	32	19	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	3	
95	Crack Willow	*Salix euxina*	86	72	47	0	0	0	4	Fair	Fair	Fair	Removal	Private	5	Cavities, decay, snags
96	Common Apple	*Malus pumila*	17	17	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	1	
97	Crack Willow	*Salix euxina*	33	22	17	17	0	0	3	Fair	Poor	Fair	Removal	Private	0	Main bole split and dead and fallen. Growth from lateral branches
98	Siberian Elm	*Ulmus pumila*	36	36	0	0	0	0	3	Fair	Fair	Fair	Removal	Private	3	
99	White Willow x Weeping Willow	*Salix xsepulcralis*	83	83	0	0	0	0	4	Fair	Fair	Fair	Removal	Private	5	
100	White Willow x Weeping Willow	*Salix xsepulcralis*	76	73	21	0	0	0	3	Fair	Poor	Poor	Removal	Private	0	Much decay and snags
101	Crack Willow	*Salix euxina*	19	19	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
102	Common Apple	*Malus pumila*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
103	White Elm	*Ulmus americana*	34	34	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
104a	Common Apple	*Malus pumila*	21	21	0	0	0	0	4	Good	Good	Good	Removal	Private	2	
104b	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
105a	Silver Maple	*Acer saccharinum*	53	53	0	0	0	0	3.5	Good	Fair	Good	Removal	Private	4	One large dead limb
105b	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1.5	Good	Good	Good	Removal	Shared	2	
106a	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
106b	Siberian Elm	*Ulmus pumila*	57	57	0	0	0	0	4	Good	Good	Good	Removal	Private	4	
107	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
108	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
109	Siberian Elm	*Ulmus pumila*	12	12	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
110	Siberian Elm	*Ulmus pumila*	16	16	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
111	Siberian Elm	*Ulmus pumila*	34	21	27	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
112	Siberian Elm	*Ulmus pumila*	40	27	30	0	0	0	2	Good	Good	Good	Removal	Private	3	
113	Siberian Elm	*Ulmus pumila*	33	33	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
117	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
118	Crack Willow	*Salix euxina*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
119	Crack Willow	*Salix euxina*	51	46	23	0	0	0	2	Fair	Fair	Fair	Removal	Private	4	Dead limbs
121	Siberian Elm	*Ulmus pumila*	12	12	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
122	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
123	Siberian Elm	*Ulmus pumila*	43	43	0	0	0	0	1.5	Good	Good	Good	Removal	Private	3	
124	Silver Maple	*Acer saccharinum*	29	18	15	13	12	0	3	Good	Good	Good	Removal	Private	2	
125	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
126	Siberian Elm	*Ulmus pumila*	34	24	18	15	0	0	1.5	Good	Good	Good	Removal	Private	2	
127	Crack Willow	*Salix euxina*	37	18	16	16	14	19	2	Fair	Fair	Fair	Removal	Private	3	
128	Crack Willow	*Salix euxina*	18	18	0	0	0	0	2	Fair	Poor	Fair	Removal	Private	0	
129	Crack Willow	*Salix euxina*	21	21	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
130	Siberian Elm	*Ulmus pumila*	34	26	22	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
131	Siberian Elm	*Ulmus pumila*	34	22	18	19	0	0	0.5	Poor	Poor	Poor	Removal	Private	0	
132	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	2	
133	Siberian Elm	*Ulmus pumila*	50	31	28	18	21	0	0.5	Good	Fair	Fair	Removal	Private	3	
134	Siberian Elm	*Ulmus pumila*	15	11	10	0	0	0	0.5	Fair	Poor	Fair	Removal	Private	0	
135	Siberian Elm	*Ulmus pumila*	35	35	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	2	
136	Siberian Elm	*Ulmus pumila*	43	28	22	16	12	12	1	Fair	Fair	Fair	Removal	Private	3	
137	Siberian Elm	*Ulmus pumila*	29	23	18	0	0	0	0.5	Fair	Poor	Poor	Removal	Private	0	
138	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
139	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
140	Siberian Elm	*Ulmus pumila*	16	16	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
141	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
142	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
143	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
144	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
145	Crack Willow	*Salix euxina*	21	21	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
146	Crack Willow	*Salix euxina*	25	23	11	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	2	
147	Crack Willow	*Salix euxina*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
148	Crack Willow	*Salix euxina*	22	22	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
149	Crack Willow	*Salix euxina*	47	36	22	17	13	0	0.5	Fair	Fair	Fair	Removal	Private	3	
150	Silver Maple	*Acer saccharinum*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
151	Crack Willow	*Salix euxina*	37	27	13	21	0	0	0.5	Fair	Fair	Fair	Removal	Private	3	
152	White Elm	*Ulmus americana*	28	28	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
153	Crack Willow	*Salix euxina*	12	12	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
154	Crack Willow	*Salix euxina*	47	42	21	0	0	0	1	Good	Good	Good	Removal	Private	3	
155	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
156	Crack Willow	*Salix euxina*	33	33	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
157	Siberian Elm	*Ulmus pumila*	34	34	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
158	Crack Willow	*Salix euxina*	94	56	49	43	38	0	3	Good	Fair	Good	Removal	Private	5	
159	Crack Willow	*Salix euxina*	95	48	49	42	37	34	6	Good	Good	Good	Removal	Private	5	
160	Crack Willow	*Salix euxina*	118	92	56	47	0	0	4	Fair	Poor	Fair	Removal	Private	0	
161	Silver Maple	*Acer saccharinum*	39	27	22	18	0	0	2	Good	Good	Good	Removal	Private	3	
162	Crack Willow	*Salix euxina*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
163	Crack Willow	*Salix euxina*	72	72	0	0	0	0	5	Fair	Fair	Fair	Removal	Private	5	
164	Crack Willow	*Salix euxina*	93	93	0	0	0	0	1.5	Fair	Poor	Poor	Removal	Private	0	
165	Crack Willow	*Salix euxina*	88	88	0	0	0	0	1.5	Poor	Poor	Poor	Removal	Private	0	Heavily cracked and broken. Little live growth.
166	Crack Willow	*Salix euxina*	37	28	24	0	0	0	1.5	Poor	Poor	Poor	Removal	Private	0	Main bike fallen. All growth from lateral branches from fallen tree
167	Crack Willow	*Salix euxina*	47	47	0	0	0	0	1	Fair	Poor	Poor	Removal	Private	0	Mostly cracked, broken and decaying
168	Crack Willow	*Salix euxina*	24	14	19	0	0	0	0.5	Poor	Poor	Poor	Removal	Private	0	
169	Siberian Elm	*Ulmus pumila*	38	38	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	3	
170	Siberian Elm	*Ulmus pumila*	35	35	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
171	Siberian Elm	*Ulmus pumila*	42	28	21	23	0	0	1	Good	Good	Good	Removal	Private	3	
172	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	2	
173	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	2	
174	White Spruce	*Picea glauca*	46	46	0	0	0	0	1	Good	Good	Good	Removal	Private	3	
175	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	0.5	Poor	Poor	Poor	Removal	Private	0	
176	Common Apple	*Malus pumila*	39	22	28	16	0	0	1.5	Good	Good	Good	Removal	Private	3	
177	Crack Willow	*Salix euxina*	76	53	28	33	33	0	1.5	Fair	Fair	Fair	Removal	Private	5	
178	Siberian Elm	*Ulmus pumila*	36	28	22	0	0	0	1.5	Good	Good	Good	Removal	Private	3	
179	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
180	Crack Willow	*Salix euxina*	125	125	0	0	0	0	2	Good	Good	Good	Removal	Private	5	
181	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
182	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	Private	1	
183	Norway Maple	*Acer platanoides*	32	32	0	0	0	0	4	Good	Good	Good	Removal	Private	2	
184	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
185	Siberian Elm	*Ulmus pumila*	31	31	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
186	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
187	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
188	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	0.5	Good	Good	Good	Removal	Private	2	
189	Silver Maple	*Acer saccharinum*	43	43	0	0	0	0	1.5	Good	Good	Good	Removal	Private	3	
190	Crack Willow	*Salix euxina*	65	65	0	0	0	0	1.5	Poor	Poor	Poor	Removal	Private	0	
191	Silver Maple	*Acer saccharinum*	37	32	19	0	0	0	1.5	Poor	Good	Good	Removal	Private	3	
192	Silver Maple	*Acer saccharinum*	44	44	0	0	0	0	2	Good	Good	Good	Removal	Private	3	
193	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
194	Crack Willow	*Salix euxina*	46	46	0	0	0	0	1.5	Good	Good	Good	Removal	Private	3	
195	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
196	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
197	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
198	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
199	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
200	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
240	White Spruce	*Picea glauca*	29	29	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
500	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
501	White Spruce	*Picea glauca*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
502	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
503	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
504	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
505	White Spruce	*Picea glauca*	34	25	23	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
506	Eastern White Cedar	*Thuja occidentalis*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
507	White Spruce	*Picea glauca*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
508	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
509	Black Locust	*Robinia pseudoacacia*	22	22	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
510	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
511	White Spruce	*Picea glauca*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
512	Eastern White Cedar	*Thuja occidentalis*	28	28	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
513	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
514	Black Locust	*Robinia pseudoacacia*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
515	Manitoba Maple	*Acer negundo*	19	14	13	0	0	0	2.5	Good	Fair	Fair	Removal	Private	1	On lean
516	White Spruce	*Picea glauca*	20	20	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
517	Black Locust	*Robinia pseudoacacia*	13	13	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
518	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
519	Black Locust	*Robinia pseudoacacia*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
520	Manitoba Maple	*Acer negundo*	25	17	15	10	0	0	1	Good	Fair	Fair	Removal	Private	2	Multiple stems, on lean
521	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
522	Black Locust	*Robinia pseudoacacia*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
523	White Spruce	*Picea glauca*	23	23	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
524	Eastern White Cedar	*Thuja occidentalis*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
525	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
526	Crack Willow	*Salix euxina*	120	120	0	0	0	0	2	Poor	Poor	Poor	Removal	Private	0	Dead and broken leaders, missing bark
528	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
529	Crack Willow	*Salix euxina*	70	70	0	0	0	0	2.5	Good	Good	Good	Removal	Private	5	
530	Crack Willow	*Salix euxina*	110	110	0	0	0	0	5	Poor	Poor	Poor	Removal	Private	0	Dead and broken leaders, missing bark, cavities
531	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
532	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
533	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
534	Crack Willow	*Salix euxina*	81	80	15	0	0	0	2	Poor	Poor	Poor	Removal	Private	0	Main stem severely bent and split, one live regenerating stem
535	Common Pear	*Pyrus communis*	21	21	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
536	Crack Willow	*Salix euxina*	50	50	0	0	0	0	2.5	Poor	Poor	Poor	Removal	Private	0	On lean, dead leaders and limb, cavity in stem, stem split
537	Crack Willow	*Salix euxina*	50	50	0	0	0	0	3	Poor	Poor	Poor	Removal	Private	0	On lean, dead limb, cavity in stem, stem split
538	Siberian Elm	*Ulmus pumila*	45	45	0	0	0	0	2	Good	Good	Good	Removal	Private	3	
539	Crack Willow	*Salix euxina*	22	22	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
540	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
541	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
542	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
543	Siberian Elm	*Ulmus pumila*	45	45	0	0	0	0	2	Good	Good	Good	Removal	Private	3	
544	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
545	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Fair	Good	Fair	Removal	Private	1	Epicormic branches
546	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Fair	Good	Fair	Removal	Private	1	Epicormic branches
547	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Fair	Good	Fair	Removal	Private	1	Epicormic branches
548	Crack Willow	*Salix euxina*	80	80	0	0	0	0	2	Poor	Poor	Poor	Removal	Private	0	On lean, dead and broken leaders, missing bark, open wound
549	Siberian Elm	*Ulmus pumila*	30	30	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
550	Crack Willow	*Salix euxina*	70	70	0	0	0	0	2	Poor	Poor	Poor	Removal	Private	0	On lean, dead and broken leaders, stem split open
551	Crack Willow	*Salix euxina*	70	70	0	0	0	0	4	Poor	Poor	Poor	Removal	Private	0	Dead and broken leaders, stem split open
552	Crack Willow	*Salix euxina*	90	90	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Most of stem and crown missing, some live limbs
553	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
554	Silver Maple	*Acer saccharinum*	22	12	11	11	10	0	2	Good	Fair	Fair	Removal	Private	2	Multiple stems
555	Cottonwood	*Populus deltoides*	30	30	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
602	White Spruce	*Picea glauca*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
603	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
604	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
605	White Spruce	*Picea glauca*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
606	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean
607	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean
608	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean
609	White Spruce	*Picea glauca*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
610	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
611	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
612	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
613	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
614	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	3	Good	Fair	Fair	Removal	Private	1	On lean
615	Manitoba Maple	*Acer negundo*	24	17	17	0	0	0	3	Good	Fair	Fair	Removal	Private	2	On lean, codominant stems
616	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
617	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
618	Manitoba Maple	*Acer negundo*	16	12	10	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	Dead limb, missing bark
619	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
620	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
621	White Spruce	*Picea glauca*	23	23	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
622	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
623	Manitoba Maple	*Acer negundo*	22	22	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
624	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
625	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
626	Eastern White Cedar	*Thuja occidentalis*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
627	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
628	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
629	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
630	Eastern White Cedar	*Thuja occidentalis*	31	22	18	12	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
631	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
632	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
633	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
634	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
635	Eastern White Cedar	*Thuja occidentalis*	23	15	14	10	0	0	2	Good	Fair	Fair	Removal	Private	2	Rubbing against tree 634, multiple stems
636	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	Rubbing against tree 635
637	Manitoba Maple	*Acer negundo*	27	27	0	0	0	0	2	Good	Good	Good	Removal	Private	2	DBH approximate
638	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
639	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
640	Manitoba Maple	*Acer negundo*	28	20	20	0	0	0	1.5	Good	Fair	Fair	Removal	Private	2	On lean, codominant stems
641	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	3.5	Fair	Fair	Fair	Removal	Private	1	On lean
642	Manitoba Maple	*Acer negundo*	33	17	17	17	12	10	3.5	Fair	Fair	Fair	Removal	Private	2	Suckering
643	Manitoba Maple	*Acer negundo*	16	12	10	0	0	0	3	Fair	Fair	Fair	Removal	Private	1	Suckering
644	Silver Maple	*Acer saccharinum*	85	85	0	0	0	0	5	Good	Fair	Fair	Removal	Private	5	Two stems (split above DBH), spreading limbs and branches
645	Manitoba Maple	*Acer negundo*	52	52	0	0	0	0	3	Good	Poor	Fair	Removal	Private	0	Grown into fence, broken limb
646	Manitoba Maple	*Acer negundo*	75	75	0	0	0	0	3	Good	Fair	Fair	Removal	Private	5	Codominant stems (split at DBH), knots in stem
647	Manitoba Maple	*Acer negundo*	57	45	35	0	0	0	3	Good	Poor	Fair	Removal	Private	0	On lean, knots in stem, weak union
648	Manitoba Maple	*Acer negundo*	30	30	0	0	0	0	3	Good	Fair	Fair	Removal	Private	2	On lean, knots in stem
649	Manitoba Maple	*Acer negundo*	46	22	22	28	13	13	4	Good	Fair	Fair	Removal	Private	3	Multiple stems, twisted stems, limb rubbing with tree 650, dead limb
650	Manitoba Maple	*Acer negundo*	41	20	19	18	17	17	4	Good	Fair	Fair	Removal	Private	3	Multiple stems, twisted stems, limb rubbing with tree 649
651	Manitoba Maple	*Acer negundo*	28	28	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean, cavity in stem
652	Manitoba Maple	*Acer negundo*	33	25	15	15	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean, multiple stems, dead limb
653	Manitoba Maple	*Acer negundo*	28	28	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
654	Manitoba Maple	*Acer negundo*	32	18	17	17	12	0	1.5	Good	Fair	Fair	Removal	Private	2	Multiple stems
655	Manitoba Maple	*Acer negundo*	19	19	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	Growing close to structure
656	Manitoba Maple	*Acer negundo*	35	26	24	0	0	0	1	Good	Fair	Fair	Removal	Private	2	Codominant stems
657	Manitoba Maple	*Acer negundo*	19	19	0	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean, multiple stems
658	Manitoba Maple	*Acer negundo*	16	13	10	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean, multiple stems
659	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
660	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
661	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
662	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
663	Manitoba Maple	*Acer negundo*	19	19	0	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
664	Manitoba Maple	*Acer negundo*	20	20	0	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
665	Manitoba Maple	*Acer negundo*	24	24	0	0	0	0	2.5	Good	Fair	Fair	Removal	Private	2	On lean
666	Manitoba Maple	*Acer negundo*	20	20	0	0	0	0	2.5	Good	Fair	Fair	Removal	Private	1	On lean
667	Manitoba Maple	*Acer negundo*	47	30	20	20	18	15	3.5	Good	Fair	Fair	Removal	Private	3	Multiple twisted stems
668	Manitoba Maple	*Acer negundo*	29	18	16	16	0	0	2	Good	Good	Good	Removal	Private	2	
669	Green Ash	*Fraxinus pennsylvanica*	42	42	0	0	0	0	4	Good	Fair	Fair	Removal	Private	3	Growing close to structure
670	Manitoba Maple	*Acer negundo*	57	40	40	0	0	0	4	Good	Good	Good	Removal	Private	4	
671	Silver Maple	*Acer saccharinum*	58	58	0	0	0	0	4	Good	Good	Good	Removal	Private	4	
672	Silver Maple	*Acer saccharinum*	38	38	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
673	Silver Maple	*Acer saccharinum*	50	50	0	0	0	0	4	Good	Good	Good	Removal	Private	3	
674	Silver Maple	*Acer saccharinum*	50	50	0	0	0	0	4	Good	Good	Good	Removal	Private	3	
675	Silver Maple	*Acer saccharinum*	74	74	0	0	0	0	5	Good	Good	Good	Removal	Private	5	
676	Silver Maple	*Acer saccharinum*	62	45	42	0	0	0	4	Good	Fair	Good	Removal	Private	4	On slight lean
677	Silver Maple	*Acer saccharinum*	33	33	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
678	Bur Oak	*Quercus macrocarpa*	14	14	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
679	Silver Maple	*Acer saccharinum*	35	35	0	0	0	0	3	Good	Good	Good	Removal	Private	2	
680	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
681	Siberian Elm	*Ulmus pumila*	35	35	0	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	2	Crown dieback
682	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
683	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
685	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
686	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
687	Cottonwood	*Populus deltoides*	29	29	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
688	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	Crown dieback, half of crown broken off
689	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
690	Siberian Elm	*Ulmus pumila*	32	32	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
691	Siberian Elm	*Ulmus pumila*	40	40	0	0	0	0	2.5	Fair	Good	Fair	Removal	Private	3	Crown dieback
692	Siberian Elm	*Ulmus pumila*	16	16	0	0	0	0	1	Fair	Good	Fair	Removal	Private	1	Crown dieback

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
693	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	2	Fair	Good	Fair	Removal	Private	2	Crown dieback
694	Silver Maple	*Acer saccharinum*	62	62	0	0	0	0	2.5	Good	Fair	Fair	Removal	Private	4	Dead and broken branches
695	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	2	Crown dieback
696	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
697	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	2	Poor	Fair	Poor	Removal	Private	0	Crown dieback
698	Siberian Elm	*Ulmus pumila*	32	32	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Crown dieback
699	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
700	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
801	Basswood	*Tilia americana*	10	10	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Main stem broken off, suckering
802	Basswood	*Tilia americana*	22	15	12	10	0	0	1	Fair	Fair	Fair	Removal	Private	2	Multiple stems
803	Basswood	*Tilia americana*	15	15	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	1	Lower branch dieback
804	Basswood	*Tilia americana*	21	15	15	0	0	0	1	Fair	Fair	Fair	Removal	Private	2	Codominant stems, crown dieback
805	Basswood	*Tilia americana*	41	25	22	18	15	0	1	Fair	Fair	Fair	Removal	Private	3	Multiple stems, insect damage to leaves
806	Silver Maple	*Acer saccharinum*	45	25	20	18	18	18	2	Fair	Fair	Fair	Removal	Private	3	Multiple Stems
807	Crack Willow	*Salix euxina*	50	50	0	0	0	0	3	Fair	Poor	Poor	Removal	Private	0	Trunk split open, on lean
808	Crack Willow	*Salix euxina*	45	45	0	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	3	Lower branch dieback
809	Crack Willow	*Salix euxina*	25	18	18	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	2	Lower branch dieback, codominant stems
810	Siberian Elm	*Ulmus pumila*	35	25	25	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Dead limbs, codominant stems
811	Crack Willow	*Salix euxina*	35	25	20	15	0	0	2	Fair	Fair	Fair	Removal	Private	2	Multiple Stems
812	Crack Willow	*Salix euxina*	34	34	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
813	White Elm	*Ulmus americana*	38	34	18	0	0	0	2	Good	Good	Good	Removal	Private	3	
814	Crack Willow	*Salix euxina*	32	25	20	0	0	0	2	Fair	Poor	Poor	Removal	Private	0	Broken limb, missing bark
815	Crack Willow	*Salix euxina*	22	22	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Top broken off
816	Crack Willow	*Salix euxina*	44	44	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
817	Crack Willow	*Salix euxina*	25	25	0	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	2	Codominant stem dead and removed
818	Crack Willow	*Salix euxina*	25	25	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	2	On lean
819	Crack Willow	*Salix euxina*	10	10	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Main stem dead and removed
820	Silver Maple	*Acer saccharinum*	45	25	25	20	20	0	3	Good	Fair	Fair	Removal	Private	3	Multiple stems
821	Silver Maple	*Acer saccharinum*	29	20	15	15	0	0	2	Fair	Fair	Fair	Removal	Private	2	Multiple stems
822	Crack Willow	*Salix euxina*	40	40	0	0	0	0	1	Poor	Poor	Poor	Removal	Private	0	Severe crown dieback
823	Silver Maple	*Acer saccharinum*	42	32	22	15	0	0	2	Fair	Fair	Fair	Removal	Private	3	Weak union
824	Crack Willow	*Salix euxina*	36	20	18	18	15	0	2	Fair	Fair	Fair	Removal	Private	3	Multiple stems
825	Silver Maple	*Acer saccharinum*	45	28	28	22	0	0	2.5	Fair	Fair	Fair	Removal	Private	3	Multiple stems
826	Silver Maple	*Acer saccharinum*	52	27	27	25	25	0	2.5	Fair	Fair	Fair	Removal	Private	4	Multiple stems
827	Silver Maple	*Acer saccharinum*	41	25	23	23	0	0	2	Fair	Fair	Fair	Removal	Private	3	Multiple stems
828	Silver Maple	*Acer saccharinum*	42	30	30	0	0	0	2	Fair	Fair	Fair	Removal	Private	3	Codominant stems, included union
829	White Spruce	*Picea glauca*	15	15	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
830	White Spruce	*Picea glauca*	28	28	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
831	White Spruce	*Picea glauca*	28	28	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
832	Silver Maple	*Acer saccharinum*	40	28	28	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	3	Codominant stems
833	Silver Maple	*Acer saccharinum*	25	18	18	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	2	Codominant stems
834	Siberian Elm	*Ulmus pumila*	30	22	15	13	0	0	2.5	Fair	Fair	Fair	Removal	Private	2	Stems grown together, rotting at base of union
835	Common Pear	*Pyrus communis*	18	18	0	0	0	0	1.5	Good	Fair	Fair	Removal	Private	1	On lean
836	Scots Pine	*Pinus sylvestris*	17	17	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	1	Crown dieback
837	Silver Maple	*Acer saccharinum*	28	20	20	0	0	0	1.5	Good	Fair	Fair	Removal	Private	2	Codominant stems
838	Cottonwood	*Populus deltoides*	20	20	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	1	Crown dieback, on lean
839	Silver Maple	*Acer saccharinum*	14	14	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
840	Silver Maple	*Acer saccharinum*	17	14	10	0	0	0	1	Good	Good	Good	Removal	Private	1	
841	Silver Maple	*Acer saccharinum*	20	20	0	0	0	0	3	Good	Good	Good	Removal	Private	1	
842	European Larch	*Larix decidua*	20	20	0	0	0	0	2.5	Poor	Fair	Poor	Removal	Private	0	Crown dieback
843	Common Pear	*Pyrus communis*	15	15	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
844	Silver Maple	*Acer saccharinum*	15	15	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	1	Multiple stems
845	Silver Maple	*Acer saccharinum*	19	19	0	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	Crown dieback
846	Silver Maple	*Acer saccharinum*	29	27	10	0	0	0	2.5	Good	Fair	Fair	Removal	Private	2	Crack in main stem
847	Silver Maple	*Acer saccharinum*	53	53	0	0	0	0	2.5	Good	Good	Good	Removal	Private	4	
848	Silver Maple	*Acer saccharinum*	80	80	0	0	0	0	5	Good	Good	Good	Removal	Private	5	
849	Siberian Elm	*Ulmus pumila*	42	42	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
850	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
851	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
852	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
853	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
854	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
855	Silver Maple	*Acer saccharinum*	16	11	11	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	1	Multiple stems, missing bark
856	Siberian Elm	*Ulmus pumila*	70	70	0	0	0	0	3	Good	Good	Good	Removal	Private	5	
857	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
858	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
859	Siberian Elm	*Ulmus pumila*	35	27	23	0	0	0	3	Good	Fair	Fair	Removal	Private	2	Codominant stems
860	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
861	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Good	Good	Good	Removal	Private	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
862	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
863	Siberian Elm	*Ulmus pumila*	12	12	0	0	0	0	0.5	Good	Good	Good	Removal	Private	1	
864	Siberian Elm	*Ulmus pumila*	49	25	25	24	23	0	3	Good	Fair	Fair	Removal	Private	3	Multiple stems
865	Siberian Elm	*Ulmus pumila*	39	28	27	0	0	0	2.5	Good	Fair	Fair	Removal	Private	3	Codominant stems
866	Siberian Elm	*Ulmus pumila*	45	45	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
867	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Poor	Fair	Poor	Removal	Private	0	Crown dieback
868	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
869	Silver Maple	*Acer saccharinum*	30	22	20	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Codominant stems
870	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	1	One dead leader
871	Siberian Elm	*Ulmus pumila*	39	28	27	0	0	0	4	Fair	Fair	Fair	Removal	Private	3	Crown dieback, codominant stems, included bark
872	Siberian Elm	*Ulmus pumila*	49	27	25	23	23	0	1.5	Fair	Fair	Fair	Removal	Private	3	Multiple stems
873	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
874	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
875	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
876	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
877	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
878	Siberian Elm	*Ulmus pumila*	21	15	15	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Codominant stems
879	Siberian Elm	*Ulmus pumila*	46	27	25	20	20	0	2	Fair	Fair	Fair	Removal	Private	3	Multiple stems, included bark, split at union
880	Siberian Elm	*Ulmus pumila*	22	20	10	0	0	0	3	Fair	Fair	Fair	Removal	Private	2	Multiple stems, included bark
881	Siberian Elm	*Ulmus pumila*	90	90	0	0	0	0	3	Fair	Fair	Fair	Removal	Private	5	Wound at base of stem, dead limb
882	Siberian Elm	*Ulmus pumila*	28	22	18	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	2	Codominant stems
883	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
884	Siberian Elm	*Ulmus pumila*	29	23	18	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	2	Codominant stems
885	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
886	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
887	Norway Maple	*Acer platanoides*	30	30	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	On lean, burn marks
888	Norway Spruce	*Picea abies*	40	40	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	3	Codominant leaders, included bark
889	Norway Spruce	*Picea abies*	60	60	0	0	0	0	3.5	Good	Good	Good	Removal	Private	4	
890	Norway Spruce	*Picea abies*	40	40	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
891	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	1	Grown into Buckthorn
892	Norway Maple	*Acer platanoides*	18	18	0	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
893	Norway Maple	*Acer platanoides*	23	23	0	0	0	0	2.5	Good	Good	Good	Removal	Private	2	
894	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
895	Manitoba Maple	*Acer negundo*	21	15	15	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Stems twisted
896	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
897	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
898	Crack Willow	*Salix euxina*	120	120	0	0	0	0	5	Poor	Poor	Poor	Removal	Private	0	Broken and dead leaders, missing bark
899	Siberian Elm	*Ulmus pumila*	40	40	0	0	0	0	2	Good	Good	Good	Removal	Private	3	
900	Crack Willow	*Salix euxina*	100	100	0	0	0	0	3	Poor	Poor	Poor	Removal	Private	0	Dead and broken leader
901	Black Locust	*Robinia pseudoacacia*	21	21	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
902	Black Locust	*Robinia pseudoacacia*	14	10	10	0	0	0	2	Good	Good	Good	Removal	Private	1	
903	Black Locust	*Robinia pseudoacacia*	14	10	10	0	0	0	2	Good	Good	Good	Removal	Private	1	
904	Black Locust	*Robinia pseudoacacia*	14	10	10	0	0	0	2	Good	Good	Good	Removal	Private	1	
905	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
906	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
907	Black Locust	*Robinia pseudoacacia*	16	16	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
908	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
909	Black Locust	*Robinia pseudoacacia*	19	19	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
910	Black Locust	*Robinia pseudoacacia*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
911	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Fair	Fair	Removal	Private	1	On lean
912	Black Locust	*Robinia pseudoacacia*	18	13	12	0	0	0	2	Good	Good	Good	Removal	Private	1	
913	Black Locust	*Robinia pseudoacacia*	15	15	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
914	Black Locust	*Robinia pseudoacacia*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
915	Black Locust	*Robinia pseudoacacia*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
916	Black Locust	*Robinia pseudoacacia*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
917	Black Locust	*Robinia pseudoacacia*	23	23	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
918	Eastern White Pine	*Pinus strobus*	22	22	0	0	0	0	2	Good	Good	Good	Preservation	Neighbour	0	
919	White Spruce	*Picea glauca*	28	28	0	0	0	0	2	Good	Good	Good	Preservation	Neighbour	0	
920	Norway Maple	*Acer platanoides*	35	35	0	0	0	0	4	Good	Good	Good	Preservation	Neighbour	0	
921	Manitoba Maple	*Acer negundo*	28	22	18	0	0	0	3	Good	Good	Good	Preservation	Private	0	
922	Crack Willow	*Salix euxina*	22	22	0	0	0	0	1.5	Good	Good	Good	Preservation	Private	0	
923	Manitoba Maple	*Acer negundo*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
924	Manitoba Maple	*Acer negundo*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
925	Manitoba Maple	*Acer negundo*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	Private	2	
926	Manitoba Maple	*Acer negundo*	22	18	12	0	0	0	1.5	Good	Fair	Fair	Removal	Private	2	On lean
927	Crack Willow	*Salix euxina*	45	45	0	0	0	0	2	Good	Fair	Fair	Removal	Private	3	On lean
928	Crack Willow	*Salix euxina*	31	18	16	16	10	0	2	Good	Fair	Fair	Removal	Private	2	On lean, multiple stems
929	Manitoba Maple	*Acer negundo*	36	20	17	17	13	13	3	Fair	Fair	Fair	Removal	Private	3	Multiple systems, crown dieback, broken limbs
930	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	1	Crown dieback, on lean

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
931	Manitoba Maple	*Acer negundo*	42	28	26	18	0	0	2.5	Fair	Fair	Fair	Removal	Private	3	Crown dieback, on lean
932	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	1	Broken crown, on lean
933	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
934	Manitoba Maple	*Acer negundo*	14	14	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
935	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
936	Littleleaf Linden	*Tilia cordata*	16	16	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
937	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
938	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
939	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
940	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
941	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
942	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean, fused at base with Buckthorn
943	Manitoba Maple	*Acer negundo*	28	28	0	0	0	0	2.5	Fair	Fair	Fair	Removal	Private	2	On lean, suckering
944	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	2	Good	Good	Good	Removal	Private	1	
945	Manitoba Maple	*Acer negundo*	20	14	14	0	0	0	2	Good	Fair	Fair	Removal	Private	1	On lean
946	Manitoba Maple	*Acer negundo*	28	28	0	0	0	0	2	Good	Fair	Fair	Removal	Private	2	On lean
947	Cottonwood	*Populus deltoides*	67	50	45	0	0	0	3	Fair	Poor	Poor	Removal	Private	0	Codominant stems, weak union, hollow at base, broken limb
948	Cottonwood	*Populus deltoides*	53	53	0	0	0	0	3	Fair	Poor	Poor	Removal	Private	0	Crown dieback, dead and broken limbs, missing bark
949	Crack Willow	*Salix euxina*	52	30	30	30	0	0	4	Fair	Poor	Poor	Removal	Private	0	Codominant stems, weak union, broken limb
950	White Elm	*Ulmus americana*	13	13	0	0	0	0	2.5	Good	Good	Good	Removal	Private	1	
951	Crack Willow	*Salix euxina*	15	15	0	0	0	0	1.5	Fairl	Poor	Poor	Removal	Private	0	On severe lean, main stem broken off, split at base of stem
952	Crack Willow	*Salix euxina*	10	10	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
953	Crack Willow	*Salix euxina*	12	12	0	0	0	0	1	Fair	Fair	Fair	Removal	Private	1	Codomjnant stems, one broken off
954	White Elm	*Ulmus americana*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
955	Crack Willow	*Salix euxina*	26	26	0	0	0	0	1	Good	Good	Good	Removal	Private	2	
956	Manitoba Maple	*Acer negundo*	31	26	12	12	0	0	4	Fair	Poor	Poor	Removal	Private	0	Rubbing stems, on lean, broken branches
957	Silver Maple	*Acer saccharinum*	44	26	26	24	0	0	2	Good	Fair	Fair	Removal	Private	3	Codominant stems
958	Common Apple	*Malus pumila*	43	43	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	3	Main limb dead and broken off, limbs twisted and rubbing
959	Common Apple	*Malus pumila*	32	20	20	15	0	0	2.5	Good	Fair	Fair	Removal	Private	2	Multiple stems, on lean
960	Silver Maple	*Acer saccharinum*	37	25	22	15	0	0	2.5	Good	Fair	Fair	Removal	Private	3	Multiple stems
961	Common Pear	*Pyrus communis*	20	15	13	0	0	0	2	Good	Good	Good	Removal	Private	1	
962	Scots Pine	*Pinus sylvestris*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
963	Silver Maple	*Acer saccharinum*	44	27	18	18	18	15	2	Good	Fair	Fair	Removal	Private	3	Multiple stems
964	Silver Maple	*Acer saccharinum*	25	22	12	0	0	0	2	Good	Good	Good	Removal	Private	2	
965	Scots Pine	*Pinus sylvestris*	21	21	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
966	Scots Pine	*Pinus sylvestris*	23	23	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
967	Scots Pine	*Pinus sylvestris*	25	25	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
968	Silver Maple	*Acer saccharinum*	52	30	28	23	23	0	2	Fair	Fair	Fair	Removal	Private	4	Multiple stems, missing bark, included bark
969	Common Pear	*Pyrus communis*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
970	Common Pear	*Pyrus communis*	10	10	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
971	Common Pear	*Pyrus communis*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
972	Common Pear	*Pyrus communis*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
973	Common Pear	*Pyrus communis*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
974	Common Pear	*Pyrus communis*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
975	Common Pear	*Pyrus communis*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
976	Common Pear	*Pyrus communis*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
977	Common Pear	*Pyrus communis*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
978	Common Pear	*Pyrus communis*	12	12	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
979	Common Pear	*Pyrus communis*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
980	Common Pear	*Pyrus communis*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
981	Common Pear	*Pyrus communis*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
982	Common Pear	*Pyrus communis*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
983	Common Pear	*Pyrus communis*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
984	Common Pear	*Pyrus communis*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	Private	1	
985	Silver Maple	*Acer saccharinum*	59	27	27	27	25	25	2	Fair	Fair	Fair	Removal	Private	4	Multiple stems, missing bark, dead twigs
986	Common Pear	*Pyrus communis*	54	30	28	20	20	20	4	Good	Fair	Fair	Removal	Private	4	Multiple stems
987	Common Pear	*Pyrus communis*	30	30	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
988	Common Pear	*Pyrus communis*	28	28	0	0	0	0	2	Good	Good	Good	Removal	Private	2	
989	Basswood	*Tilia americana*	45	45	0	0	0	0	3	Good	Good	Good	Removal	Private	3	
990	Basswood	*Tilia americana*	30	30	0	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Broken limb, missing bark, on slight lean, growing into wire fence
991	Common Apple	*Malus pumila*	50	50	0	0	0	0	3	Fair	Good	Good	Removal	Private	3	Main stem dead and missing, hollow wound, broken limb
992	Common Apple	*Malus pumila*	50	50	0	0	0	0	3	Fair	Good	Good	Removal	Private	3	On lean, twisted and rubbing limbs, knot holes
993	Basswood	*Tilia americana*	24	17	17	0	0	0	2	Fair	Fair	Fair	Removal	Private	2	Suckering
994	Basswood	*Tilia americana*	40	40	0	0	0	0	2	Poor	Poor	Poor	Removal	Private	0	Crown broken off, two limbs alive
995	Bur Oak	*Quercus macrocarpa*	45	45	0	0	0	0	2.5	Good	Good	Good	Removal	Private	3	
996	Basswood	*Tilia americana*	30	22	20	0	0	0	1.5	Fair	Fair	Fair	Removal	Private	2	Codominant stems, crown dieback
997	Basswood	*Tilia americana*	35	35	0	0	0	0	1.5	Fair	Poor	Fair	Removal	Private	0	Stunted growth, crown dieback, crack at base of trunk
998	Common Pear	*Pyrus communis*	15	15	0	0	0	0	1	Good	Good	Good	Removal	Private	1	
999	Common Pear	*Pyrus communis*	18	18	0	0	0	0	1	Good	Good	Good	Removal	Private	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius /TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Ownership	Number of Compensation Trees	Notes
1000	Crack Willow	*Salix euxina*	28	28	0	0	0	0	1	Good	Fair	Fair	Removal	Private	2	On lean
															918	

Table 2: Hedgerow Inventory

Hedgerow ID Number	Dominant Species Common Name	Dominant Species Scientific Name	Stem Count	Size (DBH)	Overall Health	Recommended Action
HR1	Blue Spruce and Austrian Pine	*Picea pungens & Pinus nigra*	9	10-20 cm	Good	Preservation
HR2	White Spruce	*Picea glauca*	6	10-30 cm	Good	Preservation
HR3	Norway Spruce	*Picea abies*	18	25-50 cm	Good	Removal
HR4	Norway Spruce	*Picea abies*	10	25-50 cm	Good	Removal
HR5	Siberian Elm	*Ulmus pumila*	8	10-30 cm	Good	Removal

Appendix H

Landscape Plan

Landscape Plan – Draft Plan Conceptual

Tullamore Employment Lands

Caledon, Ontario

Submitted to:
Tullamore Industrial LP
75 Tiverton Court
Markham, ON L3R 4M8

Submitted by:
GEI Consultants Ltd.
75 Tiverton Court, Unit 100
Markham, ON L3R 4M8

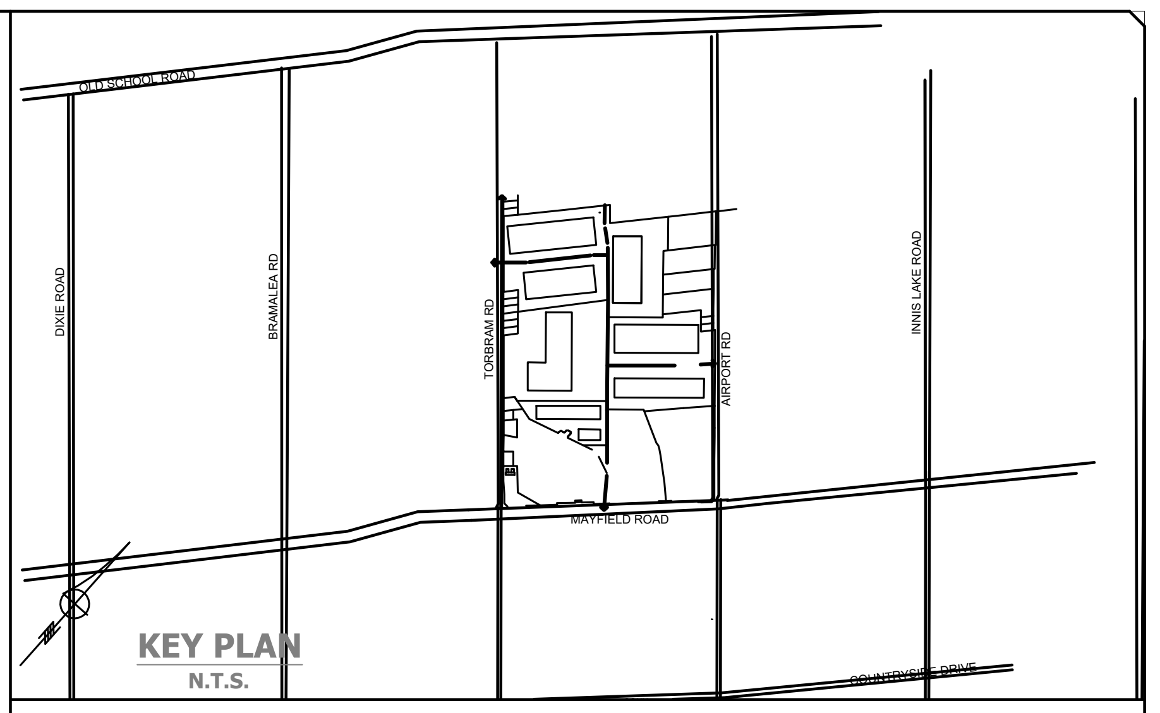
April 2023
Project 2100975

1:5000

0 10 20 40m

AREA TABLE		
BLOCK	BLOCK TYPE	TOTAL AREA
9	Restoration Area	5.633 ha
12	Environmental Protection Area	4.259 ha
13	Storm Water Management Pond	4.660 ha
14	Storm Water Management Pond	4.744 ha

Note-Streetscape Landscape Plans will be prepared for all internal streets and for the Landscape surrounding buildings.



KEY PLAN
N.T.S.

LEGEND

No.	REVISION	DATE	BY
5			
4			
3			
2			
1			

RICE GROUP

GEI Consultants

TULLAMORE EMPLOYMENT LANDS

CONCEPTUAL LANDSCAPE PLAN

DESIGNED BY: NC	CHECKED BY: SL	PROJECT No.:
DRAWN BY: NC	DATE: 14 April 2023	DRAWING No.: 1
SCALE:		

File: C:\USERS\NCOLLINS\ONEDRIVE - GEI CONSULTANTS, INC\DESKTOP\UPLOAD TO B\TULLAMORE\2023-04-14-TULLAMOREDPMARKUP.DWG

Appendix I

Slope Stability Study

GEI Consultants
Consulting Engineers and Scientists

Slope Stability Study

Tullamore Employment Lands

Mayfield Road & Torbram Road, Caledon, Ontario

Submitted to:
Tullamore Industrial Limited Partnership
75 Tiverton Court
Markham, Ontario L3R 4M8

Submitted by:
GEI Consultants Ltd.
647 Welham Road, Unit 14
Barrie, Ontario, L4N 0B7

February 18, 2022
Project No. 2100975

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1. Introduction

GEI Consultants Ltd. (GEI) was retained by Tullamore Industrial Limited Partnership (Client) to complete a visual slope inspection, slope stability analysis, and provide a slope stability study delineating the Long Term Stable Top of Slope (LTSTOS) position for the proposed Tullamore Employment Lands development northeast of Mayfield Road and Torbram Road, in Caledon, Ontario. A site location plan is provided as Figure 1.

GEI was provided with the following drawings and report:

- *"Report on Geotechnical Investigation, 0 & 12245 Torbram Road, Caledon, Ontario,"* Report No. 5552-21-GB, dated June 24, 2021, by Toronto Inspection Ltd.
- *"Draft Plan of Subdivision,"* Drawing No. D2, File Number 10208, dated November 26, 2021, by Weston Consulting.
- *"Topographic Plan of Part of Lots 18, 19 and 20, Concession 6, East of Hurontario Street, Part of Lots The Road Allowance between Lots 17 and 18, Concession 6, East of Hurontario Street,"* Project No. 21-B7601, dated July 22, 2021, by Young & Young Surveying Inc.

The overall site has an area of 149.5 ha and is proposed to be primarily developed with industrial land use. The remaining parts of site will consist of space for future development, a stormwater management pond, new stormwater channels, new roadways, and dedicated greenbelt space associated with the west tributary of West Humber River that generally flows through the southwestern quadrant of the site. There are various headwater drainage features and three small, ephemeral watercourses that drain into the east tributary. Based on site observations, site topography, and detailed cross-sections, these ephemeral watercourses are interpreted to be unconfined systems. There are two existing ponds online with the east tributary (upper and lower ponds) that were formed by historically filling the channel to create earth embankment dams, which are failing, eroding, and showing signs of distress. The ponds are drained through culverts beneath the embankment dams.

The site is in the Humber River Watershed, within the jurisdiction of the Toronto and Region Conservation Authority (TRCA). A review of TRCA mapping shows that both the eastern and western tributaries are Regulated Areas. The TRCA requested a slope stability study for the site to determine the Long Term Stable Top of Slope (LTSTOS) position (slope stability setback) as part of the permitting process, per the comments provided in the document, *"Comment Response Matrix,"* Dated January 17, 2022, from the Town of Caledon. This slope stability study provides the results of a visual slope inspection, summarizes the existing borehole information from the site, carries out detailed slope stability analysis, and calculates the LTSTOS for the site. A preliminary assessment of the embankment dams is also provided.

2. Visual Slope Inspections

The site and slopes within the Tullamore Employment Lands were inspected on January 11, 2022, by Bo Hwang, a Senior Field Technician at GEI. The weather was sunny, clear, and cold with an estimated air temperature of -25°C at the time of the inspection. The site is within the jurisdiction of the Toronto and Region Conservation Authority (TRCA) in the Humber River Watershed. Due to the large size and the changing slope conditions within the site, separate slope inspections were conducted for the following areas:

- West Tributary – Northern Slope of the Main Tributary Valley Wall (note: the southern slope of the main western tributary is within the greenbelt and development will not occur on the tableland, so the area was not inspected).
- West Tributary – Southern Slope of the Southern Drainage Feature.
- East Tributary – Southern Slope of the Main Tributary Valley Wall.
- East Tributary – Embankment Dams.

Photographs taken during the inspection are included in Appendix B and photograph and site features plans are provided as Figures 2A and 2B. The field records of the inspection, including the Ministry of Natural Resources (MNR) Slope Rating and Slope Inspection Forms are provided in Appendix F.

2.1 West Tributary – Northern Slope of the Main Valley Wall

The greenbelt area at the site contains a tributary watercourse of the West Humber River (called the west tributary) along with a confined valley system including floodplain areas and a slope extending generally east to west between Torbram Road and Mayfield Road.

The eastern third of this slope (extending from Mayfield Road to the existing barns and structures on the tableland) ranges from about 8 to 10 metres in height with inclinations of 3 horizontal to 1 vertical or flatter. The slope is separated from the watercourse by a floodplain that is greater than 15 metres wide. The slope is lightly vegetated with grasses and some small shrubs and trees. There are more trees along the watercourse. A driveway extends from Mayfield Road to the existing farm house, barns and other structures on the tableland near the slope. There are some localized drainage gullies that extend down the slope near the barns, conveying concentrated runoff down the slope. A weeping tile also outlets partway down the slope in one of the erosion gullies. Otherwise, sheet drainage is expected.

The western two-thirds of this slope (extending from the barns to Torbram Road) ranges from about 6 to 12 metres in height with typical inclinations flatter than 2 horizontal to 1 vertical. There are some localized areas where the slope is as steep as 1.4 horizontal to 1 vertical. The watercourse is generally adjacent to the slope toe and active erosion was observed along the banks (undercutting, exposed roots, small scarps). There are localized marshy areas in the floodplain. The top of slope consists of farmland, but the slope is generally well vegetated with large trees (vertical to slightly leaning) and some undergrowth. There are two locations west of the barns that appear to be historic drainage features (large, shallow gullies) that likely convey concentrated runoff from the tableland to the north.

Overall, there were no signs of slope instability. Some of the trees were leaning but this is likely from long-term creep of the slope. Active erosion was observed along the watercourse and the drainage gullies on the slope indicate there are areas of concentrated runoff flowing down the slope.

The Rating Value obtained from the MNR Slope Rating Form was 21 for the section of slope between Mayfield Road and the barns (with the wide floodplain), which indicates a low potential for slope instability. The Rating Value obtained from the MNR Slope Rating Form was 43 for the slope between the barns and Torbram Road, which indicates a moderate potential for slope instability.

2.2 Western Tributary – South Drainage Feature

The south drainage feature is located in the west tributary but in the southern corner of the site near the intersection of Torbram Road and Mayfield Road. This is a confined system but it is assumed that it only conveys runoff during or after precipitation and snowmelt events. No flowing water was observed during the inspection but marshy vegetation was observe at the bottom of the slope. The slope height ranges from about 2 to 4 metres and the inclinations are typically 4 horizontal to 1 vertical or flatter. No structures were observed near the slope crest.

The area consists of farmland divided by the drainage feature. A small embankment path bisects the channel to connect the divided farmland, but no culvert was observed beneath the embankment. It is expected sheet drainage will occur into the channel from the surrounding farmland, and there is some evidence of concentrated runoff due to rilling or gullies in localized areas.

The surrounding site and slopes are lightly vegetated with grasses and weeds. Some shrubs were seen along the face of the slopes, with tall grass and some small trees seen within the marshy grounds at the bottom. Based on the borehole findings and visual observations, stratigraphy consists of topsoil underlain by earth fill consisting of reworked sandy silt to clayey silt glacial till, followed by undisturbed glacial till.

No signs of slope instability were observed along the slopes. Some localized rills and gullies were observed from the top extending down the face of the slope due to concentrated runoff.

The Rating Value obtained from the MNR Slope Rating Form was 25, which indicates a slight potential for slope instability.

2.3 East Tributary

The east tributary on site consists primarily of a confined watercourse system with a valley slope. The slope heights typically range from 3 to 5 metres with inclinations of 4 horizontal to 1 vertical or flatter. There are two artificial ponds (upper and lower) created by historically filling the channel to create earth embankment dams (more details on the dams in Section 2.4). The ponds are online with the tributary. Flowing water was not observed within the eastern tributary during the inspection but the channel between the ponds contained marshy vegetation and the ponds were surrounded by marshy vegetation. The slopes were vegetated with grasses, shrubs and some trees.

There are two ephemeral watercourses near the headwaters of the tributary that drain into the northern pond. There is another smaller drainage feature that outlets into the lower pond. Based on visual observations, these drainage features are unconfined systems as there is not a discernable slope crest position and the topography is gradual / undulating. No water or defined watercourse channel was observed within the drainage features but they contained marshy vegetation throughout.

The tableland typically contains farmland within the property limits, but there is an industrial development on the opposite side of the east tributary on an adjacent property.

It is expected that some sheet drainage will runoff into the east tributary but it is mainly fed by runoff from the intermittent drainage features. No signs of localized, concentrated runoff were observed along the slope crest and no active erosion at the bottom of the slope was observed. No signs of slope instability were observed along the southern slope of the east tributary.

The Rating Value obtained from the MNR Slope Rating Form was 27 for the southern slope of the east tributary, which indicates a slight potential for slope instability.

2.4 Embankment Dams

There are two existing ponds online with the east tributary (upper and lower ponds) that were formed by historically filling the channel to create earth embankment dams. The upper embankment dam is about 3.5 to 4.5 metres in height with side slope inclinations of 3.5 horizontal to 1 vertical or flatter. The lower embankment dam is about 4 to 4.5 metres in height with side slope inclinations of typically 2.5 horizontal to 1 vertical or flatter, but there is a localized area near the culvert inlet with inclinations of 1.1 horizontal to 1 vertical due to erosion. The embankment dams are failing, eroding, and showing signs of distress.

The ponds are drained through culverts that extend beneath the dams. The culvert inlet at the upper pond is partially damaged or destroyed and the exact inlet location / configuration is unknown. Broken sections of CSP culverts are scattered near the assumed inlet location, along with some boulders and a metal tank. Erosion is occurring around the culvert inlet, and slope failures are occurring up to the embankment crest (slumping / sloughing of soil from the exposed face). It is possible the culvert was partially exposed due to piping erosion from water flowing along the outside of the culvert within the berm. The CSP culvert outlets into the tributary on the south side of the embankment dam, and erosion scarps and slumping were observed surrounding the outlet.

There is also significant erosion at the culvert inlet for the southern embankment dam. The erosion has resulted in slope failures including slumping and sloughing of soil from the over-steepened slope face. A broken piece of CSP culvert and a pile of boulders are located at the assumed inlet location, however the culvert was not observed extending beneath the embankment. The assumed outlet location is eroding and the actual CSP was not observed.

The embankments are vegetated mostly with grass but sporadically contain some small trees and shrubs. Concrete and metal debris were observed along the face of the slope of the northern dam, with metal debris along the slope of the southern dam.

It is understood that seepage was observed from the downstream slope of the embankments by GEI staff during previous site inspections, which indicates water also seeps through the embankment (not just through the culverts).

3. Subsurface Conditions

3.1 General Overview

Toronto Inspection advanced thirty-eight (38) boreholes across the site as part of a geotechnical investigation at the site in 2021. Fourteen (14) of the boreholes were advanced near the slopes under investigation, including 21BH-1 to 21BH-5, 21BH-7 to 21BH-10, 21BH-17, 21BH-33, and 21BH-36.

The detailed soil profiles encountered in the boreholes are indicated on the attached borehole logs from Toronto Inspection (2021) in Appendix A. The borehole logs were provided within a geotechnical engineering report signed and stamped by a Professional Engineer, and GEI has relied on the boreholes as factual information.

The borehole locations are shown on Figures 3A and 3B. Interpreted subsurface stratigraphy is also shown on the subsurface profiles included as Figures XS1 to XS26. It should be noted that the conditions indicated on the borehole logs are for specific locations only and can vary between and beyond the borehole locations. It should be noted that the soil boundaries indicated on the borehole logs and cross sections are inferred from non-continuous or continuous (but disturbed) sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones and should not be interpreted as exact planes of geological change.

3.2 Stratigraphy

3.2.1 Topsoil and Earth Fill

Boreholes 21BH-1 to 21BH-5, 21BH-7 to 21BH-10, 21BH-17, 21BH-33, and 21BH-36 to 21BH-38 encountered approximately 10 to 300 mm of topsoil or compost at the ground surface.

Underlying the topsoil or compost, all boreholes encountered a zone of earth fill consisting of clayey silt to sandy silt (reworked glacial till), with some rootlets and topsoil, trace to some gravel and trace to some sand. Pockets of organics were encountered from 4.5 to 6.0 metres below grade in 21BH-8. The earth fill typically extended to depths of approximately 0.4 to 1.0 metres below grade (Elev. 232.4 to 242.8 metres), but extended to 3.1 metres below grade (Elev. 236.9 metres) in 21BH-37 and extended beyond the depth of investigation at 6.5 metres below grade (Elev. 231.8 metres) in 21BH-8, which was drilled through the embankment dam at the upper pond. The earth fill was typically brown and moist. The Standard Penetration Test (SPT) results (“N” Values) ranged from 3 to 29 blows per 300 mm of penetration, indicating a very loose to compact (but typically loose) relative density, or a soft to very stiff consistency.

3.2.2 Native Soils

Underlying the earth fill, Boreholes 21BH-1 to 21BH-5, 21BH-7, 21BH-17 and 21BH-33 encountered native deposits with a cohesive matrix consisting of clayey silt to clayey silt glacial till, with trace to some sand and trace to some gravel. Occasional sand seams were noted in the deposits. The clayey silt to clayey silt glacial till deposits extended to a depth of approximately 5.8 metres below grade (Elev. 232.7 metres) in 21BH-33 and extended beyond the vertical depth of investigation in the other boreholes at 6.5 metres below grade (Elev. 226.4 to 233.6 metres). The SPT "N" Values measured in the cohesive deposits ranged from 10 to 35 blows per 300 mm of penetration, indicating a stiff to hard consistency. The cohesive deposits were moist and brown, turning grey with depth.

Underlying the earth fill in Boreholes 21BH-9, 21BH-10, and 21BH-36 to 21BH-38, and underlying the clayey silt glacial till in 21BH-33 at 5.8 metres below grade (Elev. 232.7 metres), deposits of glacial till were encountered with a mostly cohesionless matrix consisting of sandy silt, some clay to clayey, and trace to some gravel. The sandy silt glacial till was brown and moist, turning grey with depth. The deposits extended beyond the vertical depth of exploration at 6.2 to 6.5 metres below grade (Elev. 231.9 to 236.8 metres). SPT "N" Values measured in the sandy silt glacial till ranged from 11 to greater than 50 blows per 300 mm of penetration, indicating a compact to very dense (but generally compact to dense) relative density.

3.3 Groundwater

Toronto Inspection Boreholes 21BH-2, 21BH-3, 21BH-7, 21BH-10, 21BH-33, 21BH-36 and 21BH-37 were instrumented with monitoring wells with 3-metre-long screens, as shown in the borehole logs in Appendix A. The diameter of the wells is unknown. The results summarized below are taken from the most recent measurements provided in the report, *"Preliminary, Hydrogeological Investigation, Tullamore Lands, 0 & 12245 Torbram Road, Caledon, Ontario,"* Report No. 5552-21-HC, dated June 30, 2021, by Toronto Inspection Ltd.

Monitoring Well Location	Depth / Elev. (m) of Well Screen Location	Strata Screened	Depth / Elev. (m) of Groundwater Level on June 14, 2021
21BH-2	3.1 to 6.1 / 229.9 to 226.9	Clayey Silt Glacial Till	5.36 / 227.63
21BH-3	3.1 to 6.1 / 232.5 to 229.4	Clayey Silt Glacial Till	Dry
21BH-7	3.1 to 6.1 / 237.1 to 234.1	Clayey Silt Glacial Till	4.52 / 235.65
21BH-10	3.1 to 6.1 / 240.3 to 237.3	Sandy Silt Glacial Till	3.19 / 240.19
21BH-33	3.1 to 6.1 / 235.4 to 232.4	Clayey Silt to Sandy Silt Glacial Till	2.46 / 236.02

Monitoring Well Location	Depth / Elev. (m) of Well Screen Location	Strata Screened	Depth / Elev. (m) of Groundwater Level on June 14, 2021
21BH-36	3.1 to 6.1 / 239.2 to 236.1	Sandy Silt Glacial Till	4.58 / 237.64
21BH-37	3.1 to 6.1 / 237.1 to 234.0	Sandy Silt Glacial Till	5.61 / 234.52

Based on the above groundwater measurements from Toronto Inspection, the groundwater table is approximately 2.5 metres below grade or deeper across the site (as measured from the tableland areas).

It is typical for groundwater to loosely mimic the topography of the ground surface of a slope before daylighting as base flow into a watercourse at or beyond the bottom of the slope. The slope stability models in Appendices C and D reflect this assumption.

Groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions.

4. Slope Stability Analysis

4.1 Slope Stability Setbacks and Policies

The Toronto and Region Conservation Authority (TRCA) provides policy requirements and technical guidance for developments within slope and erosion hazard zones based on the following documents:

- *"The Living City Policies for Planning and Development in the Watersheds of the Toronto and Region Conservation Authority,"* by TRCA, dated November 28, 2014.
- *"Technical Guide on River and Stream Systems: Erosion Hazard Limit,"* by the Ministry of Natural Resources (MNR), dated 2002.

The subject tributaries are within mapped TRCA Regulated Areas and are therefore subject to these policy guidelines. Included in these policy guidelines are setbacks in which all new development must be set behind. The following allowances are applicable for the confined valley systems at the site:

- Toe Erosion Allowance: This setback is an estimate of the distance the toe of slope will move over the next 100 years. This can be based on a site-specific fluvial geomorphology study, average annual recession rate based on 25 years of data or based on set values provided by the MNR depending on the soil type encountered. If the watercourse is greater than 15 metres away from the slope toe, no toe erosion allowance is required.
- Stable Slope Allowance: This setback is associated with determining the inclination of the slope that achieves a minimum factor of safety of 1.5. In some cases, the existing slope inclination may meet this minimum requirement. In lieu of detailed geotechnical engineering analysis, a conservative estimate for the stable slope inclination of 3H : 1V can typically be applied.
- Erosion Access Allowance: An additional 6 metre setback (for ancillary structures) or 10 metre setback (for buildings) is applied to allow for emergency access, routine maintenance of the slope and potential erosion areas, and to create an additional buffer between the development and the potential erosion hazard. The TRCA may allow for a reduction of this access allowance on a case-by-case basis.

The toe erosion allowance and stable slope allowance combine to form the Long Term Stable Top of Slope (LTSTOS). When the LTSTOS is combined with the erosion access allowance, this total setback line is the Erosion Hazard Limit from which all new development or redevelopment must be set behind, per TRCA guidelines. The above setbacks are applicable to sites where there is a confined valley system, and an LTSTOS model is shown on Figure 5.

These policies are not applicable for unconfined systems, where the Erosion Hazard Limit is defined by the meander belt allowance or flooding hazard limit, plus the erosion access allowance (beyond the scope of work in this report).

4.2 Soil Strength Design Parameters

Soil strength parameters for the soil strata were determined by GEI based on the Toronto Inspection 2021 borehole findings, published information, empirical correlations relating Standard Penetration Test (SPT) results ("N" Values) with soil type, unit weight and friction angle, and our experience on other slope evaluation projects in the area.

The site is underlain by typically 0.5 to 1.0 metres of earth fill, followed by compact to dense sandy silt glacial till deposits or stiff to hard clayey silt to clayey silt glacial till deposits. The values used in the slope stability analysis for this project are summarized below.

Stratum	γ - Bulk Unit Weight (kN/m^3)	Φ - Friction Angle (degrees)	c' – Effective Cohesion (kPa)
Earth Fill	19.0	29	0
Sandy Silt Glacial Till (Compact to Dense)	20.0	33	2
Clayey Silt to Clayey Silt Glacial Till (Very Stiff to Hard)	19.5	30	5

The soil strength parameters are also indicated on the results of the slope stability analysis within Appendices C to E. The soil strength parameters are based on effective stress analysis for long-term slope stability, and are likely conservative values. Furthermore, other effects which can increase the stability of the slope, such as negative pore water pressures within unsaturated soils (matric suction), and root mat reinforcement, have not been modelled. No existing retaining walls or toe erosion protection measures were encountered at the site.

4.3 Slope Geometry, Material Boundaries and Groundwater

GEI was provided with the following topographic plan of the site, which included 0.25 metre contour spacing: *"Topographic Plan of Part of Lots 18, 19 and 20, Concession 6, East of Hurontario Street, Part of Lots The Road Allowance between Lots 17 and 18, Concession 6, East of Hurontario Street,"* Project No. 21-B7601, dated July 22, 2021, by Young & Young Surveying Inc.

To assess the stability of the existing slopes at the site, twenty-six (26) cross-sections were created, typically from areas that were considered more critical (e.g. steepest portions of the slope) using the survey. The cross-section locations are shown on Figures 3A and 3B and the detailed slope profiles are included as Figures XS1 to XS26.

An AutoCAD file was received from TRCA with the staked top of slope for the northern valley wall of the west tributary and for parts of the southern valley wall for the east tributary. The staked top of slope line is shown as a solid purple line in the enclosed figures. GEI notes that in some locations (e.g. between Cross-Sections 4 to 7), the staked top of slope position provided from TRCA in the CAD file appears to extend partially over the top of slope location that would be established based on the topographic plan and profile views.

The top of slope positions for the confined valley slopes were established by GEI along the southern drainage feature in the western tributary, and along additional sections of the eastern tributary for slope analysis purposes based on interpretation of the slope profiles and on-site observations in relation to the methodology as described in TRCA's field staking protocol. This protocol states that the top of slope should be determined by "*the point where there is a break in slope or grade which distinguishes the valley corridor landform from its surrounding landscape*", and "*based on … professional judgment and can generally be described as the first main point of inflection or start of downward valley slope as observed from the adjacent tableland and does not include plateaus within the valley corridor with secondary points of inflection*". It must be noted that only TRCA Planning and Development staff can stake the physical top of slope that must be used by others for future planning and development purposes. The top of slope position established by GEI is shown with a dashed magenta line on the enclosed figures.

Cross-Sections 21 and 23 to 26 were cut through the unassessed drainage feature extending west from the lower pond, and through the ephemeral watercourses extending west to northwest from the upper pond. No flowing water was observed in these features during the visual inspection, and a neither a distinct / defined top of slope position nor a bankfull width / channel were observed on site or from the topographic plan or cross-sections. These gently rolling and undulating features near the headwaters of the tributary are considered to be unconfined systems, where there is no discernable top of slope or bank. Slope stability analysis is not required for the unconfined systems per the MNR provincial technical guideline and TRCA's *Living City Policies*. Cross-Sections 21 and 23 to 26 are appended to illustrate the gently rolling / undulating nature of the ephemeral watercourses or drainage features with average inclinations of 11 to 14 horizontal to 1 vertical.

The slope and embankment dam stratigraphy were determined based on the 2021 Toronto Inspection borehole results as discussed in Section 3.2. The groundwater was modelled in the analysis to reflect the conditions discussed in Section 3.3.

4.4 Slope Stability Analysis for Existing Conditions

Stability analysis was carried out using the commercially available computer program *Slide2* (Version 9.020) by RocScience Inc. The slope stability analysis was based on a force and moment limit equilibrium analysis using the Spencer method. This method of analysis calculates the minimum factor of safety (resisting versus driving forces) for numerous circular surfaces. The circular surfaces are centered on points on a grid with a set number of radius distances to be calculated for each centre. A factor of safety of 1.0 indicates the slope is at a point of pending failure since the resisting forces are equal to the driving forces.

Slope stability analysis was performed on various cross-sections and calculated the existing factor of safety (FOS) for the section using existing slope geometry, stratigraphy and groundwater conditions. The results are included in Appendix C and are summarized in the table below:

Location on Site	Cross-Section	Approximate Slope Height (m)	Maximum Existing Slope Inclination (Horizontal to Vertical)	Minimum Factor of Safety (FOS) for Existing Conditions
West Tributary, South Slope of Southern Drainage Feature	1	4	4.0:1	3.2
	2	2.2	5.2:1	4.5
	3	3.1	4.8:1	3.9
North Slope of West Tributary Valley Wall	4	11.5	4.3:1	3.4
	5	10.5	3.7:1	2.4
	6	8.6	1.9:1	1.6
	7	6.0	1.4:1	1.3
	8	10.5	6.6:1	4.5
	9	10.2	7.6:1	4.7
	10	9.5	3.4:1	2.4
	11	8.4	2.9:1	2.3
	12	7.8	4.2:1	2.5
	13	9.0	4.2:1	2.6
	14	9.1	4.1:1	2.4
South Slope of East Tributary Valley Wall	15	4.5	5.6:1	4.1
	18	4.0	4.1:1	3.2
	19	3.0	4.0:1	3.5
	22	3.5	6.2:1	3.8

The minimum factor of safety (FOS) calculated for existing slopes across the site were typically greater than 2. The average inclination of the slopes was typically 3 horizontal to 1 vertical or flatter. The analysis is consistent with the conditions observed during the visual slope inspection; no signs of historic or recent slope instability were observed.

An exception is an approximately 100-metre-long section of the west tributary northern slope near Sections 6 and 7, where the watercourse is typically adjacent to the bottom of the slope, and the slope has inclinations as steep as 1.4 horizontal to 1 vertical. The existing FOS is this area ranged from 1.3 to 1.6.

Although the existing FOS of the slopes are typically greater than 1.5, a toe erosion allowance must be considered for long-term setbacks when a watercourse is within 15 metres of the slope toe as discussed below.

4.5 Long Term Stable Top of Slope Determination

The method used to determine the Long Term Stable Top of Slope (LTSTOS) is discussed in Section 4.1 and follows the *Living City Policies* (TRCA, 2014) and the MNR technical guideline.

4.5.1 Toe Erosion Allowance

The toe erosion allowance is a horizontal distance typically measured out from the bankfull width of a watercourse, existing water level of the watercourse, or bottom of the watercourse channel as deemed appropriate based on site specific conditions. The toe erosion allowance applied is based on numerous considerations such as: proximity of the watercourse to the slope toe, the presence of existing erosion, average and peak velocity within the watercourse, susceptibility of the soils at the slope toe to erosion, extent of vegetation, fluvial geomorphological processes, etc. Due to the varied and complex nature of determining toe erosion, multiple simplified methods are available for determining this toe erosion allowance, including:

- Using a value of 15 metres if no information is available;
- Use of an average annual recession rate based on a minimum of 25 years data, and extrapolated to a 100-year planning horizon;
- A fluvial geomorphological study based on a minimum of 25 years of record;
- Use of the table "*Determination of Toe Erosion Allowance*" provided within MNR technical guidelines (2002) as provided below.

For the purposes of determining the toe erosion allowance at this site, the MNR table provided below was used:

Minimum Toe Erosion Allowance – River within 15 Metres of Slope Toe				
Native Soil Structure at Slope Toe	**Evidence of Active Erosion or Bankfull Flow Velocity > Competent Flow Velocity**	**No evidence of Active Erosion or Flow Velocity << Competent Flow Velocity, Bankfull Width**		
		< 5 metres	**5 to 30 metres**	**> 30 metres**
Hard Rock	0 to 2 metres	0 metres	0 metres	1 metre
Soft Rock or Cobbles/Boulders	2 to 5 metres	0 metres	1 metre	3 metres
Stiff to Hard Cohesive Soil, Coarse Granulars or Glacial Tills	5 to 8 metres	1 metre	2 metres	4 metres
Soft/Firm Cohesive Soil, Fine Granular or Fill	8 to 15 metres	1 to 2 metres	5 metres	7 metres

The boreholes results suggest that the slope toe will consist of compact to dense or very stiff to hard glacial till deposits. The toe erosion allowances selected for the three different confined valley systems at the site are summarized in the following table:

Confined Valley System Location	**Soil Structure at Slope Toe**	**Active Toe Erosion Observed?**	**Estimated Bankfull Width (m)**	**Selected Toe Erosion Allowance (m)**
West Tributary, South Slope of Southern Drainage Feature	Clayey Silt to Sandy Silt Glacial Till (Compact to Dense / Very Stiff to Hard)	No	5 to 30	2
North Slope of West Tributary Valley Wall		Yes	N/A	5
South Slope of East Tributary Valley Wall		No	5 to > 30	4

The toe erosion allowance was applied from the edge of the watercourse for the eastern and western tributary slopes, and from the estimated bankfull width in the southern drainage feature which does not contain a permanent watercourse.

4.5.2 Stable Slope Inclination

It is noted that MNR guidelines allow a factor of safety between 1.3 to 1.5 for active land use (e.g. commercial and industrial buildings), which is applicable to this site. The minimum factors of safety recommended for design by the MNR are summarized below.

Land Uses	Design Minimum Factor of Safety
Passive: no buildings near slope; farm field, bush, forest, timberland, woods, wasteland, badlands, tundra.	1.10
Light: no habitable structures near slope; recreational parks, golf courses, buried small utilities, tile beds, barns, garages, swimming pools, sheds, satellite dishes, dog houses.	1.20 to 1.30
Active: habitable or occupied structures near slope; residential, commercial, and industrial buildings, retaining walls, storage/warehousing of non-hazardous substances.	1.30 to 1.50
Infrastructure and Public Use: public use structures or buildings (i.e. hospitals, schools, stadiums), cemeteries, bridges, high voltage power transmission lines, towers, storage/warehousing of hazardous materials, waste management areas.	1.40 to 1.50

TRCA policy guidelines require a factor of safety (FOS) of 1.5 for new developments, and therefore an FOS of 1.5 is applicable for the stable slope inclination at this site.

The existing FOS at Section 7 was 1.3, but the existing FOS for all other sections was greater than 1.5. Where a watercourse is within 15 metres of the slope toe, the toe erosion allowance must be considered. A toe erosion allowance is not required for Sections 11 to 14 as the existing floodplain is wider than 15 metres.

Trial slope models were created which decreased the slope inclination by increments of 0.1H:1V until a minimum FOS of 1.5 was obtained, after the toe erosion allowance was applied. A minimum factor of safety of 1.5 is achieved in the compact to dense sandy silt glacial till and the very stiff to hard clayey silt / clayey silt glacial till deposits with a stable slope inclination of 1.9 horizontal to 1 vertical. Example *Slide2* trial models from Sections 5, 6, 7, 18 and 19 are included in Appendix D illustrating the stable slope inclination of 1.9H:1V achieves a minimum factor of safety of 1.5 after the toe erosion allowance is applied.

Where applicable, the stable slope inclinations are shown on Figures XS1 to XS26. It is noted that apart from Sections 6 and 7, the toe erosion allowance has a negligible impact on the slopes because the existing inclinations are typically 3 horizontal to 1 vertical or flatter.

4.5.3 Long-Term Stable Top of Slope Position

The Long Term Stable Top of Slope (LTSTOS) position for a factor of safety (FOS) of 1.5 is determined by the combination of both the stable slope inclination of the slope profile that achieves the requisite minimum factor of safety, combined with the toe erosion allowance. A schematic sketch visually illustrating how the LTSTOS is determined is provided as Figure 5.

Based on the detailed slope stability analysis, the LTSTOS for an FOS of 1.5 coincides with the existing top of slope (as established by GEI in some locations and staked by TRCA in other locations) for the slopes included within the study area with only one minor exception. The LTSTOS is shown in plan view on Figures 3A and 3B, and in profile view on Figures XS1 to XS26 (where applicable). Between Cross-Sections 6 and 7, the TRCA staked top of bank provided in the CAD file appears to extend partially over the upper slope face. The LTSTOS will extend back to the assumed top of slope position in this area as shown on Figure 3A.

The average inclination of the slopes was typically 3 horizontal to 1 vertical or flatter. Even with the toe erosion allowance, the stable slope inclination has a negligible impact on most of the slopes due to the gentle existing slope inclinations (refer to the enclosed Cross-Sections). Sections 6 and 7 have steeper existing inclinations and active erosion at the toe of the slope, but the LTSTOS does not extend beyond the existing top of slope as staked by TRCA (see Figures XS6 and XS7).

The LTSTOS positions described above are applicable only for the location of the cross-sections. Interpolation of the LTSTOS positions for the remaining areas of the study area was completed based on engineering judgement to address a variety of factors including (but not limited to): location of top of slope, slope inclination and height, structures present, nearby analysis, erosion scarps, etc. The LTSTOS mostly coincides with the existing top of slope across the site, with the exception of the slope between Sections 6 and 7 previously discussed.

It should be noted that the LTSTOS is related to riverine erosion and slope stability processes. The LTSTOS does not account for gully erosion caused by concentrated runoff from the tableland flowing down the slope, which can change over time based on grading or drainage patterns of the tableland. Site grading and stormwater control must be carried out to ensure concentrated runoff will not flow uncontrolled down the slopes after the site has been developed. In addition, the LTSTOS does not apply in unconfined systems that exist to the west of the East Tributary as previously noted.

4.5.4 Erosion Access Allowance

TRCA guidelines require that new developments be setback an additional 10 metres (for commercial or industrial buildings, etc.) from the LTSTOS position. The erosion access allowance is a regulatory setback and not a technically derived setback like the toe erosion allowance and stable slope allowance. As the erosion access allowance is not a technically derived setback, it has not been included on Figures 3A and 3B.

4.6 General Considerations for Construction Near Slopes

For any work conducted in near proximity to the valley slopes, the following recommendations should be followed during construction:

- Construction and restoration activities should be conducted in a manner which does not result in surface erosion of the slope;
- Site grading and drainage should be designed to prevent direct concentrated or channelized surface runoff from flowing directly over the slope;
- Water drainage from down-spouts, sumps, road drainage, and the like should not be permitted to flow over the slope, but be directed towards stormwater sewers or extended down the slope to areas where the erosive energy can be dissipated (e.g. rip-rap splash pads);
- A healthy vegetative cover should be maintained on the slope. Any slope areas disturbed by construction should be restored with suitable native vegetation as soon as possible;
- The slope should not be further steepened and fill materials (including landscape debris, soil, stone slabs, etc.) should not be placed on the slope or within 3 metres of the slope crest.; and
- A sedimentation control fence (silt fence) should be erected around work areas prior to the commencement of site works.

4.7 Embankment Dam Geotechnical Analysis

There are two existing ponds online with the east tributary (upper and lower ponds) that were formed by historically filling the channel to create earth embankment dams. The embankment dams are failing, eroding, and showing signs of distress. The ponds are drained through culverts beneath the embankment dams. Erosion is occurring at the inlets and outlets of the culverts and the culverts are typically damaged or broken. The extent of culvert damage or internal piping erosion is unknown. Seepage was observed from the downstream slope of the embankments by GEI staff during previous site inspections, which indicates water is also seeping through the embankment (not just through the culverts).

4.7.1 Policy and Technical Guidelines

The *Lakes and Rivers Improvement Act* (LRIA) provides the Minister of Natural Resources and Forestry (MNRF) with the legislative authority to govern the design, construction, operation, maintenance and safety of dams in Ontario.

The LRIA defines a dam as *"...a structure or work forwarding, holding back or diverting water and includes a dam, tailings dam, dike, diversion, channel alteration, artificial channel,* *culvert or causeway."* The two embankments are holding water within the upper and lower ponds and are considered to be embankment dams as defined in the LRIA. There are various technical bulletins available from MNRF that govern the design, construction, operation, decommissioning, etc. of dams under the LRIA, including *"Geotechnical Design and Factors of Safety, Technical Bulletin,"* dated August 2011.

This technical bulletin provides direction and design guidance on the geotechnical engineering factors of safety for design of dams under the LRIA. The guidelines require stability analysis to be assessed under the following six (6) loading conditions:

- Long-term conditions – steady-state seepage, maximum normal reservoir water level, upstream and downstream faces;
- End of construction – before filling the reservoir, upstream and downstream faces;
- Inflow design flood (IDF) – inflow flooded reservoir level, steady-state phreatic surfaces through the dam, upstream and downstream faces;
- Earthquake (pseudo-static) loading – Maximum Design Earthquake (MDE), maximum normal reservoir water level, long-term steady state phreatic surfaces through the dam, upstream and downstream faces.
- Post earthquake loading, upstream and downstream faces.
- Full rapid drawdown from the maximum normal reservoir water level, upstream face.

The design factors of safety for these loading conditions are summarized in the table below:

Loading Condition	Minimum Factor of Safety	Slope	Was Loading Condition Analysed in This Report?
End of construction before reservoir filling	1.3	Upstream and Downstream	No [1]
Long-term (steady state seepage, normal reservoir level)	1.5	Upstream and Downstream	Yes
IDF loading condition	1.3	Upstream and Downstream	No [2]
Full or partial rapid drawdown	1.2 to 1.3	Upstream	No [2]
Pseudo-static	> 1.0	Upstream and Downstream	Yes
Post earthquake	1.1	Upstream and Downstream	No [3]

1. The embankments are already constructed, so the end of construction condition does not apply at this site.
2. Inflow design floods for the ponds are unknown, so the IDF and rapid drawdown conditions were not analyzed.
3. Post-earthquake condition not included in the preliminary assessment.

GEI carried out a preliminary assessment on the geotechnical stability of the embankment dams to provide preliminary commentary if the dams are suitable to remain in place. Long-term conditions with steady-state seepage and pseudo-static loading were checked for this preliminary assessment.

4.7.2 Preliminary Stability Analysis

The seismic (pseudo-static) loading condition, or Maximum Design Earthquake (MDE) required for the site was determined following, *"Seismic Hazard Criteria, Assessment and Considerations, Technical Bulletin,"* dated August 2011, by Ontario Ministry of Natural Resources. The dams were assumed to have a "low" Hazard Potential Classification, and therefore must use the 500-year earthquake design ground motion for the MDE loading in the stability analysis. This is equivalent to a 0.002 per annum probability of exceedance. The assumed Hazard Potential Classification must be confirmed by a civil engineer, water resources engineer, or dam design engineer.

Natural Resources Canada has online seismic design tools for engineers, including a seismic hazard value calculator from the 2015 National Building Code of Canada. The calculator determines the seismic hazard values based on user-defined latitude and longitude. The peak ground acceleration (PGA) appropriate for the site is 0.033g based on a 0.002 per annum probability of exceedance.

Toronto Inspection advanced a borehole through the upper berm in 2021 during their geotechnical investigation at the site. Borehole 21BH-8 encountered clayey silt to sandy silt earth fill (reworked glacial till) that extended beyond the depth of investigation at 6.5 metres below grade. Trace rootlets, gravel and topsoil were encountered in the fill, and organic pockets were noted at 4.5 and 6.0 metres below grade. The borehole encountered a 19 mm diameter pipe about 2.3 metres below grade, which yielded free-flowing water (potentially a weeping tile). It is assumed that the lower embankment dam consists entirely of earth fill (reworked glacial till), consistent with the upper dam though no borehole was specifically advanced within this dam.

The side slopes of the lower and upper embankment dams typically ranged from 2.9 to 4.0 horizontal to 2 vertical, as shown on Cross-Sections 17 and 20 that were cut through the lower and upper dams, respectively. There is a portion of the lower dam that is over-steepened at the upstream face due to erosion at the culvert inlet, with an inclination of 1.1 horizontal to 1 vertical as shown on Cross-Section 16. Active slope failures (slumping / sloughing of soil from the exposed face) were observed near the culvert inlets of both dams during the visual inspection.

The table below summarizes the results of the analysis for the two loading cases at the upper embankment dam, and the models are included in Appendix E:

Upper Pond Embankment Dam - Preliminary Slope Stability Analysis Results

Loading Condition	**Minimum Factor of Safety Required per MNRF Guidelines**	**Cross-Section Location**	**Minimum Calculated Factor of Safety for Embankment**		**Meets Guidelines?**
			Upstream	**Downstream**	
Long-Term (steady state seepage, normal reservoir level)	1.5	20	2.2	1.9	See notes [1,2]
Pseudo-Static Loading	Greater than 1.0		1.9	1.7	See notes [1,2]

1. Based on the assumption that the current pond level is the normal operating level.
2. Erosion and localized slope failures observed on site, therefore considered to not meet the guidelines.

Although the analysis shows the upper embankment dam exceeds the required FOS for the two loading cases, the dam is eroding and there are localized slope failures that are not reflected in the topographic information available for the cross-sections. Based on this, the upper embankment dam does not meet the guidelines as the factor of safety will be less than 1.0 in the localized areas.

The table below summarizes the results of the analysis for the two loading cases at the lower embankment dam, and the models are included in Appendix E:

Lower Pond Embankment Dam - Preliminary Slope Stability Analysis Results

Loading Condition	**Minimum Factor of Safety Required per MNRF Guidelines**	**Cross-Section Location**	**Minimum Calculated Factor of Safety for Embankment**		**Meets Guidelines?**
			Upstream	**Downstream**	
Long-Term (steady state seepage, normal reservoir level)	1.5	16	0.7	N/A	**No**
		17	1.8	1.9	Yes[1]
Pseudo-Static Loading	Greater than 1.0	17	1.6	1.7	Yes[1]

1. Based on the assumption that the current pond level is the normal operating level.

The lower pond does not meet the MNRF design factors of safety for the two loading conditions.

It must also be noted that only two of the six geotechnical loading conditions were assessed based on the information available at this time, to provide a preliminary assessment and commentary. Additional boreholes must be advanced through the embankments, and the civil or water resources engineer must provide the normal operating levels and the inflow design floods for both ponds for detailed geotechnical analysis to be completed. However, both embankment dams are failing and do not meet the MNRF geotechnical design factors of safety based on the two loading conditions reviewed.

4.7.3 Preliminary Commentary

The scope of work did not include a comprehensive review and detailed inspection of the dams which would be completed by others. There are additional factors included in earthen dam design such as bearing, erosion control (e.g. piping), operating levels, flood control / outflow structures, and dam material composition that are not evaluated in this report. High-level commentary is provided below:

- It is expected that the embankment dams were not designed by an engineer or constructed following MNRF guidelines or industry standards. This includes the design and installation of the culverts (e.g. were they sized appropriately, do they have adequate bedding or anti-seepage collars, etc.).
- The embankments are showing signs of distress and are eroding / failing in some locations (see Cross-Section 16 at the lower dam and the photos of the culvert inlets and outlets at both locations).
- The dams do not meet MNRF geotechnical design guidelines for two loading cases.
- No clay core was encountered in 21BH-8 advanced through the upper embankment. Impermeable lining was not observed on the upstream face of the ponds. This increases the risk of long-term piping erosion caused by seepage through the embankment. Signs of seepage were observed by GEI staff on the downstream face of the dams during previous field visits.
- Based on visual observations, the culverts beneath the dams are damaged or destroyed. The extent of damage is unknown, but it is expected there is an increased risk of piping erosion underneath the entire embankment.

The owner of the property should be aware of the potential liabilities related to owning, operating and maintaining the embankment dams in their current state. The risk to the public and environment downstream of the embankment dams must not be overlooked. It is strongly recommended that additional work be carried out such as a detailed dam inspections, dam safety reviews and dam break analysis to determine potential impacts and risk of dam failure to the public and environment downstream. Additional boreholes must be drilled through the embankments if detailed geotechnical analysis will be completed following MNRF guidelines. The normal operating levels and inflow design floods must also be determined by the civil or water resources engineer. It is understood that drainage patterns may change at the site as part of the proposed development, and the potential increased flows into the ponds and their effect onto the embankment dams must be analyzed.

5. Limitations and Conclusions

5.1 Limitations

The recommendations and comments provided are necessarily on-going as new information of underground conditions becomes available. The analysis was completed using boreholes advanced at the site in 2021 by Toronto Inspection Ltd. The borehole logs were provided within a geotechnical engineering report signed and stamped by a Professional Engineer, and GEI has relied on the boreholes as factual information. More specific information with respect to the conditions between samples, or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, conditions not observed during the investigation may become apparent. Should this occur, GEI Consultants should be contacted to assess the situation and additional testing and reporting may be required.

GEI Consultants should be retained for a general review of the final design drawings and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, GEI Consultants will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of the design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report was prepared by GEI Consultants for the account of Tullamore Industrial Limited Partnership. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GEI Consultants accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

5.2 Conclusion

It is recognized that municipal/regional governing bodies, in their capacity as the planning and building authority under Provincial statues, will make use of and rely upon this report, cognizant of the limitations thereof, both as are expressed and implied.

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to contact our office.

Yours Truly,

GEI Consultants

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Figures

Site Location Plan

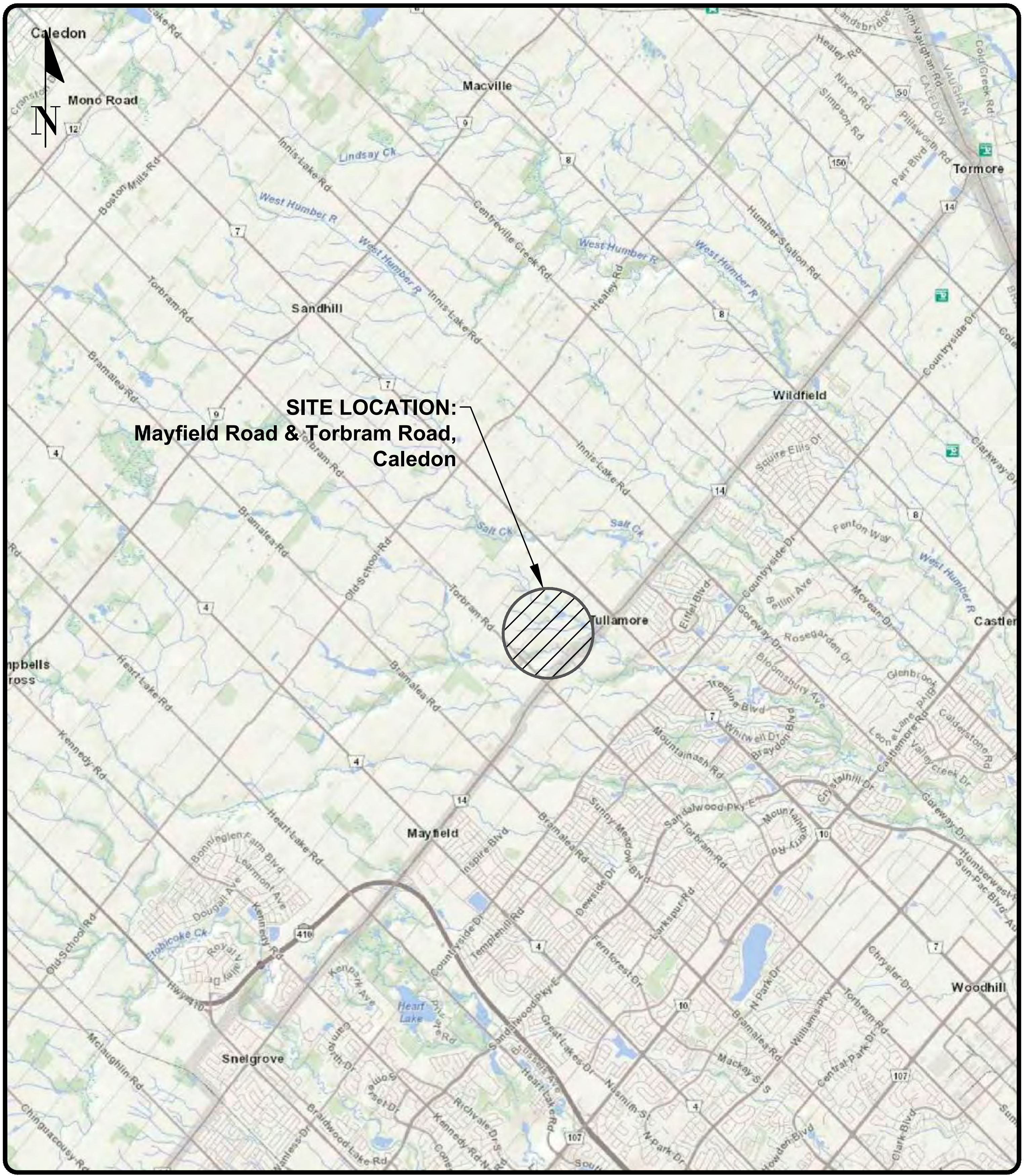
Site Context Plan

Photograph and Site Feature Location Plans

Borehole, Cross-Section and LTSTOS Location Plans

Detailed Cross-Sections

Long Term Stable Top of Slope Model



SITE LOCATION:
Mayfield Road & Torbram Road,
Caledon

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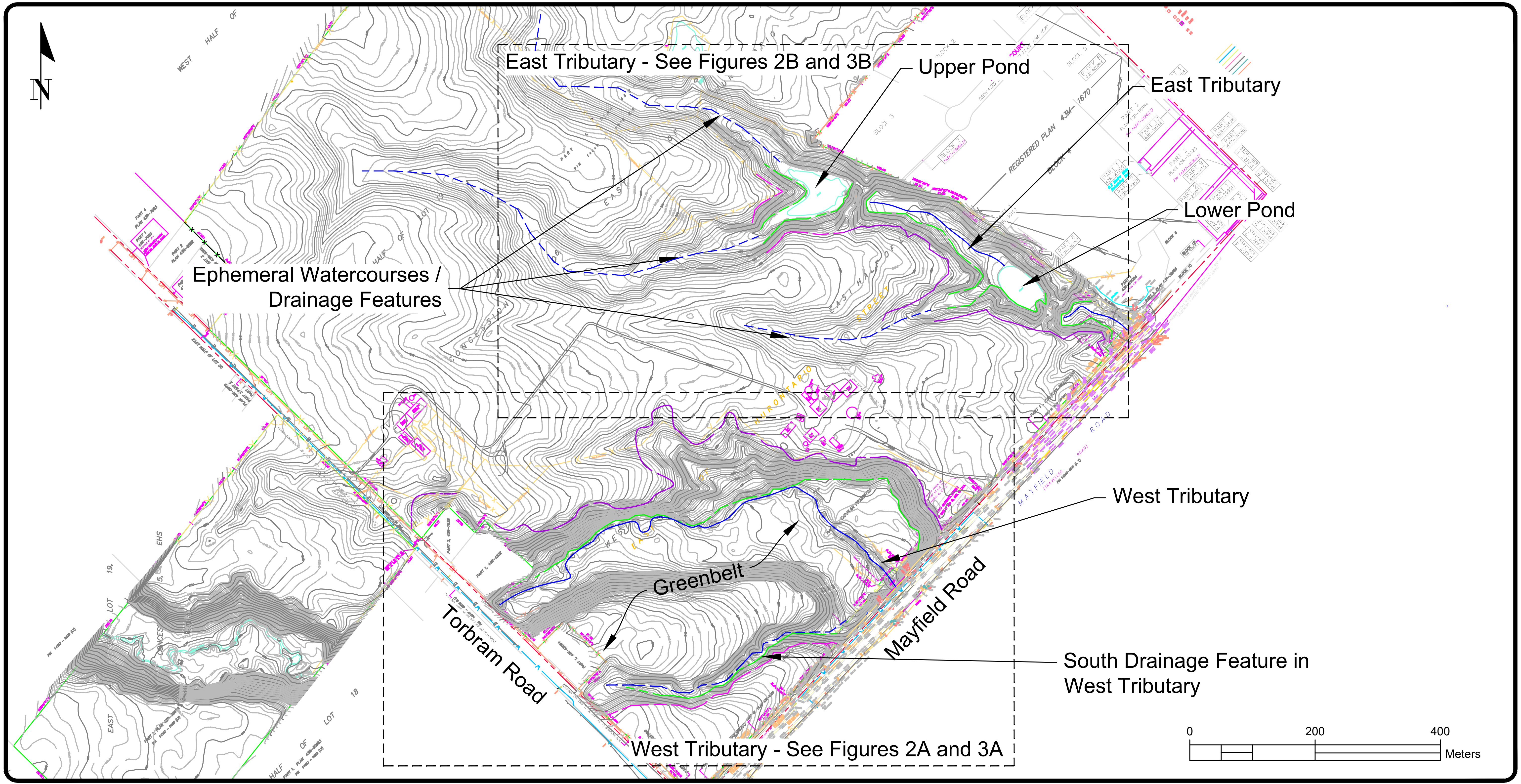
Project: Tullamore Employment Lands

Title: Site Location Plan

Approved by: A.W.
Date: February 2022
Project No.: 2100975

Drawn by: R.W.
Scale: N.T.S
Figure No.: 1A



Legend:

Bottom of Slope

Top of Slope (Staked by TRCA)

Top of Slope (Est. by GEI)

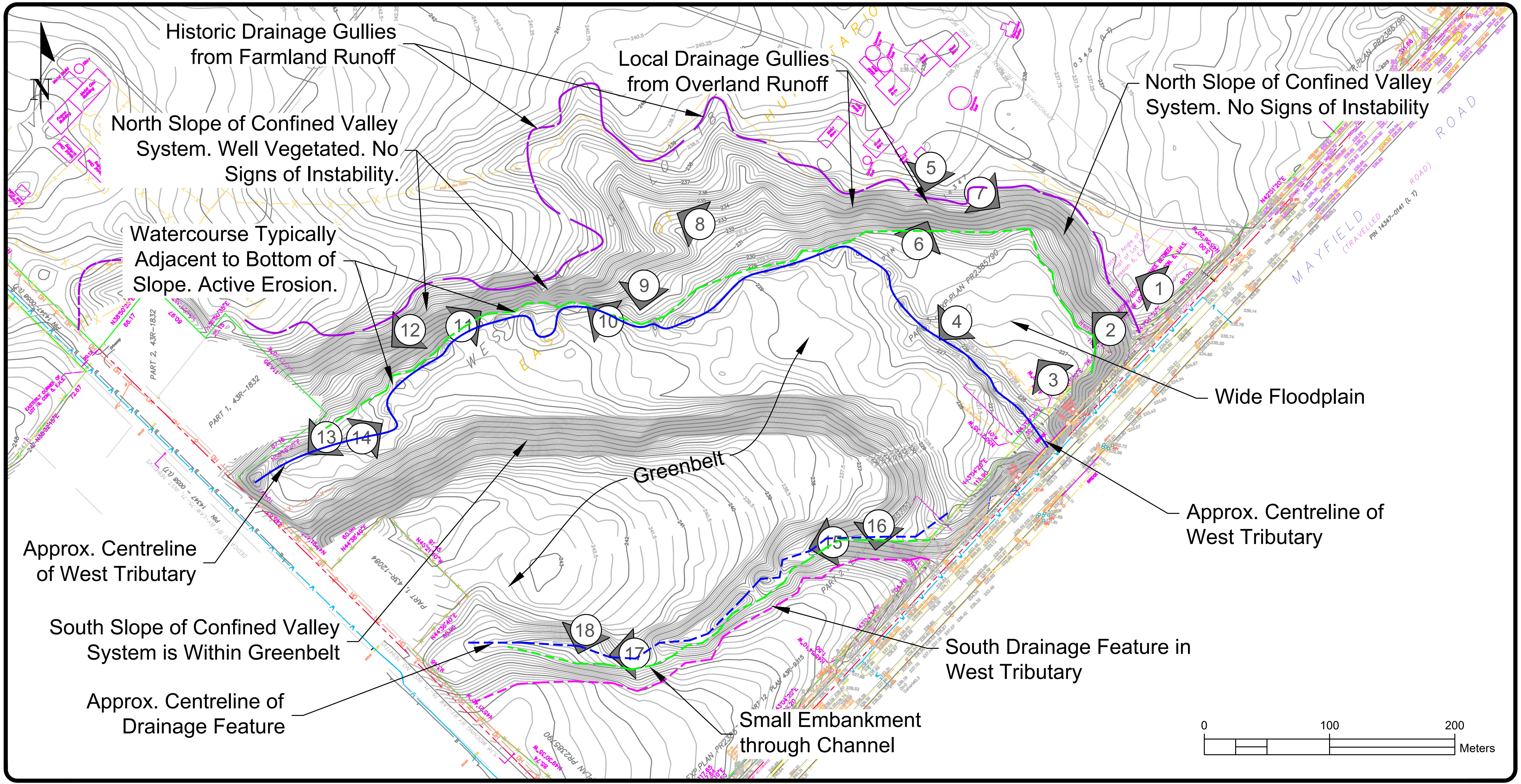
Approx. C/L of Watercourse

Approx. C/L of Intermittent Drainage Feature

Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands," Project No. 21-00975, dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project:	Tullamore Employment Lands				
Title:	Site Context Plan				
Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	1:6000	Figure No.:	1B



Legend:

Photo Direction & Location

🟩 Bottom of Slope

Top of Slope (Staked by TRCA)

Top of Slope (Est. by GEI)

Approx. C/L of Watercourse

Approx. C/L of Intermittent Drainage Feature

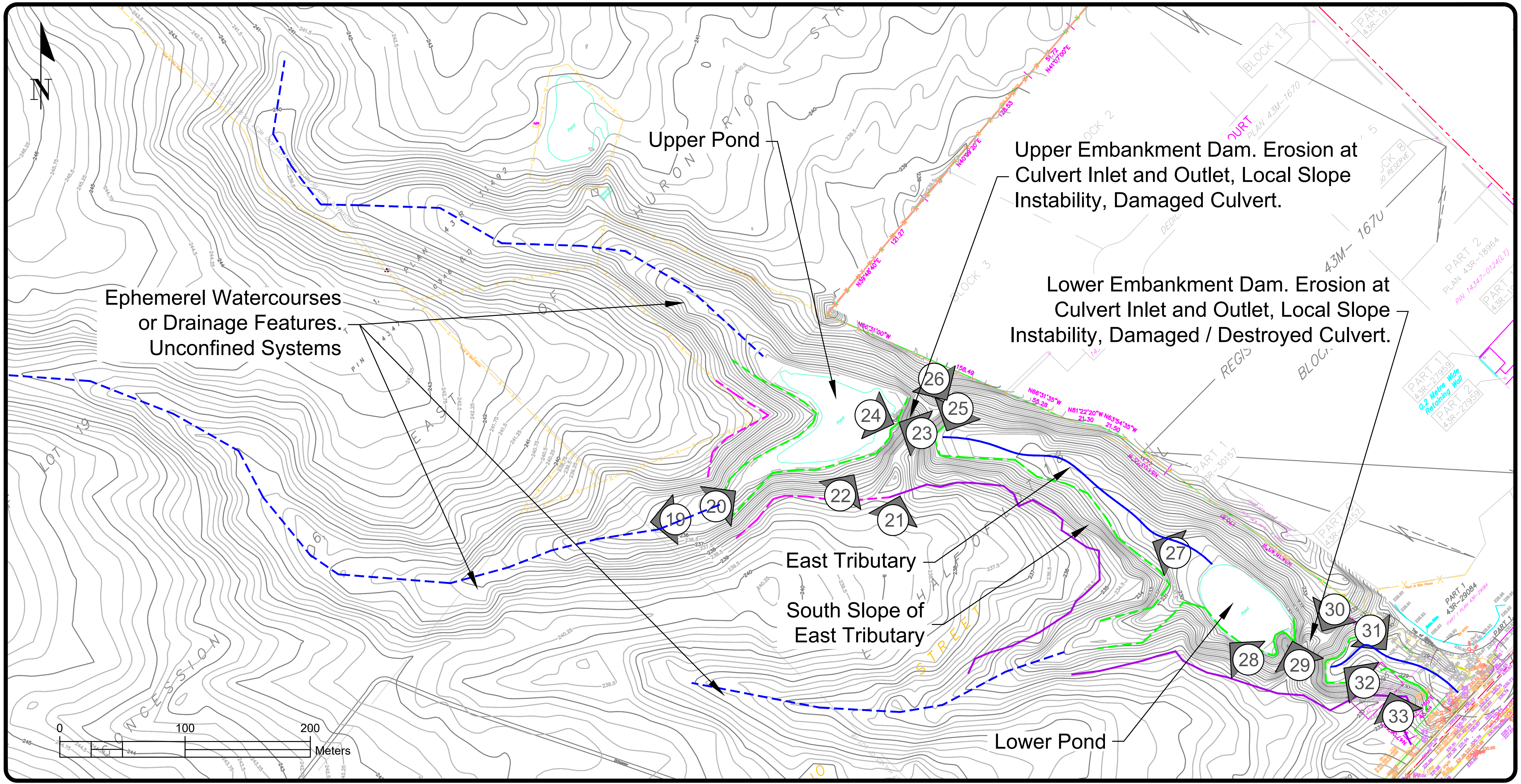
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands," Project No. 21-00975, dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Photograph & Site Features Location Plan

Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	1:3000	Figure No.:	2A



Legend:

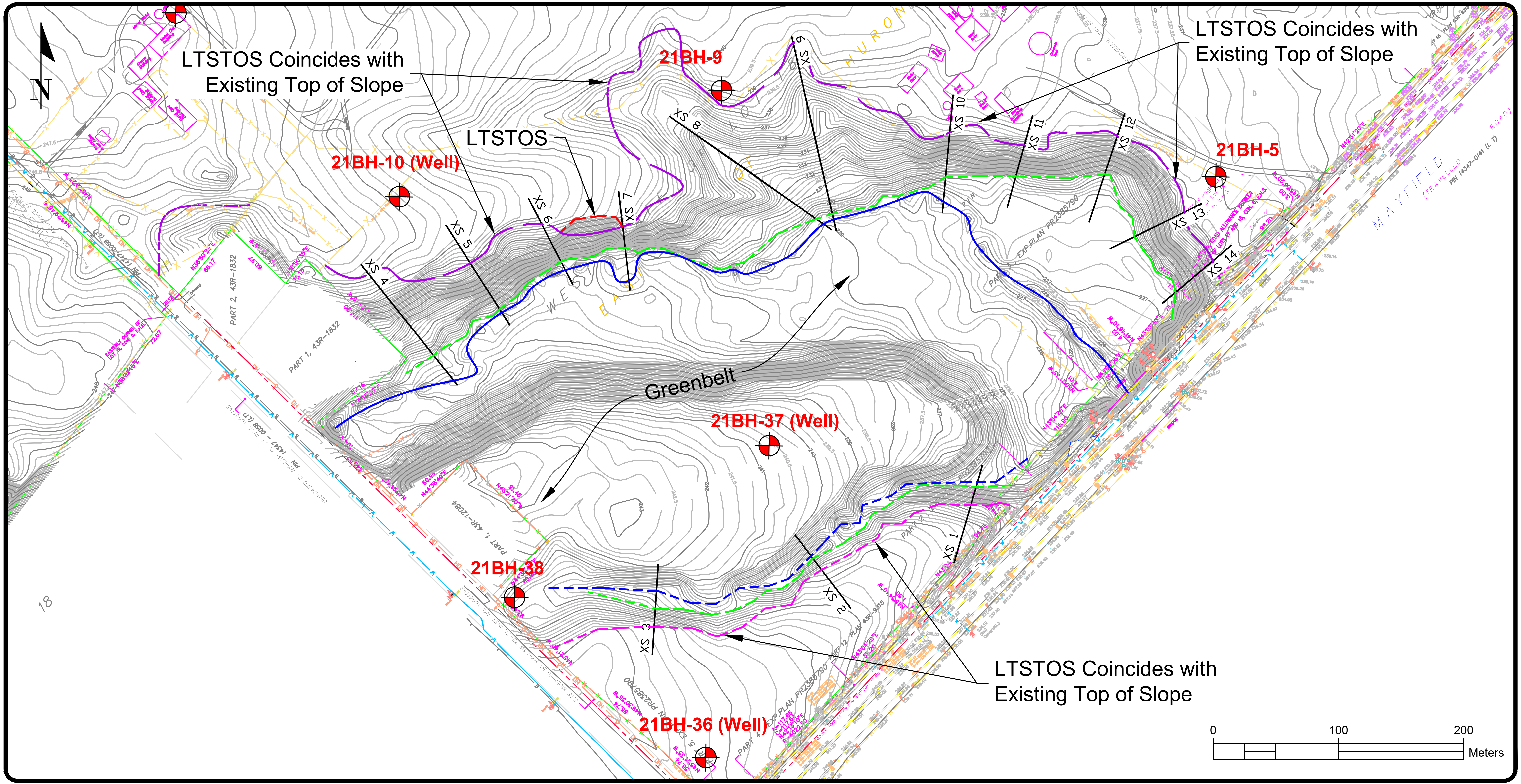
- Photo Direction & Location
- Bottom of Slope
- Top of Slope (Staked by TRCA)
- Top of Slope (Est. by GEI)
- Approx. C/L of Watercourse
- Approx. C/L of Intermittent Drainage Feature

Reference:
21-B7601_TOPO 2021-07-22.dwg "Sketch Showing Topographic Details on Tullamore Employment Lands," Project No. 21-00975, dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants

647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands			
Title: Photograph & Site Features Location Plan			
Approved by: A.W.	Date: February 2022	Project No.: 2100975	
Drawn by: R.W.	Scale: 1:3000	Figure No.: 2B	



Legend:

XS 1	Cross - Section Location
⊕	Approx. Borehole Location (Toronto Inspection 2021)
🟩 - -	Bottom of Slope
—	Top of Slope (Staked by TRCA)
- -	Top of Slope (Est. by GEI)
- -	LTSTOS Position for FOS of 1.5
—	Approx. C/L of Watercourse
- -	Approx. C/L of Intermittent Drainage Feature

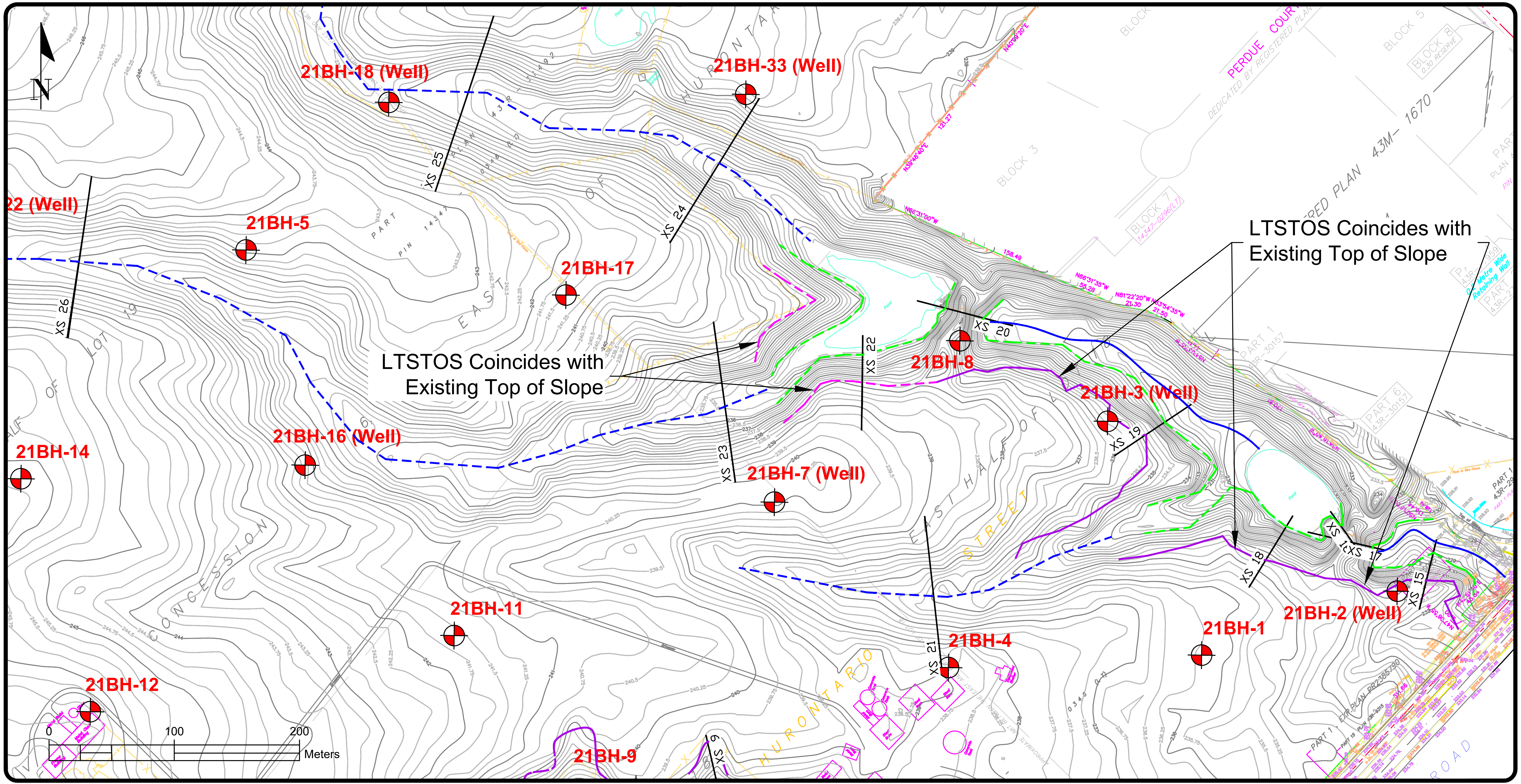
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands," Project No. 21-00975, dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Borehole, Cross-Section and LTSTOS Location Plan

Approved by: A.W.	Date: February 2022	Project No.: 2100975
Drawn by: R.W.	Scale: 1:3000	Figure No.: 3A



Legend:

XS 1	Cross - Section Location
⊕	Approx. Borehole Location (Toronto Inspection 2021)
- - -	Bottom of Slope
——	Top of Slope (Staked by TRCA)
- - -	Top of Slope (Est. by GEI)
- - -	LTSTOS Position for FOS of 1.5
——	Approx. C/L of Watercourse
- - -	Approx. C/L of Intermittent Drainage Feature

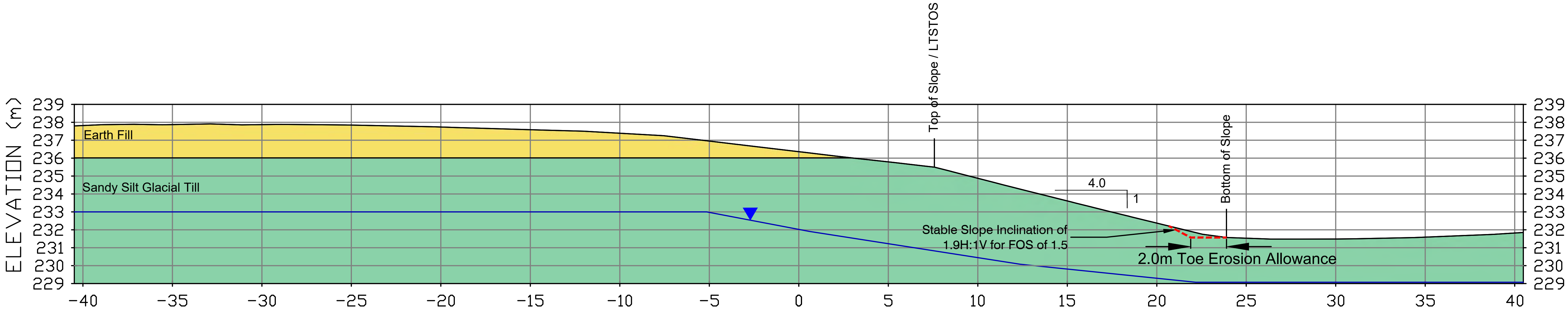
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands," Project No. 21-00975, dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Borehole, Cross-Section and LTSTOS Location Plan

Approved by: A.W.	Date: February 2022	Project No.: 2100975
Drawn by: R.W.	Scale: 1:3000	Figure No.: 3B



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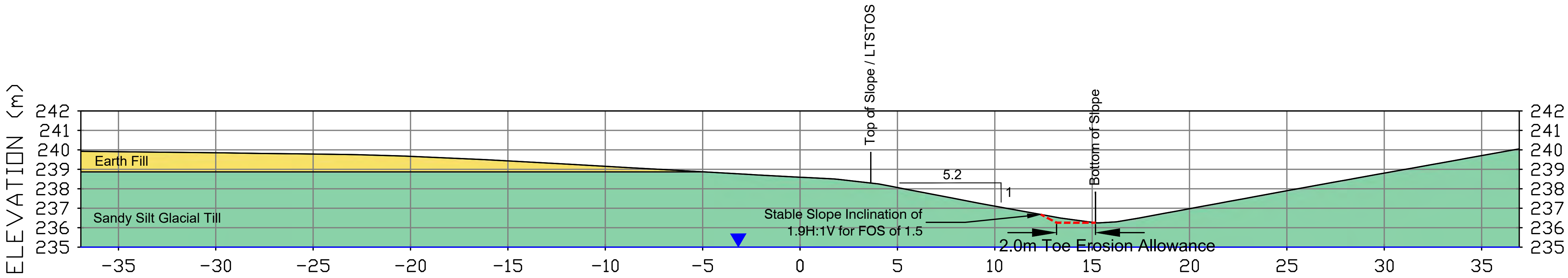

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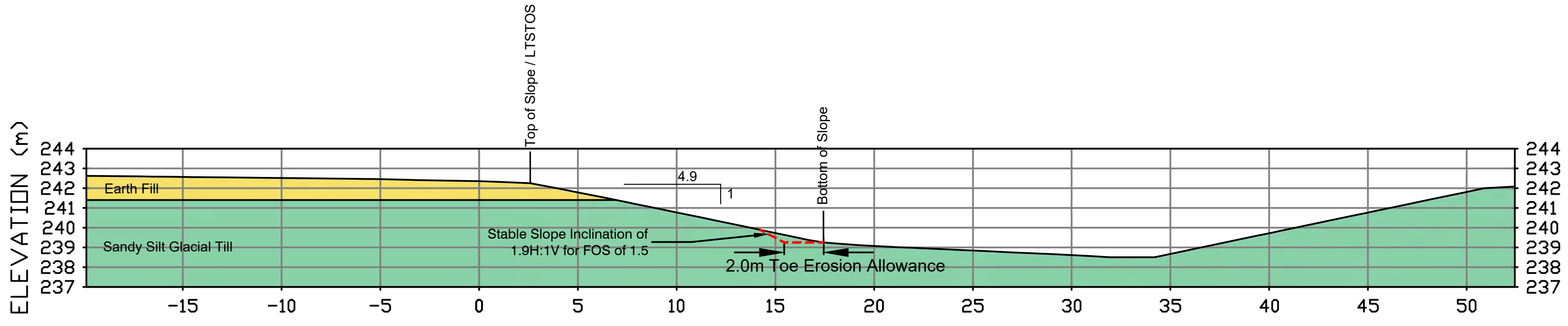
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Detailed Cross-Section 1 & 2

Approved by: A.W.
Date: February 2022
Project No.: 2100975
Drawn by: R.W.
Scale: 1:250
Figure No.: XS 1-2



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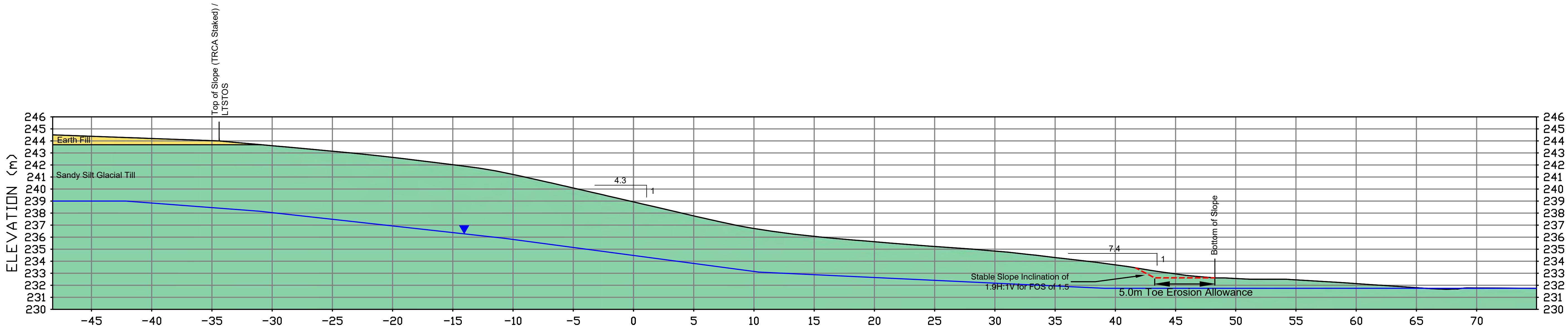

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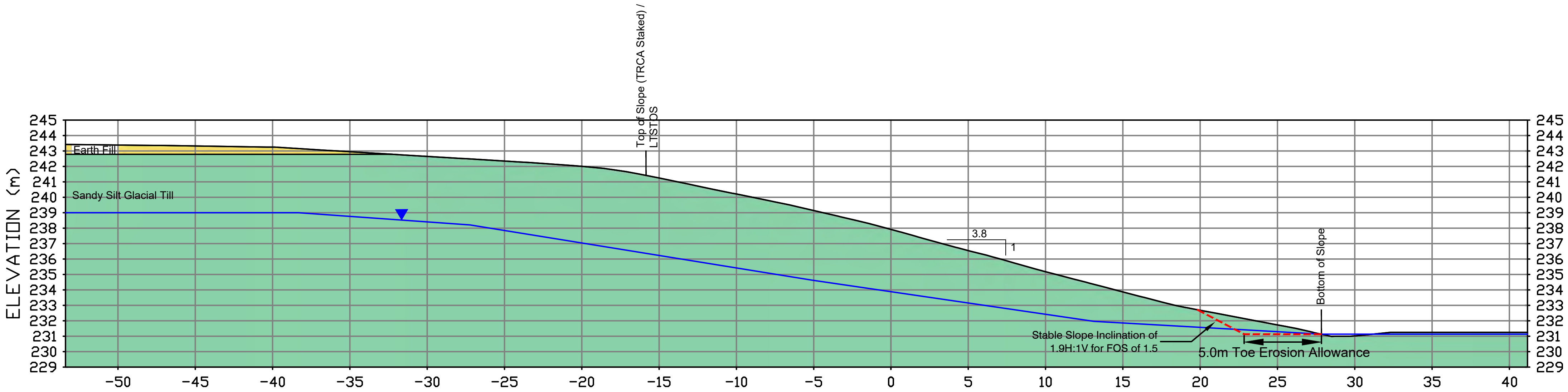
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project:	Tullamore Employment Lands
Title:	Detailed Cross-Section 3 & 4

Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	1:350	Figure No.:	XS 3-4



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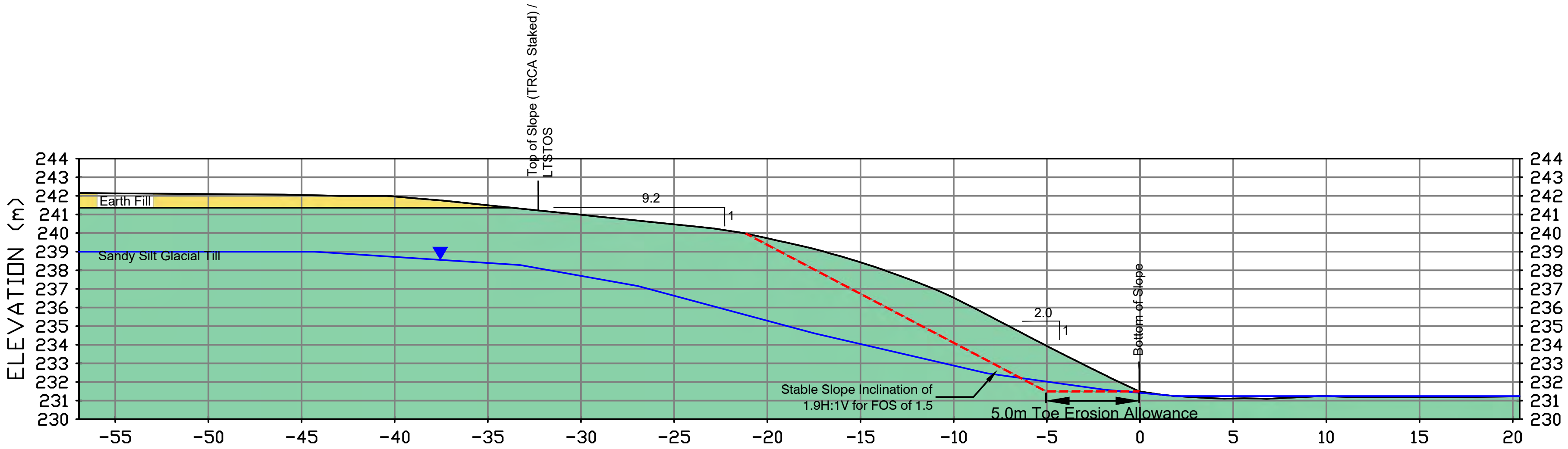

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Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants

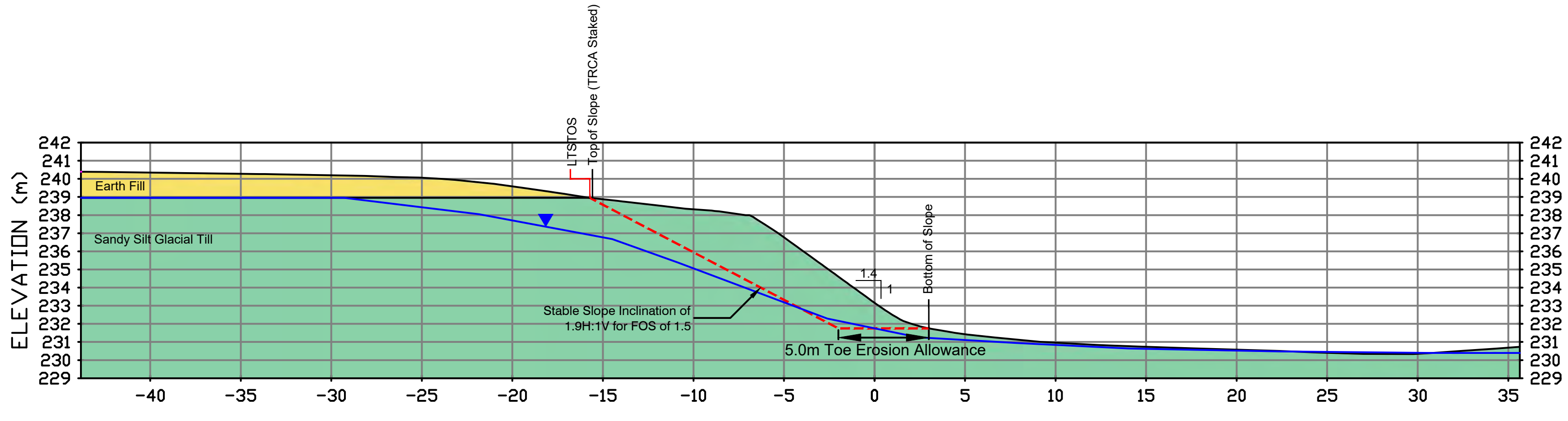
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Detailed Cross-Section 5 & 6

Approved by: A.W.
Date: February 2022
Project No.: 2100975

Drawn by: R.W.
Scale: 1:350
Figure No.: XS 5-6



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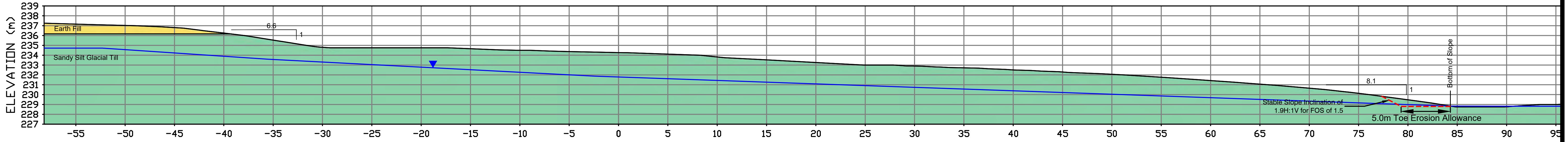

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Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

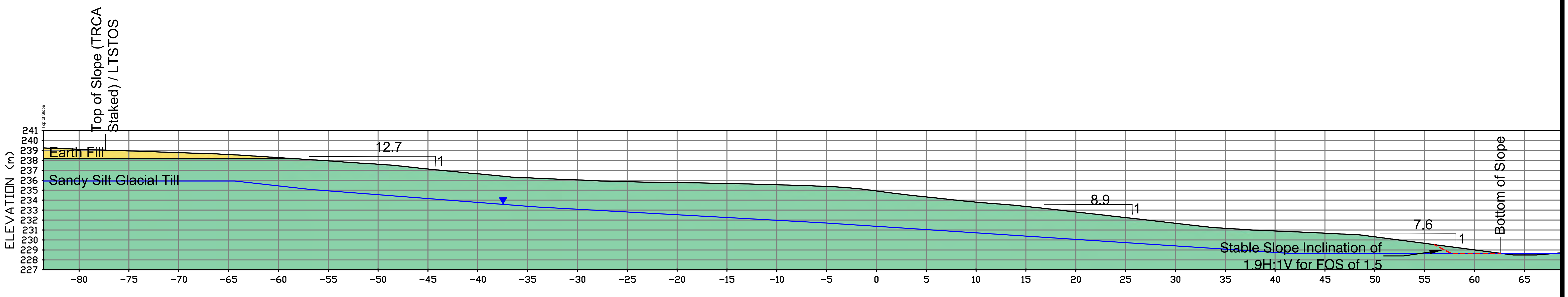
GEI Consultants

647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Detailed Cross-Section 7 & 8

Approved by: A.W.	Date: February 2022	Project No.: 2100975
Drawn by: R.W.	Scale: 1:400	Figure No.: XS 7-8



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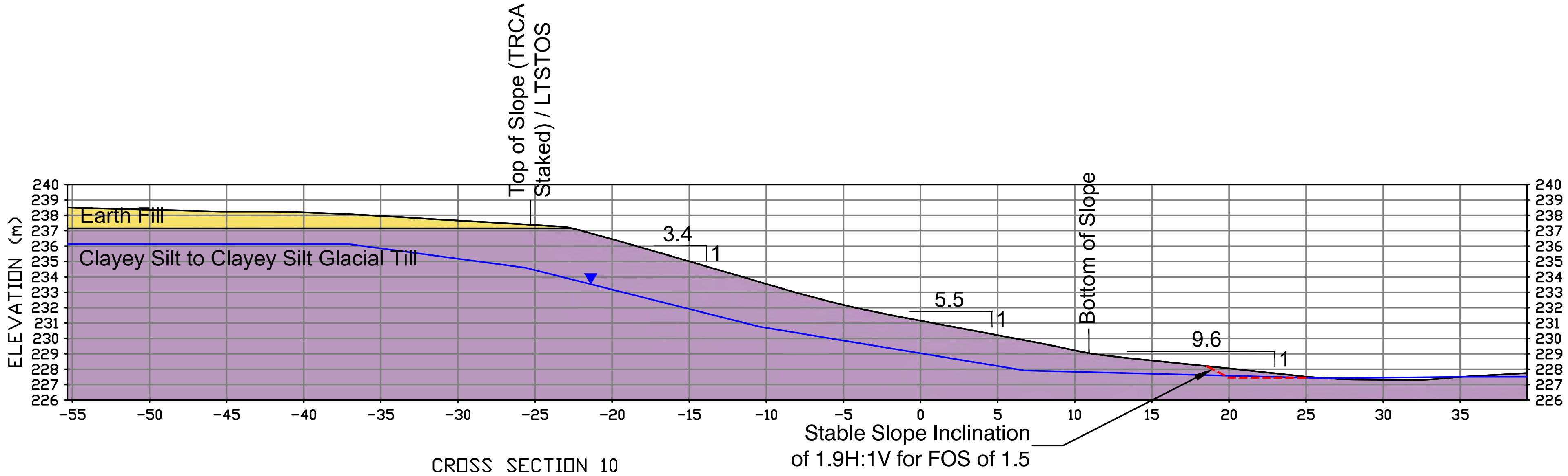

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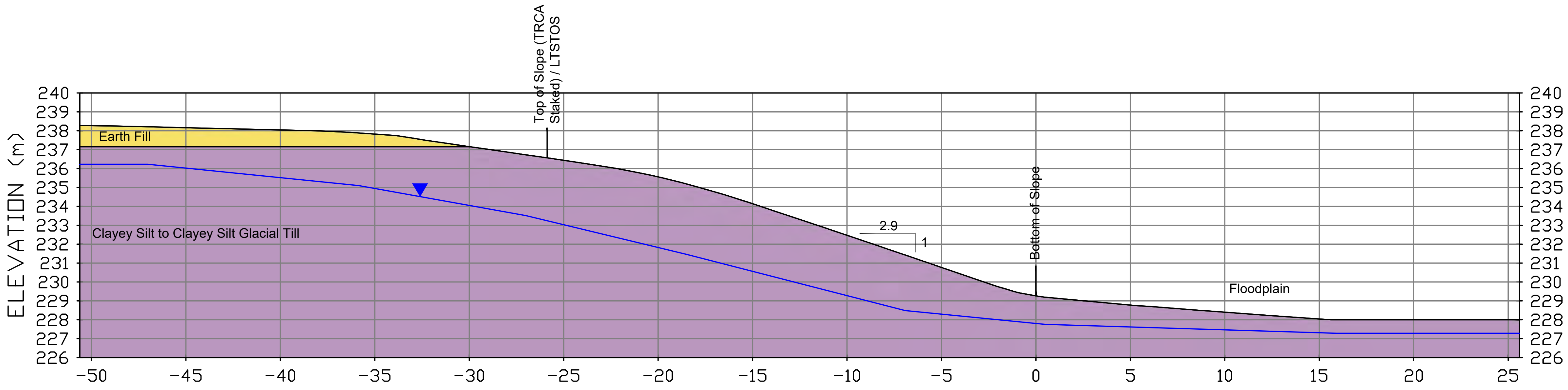
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants

647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project:	Tullamore Employment Lands
Title:	Detailed Cross-Section 9 & 10

Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	1:400	Figure No.:	XS 9-10



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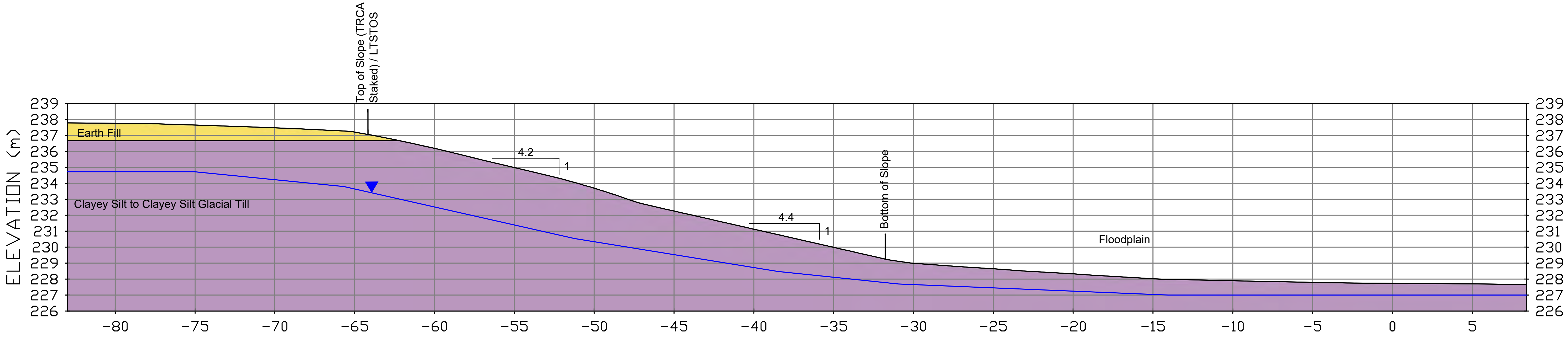

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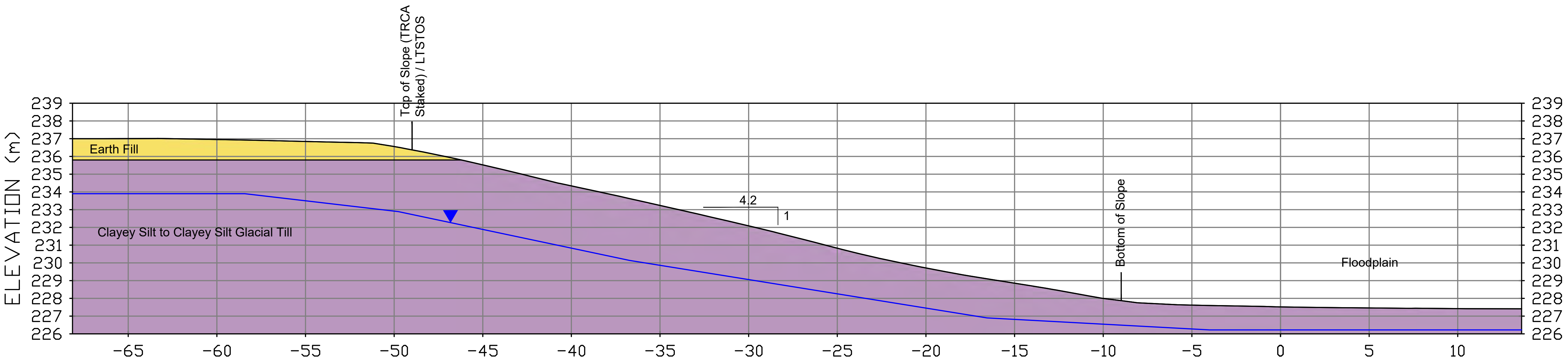
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands
Title: Detailed Cross-Section 11 & 12
Approved by: A.W.
Date: February 2022
Project No.: 2100975
Drawn by: R.W.
Scale: 1:250
Figure No.: XS 11-12



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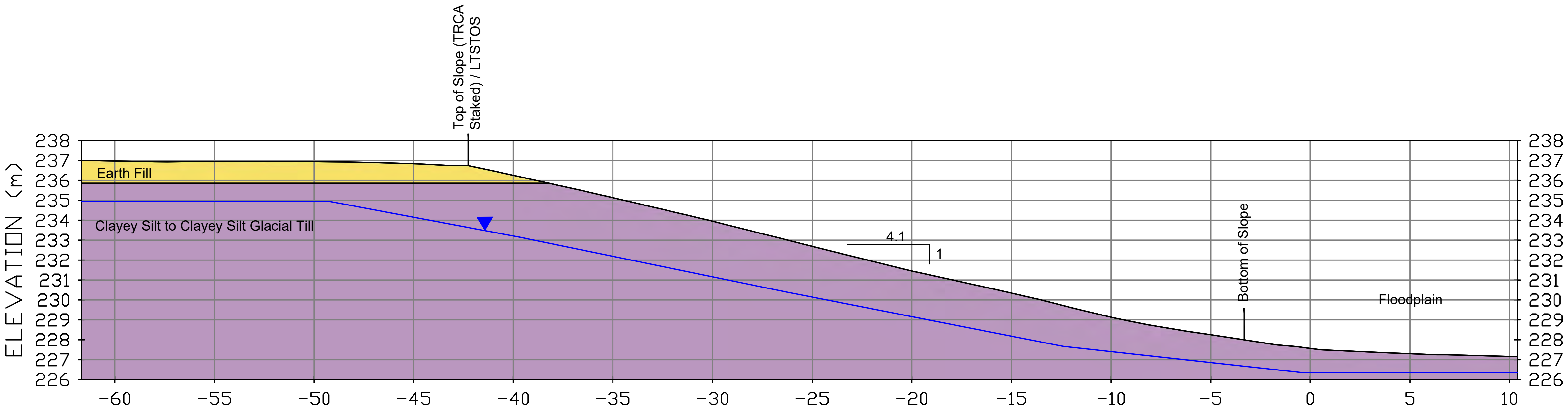

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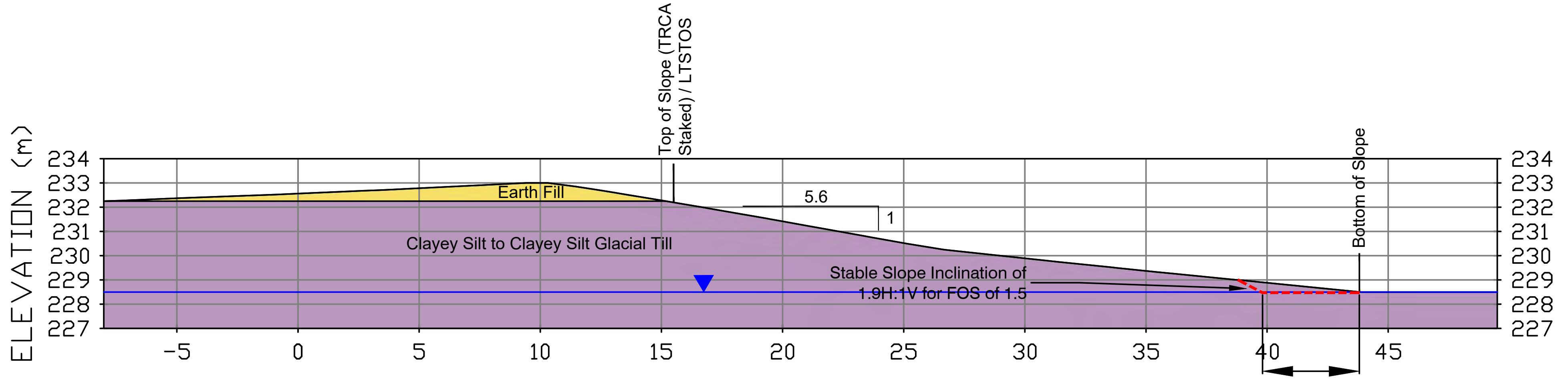
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands
Title: Detailed Cross-Section 13 & 14
Approved by: A.W.
Date: February 2022
Project No.: 2100975
Drawn by: R.W.
Scale: 1:250
Figure No.: XS 13-14



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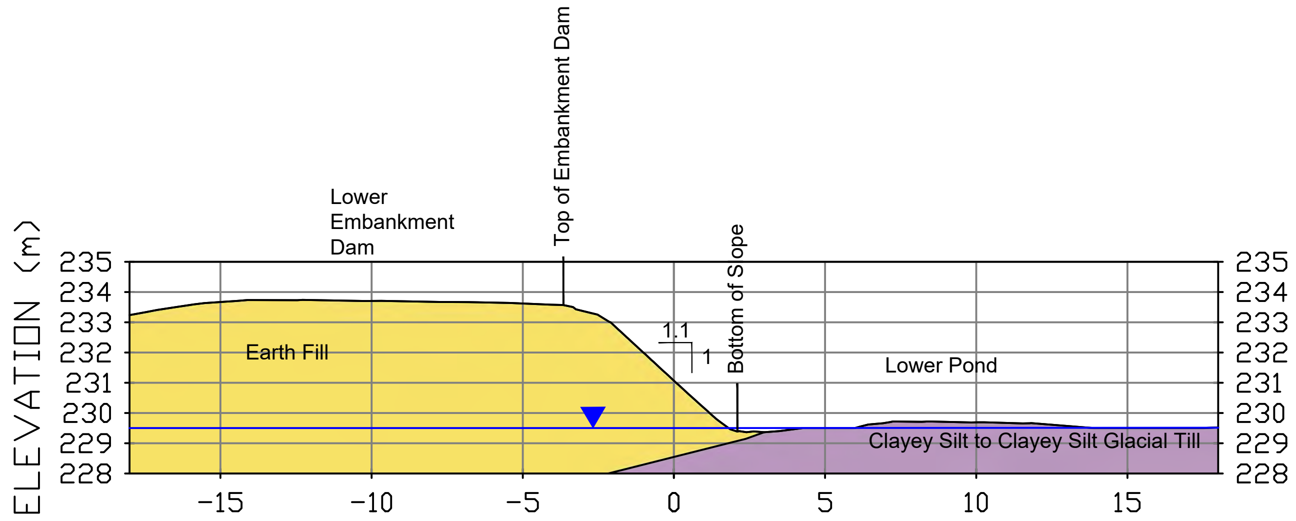

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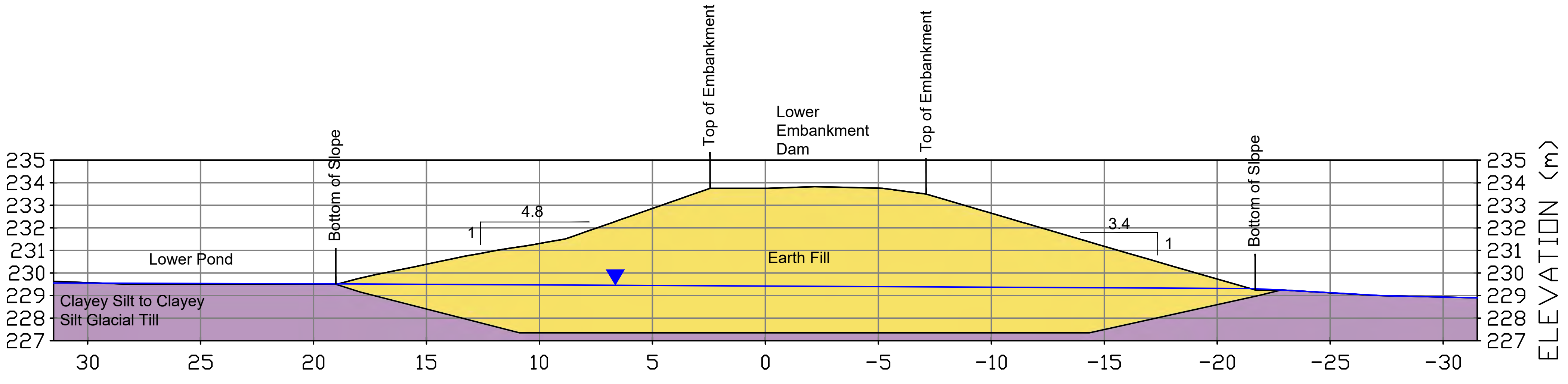
<u>Reference:</u>
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands			
Title: Detailed Cross-Section 15 & 16			
Approved by: A.W.	Date: February 2022	Project No.: 2100975	
Drawn by: R.W.	Scale: 1:250	Figure No.: XS 15-16	



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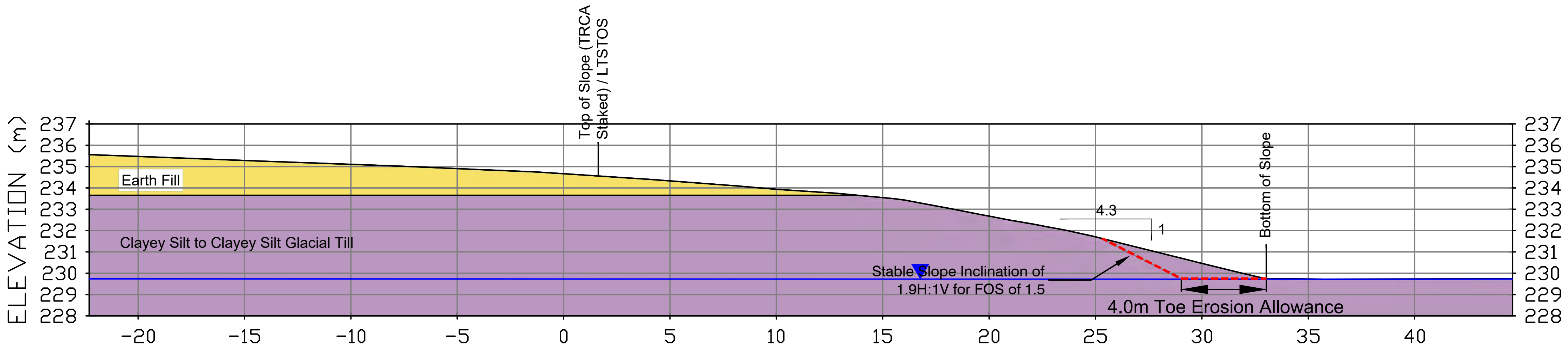

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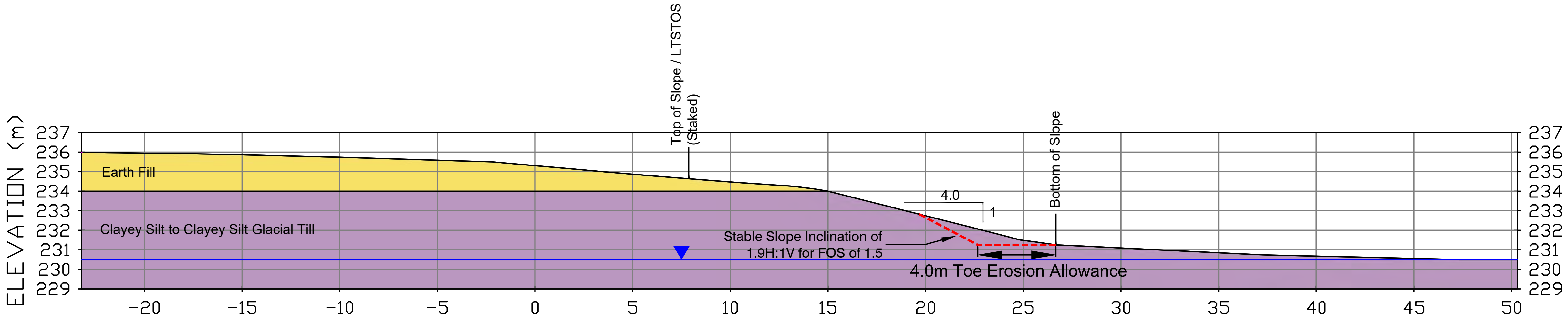
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details
on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22,
2021, by Young & Young Surveying
Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project:	Tullamore Employment Lands		
Title:	Detailed Cross-Section 17 & 18		
Approved by: A.W.	Date: February 2022	Project No.: 2100975	
Drawn by: R.W.	Scale: 1:250	Figure No.: XS 17-18	



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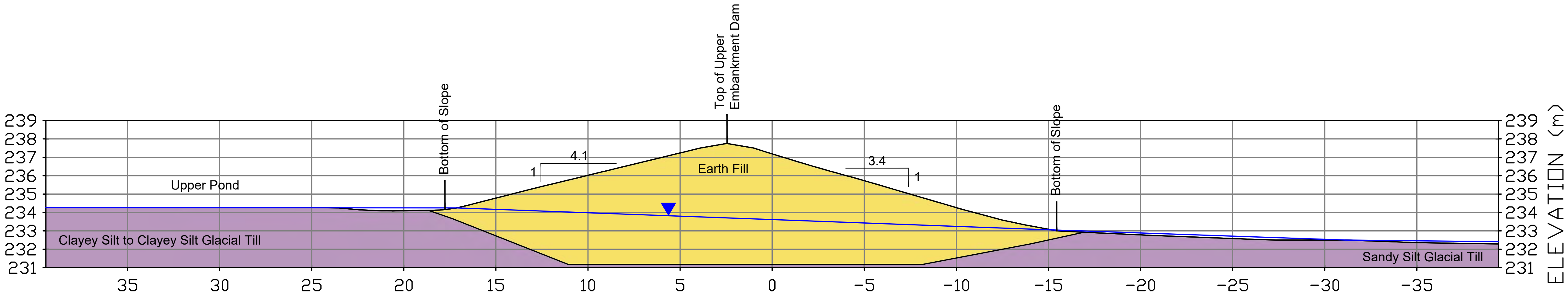

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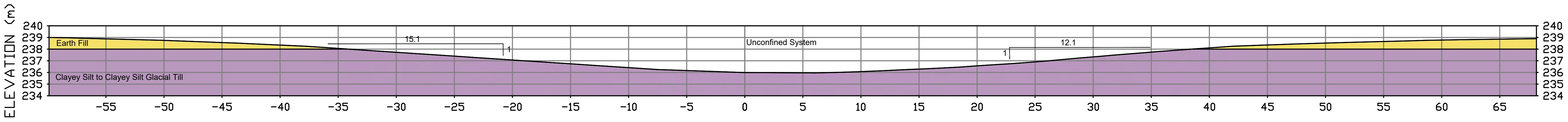
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project:	Tullamore Employment Lands				
Title:	Detailed Cross-Section 19 & 20				
Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	1:250	Figure No.:	XS 19-20



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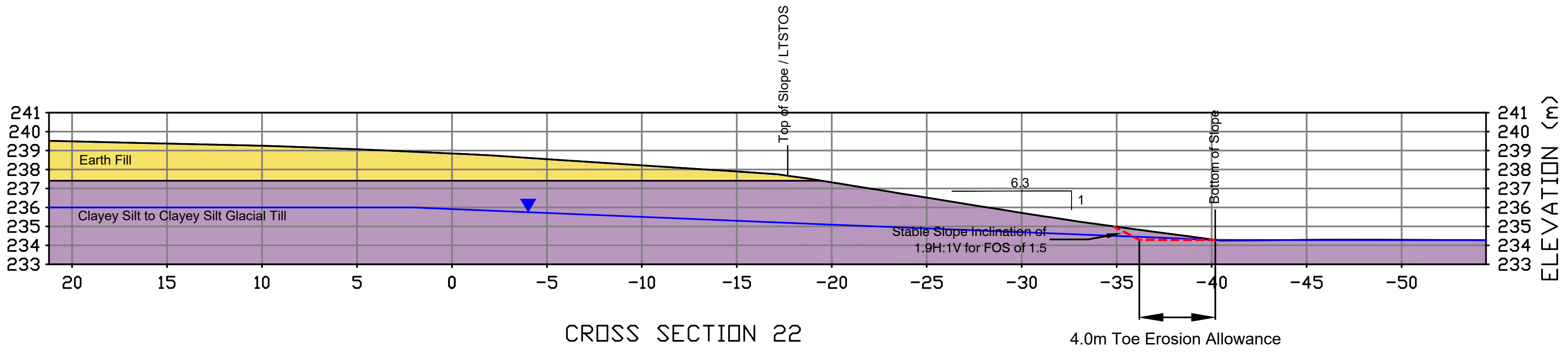


CROSS SECTION 22

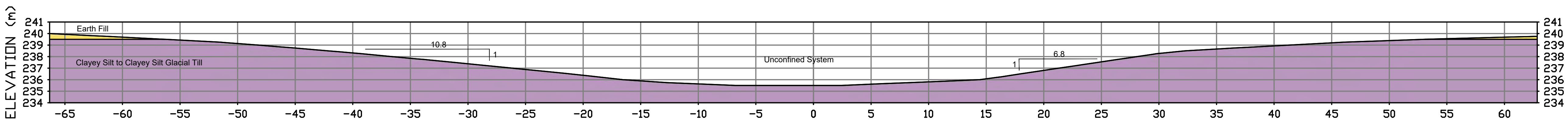
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Detailed Cross-Section 21 & 22

Approved by: A.W.	Date: February 2022	Project No.: 2100975
Drawn by: R.W.	Scale: 1:350	Figure No.: XS 21-22



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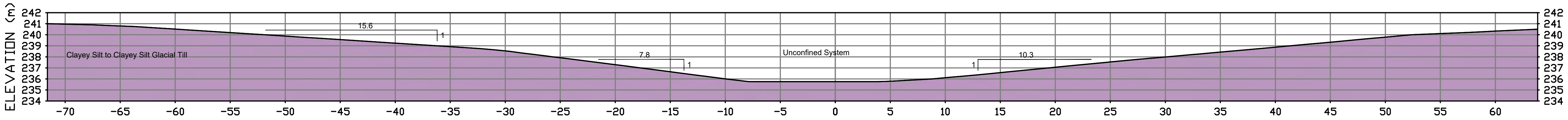
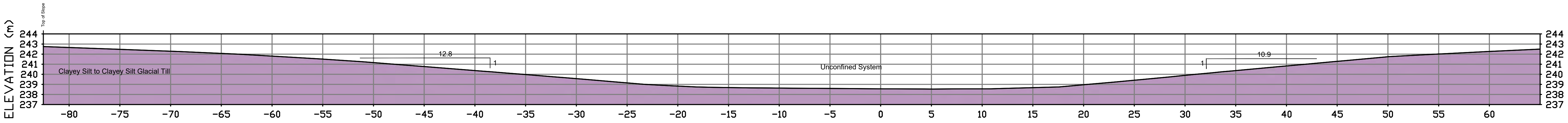


CROSS SECTION 24

Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands
Title: Detailed Cross-Section 23 & 24
Approved by: A.W.
Date: February 2022
Project No.: 2100975
Drawn by: R.W.
Scale: 1:400
Figure No.: XS 23-24



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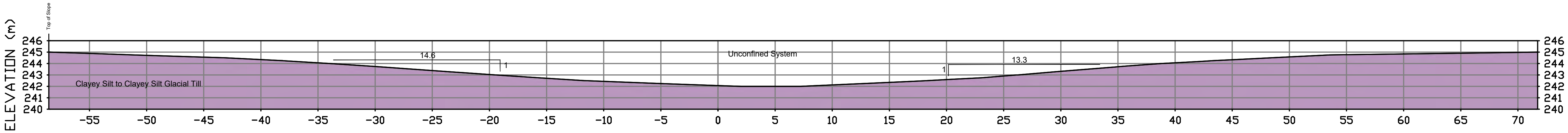

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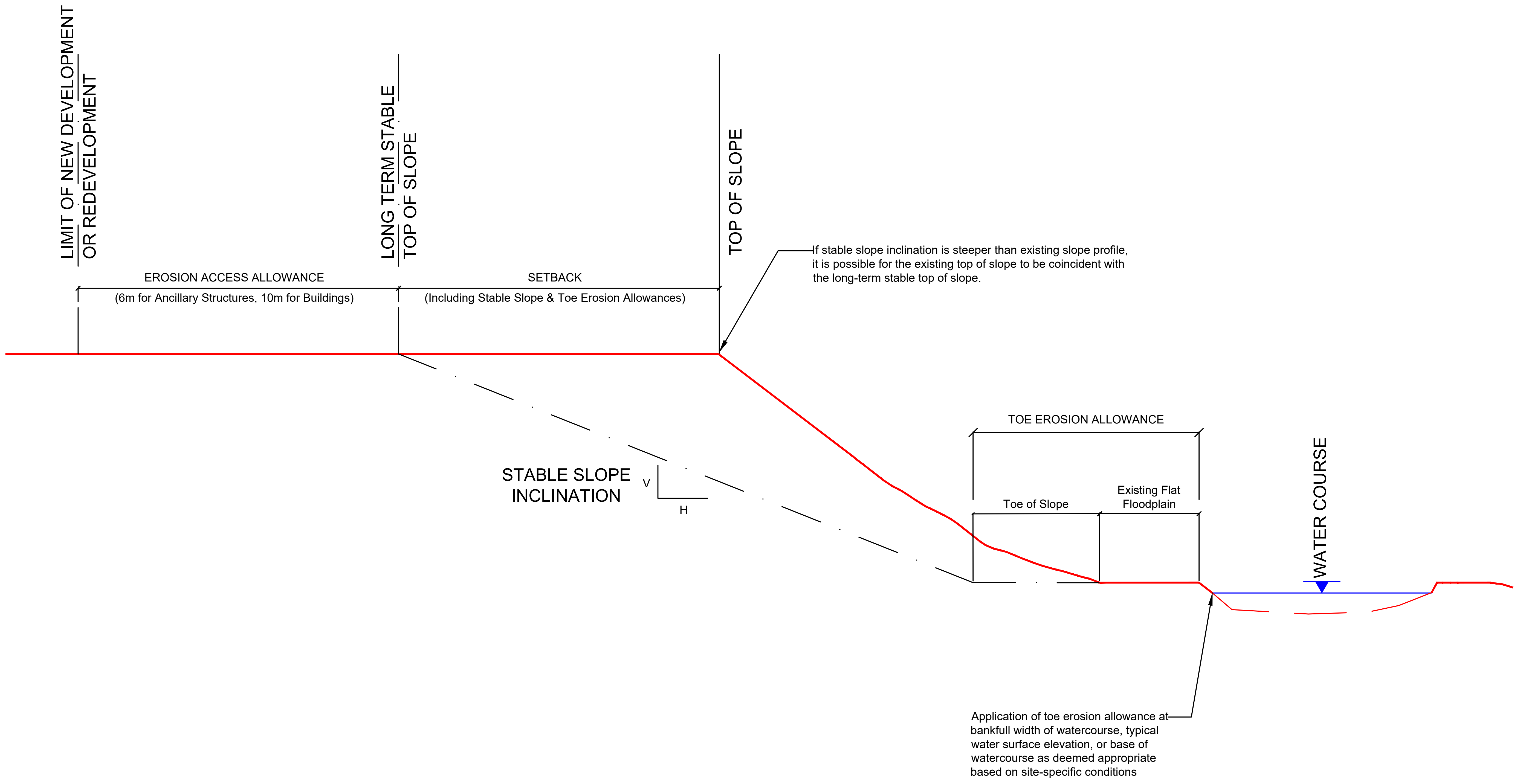
Reference:
21-B7601_TOPO 2021-07-22.dwg
"Sketch Showing Topographic Details on Tullamore Employment Lands,"
Project No. 21-00975, Dated July 22, 2021, by Young & Young Surveying Inc.

GEI Consultants
647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Detailed Cross-Section 25 & 26

Approved by: A.W.	Date: February 2022	Project No.: 2100975
Drawn by: R.W.	Scale: 1:400	Figure No.: XS 25-26



If stable slope inclination is steeper than existing slope profile, it is possible for the existing top of slope to be coincident with the long-term stable top of slope.

Application of toe erosion allowance at bankfull width of watercourse, typical water surface elevation, or base of watercourse as deemed appropriate based on site-specific conditions

GEI Consultants

647 Welham Rd, Unit 14, Barrie, ON, L4N 0B7
P: (705) 719-7994

Project: Tullamore Employment Lands

Title: Long Term Stable Top of Slope Model

Approved by:	A.W.	Date:	February 2022	Project No.:	2100975
Drawn by:	R.W.	Scale:	N.T.S	Figure No.:	5

Appendix A

Borehole Logs (Toronto Inspection, 2021)

Project No. 5552-21-GB

Log of Borehole 21BH-01

Dwg No. 2

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

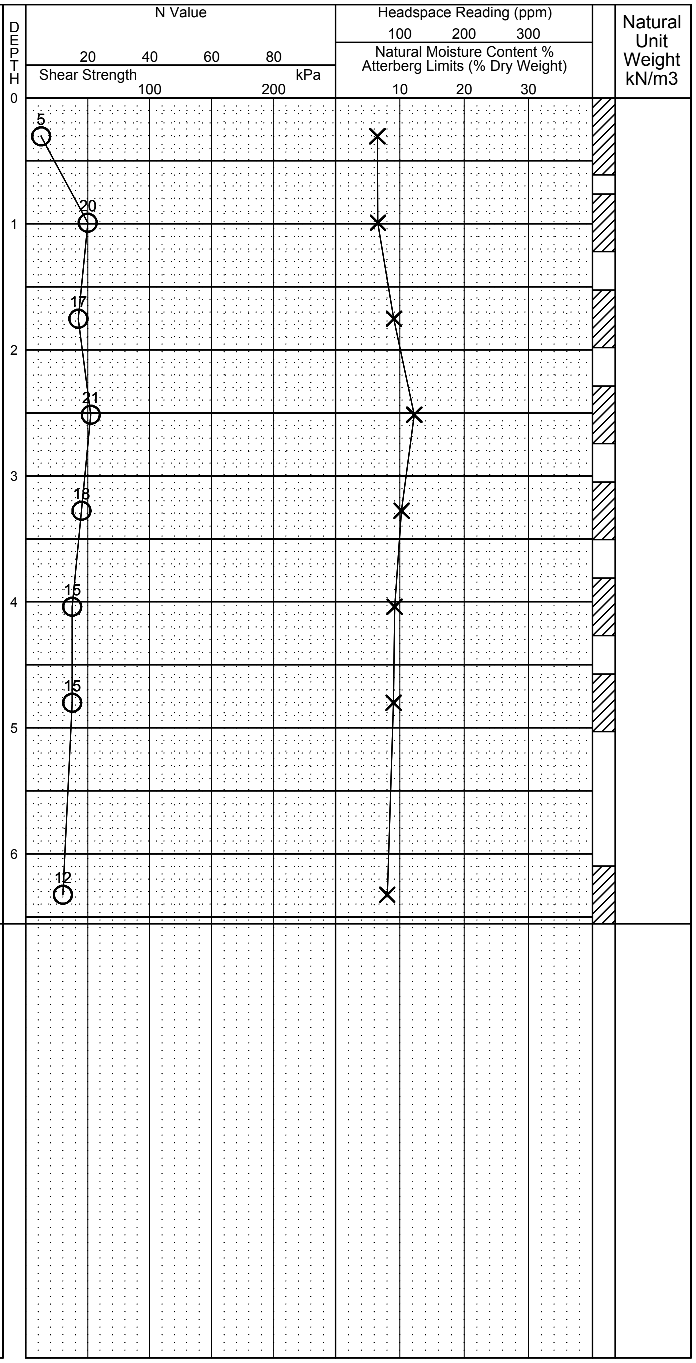
Date Drilled: 5/21/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	236.25
	▩	**COMPOST**	236.07
	▩	**FILL (REWORKED)** - brown clayey silt - some rootlets & topsoil - trace gravel - moist	235.64
	▨	**CLAYEY SILT** - very stiff to stiff - brown, grey below 4.5m - trace to some gravel - moist	229.70
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-02 (MW)

Dwg No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

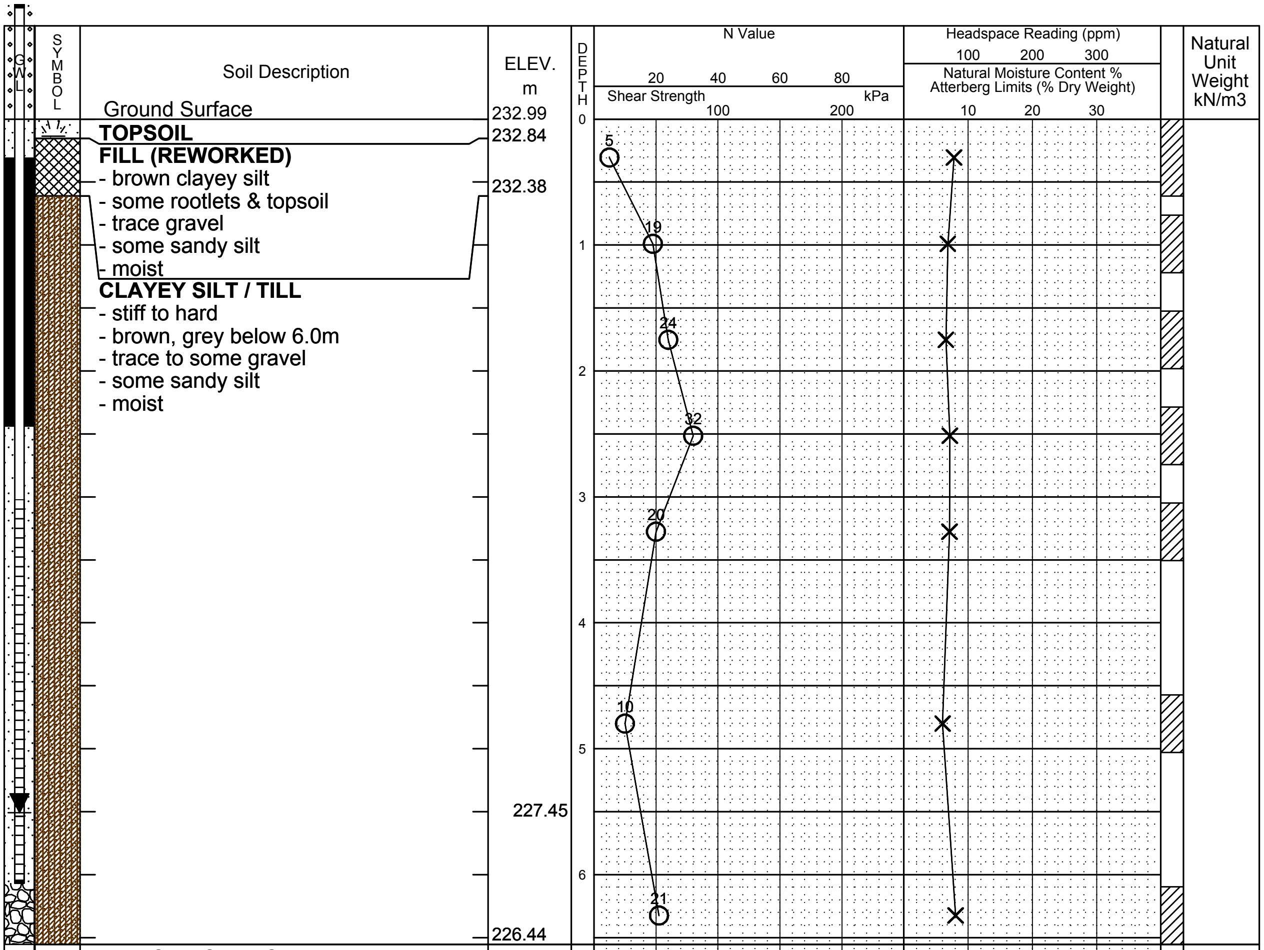
Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 5/21/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	232.99
TOPSOIL	232.84
FILL (REWORKED) - brown clayey silt - some rootlets & topsoil - trace gravel - some sandy silt - moist	232.38
CLAYEY SILT / TILL - stiff to hard - brown, grey below 6.0m - trace to some gravel - some sandy silt - moist	227.45 226.44

END OF BOREHOLE

NOTE:

Upon completion of drilling:

- no free water

LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 3, 2021	5.54m	

Project No. 5552-21-GB

Log of Borehole 21BH-03 (MW)

Dwg No. 4

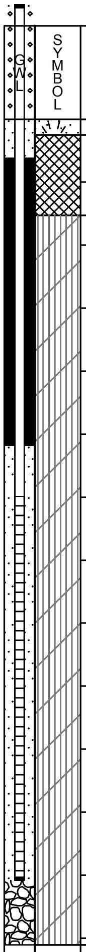
Project: Geotechnical Investigation

Sheet No. 1 of 1

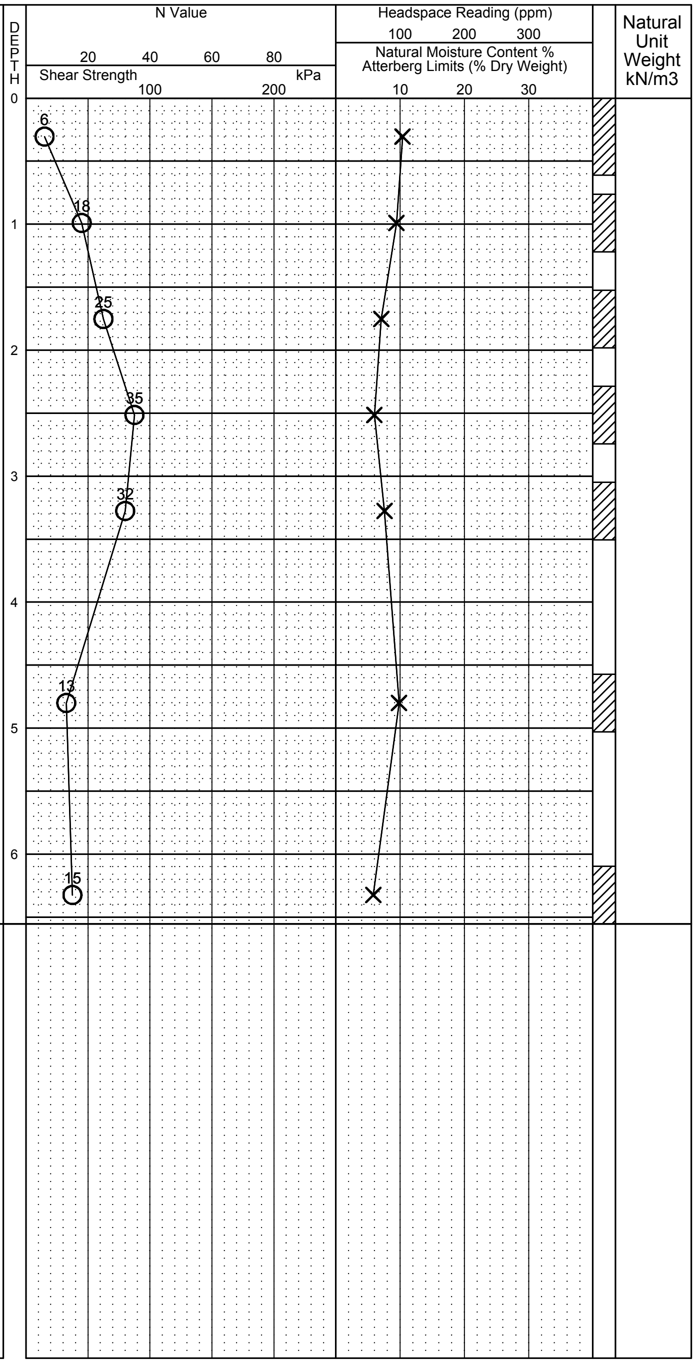
Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 5/21/21
Drill Type: Track Mounted Drill Rig
Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	235.52
TOPSOIL	235.39
FILL (REWORKED) - brown clayey silt - some rootlets & topsoil - moist	234.76
CLAYEY SILT / TILL - stiff to hard - brown, grey below 6.0m - trace to some gravel - seams of fine sand - occasional layers of clayey silt till - trace sandy silt - moist	
	228.97
END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 3, 2021	Dry	

Project No. 5552-21-GB

Log of Borehole 21BH-04

Dwg No. 5

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

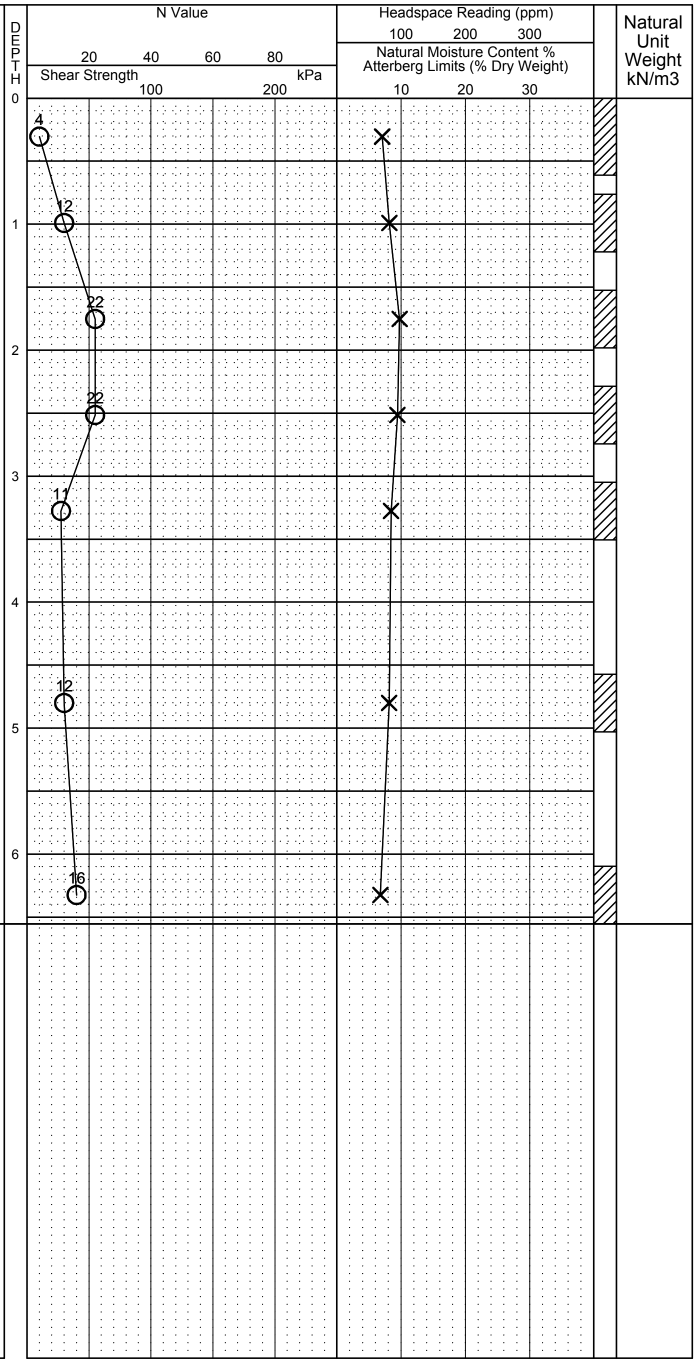
Date Drilled: 5/21/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	238.67
		TOPSOIL	238.62
		FILL (REWORKED) - brown clayey silt - trace to some rootlets & topsoil - moist to very moist	238.06
		CLAYEY SILT / TILL - stiff to very stiff - brown, grey below 6.0m - trace gravel, trace sand - seams of fine sand - moist	232.11
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-05

Dwg No. 6

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

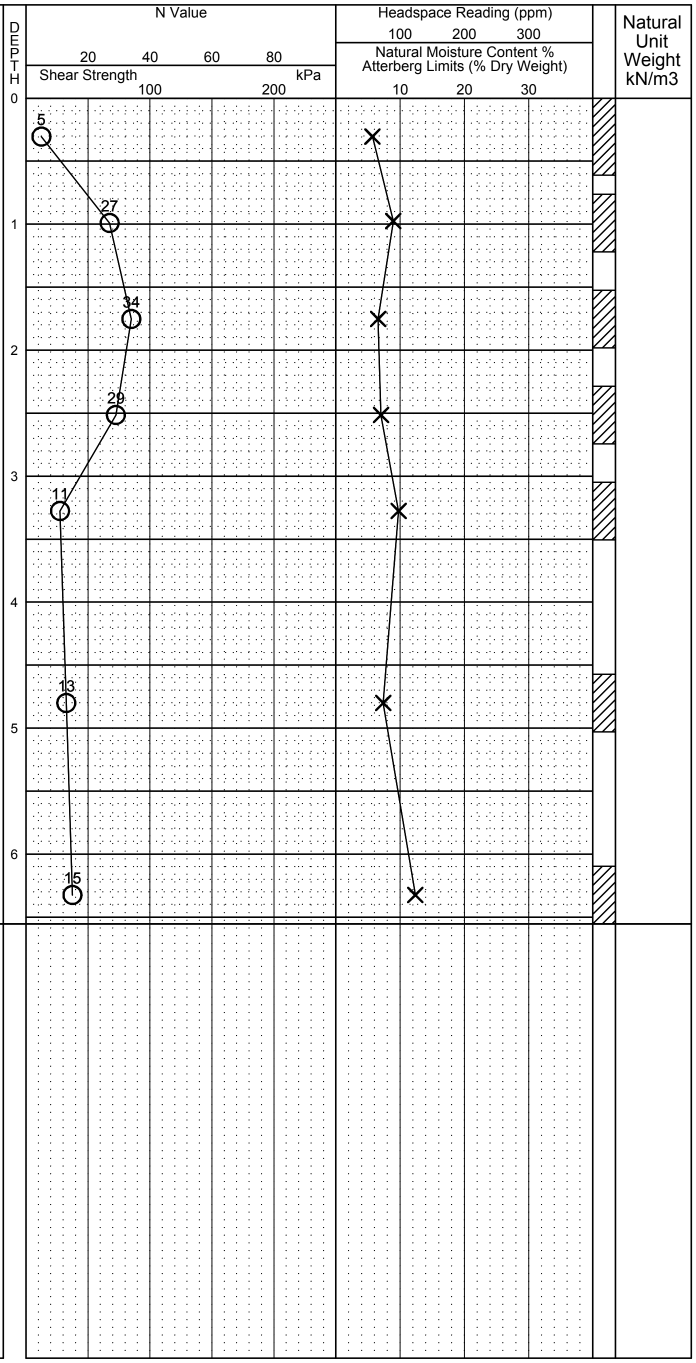
Date Drilled: 5/25/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	237.16
		TOPSOIL	236.96
		FILL (REWORKED) - dark brown to brown clayey silt - some rootlets & topsoil - some sandy silt - moist	236.56
		CLAYEY SILT - stiff to hard - brown, grey below 6.0m - trace to some gravel - trace sand, trace silty clay - moist	230.61
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-07 (MW)

Dwg No. 8

Project: Geotechnical Investigation

Sheet No. 1 of 1

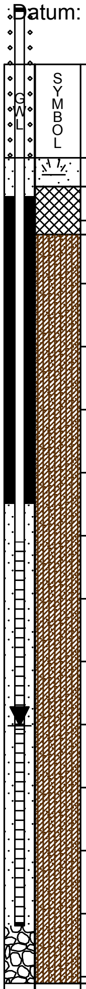
Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 5/25/21

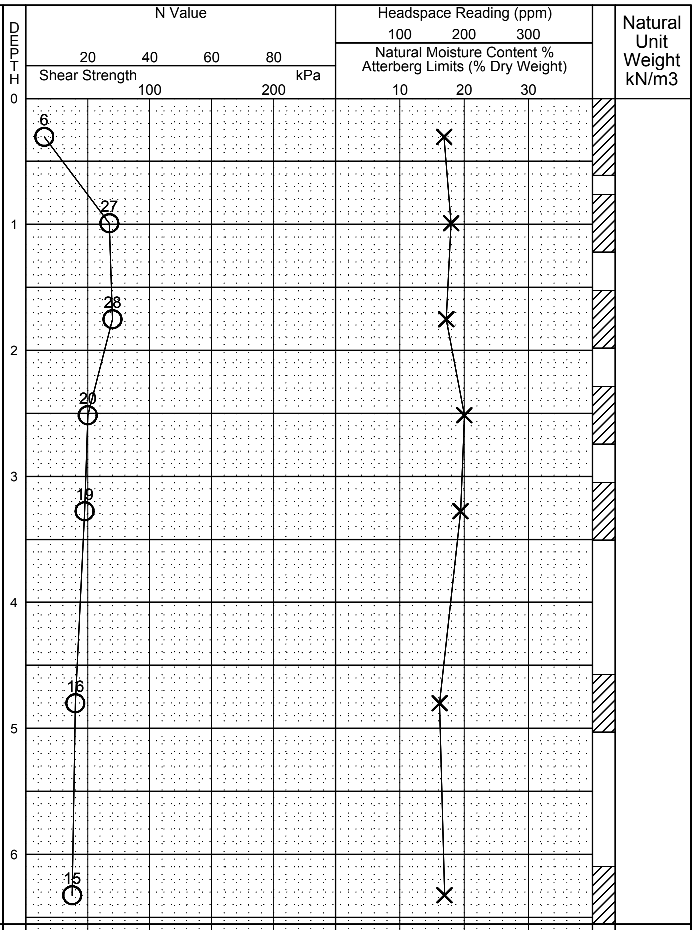
Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	240.17
TOPSOIL	239.94
FILL (REWORKED) - brown clayey silt - some rootlets & topsoil - moist	239.56
CLAYEY SILT / TILL - very stiff - brown, grey below 4.5m - trace to some gravel - seams of fine sand - moist to very moist	235.63 233.62
END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 3, 2021	4.54m	

Project No. 5552-21-GB

Log of Borehole 21BH-08

Dwg No. 9

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

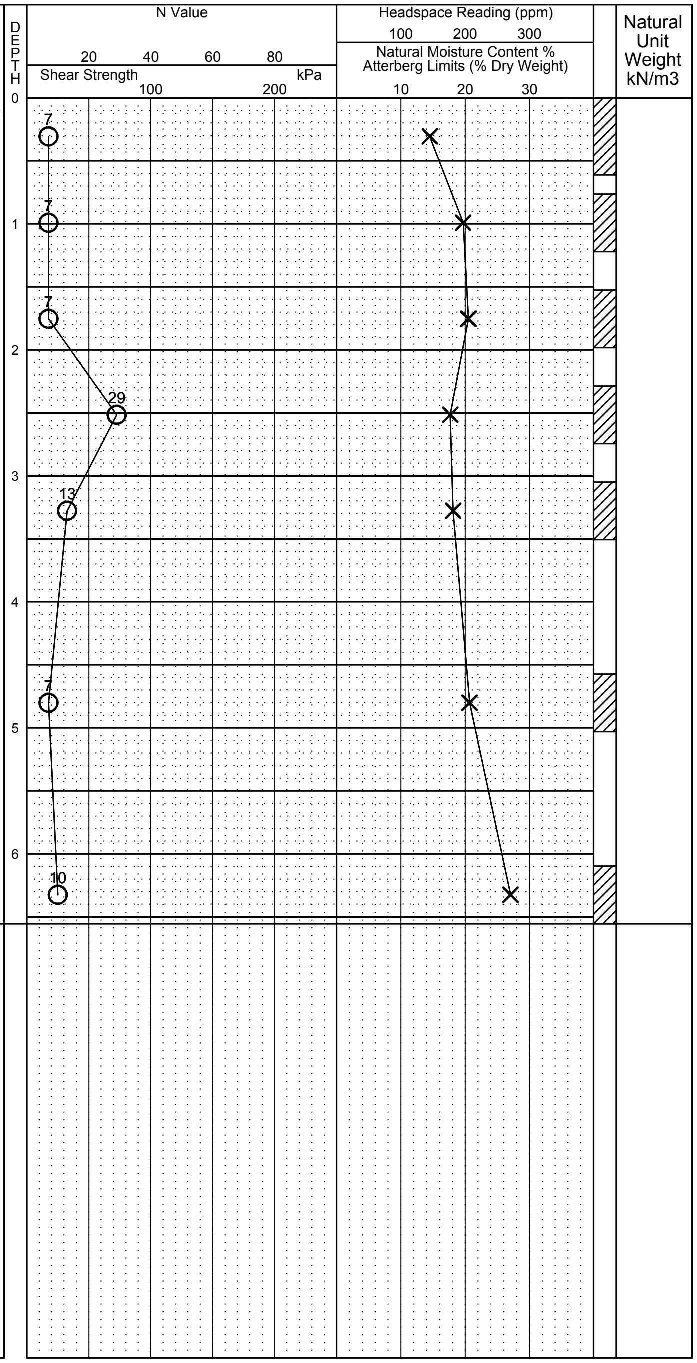
Date Drilled: 5/25/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	•
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL ▼	SYMBOL	Soil Description	ELEV. m
		Ground Surface	238.39
		TOPSOIL	238.34 238.39
		FILL (REWORKED) - brown clayey silt - trace rootlets & topsoil - some sandy silt - trace gravel - pockets of organics at 4.5m & 6.0m - moist to very moist, wet layers	231.84
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - hit a 3/4" pipe at 2.3m from top of the berm - water level at 0.0m (flowing out)	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-09

Dwg No. 10

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

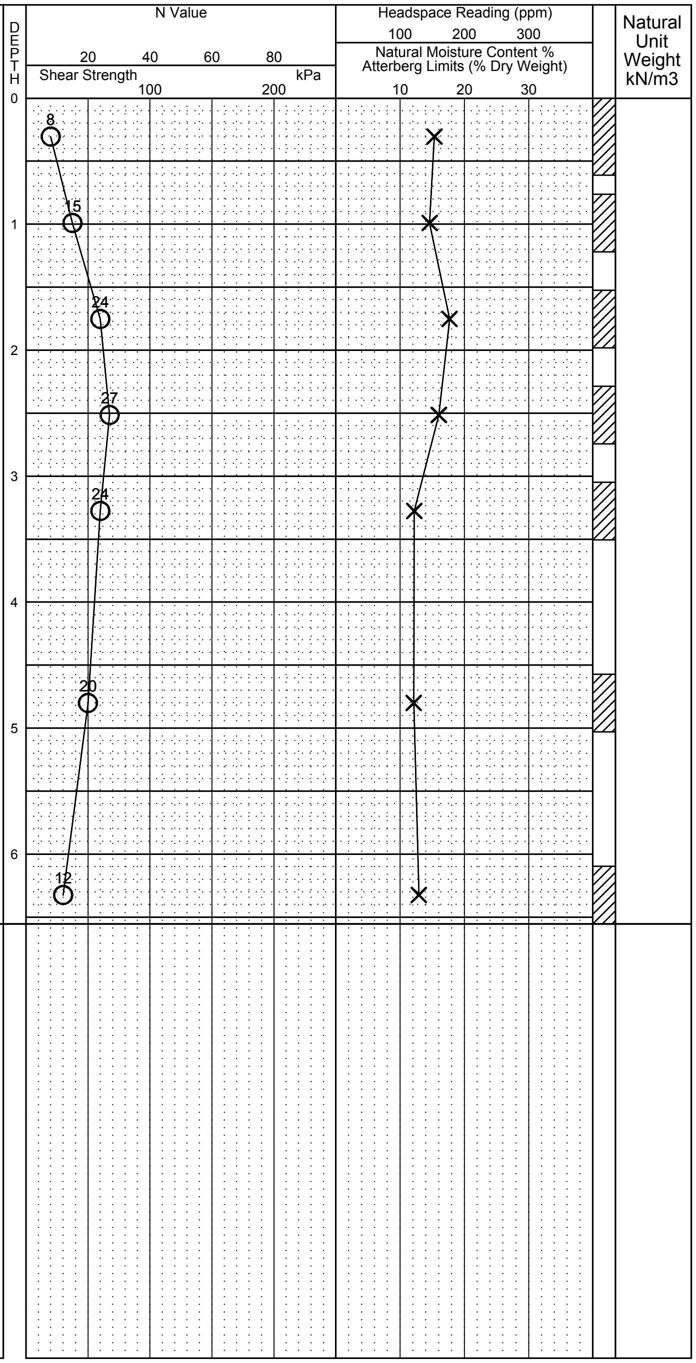
Date Drilled: 5/25/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	239.51
		TOPSOIL	239.28
		FILL (REWORKED) - brown sandy silt to clayey silt - some rootlets & topsoil - moist	238.74
		CLAYEY / SANDY SILT TILL - soft to very stiff / compact - brown, grey below 6.0m - some gravel - seams of fine sand - moist to very moist	232.95
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-10 (MW)

Dwg No. 11

Sheet No. 1 of 1

Project: Geotechnical Investigation

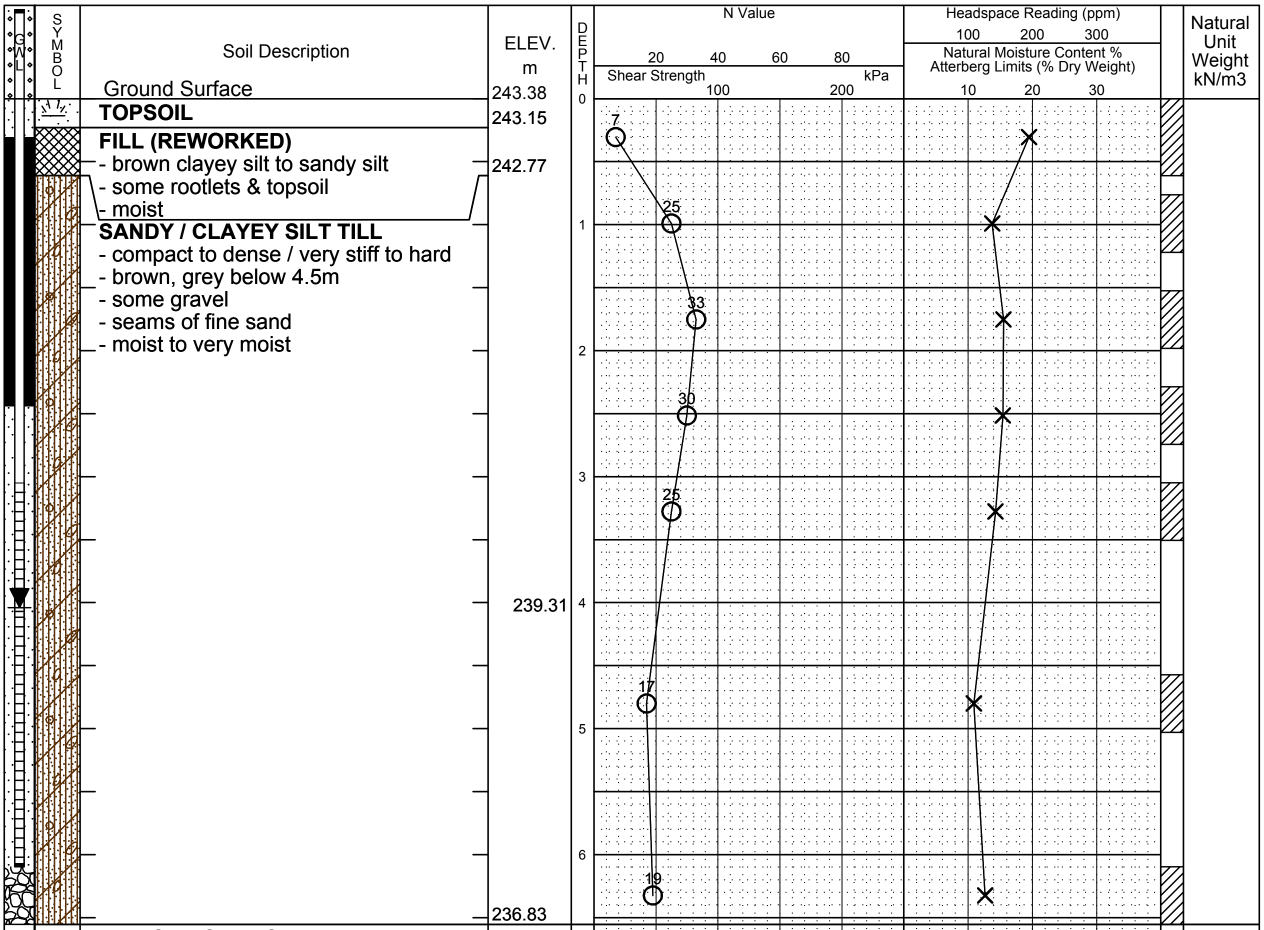
Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 5/26/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	✕
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	243.38
TOPSOIL	243.15
FILL (REWORKED) - brown clayey silt to sandy silt - some rootlets & topsoil - moist	242.77
SANDY / CLAYEY SILT TILL - compact to dense / very stiff to hard - brown, grey below 4.5m - some gravel - seams of fine sand - moist to very moist	239.31 236.83

END OF BOREHOLE
NOTE:
Upon completion of drilling:
- no free water

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 3, 2021	4.07m	

Project No. 5552-21-GB

Log of Borehole 21BH-17

Dwg No. 18

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 5/27/21

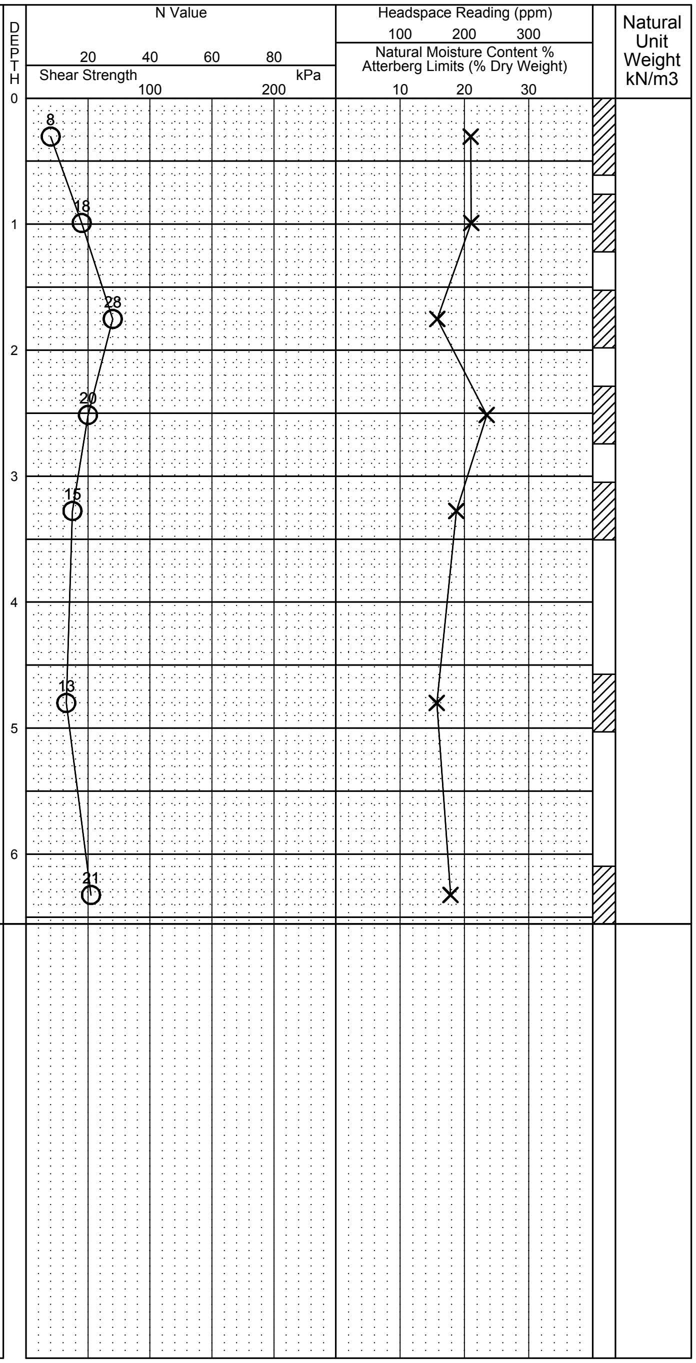
Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test ―
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) ●
Natural Moisture ×
Plastic and Liquid Limit ├─┤
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	240.60
		TOPSOIL	240.40
		FILL (REWORKED) - brown clayey silt - some rootlets & topsoil - moist	239.99
		CLAYEY SILT / TILL - stiff to very stiff - brown, grey below 4.5m - trace gravel - occasional layers of sandy silt till - moist to very moist, wet pockets	
▼			234.50
			234.05
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 6.1m	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 5552-21-GB

Log of Borehole 21BH-33 (MW)

Dwg No. 34

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

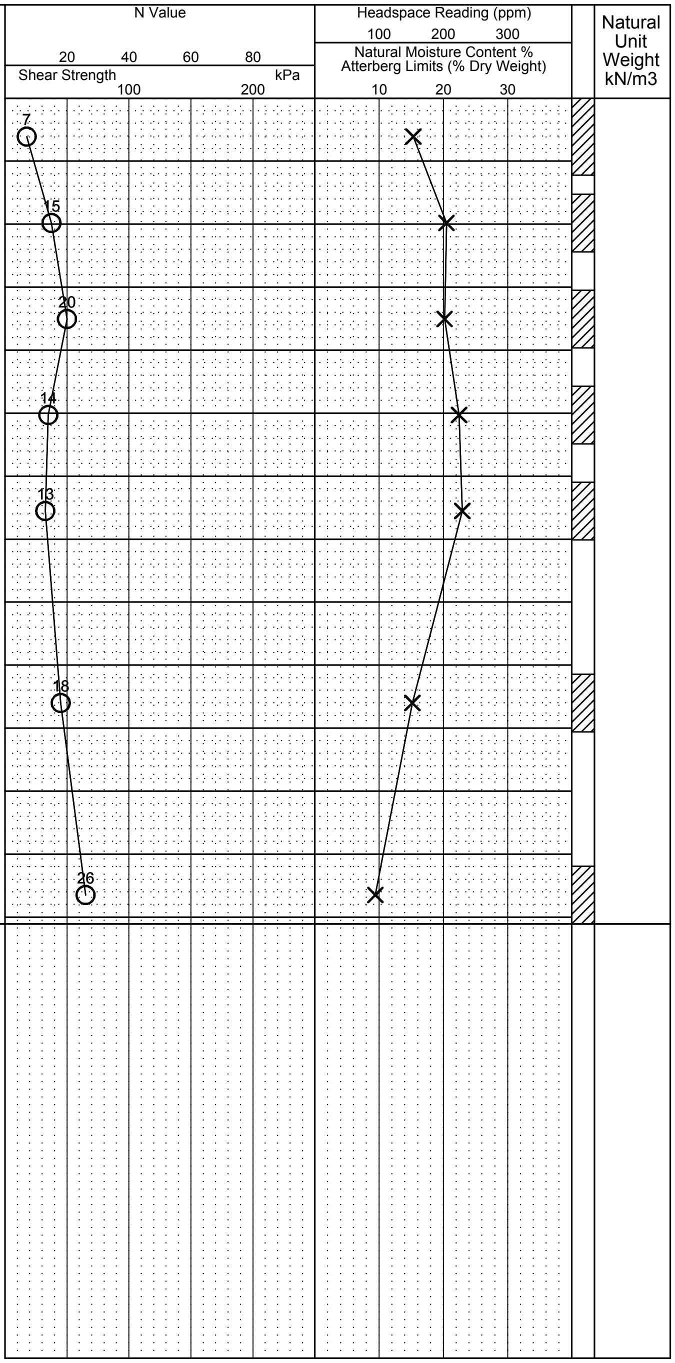
Date Drilled: 6/2/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	238.48
TOPSOIL	238.27
FILL (REWORKED) - brown clayey silt - trace rootlets & topsoil - some sandy silt - moist	238.02
CLAYEY SILT - stiff to very stiff - brown, grey below 4.5m - trace gravel - moist to very moist	
	234.49
	232.68
SANDY SILT TILL - compact, grey - some gravel, some clayey silt - moist	231.92
END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 3, 2021	3.99m	

Project No. 5552-21-GB

Log of Borehole 21BH-36 (MW)

Dwg No. 37

Project: Geotechnical Investigation

Sheet No. 1 of 1

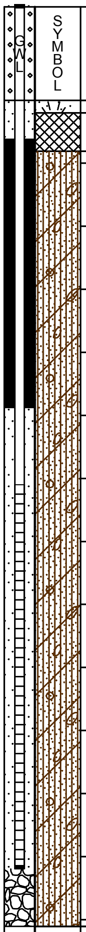
Location: Airport Road and Mayfield Road, Caledon, Ontario

Date Drilled: 6/3/21

Drill Type: Track Mounted Drill Rig

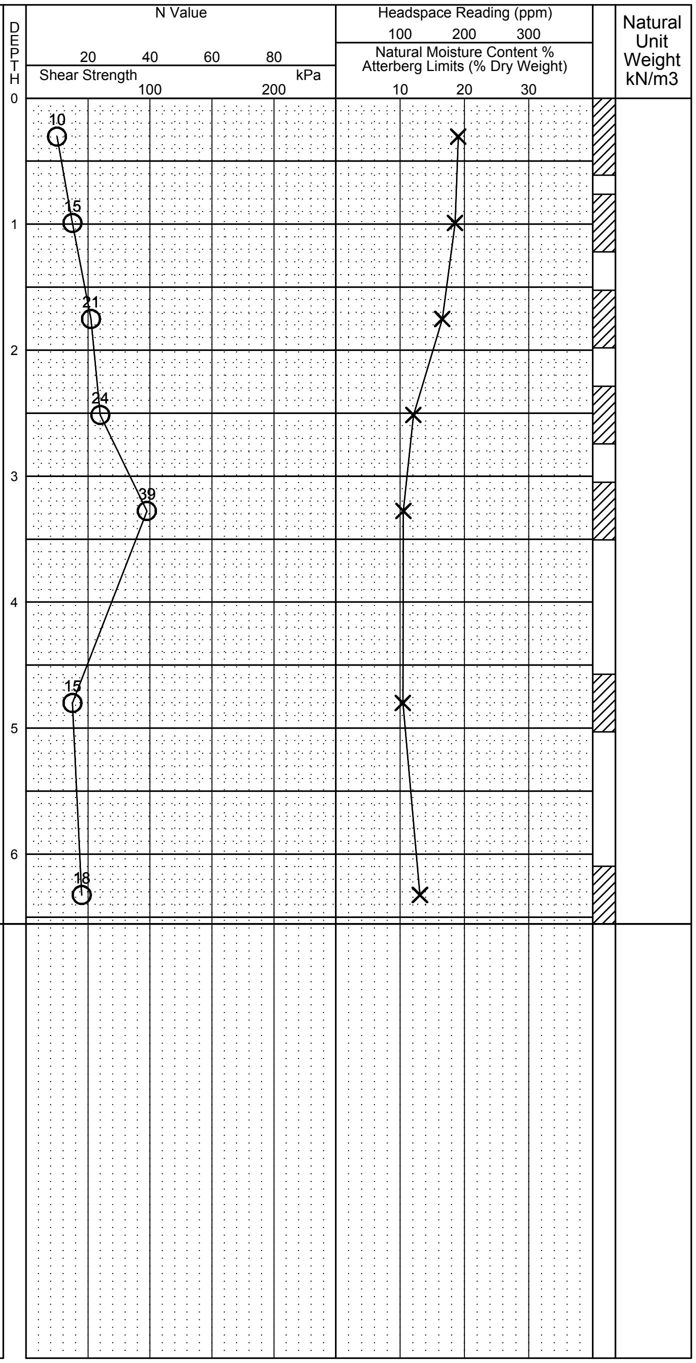
Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	•
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲



Soil Description	ELEV. m
Ground Surface	242.22
TOPSOIL	242.12
FILL (REWORKED) - brown sandy silt - trace rootlets & topsoil - moist	241.82
SANDY SILT TILL - compact to dense - some gravel, some clayey silt - moist	
	235.67

END OF BOREHOLE
NOTE:
Upon completion of drilling:
- no free water



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 7, 2021	Dry	

Project No. 5552-21-GB

Log of Borehole 21BH-37 (MW)

Dwg No. 38

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

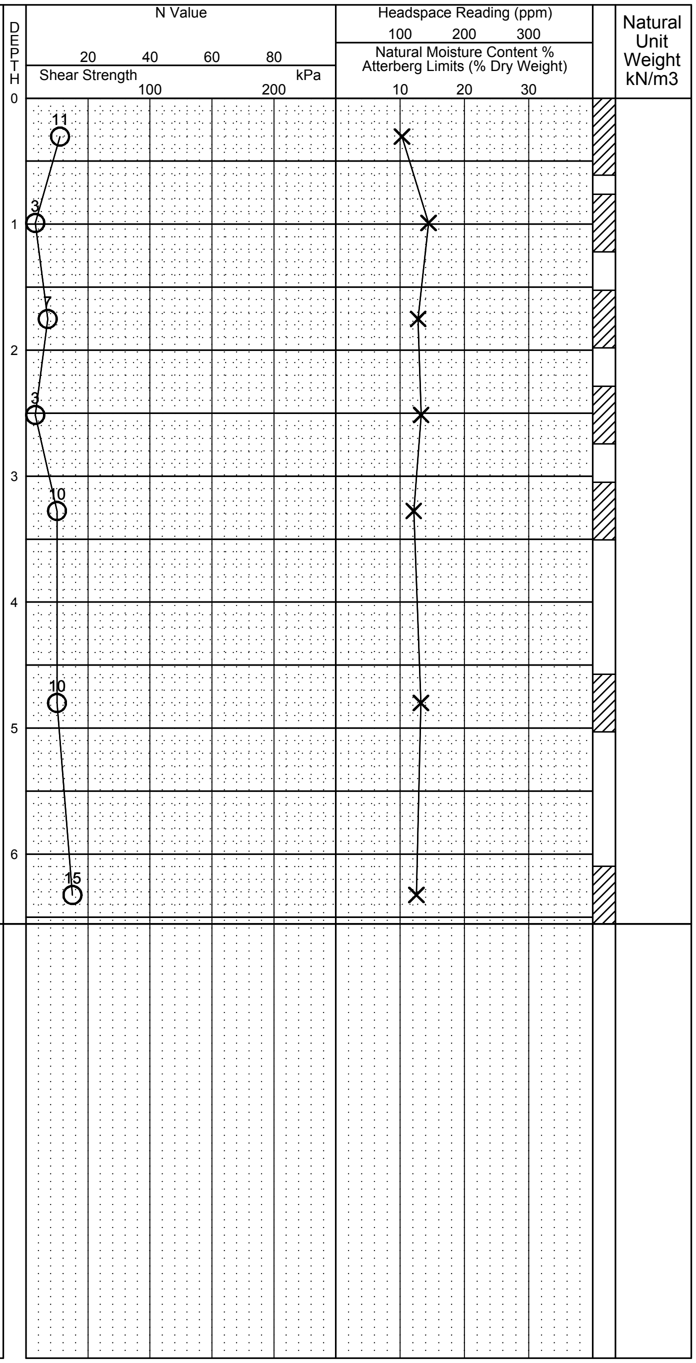
Date Drilled: 6/3/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	240.13
TOPSOIL	239.98
FILL (REWORKED) - brown sandy silt to clayey silt - trace rootlets & topsoil to 1.0m - trace to some gravel - moist to very moist	236.93
SANDY SILT TILL - compact - brown, grey below 6.0m - some gravel, some clayey silt - moist to very moist	233.58
END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
June 7, 2021	Dry	

Project No. 5552-21-GB

Log of Borehole 21BH-38

Dwg No. 39

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: Airport Road and Mayfield Road, Caledon, Ontario

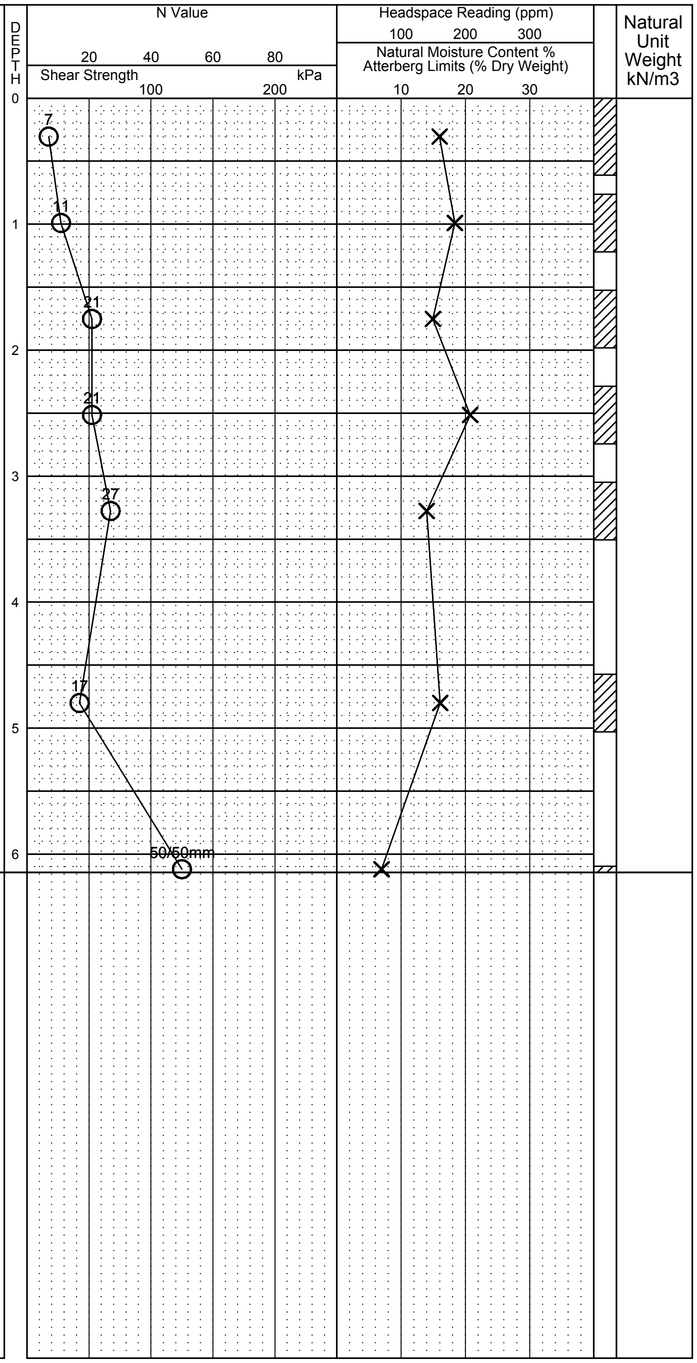
Date Drilled: 6/3/21

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	240.72
		TOPSOIL	240.57
		FILL (REWORKED) - brown clayey silt to sandy silt - trace rootlets & topsoil - moist	239.81
		SANDY SILT TILL - compact - brown, grey below 4.5m - some gravel, some clayey silt - possible cobbles at 6.0m - moist	234.58
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - no free water	



LGBE3 5552-21-GB.GPJ 6/22/21

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Appendix B

Site and Slope Photographs

PHOTOGRAPH 1

GEI (2022)

Description:
A view of the west tributary northern slope crest near the driveway from Mayfield Road (confined valley system).

PHOTOGRAPH 2

GEI (2022)

Description:
A view of the west tributary northern slope profile.

PHOTOGRAPH 3

GEI (2021)

Description:
A view of the wide floodplain between the slope and west tributary watercourse between Mayfield Road and the barns.

PHOTOGRAPH 4

GEI (2022)

Description:
A view of the west tributary watercourse near Mayfield Road.

PHOTOGRAPH 5

GEI (2022)

Description:
A view of gully erosion extending down the slope face due to concentrated runoff from the barns and other structures.

PHOTOGRAPH 6

GEI (2022)

Description:
Another view of gully erosion extending down the slope face due to concentrated runoff from the barns and other structures. Weeping pipes outlet partway down the slope.

PHOTOGRAPH 7

GEI (2022)

Description:
Another general view of the northern slope of the western tributary confined valley system.

PHOTOGRAPH 8

GEI (2022)

Description:
A view of the tableland (farmland) north of the northern slope of the western tributary.

PHOTOGRAPH 9

GEI (2022)

Description:
Another view of the west tributary watercourse.

PHOTOGRAPH 10

GEI (2022)

Description:
Another view of the west tributary watercourse. The watercourse is typically adjacent to the northern slope toe between the barns and Torbram Road.

PHOTOGRAPH 11

GEI (2022)

Description:
A view of the well vegetated northern slope profile.

PHOTOGRAPH 12

GEI (2022)

Description:
Another view of the well vegetated northern slope profile. Some trees are partially tilting, likely due to long term slope creep.

PHOTOGRAPH 13

GEI (2022)

Description:
Active erosion is occurring along the west tributary watercourse.

PHOTOGRAPH 14

GEI (2022)

Description:
Active erosion is occurring along the west tributary watercourse.

PHOTOGRAPH 15

GEI (2022)

Description:
A view of the southern drainage feature (confined valley system) that is expected to only contain intermittent flows during or after runoff events.

PHOTOGRAPH 16

GEI (2022)

Description:
A view of the south slope of the southern drainage feature. Some rilling was observed on the slope face, due to concentrated runoff.

PHOTOGRAPH 17

GEI (2022)

Description:
Another view of the southern drainage feature (confined valley system) that is expected to only contain intermittent flows during or after runoff events.

PHOTOGRAPH 18

GEI (2022)

Description:
Another view of the southern drainage feature (confined valley system) that is expected to only contain intermittent flows during or after runoff events.

PHOTOGRAPH 19

GEI (2022)

Description:
A view of the unconfined feature that drains into the upper pond of the eastern tributary.

PHOTOGRAPH 20

GEI (2022)

Description:
Another view of the unconfined feature that drains into the upper pond of the eastern tributary.

PHOTOGRAPH 21

GEI (2022)

Description:
A view of the northern embankment dam crest, at the upper pond location.

PHOTOGRAPH 22

GEI (2022)

Description:
A view of the side slope of the upper pond / embankment dam, containing some concrete and other debris.

PHOTOGRAPH 23

GEI (2022)

Description:
A view of the upper pond and damaged / destroyed culvert intlet that extends below the berm (upstream side of the upper pond).

PHOTOGRAPH 24

GEI (2022)

Description:
A view of the damaged culvert and active erosion and slope failures (slumping) at the upstream face of the northern embankment dam (upper pond).

PHOTOGRAPH 25

GEI (2022)

Description:
A view of the culvert outlet downstream at the northern embankment dam.

PHOTOGRAPH 26

GEI (2022)

Description:
A general view of the eastern tributary, looking south / downstream of the upper pond.

PHOTOGRAPH 27

GEI (2022)

Description:
A general view looking north along the eastern tributary.

PHOTOGRAPH 28

GEI (2022)

Description:
A view of the western slope along the lower pond.

PHOTOGRAPH 29

GEI (2022)

Description:
A view of the damaged / destroyed culvert inlet at the upstream face of the lower pond embankment dam. There is erosion and slope failures around the inlet.

PHOTOGRAPH 30

GEI (2022)

Description:
A view of the crest of the lower pond embankment dam.

PHOTOGRAPH 31

GEI (2022)

Description:
A view looking south of the remaining section of the eastern tributary before it flows beneath Mayfield Road through a concrete box culvert.

PHOTOGRAPH 32

GEI (2022)

Description:
A view of the assumed outlet (downstream side) for the culvert that passes beneath the lower pond embankment dam. There is erosion in the area.

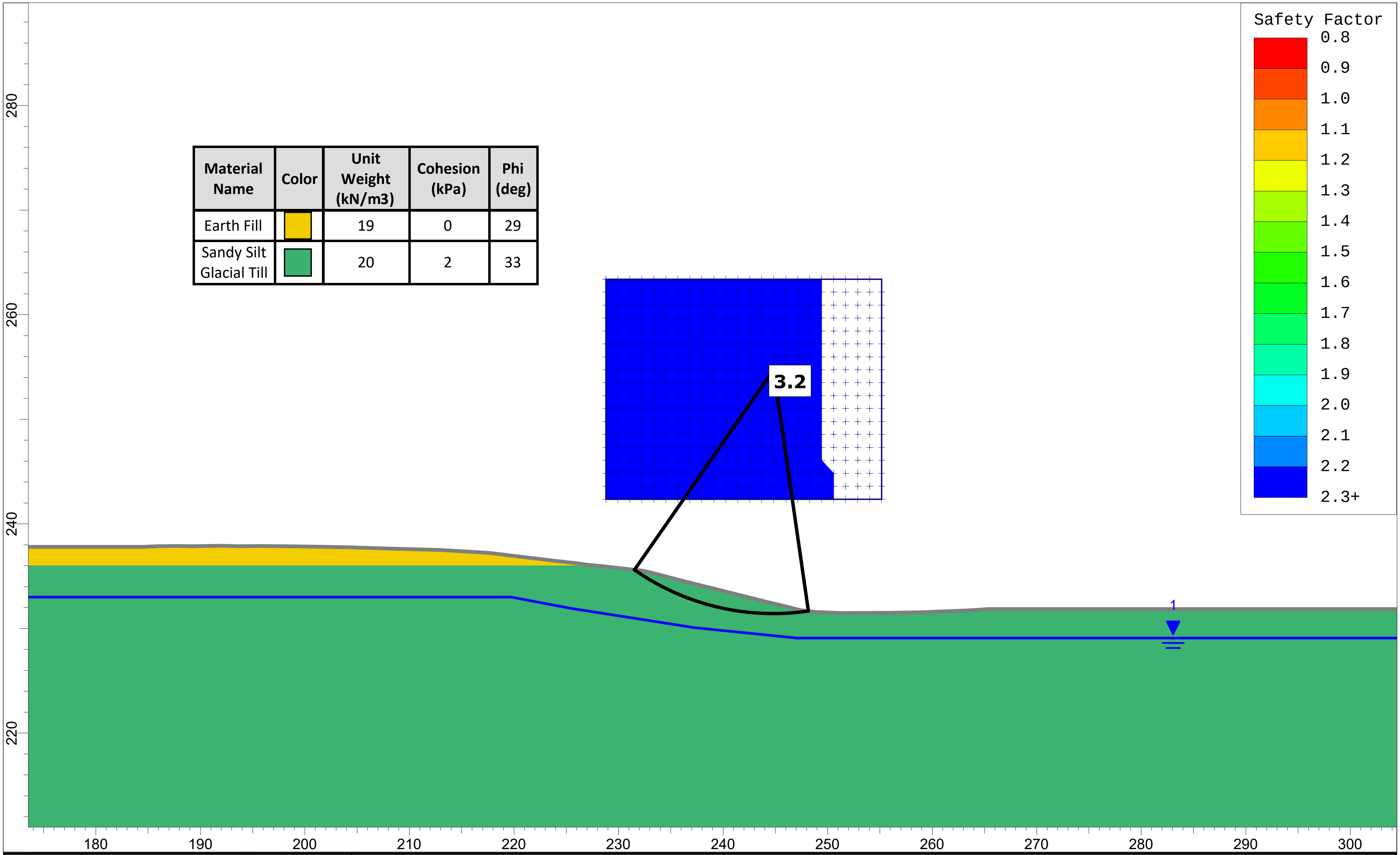
PHOTOGRAPH 33

GEI (2022)

Description:
A general view of the lower pond embankment dam.

Appendix C

Slope Stability Analysis – Existing Conditions



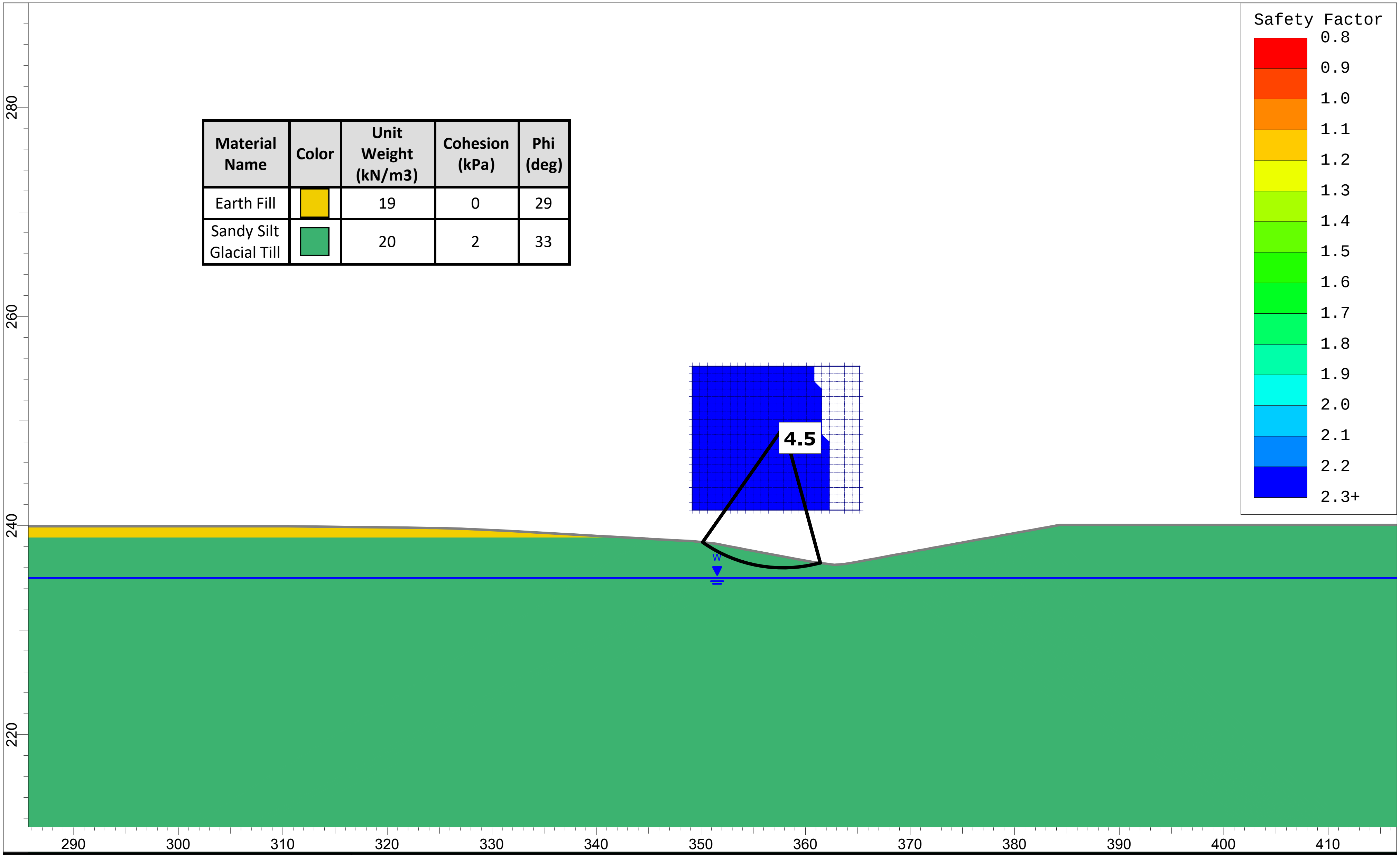
Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

Project	Tullamore Employment Lands
Analysis Description	Section 1 - Existing Conditions

Drawn By	RW	*Scale*	1:500	*Company*	GEI
Date	2/15/2022			*Project No.*	2100975

SLIDEINTERPRET 9.020

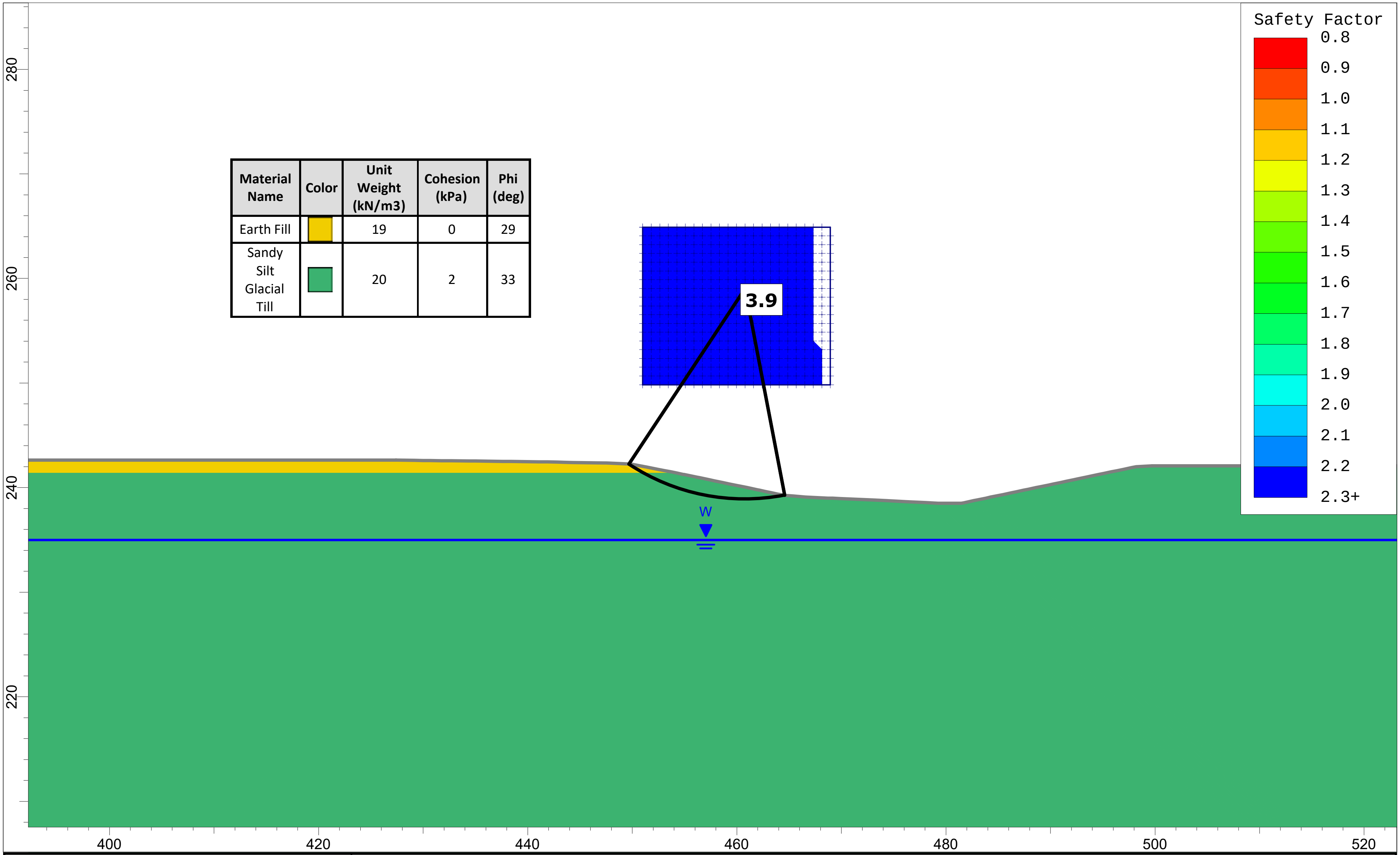


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands		
Analysis Description	Section 2 - Existing Conditions		
Drawn By RW	*Scale* 1:500	*Company*	GEI
Date	2/15/2022	*Project No.*	2100975

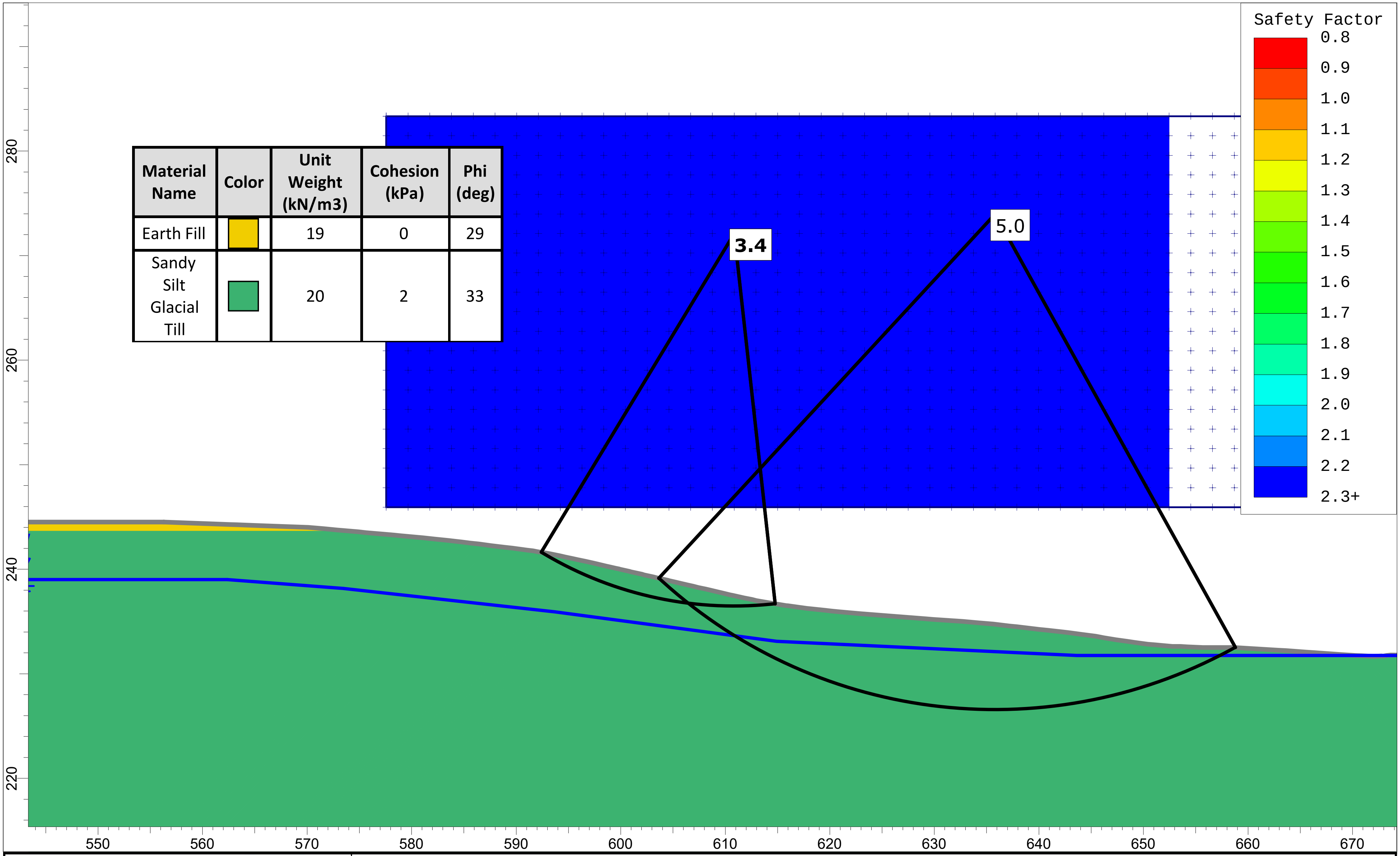


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 3 - Existing Conditions
Drawn By	RW
Scale	1:500
Company	GEI
Date	2/15/2022
Project No.	2100975

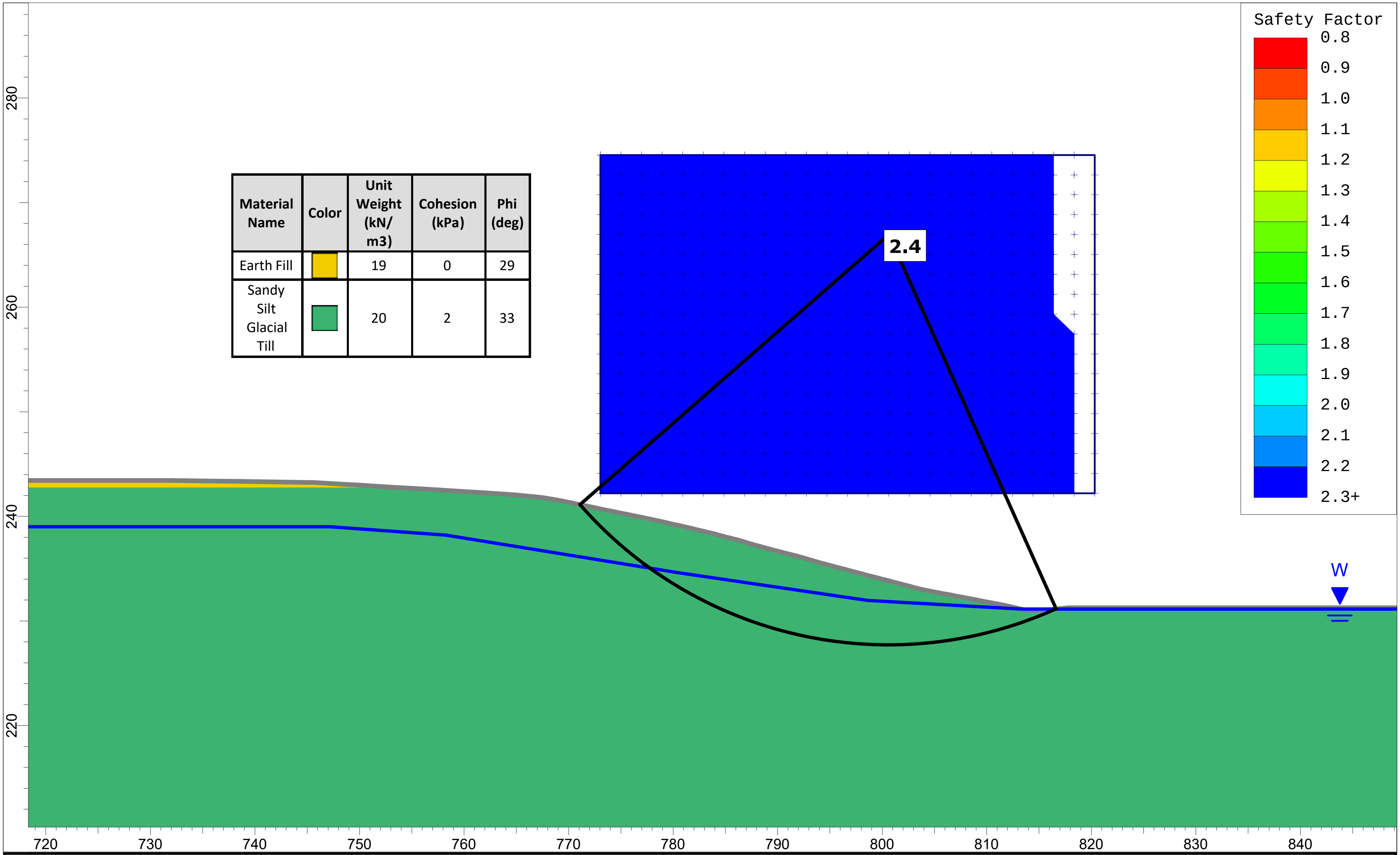


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 4 - Existing Conditions
Drawn By	RW
Scale	1:500
Company	GEI
Date	2/15/2022
Project No.	2100975

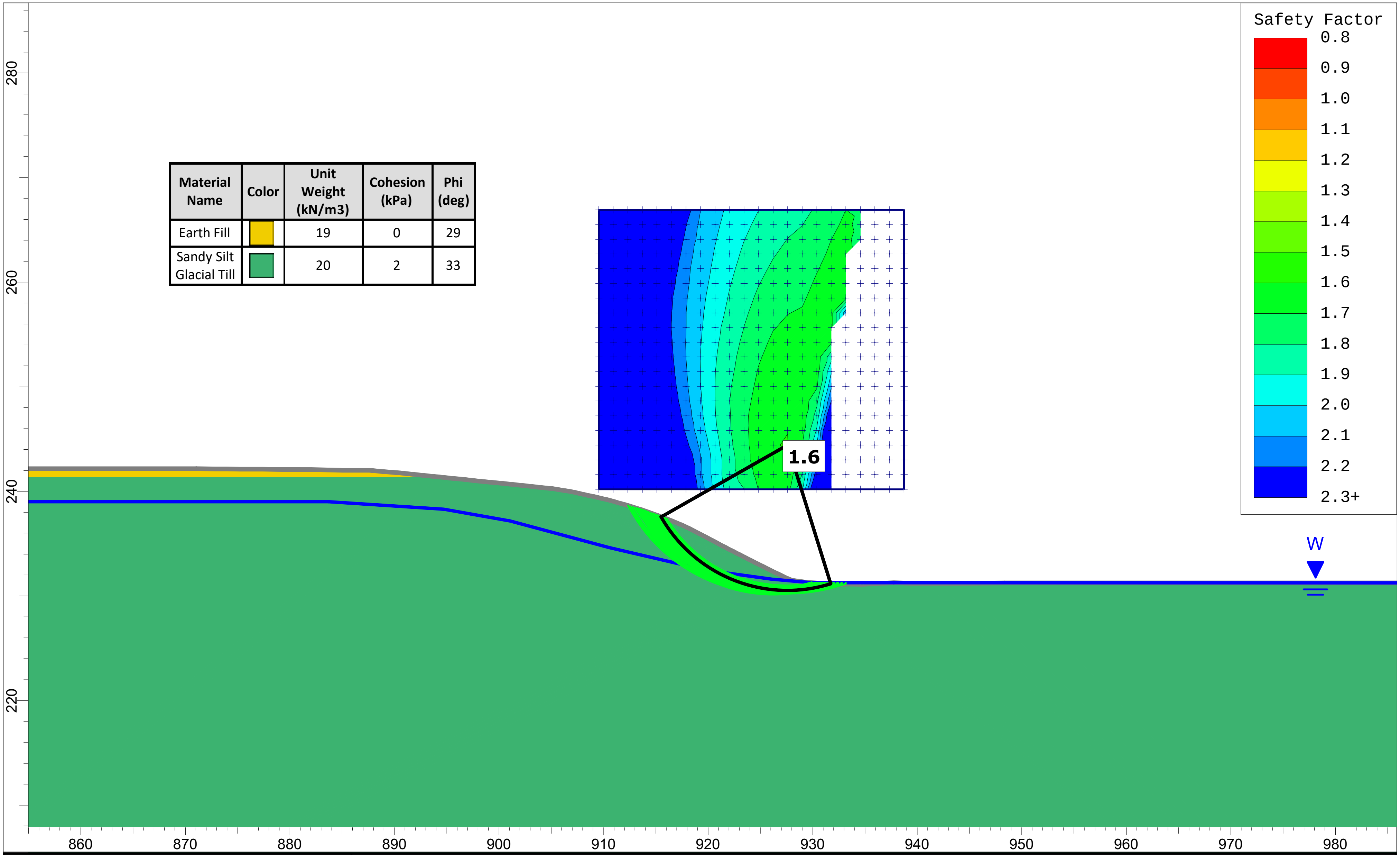


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 5 - Existing Conditions
Drawn By	RW
Scale	1:500
Company	GEI
Date	2/15/2022
Project No.	2100975



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project Tullamore Employment Lands

Analysis Description Section 6 - Existing Conditions

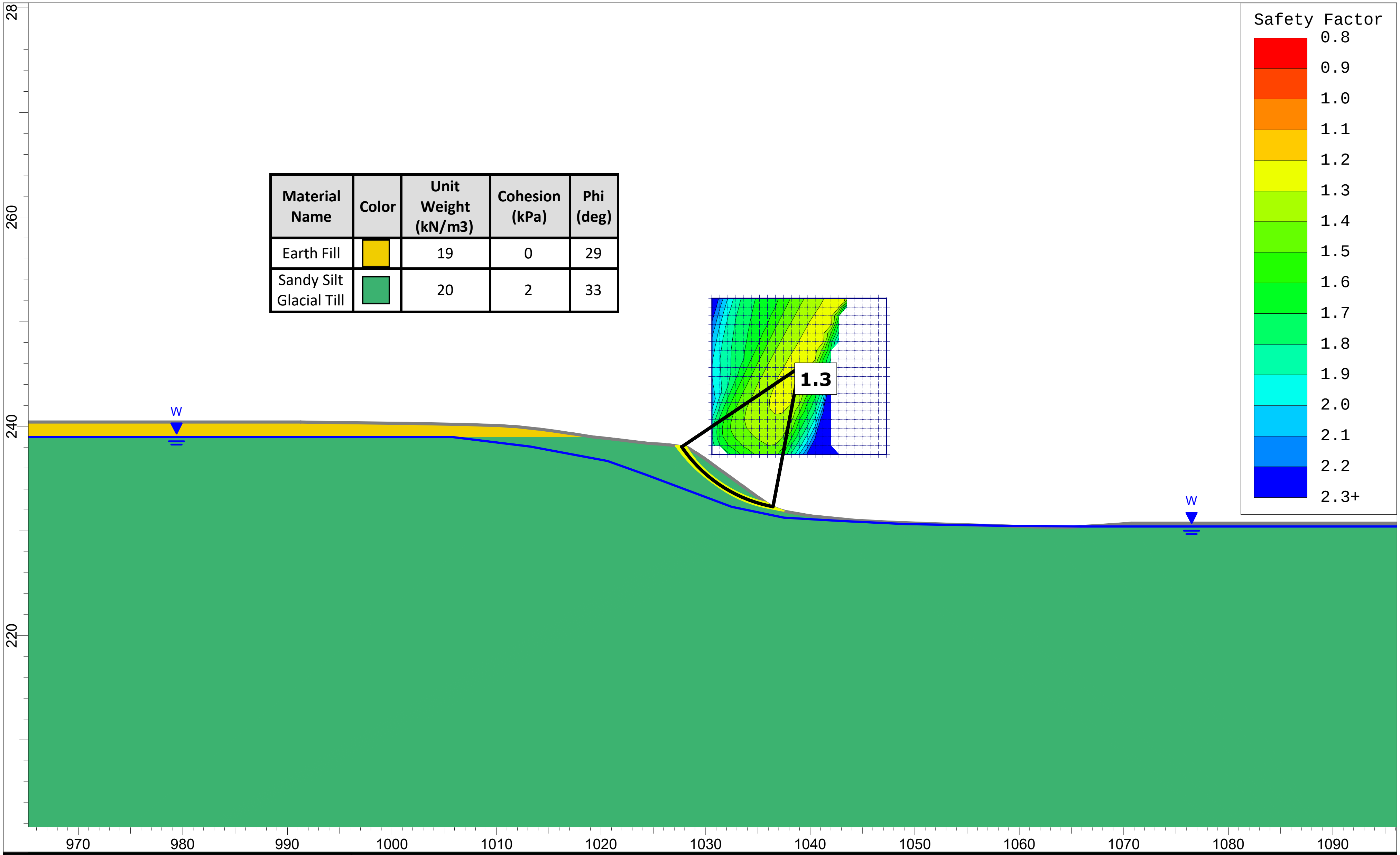
Drawn By RW

Scale 1:500

Company GEI

Date 2/15/2022

Project No. 2100975



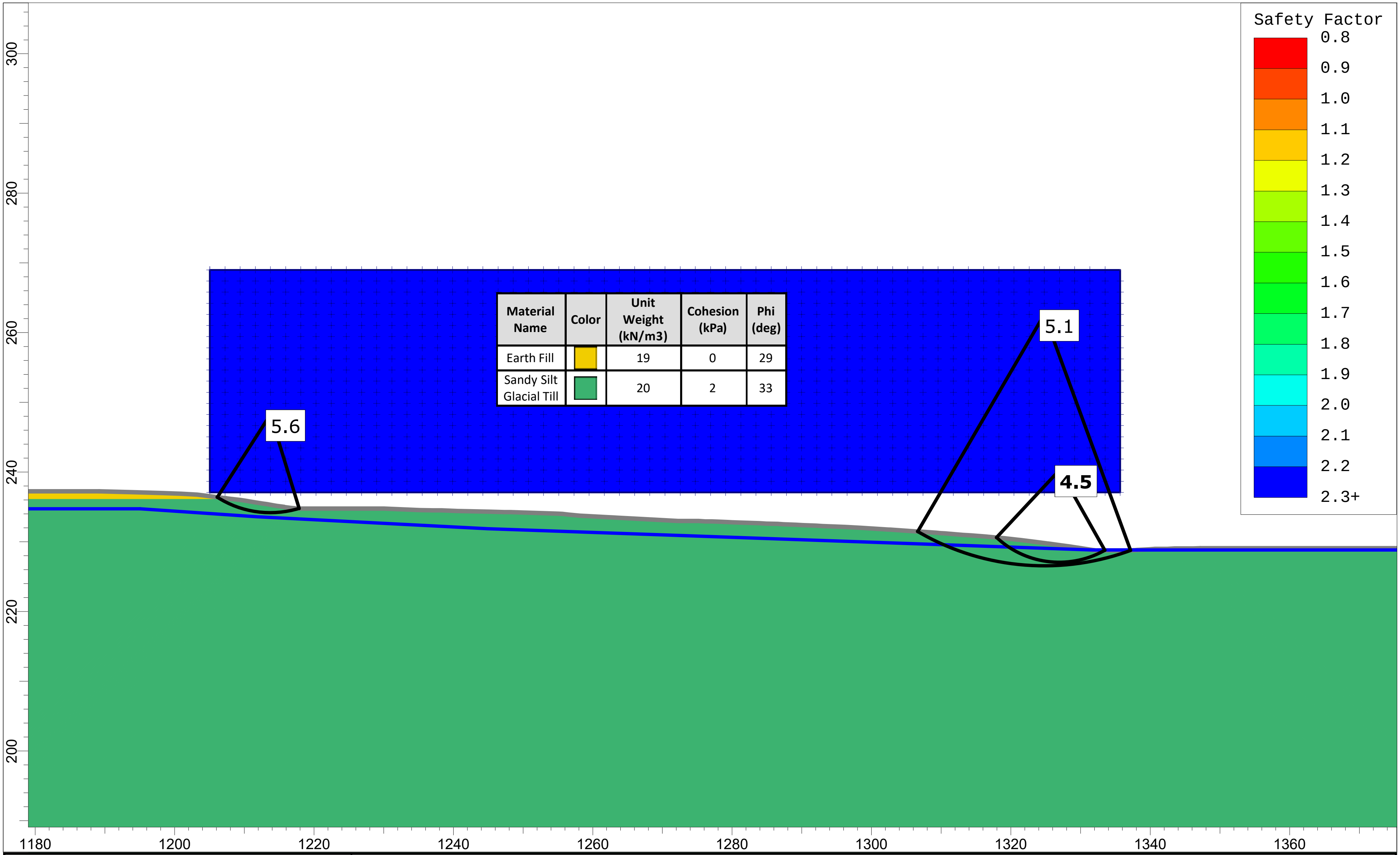
Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 7 - Existing Conditions

Drawn By	RW	*Scale*	1:500	*Company*	GEI
Date	2/15/2022			*Project No.*	2100975



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

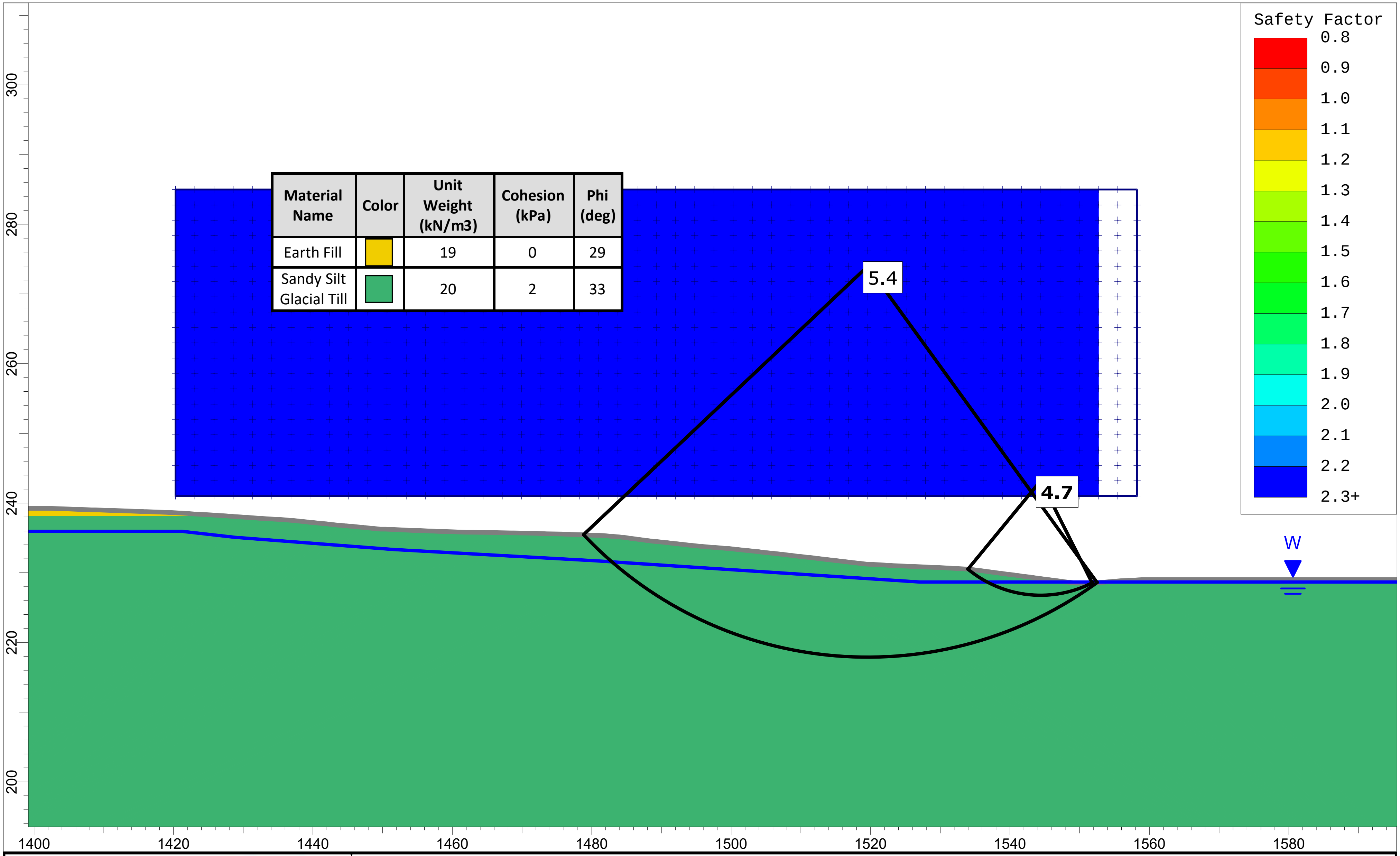
GEI Consultants

SLIDEINTERPRET 9.020

Project
Tullamore Employment Lands

Analysis Description
Section 8 - Existing Conditions

Drawn By RW
Scale 1:750
Company GEI
Date 2/15/2022
Project No. 2100975

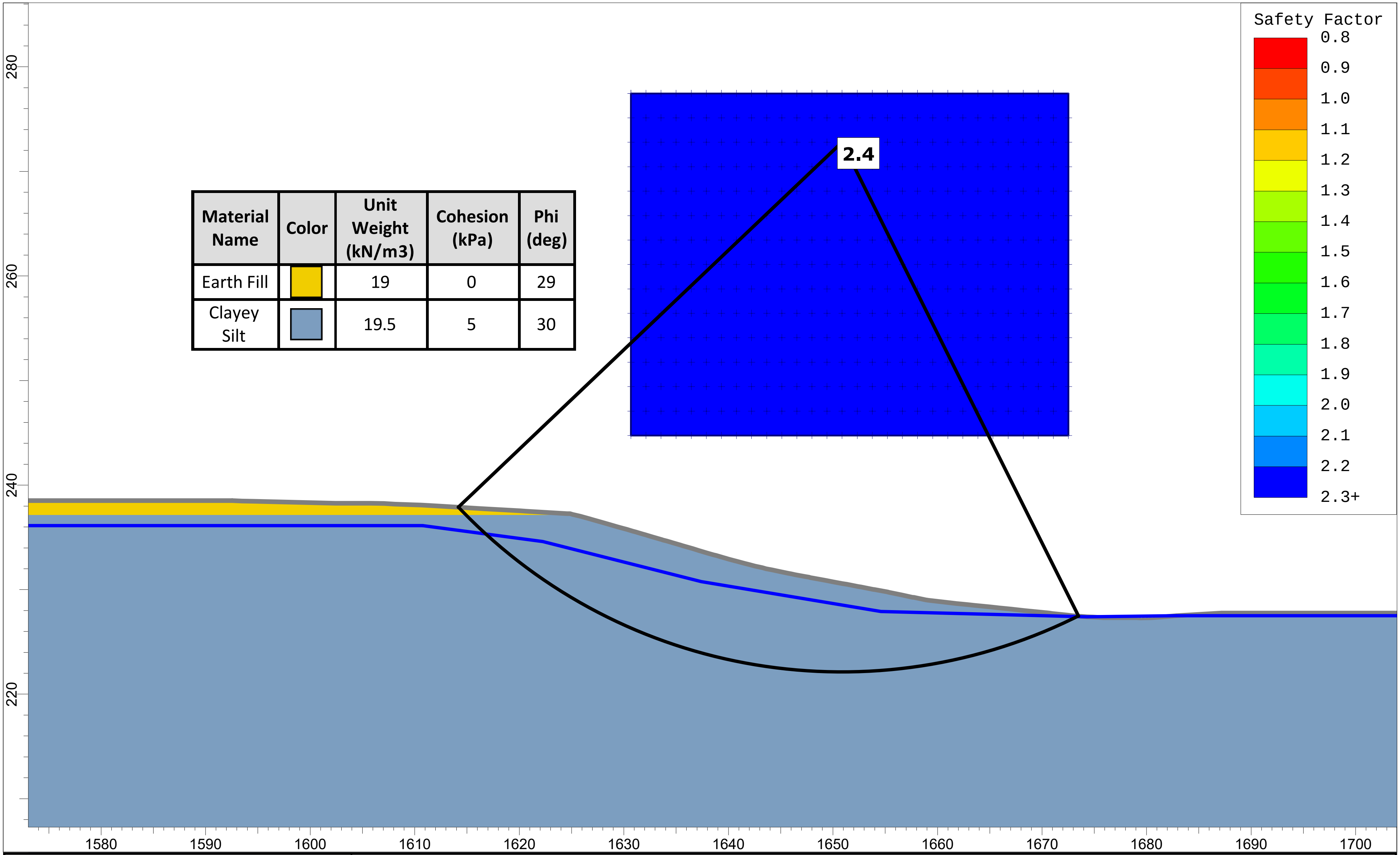


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands		
Analysis Description	Section 9 - Existing Conditions		
Drawn By RW	*Scale* 1:750	*Company*	GEI
Date	2/15/2022	*Project No.*	2100975

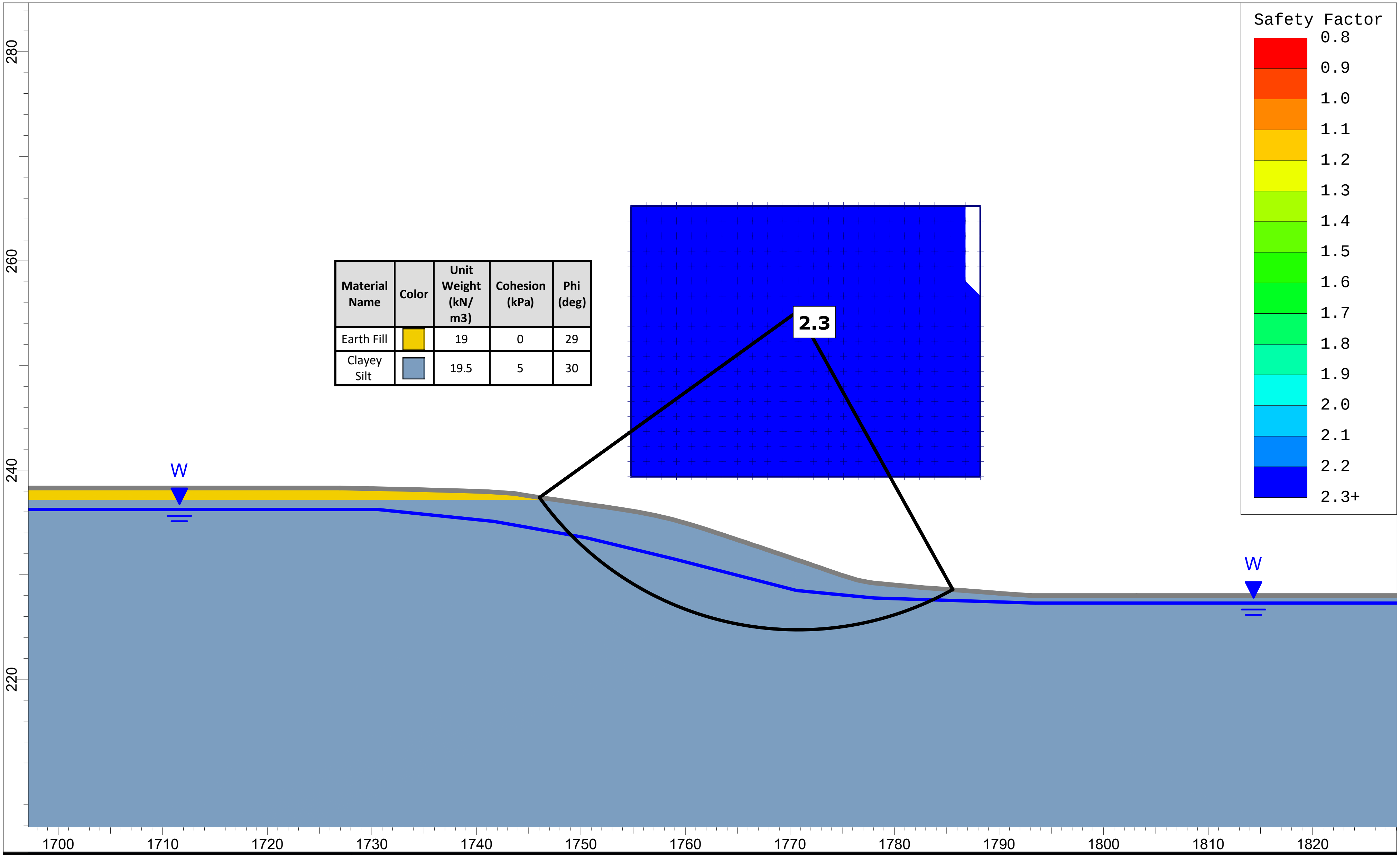


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt	🟦	19.5	5	30

Project	Tullamore Employment Lands		
Analysis Description	Section 10 - Existing Conditions		
Drawn By	RW	*Scale*	1:500
Company	GEI		
Date	2/15/2022	*Project No.*	2100975

GEI Consultants

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt	🟦	19.5	5	30

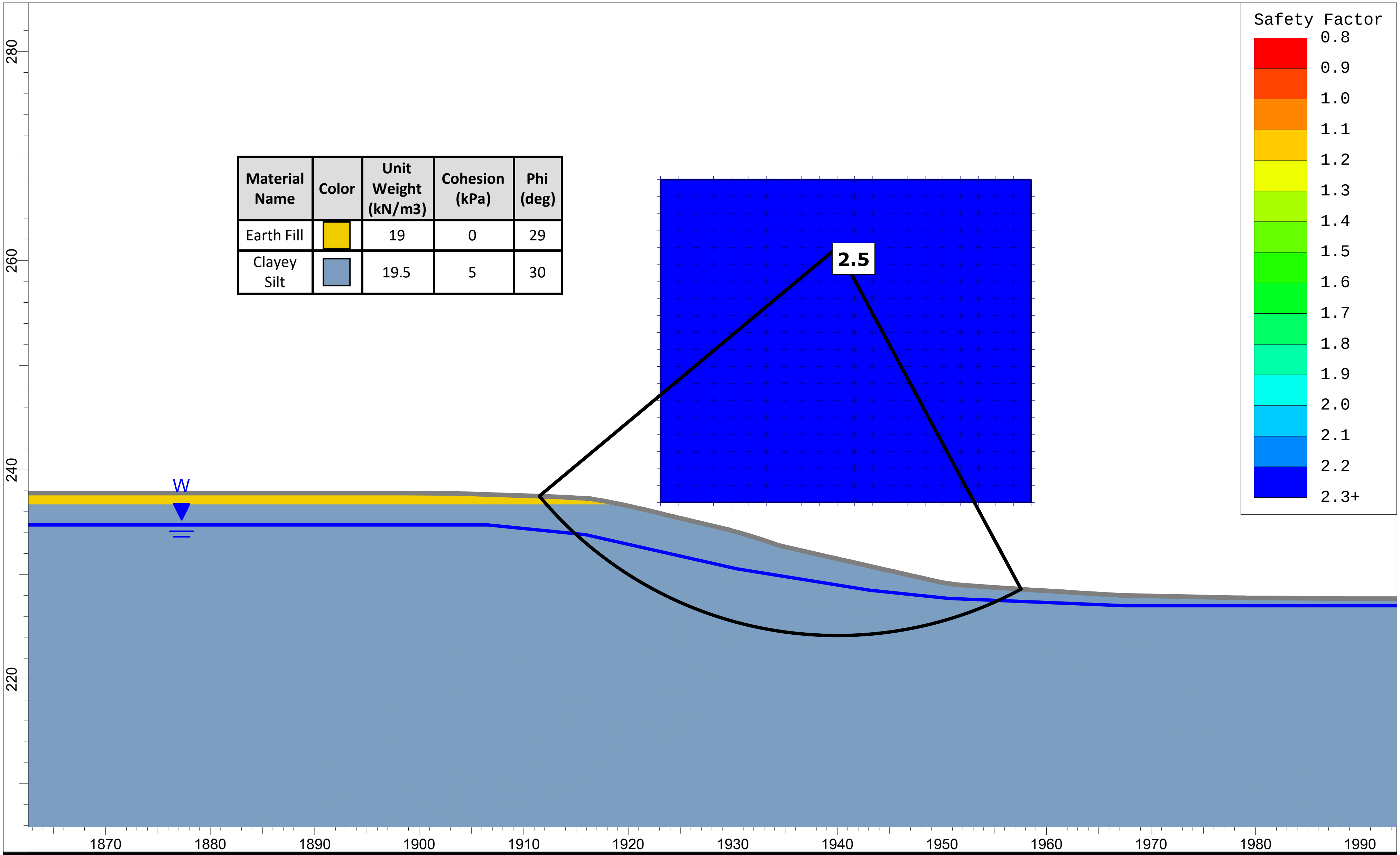
Project
Tullamore Employment Lands

Analysis Description
Section 11 - Existing Conditions

Drawn By RW
Scale 1:500
Company GEI

Date 2/15/2022
Project No. 2100975

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt	🟦	19.5	5	30

GEI Consultants

SLIDEINTERPRET 9.020

Project Tullamore Employment Lands

Analysis Description Section 12 - Existing Conditions

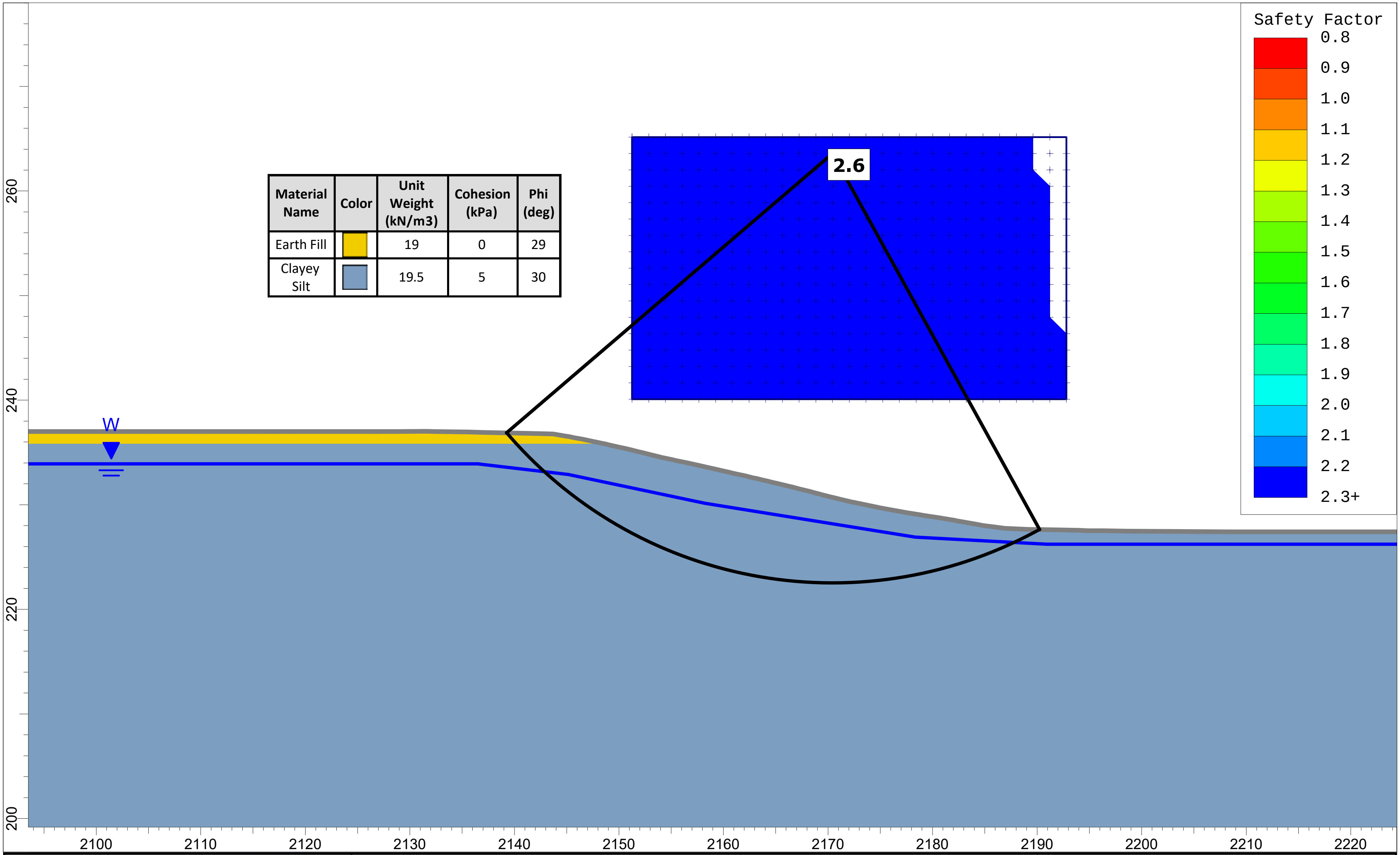
Drawn By RW

Scale 1:500

Company GEI

Date 2/15/2022

Project No. 2100975

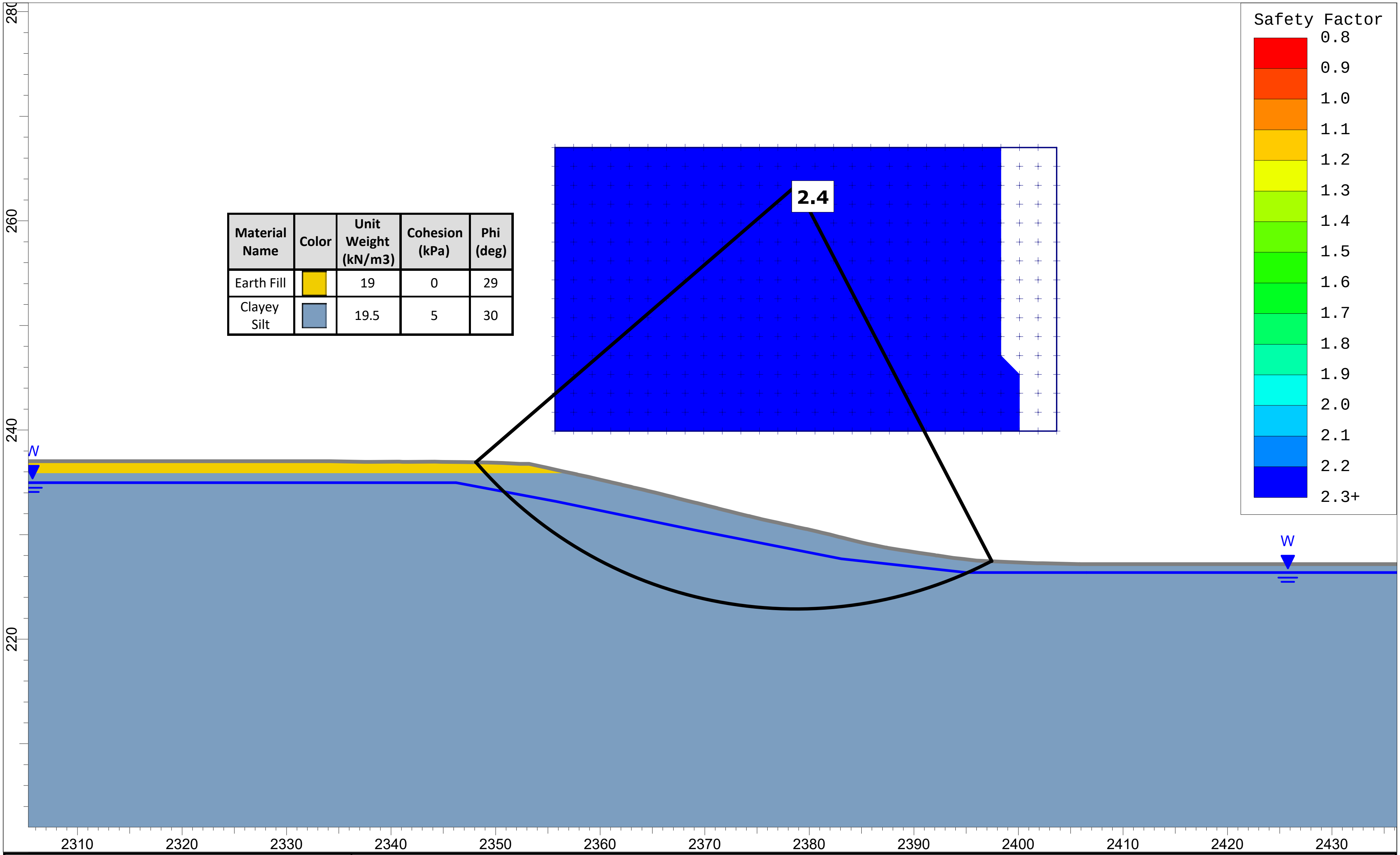


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt	🟦	19.5	5	30

Project	Tullamore Employment Lands		
Analysis Description	Section 13 - Existing Conditions		
Drawn By RW	*Scale* 1:500	*Company*	GEI
Date	2/15/2022	*Project No.*	2100975

GEI Consultants

SLIDEINTERPRET 9.020

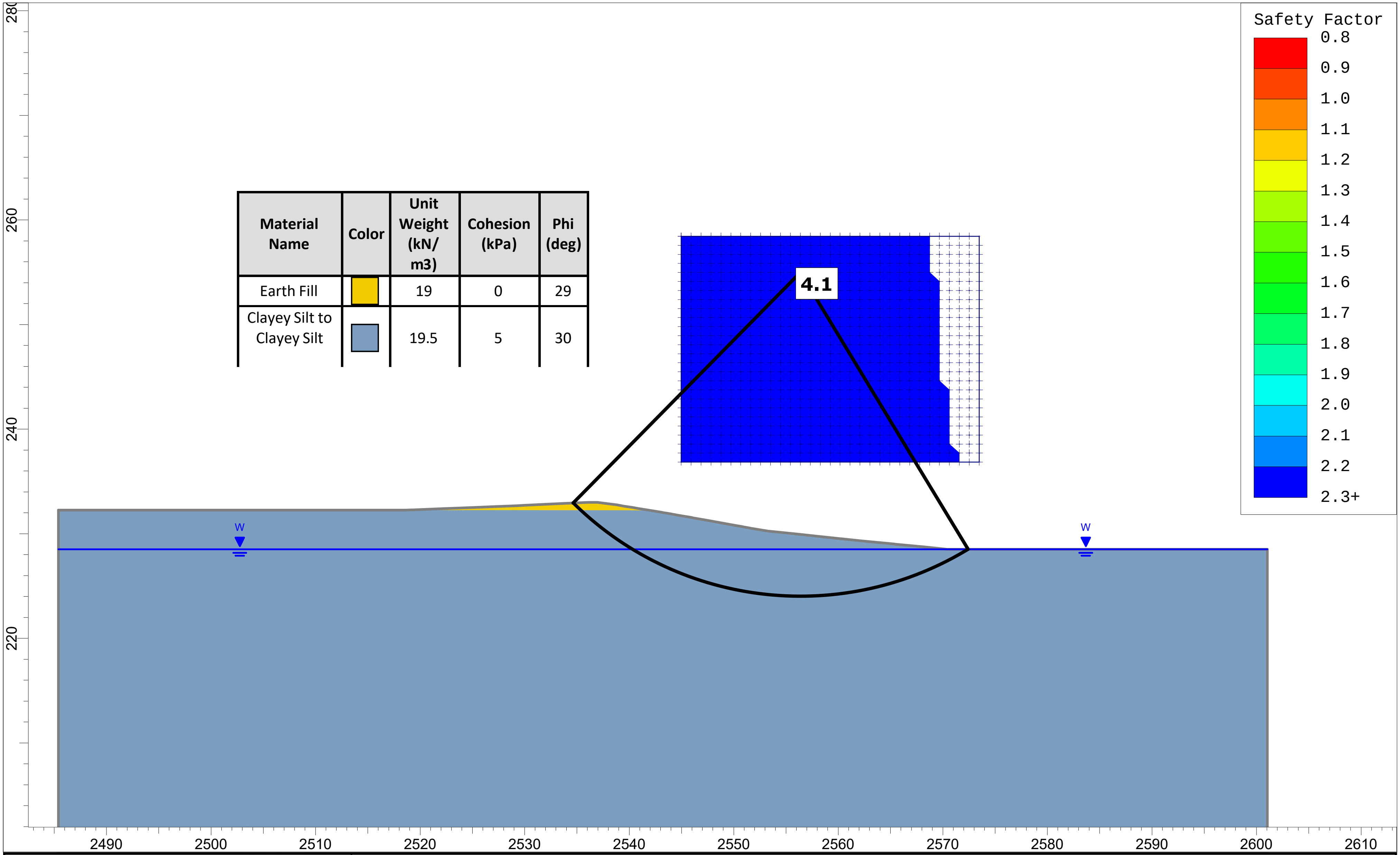


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt	🟦	19.5	5	30

Project	Tullamore Employment Lands		
Analysis Description	Section 14 - Existing Conditions		
Drawn By RW	*Scale* 1:500	*Company*	GEI
Date	2/15/2022	*Project No.*	2100975

GEI Consultants

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt	🟦	19.5	5	30

GEI Consultants

Project Tullamore Employment Lands

Analysis Description Section 15 - Existing Conditions

Drawn By RW

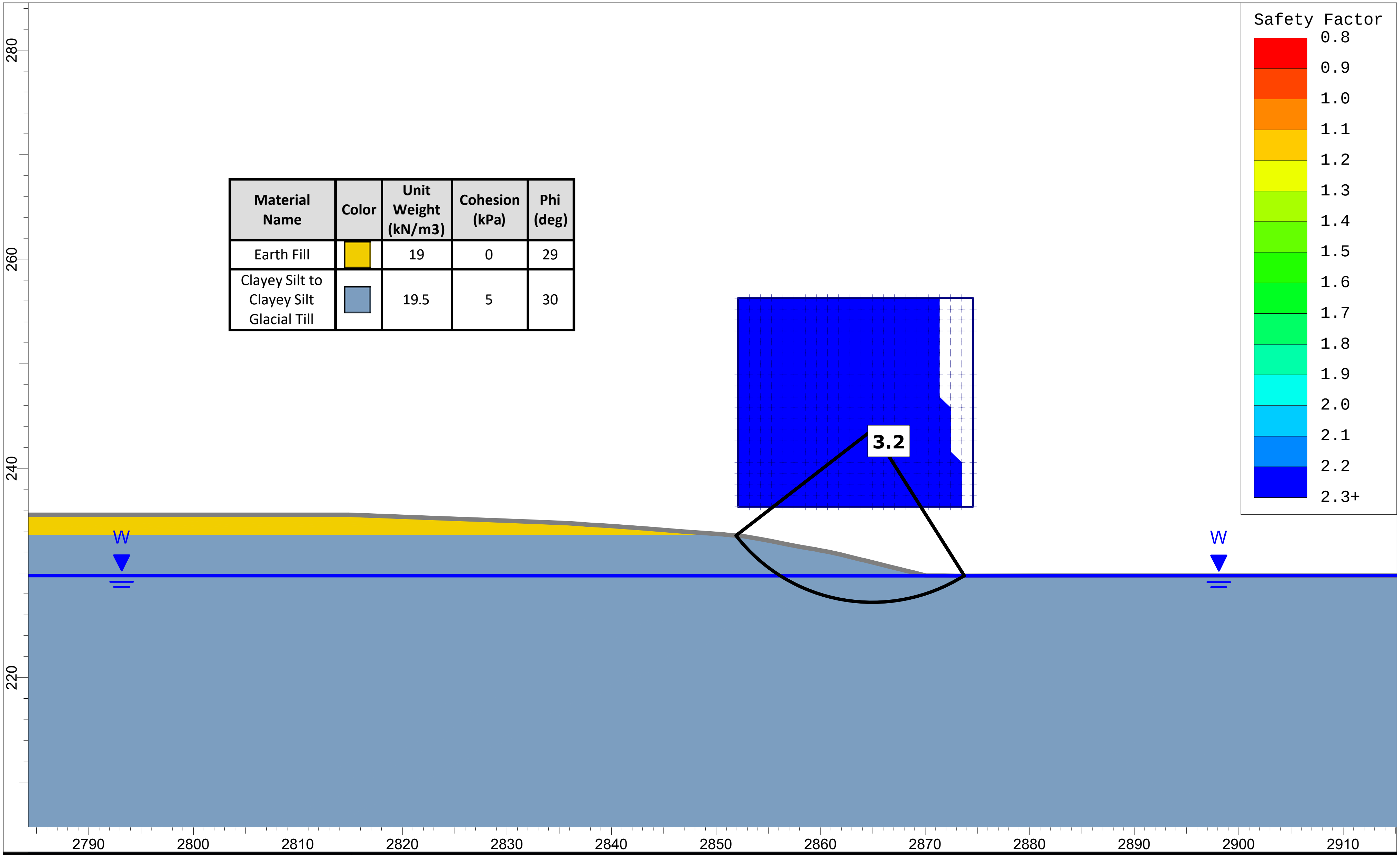
Scale 1:500

Company GEI

Date 2/15/2022

Project No. 2100975

SLIDEINTERPRET 9.020

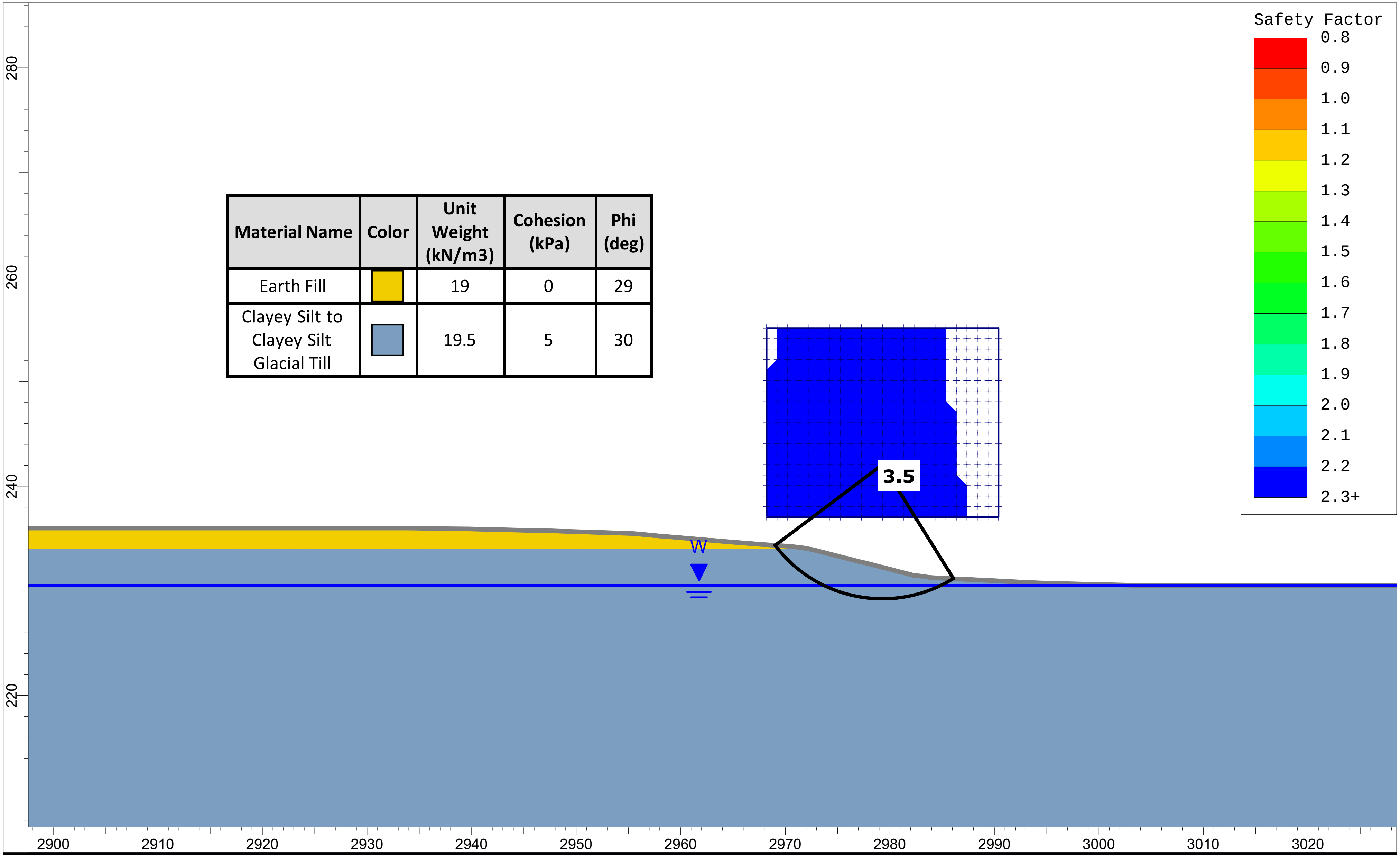


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

Project	Tullamore Employment Lands		
Analysis Description	Section 18 - Existing Conditions		
Drawn By	RW	*Scale*	1:500
Company	GEI		
Date	2/15/2022	*Project No.*	2100975

SLIDEINTERPRET 9.020

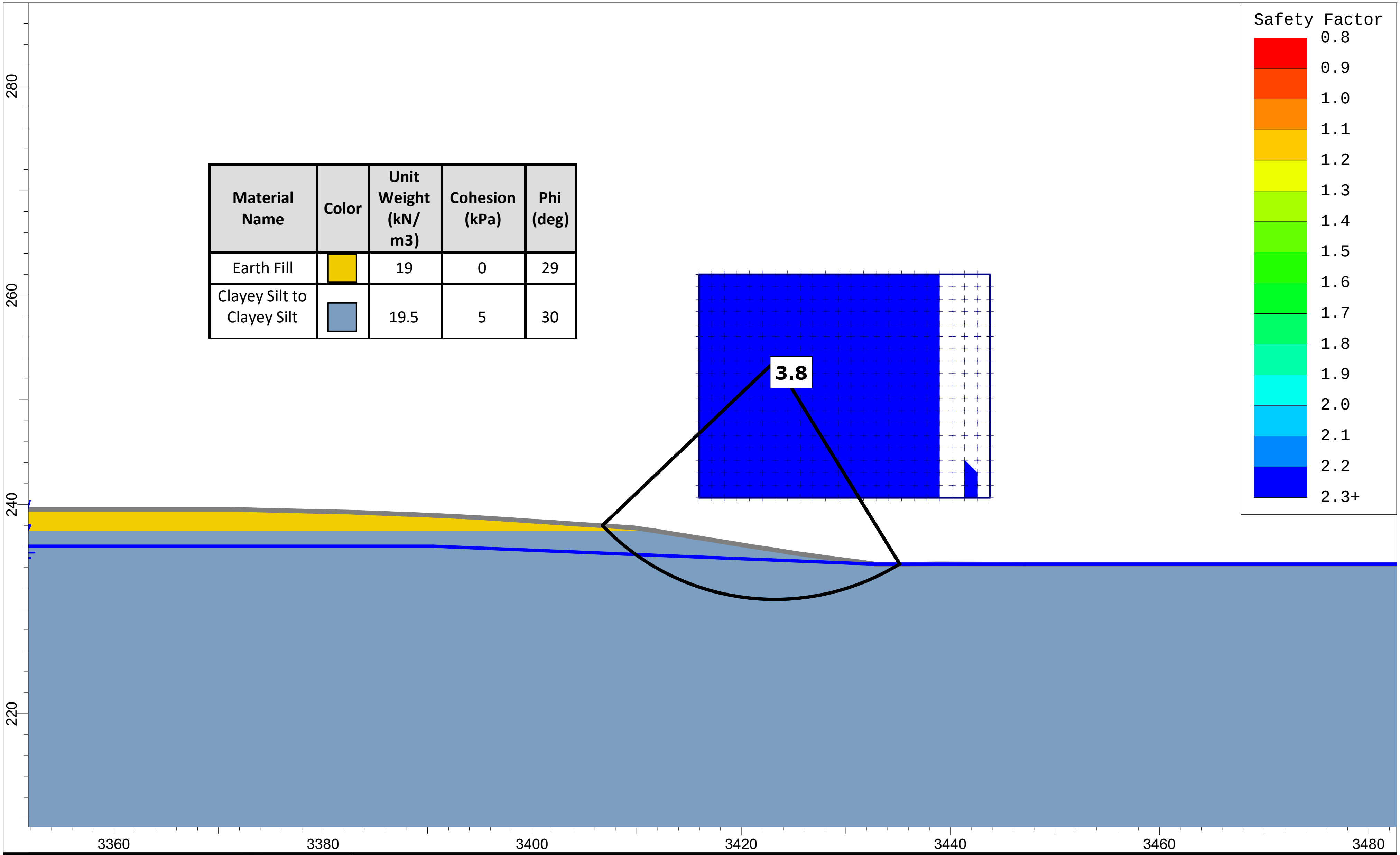


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

Project	Tullamore Employment Lands		
Analysis Description	Section 19 - Existing Conditions		
Drawn By RW	*Scale* 1:500	*Company*	GEI
Date	2/15/2022	*Project No.*	2100975

GEI Consultants

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt	🟦	19.5	5	30

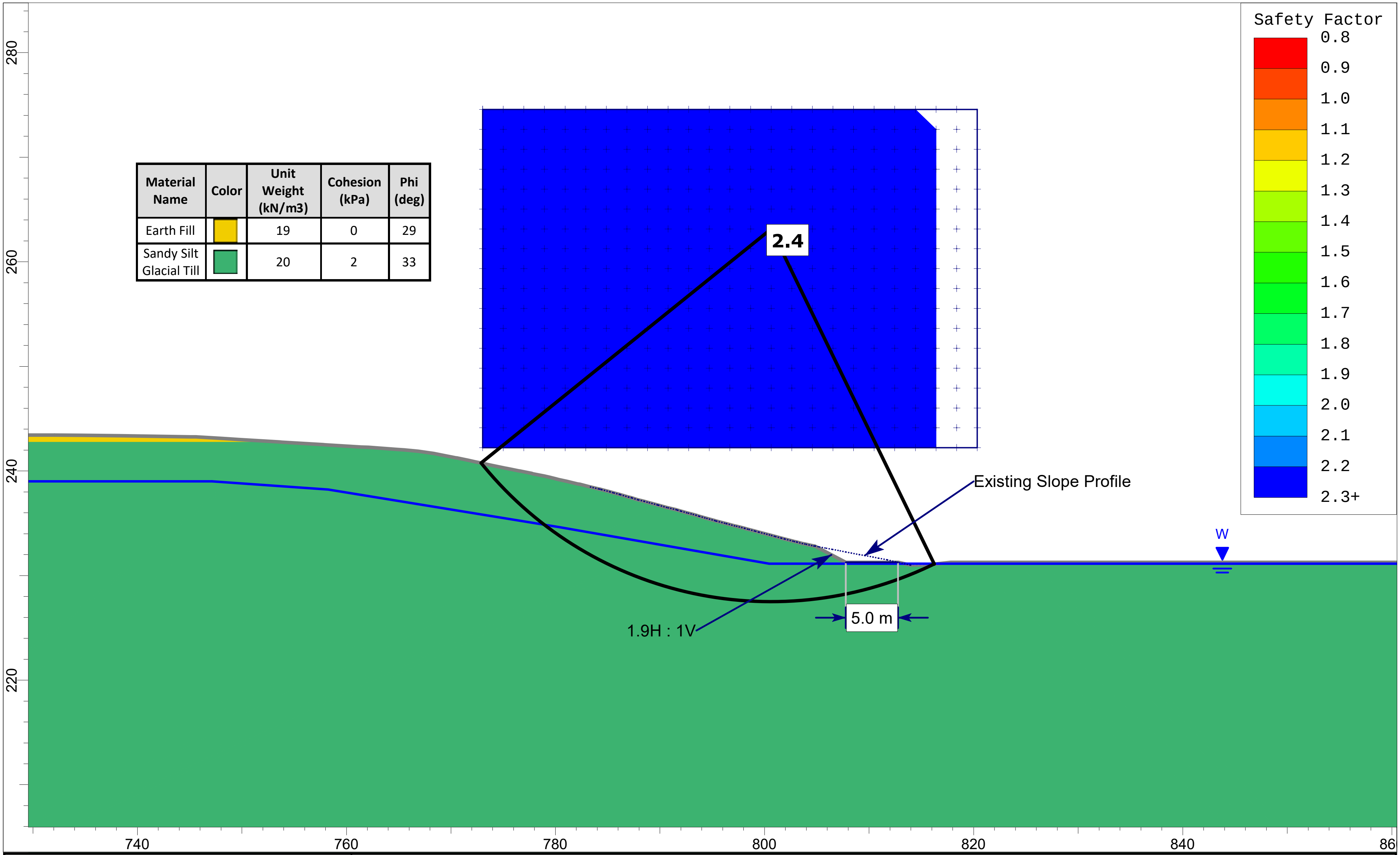
GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands		
Analysis Description	Section 22 - Existing Conditions		
Drawn By	RW	*Scale*	1:500
Company	GEI		
Date	2/15/2022	*Project No.*	2100975

Appendix D

Slope Stability Analysis – LTSTOS Position



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

GEI Consultants

SLIDEINTERPRET 9.020

Project Tullamore Employment Lands

Analysis Description Section 5 - LTSTOS Position

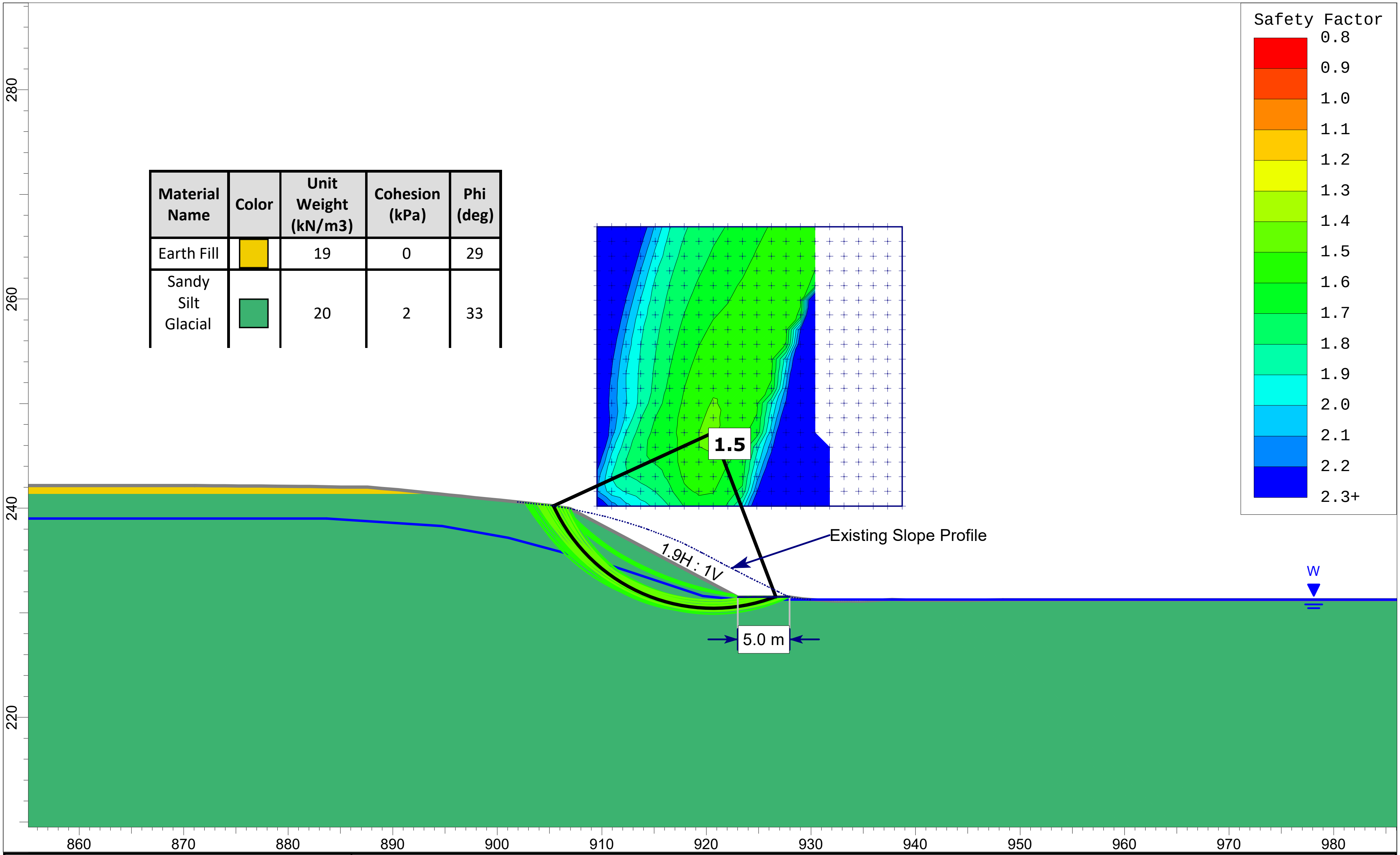
Drawn By RW

Scale 1:500

Company GEI

Date 2/15/2022

Project No. 2100975



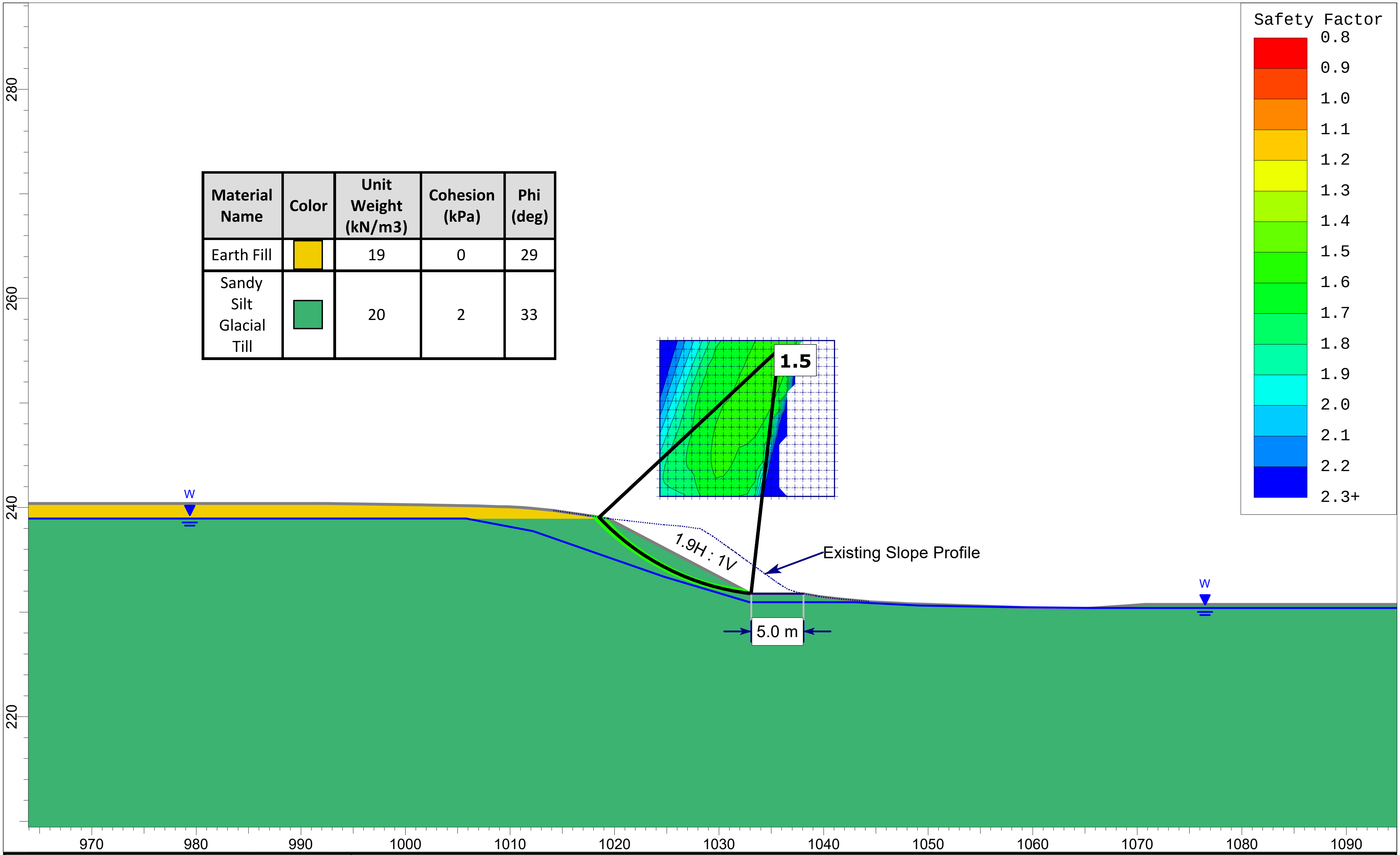
Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial	🟩	20	2	33

GEI Consultants

Project	Tullamore Employment Lands
Analysis Description	Section 6 - LTSTOS Position

Drawn By	RW	*Scale*	1:500	*Company*	GEI
Date	2/15/2022			*Project No.*	2100975

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Sandy Silt Glacial Till	🟩	20	2	33

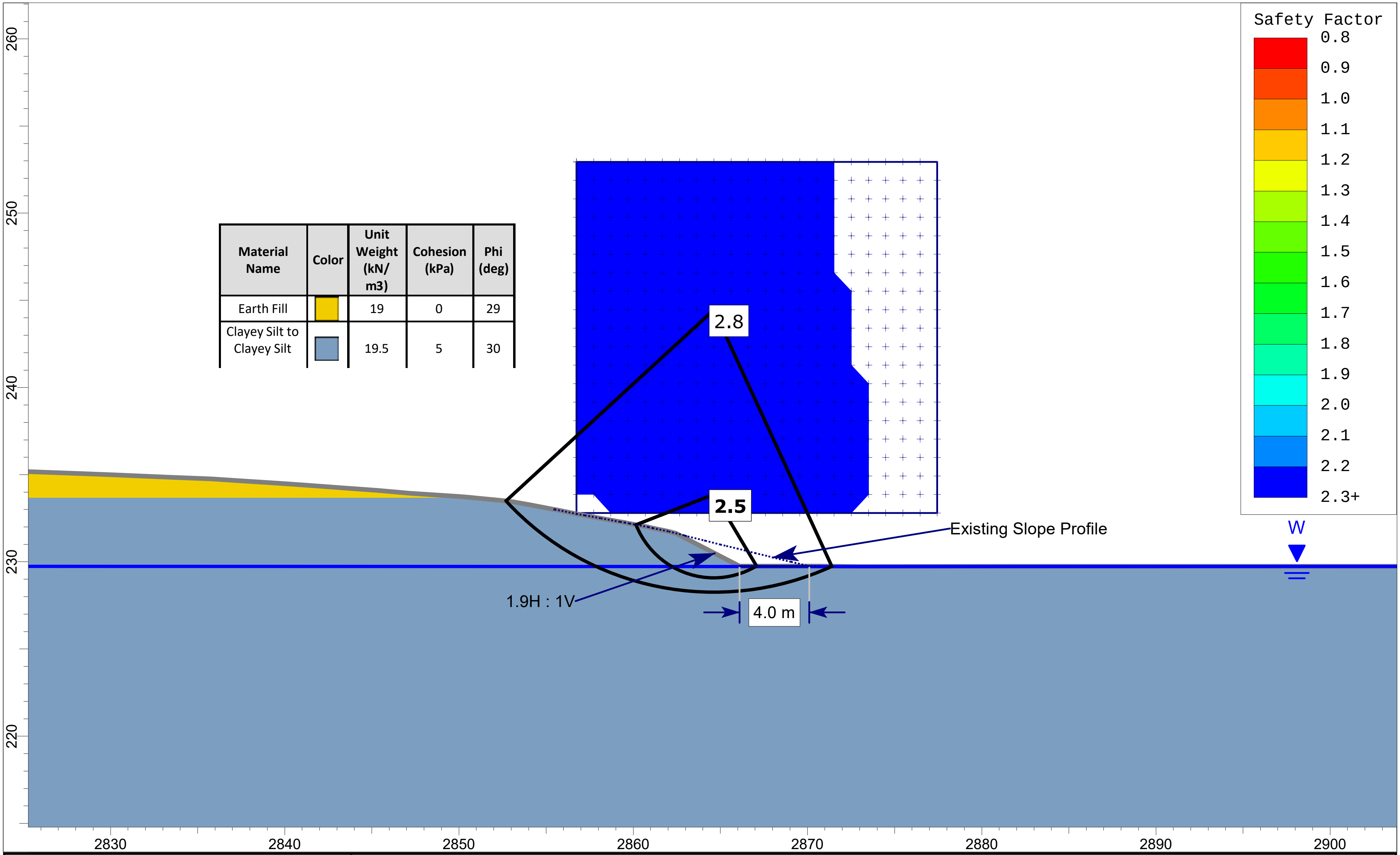
GEI Consultants

Project
Tullamore Employment Lands

Analysis Description
Section 7 - LTSTOS Position

Drawn By RW
Scale 1:500
Company GEI
Date 2/15/2022
Project No. 2100975

SLIDEINTERPRET 9.020



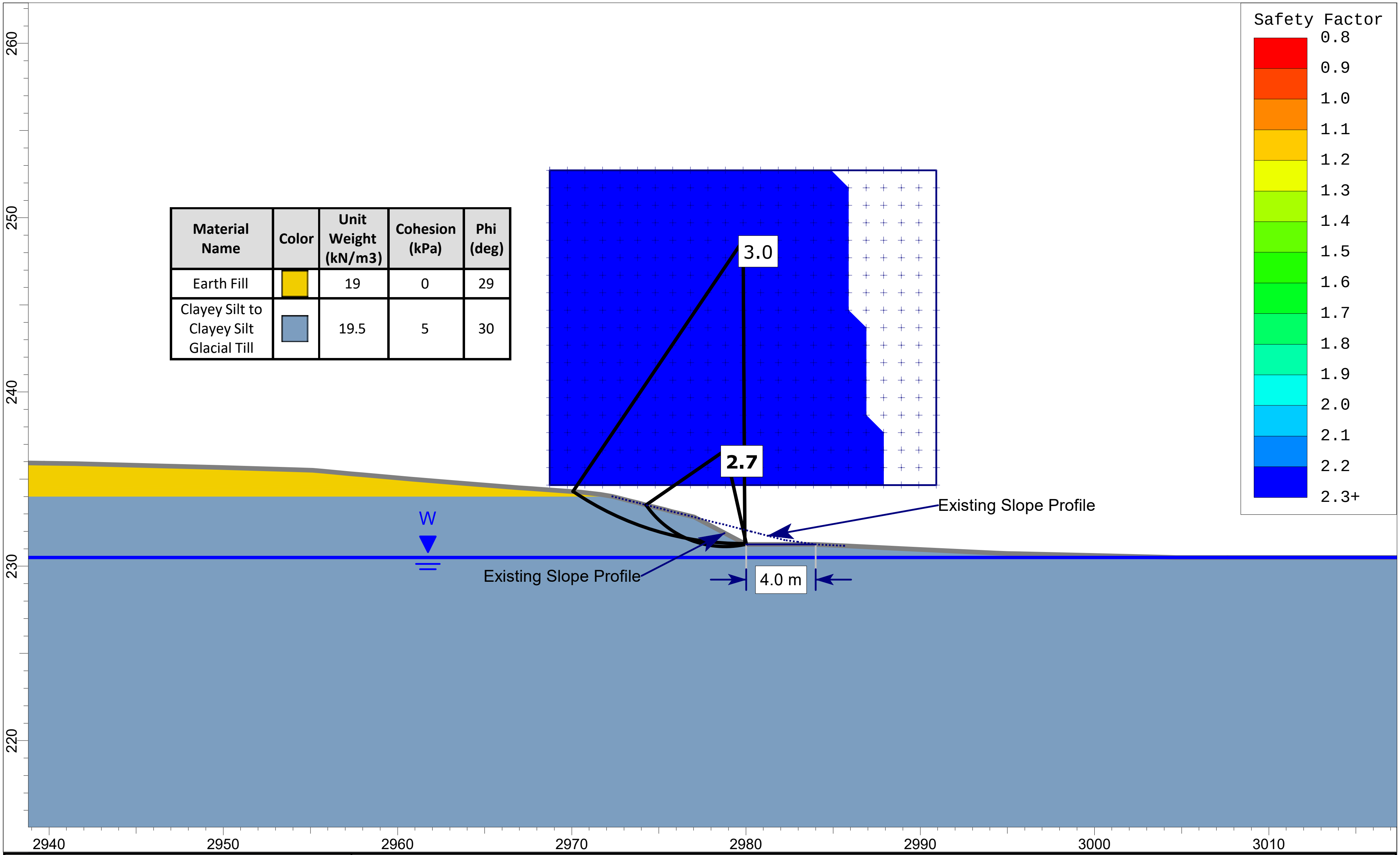
Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt	🟦	19.5	5	30

GEI Consultants

Project	Tullamore Employment Lands
Analysis Description	Section 18 - LTSTOS Position

Drawn By RW
Scale 1:300
Company GEI
Date 2/15/2022
Project No. 2100975

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

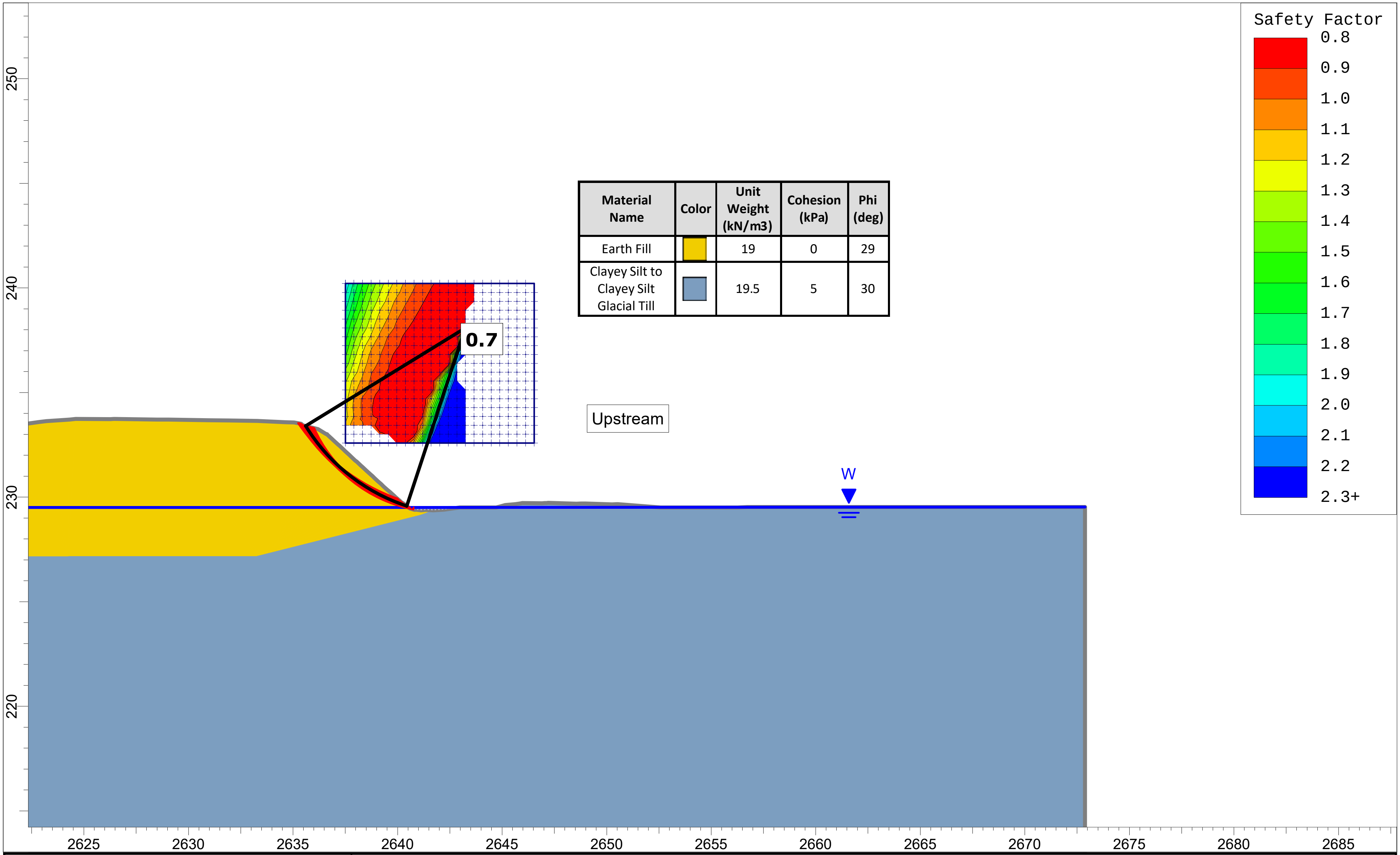
SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 19 - LTSTOS Position

Drawn By	RW	*Scale*	1:300	*Company*	GEI
Date	2/15/2022			*Project No.*	2100975

Appendix E

Slope Stability Analysis – Embankment Dams

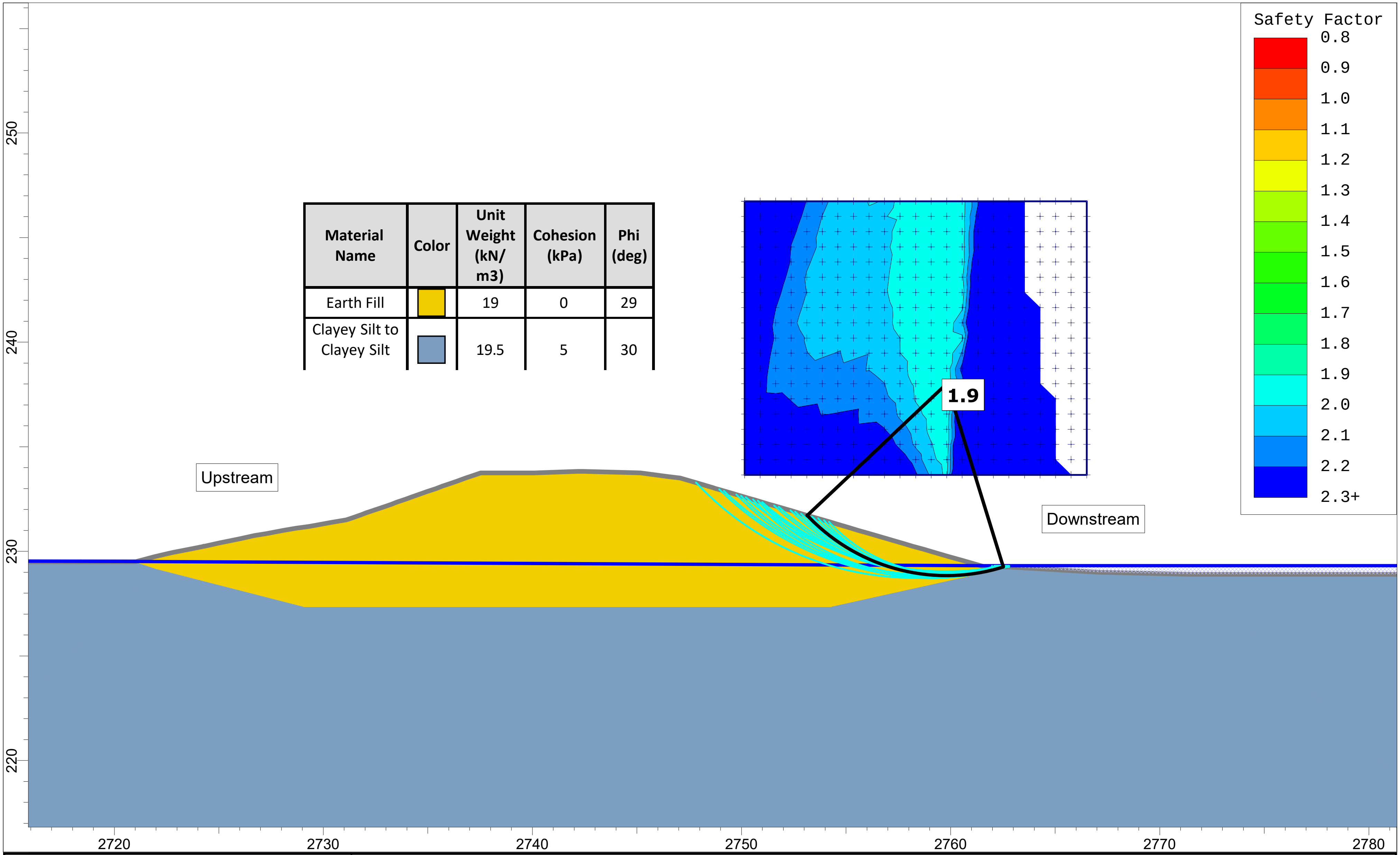


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

Project	Tullamore Employment Lands
Analysis Description	Section 16 - Lower Pond, Embankment Dam at Culvert Inlet - Long-Term
Drawn By	RW
Scale	1:250
Company	GEI
Date	2/17/2022
Project No.	2100975

SLIDEINTERPRET 9.020



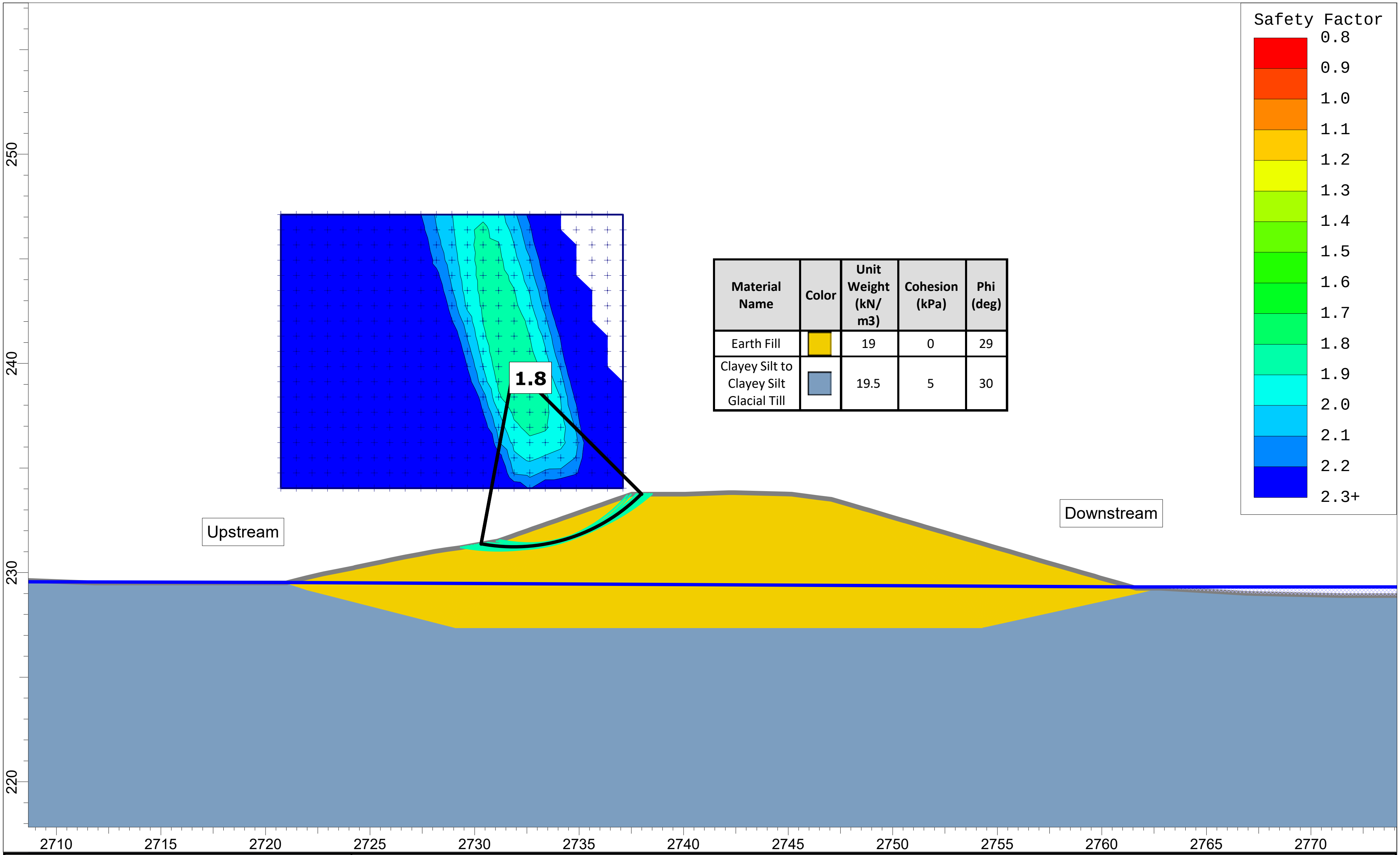
Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt	🟦	19.5	5	30

GEI Consultants

Project	Tullamore Employment Lands
Analysis Description	Section 17 - Lower Pond Embankment Dam, Downstream - Long-Term

Drawn By RW
Scale 1:250
Company GEI
Date 2/17/2022
Project No. 2100975

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

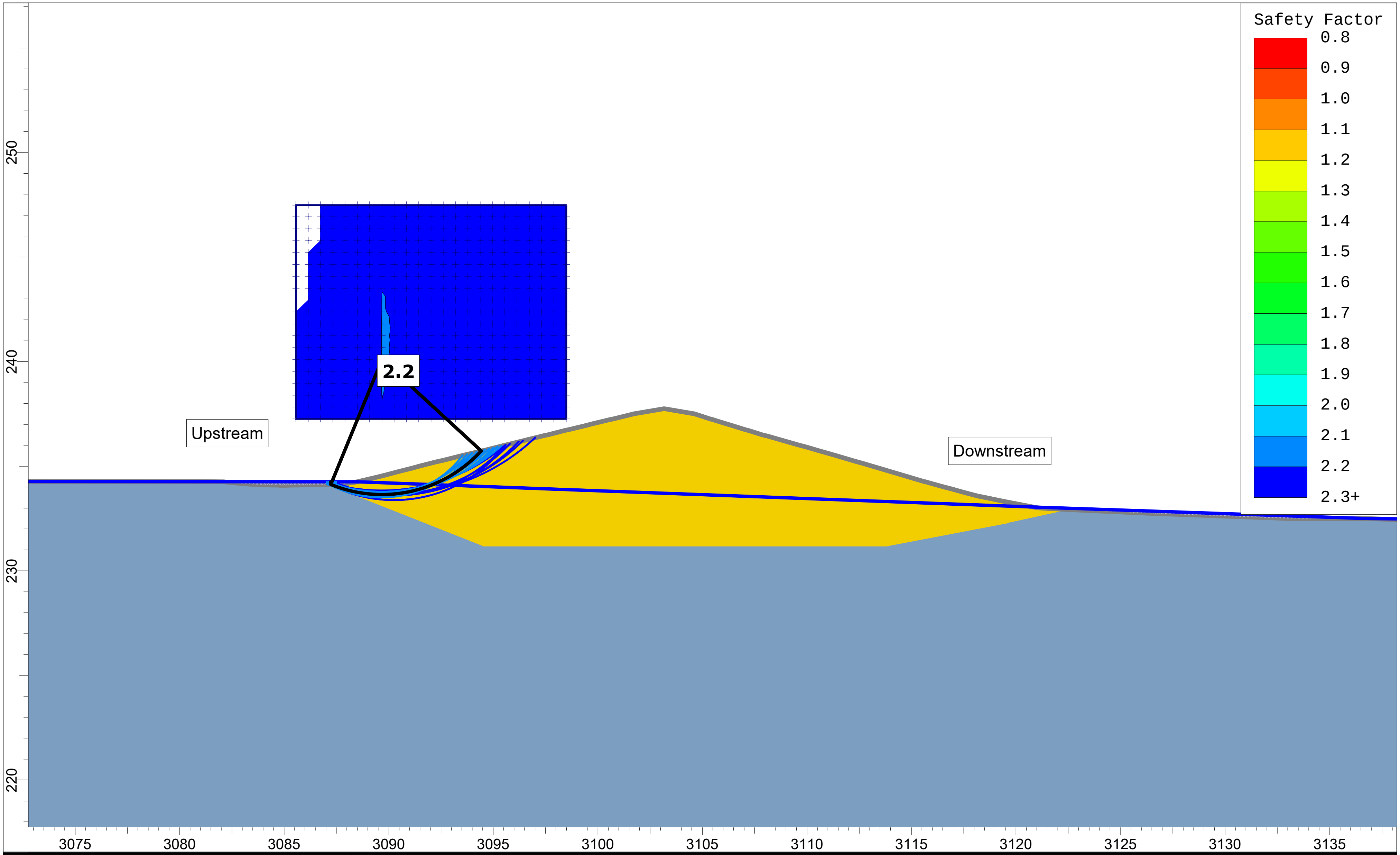
GEI Consultants

Project
Tullamore Employment Lands

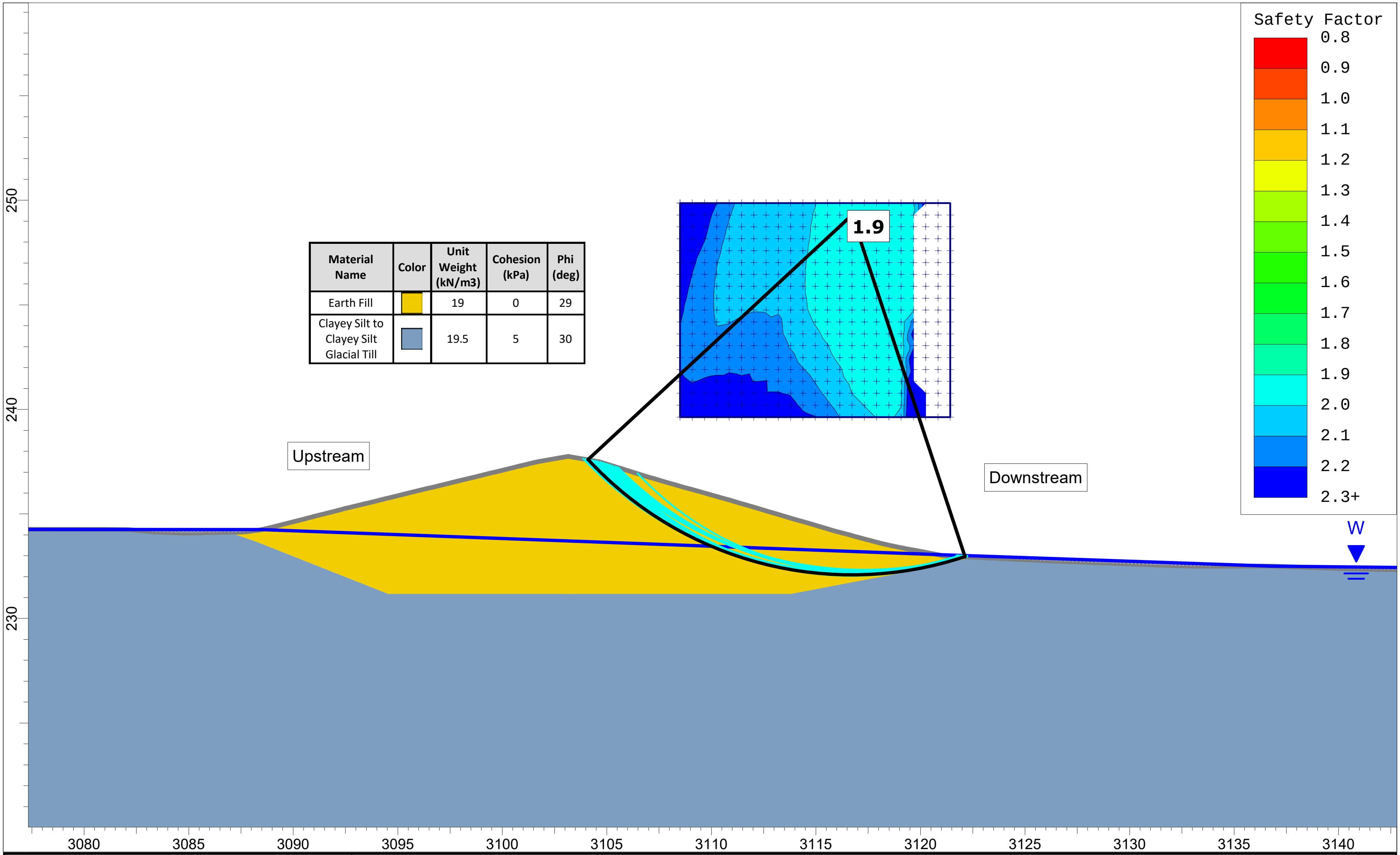
Analysis Description
Section 17 - Lower Pond, Embankment Dam, Upstream - Long-Term

Drawn By RW
Scale 1:250
Company GEI
Date 2/17/2022
Project No. 2100975

SLIDEINTERPRET 9.020



GEI Consultants	*Project*	Tullamore Employment Lands		
	Analysis Description	Section 20 - Upper Pond, Embankment Dam, Upstream - Long-Term		
	Drawn By RW	*Scale* 1:250	*Company*	GEI
SLIDEINTERPRET 9.020	*Date*	2/17/2022	*Project No.*	2100975

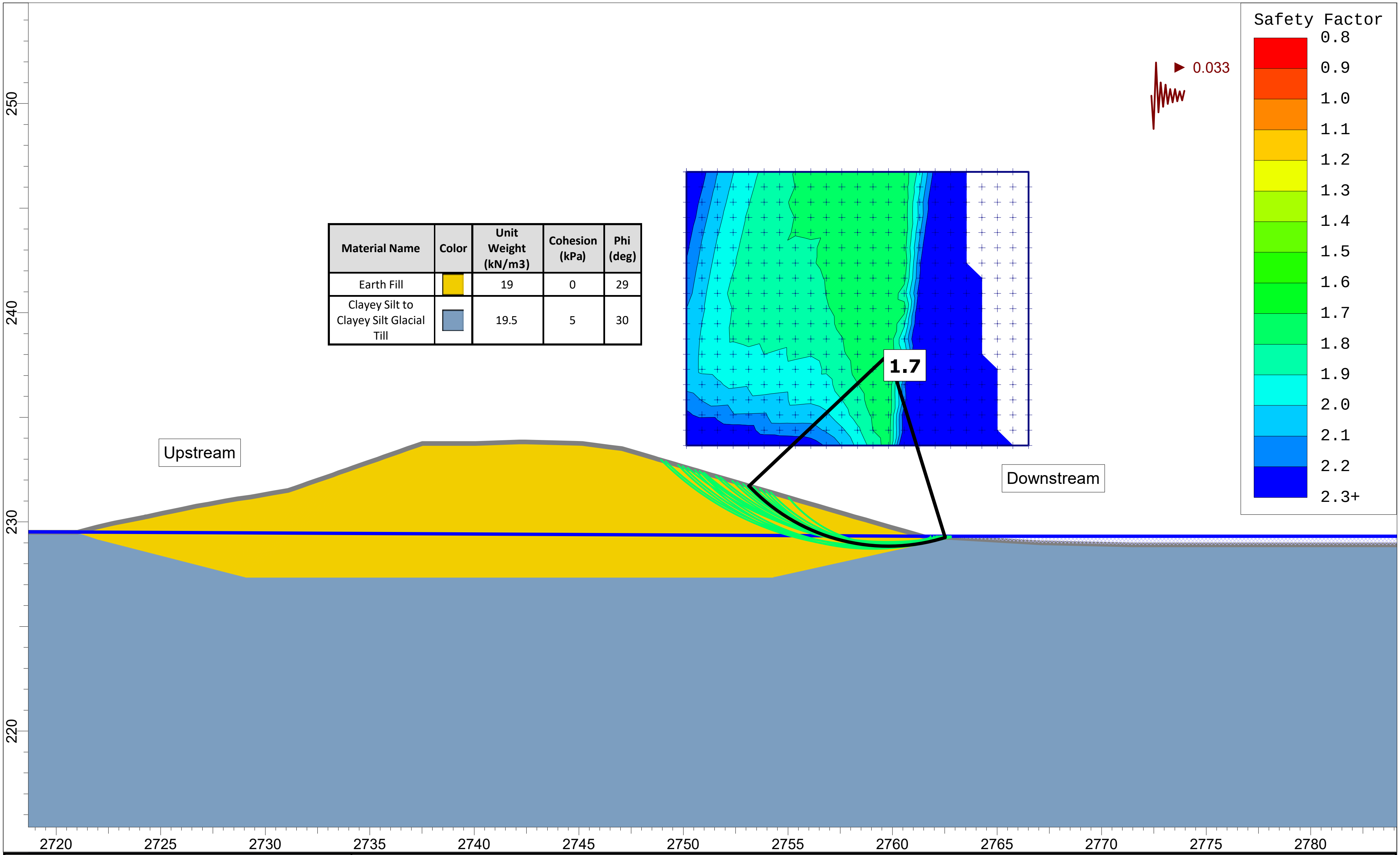


Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

SLIDEINTERPRET 9.020

Project	Tullamore Employment Lands
Analysis Description	Section 20 - Upper Pond, Embankment Dam, Downstream - Long-Term
Drawn By	RW
Scale	1:250
Company	GEI
Date	2/17/2022
Project No.	2100975



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

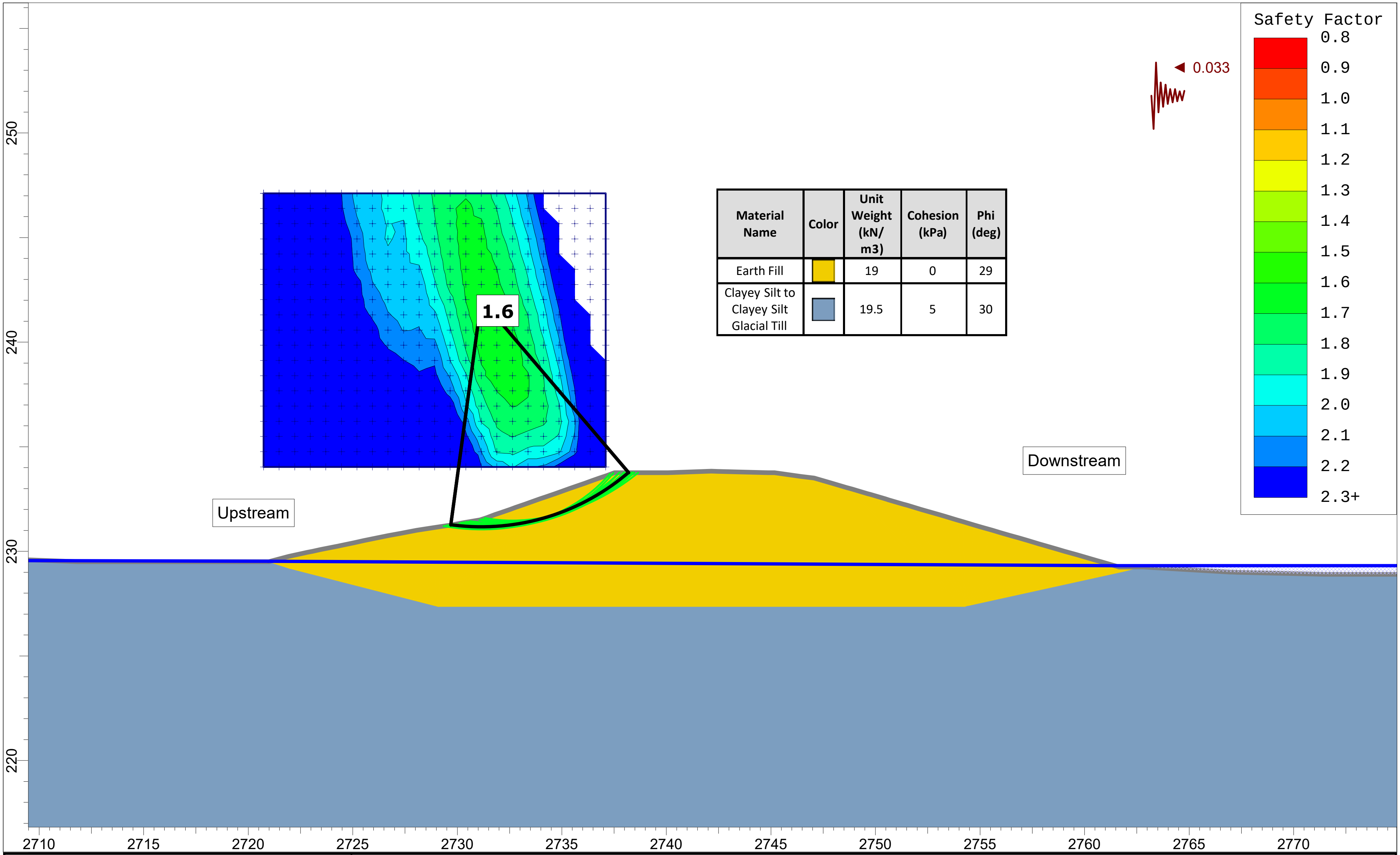
SLIDEINTERPRET 9.020

Project Tullamore Employment Lands

Analysis Description Section 17 - Lower Pond Embankment Dam, Downstream - Seismic Loading

Drawn By RW
Scale 1:250
Company GEI

Date 2/17/2022
Project No. 2100975

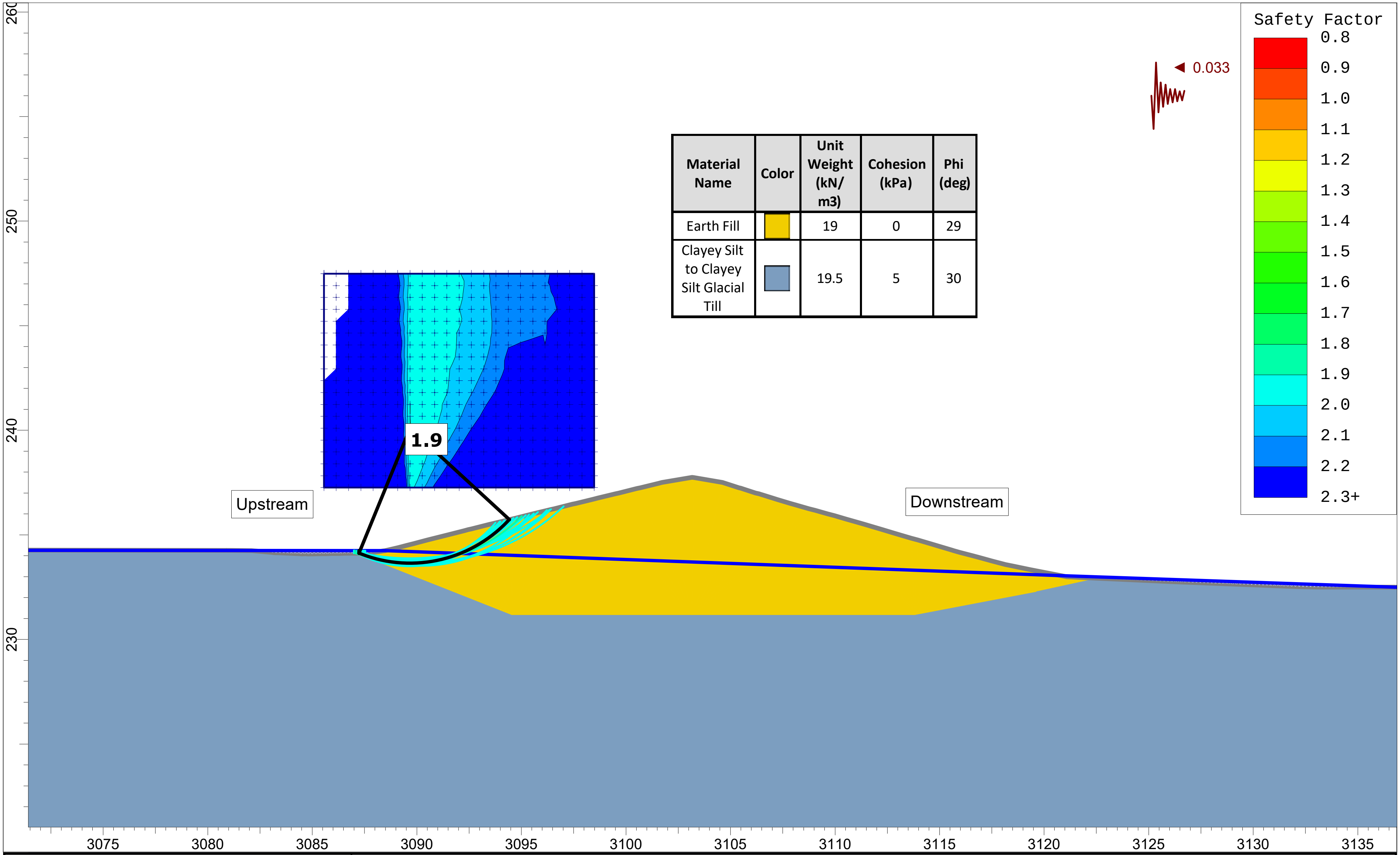


Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

Project	Tullamore Employment Lands
Analysis Description	Section 17 - Lower Pond, Embankment Dam, Upstream - Seismic Loading

Drawn By	RW	*Scale*	1:250	*Company*	GEI
Date	2/17/2022			*Project No.*	2100975

SLIDEINTERPRET 9.020

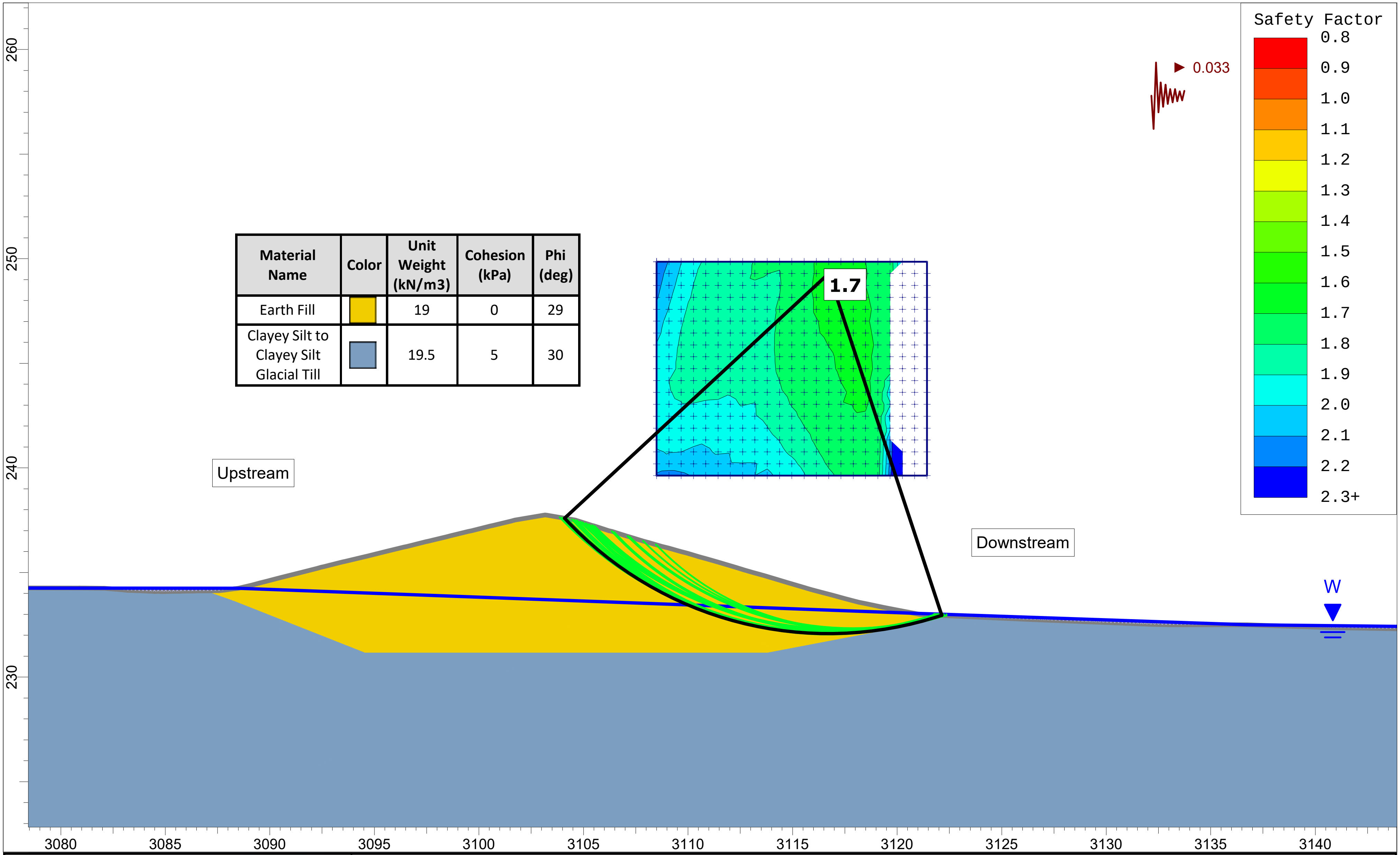


Material Name	Color	Unit Weight (kN/ m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

Project	Tullamore Employment Lands		
Analysis Description	Section 20 - Upper Pond, Embankment Dam, Upstream - Seismic Loading		
Drawn By RW	*Scale* 1:250	*Company*	GEI
Date	2/17/2022	*Project No.*	2100975

GEI Consultants

SLIDEINTERPRET 9.020



Material Name	Color	Unit Weight (kN/m3)	Cohesion (kPa)	Phi (deg)
Earth Fill	🟨	19	0	29
Clayey Silt to Clayey Silt Glacial Till	🟦	19.5	5	30

GEI Consultants

Project
Tullamore Employment Lands

Analysis Description
Section 20 - Upper Pond, Embankment Dam, Downstream - Seismic Loading

Drawn By	RW	*Scale*	1:250	*Company*	GEI
Date	2/17/2022			*Project No.*	2100975

SLIDEINTERPRET 9.020

Appendix F

MNR Slope Inspection and Slope Rating Forms

SLOPE INSPECTION FORM

File No: 2100975

File Name: Tullamore Employment Lands

Inspection Date: Jan 11/22

Inspected By (name): Bo Hwang

Weather (circle): ☒ sunny ☐ partly cloudy ☐ overcast ☐ calm ☐ breezy ☐ windy

☒ clear ☐ fog ☐ rain ☐ snow ☒ cold ☐ cool ☐ warm ☐ hot

Est. Air Temp. (°C): -25C

Site Location / Directions (describe main roads, features)**:**

Inspection Location - West Tributary, Northern Slope of Valley Wall (From Mayfield Road to Existing Barns)

Site Location Sketch:

Property Ownership (name, address, phone)**:**

Legal Description:

Lot 18

Concession 16 E.H.S (CHING)

Township Caledon

County Peel

Watershed: West Humber River

Governing Regional Body: Town of Caledon

Governing Conservation Authority: TRCA

Current Land Use (circle and describe)**:**

☐ Vacant – Field, bush, woods, forest, wilderness, tundra

☐ Passive – Recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools

☒ Active – Habitable structures, residential, commercial, industrial, warehousing, storage

☐ Infrastructure/Public Use – Stadiums, hospitals, schools, bridges, high voltage power lines, waste management sites

SLOPE DATA

Height
☒ 3 - 6 m ☐ 6 - 10 m ☐ 10 - 15 m ☐ 15 - 20 m
☐ 20 - 25 m ☐ 25 - 30 m ☐ >30 m
Estimated height (m): 8 to 10 m

Inclination / Shape
☐ 4:1 or flatter (25% / 14°) ☒ Up to 3:1 (33% / 18.5°) ☐ Up to 2:1 (50% / 26.5°)
☐ Up to 1:1 (100% / 45°) ☐ Up to 0.5:1 (200% / 63.5°) ☐ Steeper than 0.5:1 (>63.5°)

SLOPE DRAINAGE (describe):

TOP

- Tableland slopes gently towards the slope

FACE

-Gullies/Ditch near house and barn area (concentrated runoff from the barn areas)

BOTTOM

- Sheet drainage

SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types):

TOP

- Topsoil and some Earth Fill over Glacial Till

FACE

- Topsoil over Glacial Till

BOTTOM

- Topsoil over Glacial Till

WATER COURSE FEATURES (circle and describe)**:**

SWALES, GULLIES, DITCHES, CHANNELS

STREAMS, CREEKS, RIVERS

- Tributary of the West Humber River flows past the site, located more than 15 m from the slope toe (wide floodplain in the area).

PONDS, BAYS, LAKES

SPRINGS, SEEPS, MARHSY GROUND

VEGETATION COVER (grasses, weeds, shrubs, saplings, trees):

TOP

- Grasses
- Small shrubs and some mature trees

FACE

- Grasses and some small trees

BOTTOM

- Grass (Floodplain), some trees along the watercourse.

STRUCTURES (buildings, walls, fences, sewers, roads, stairs, decks, towers):

TOP

- Farm house and barns located Northeast of slope

FACE

- Noted some debris on the slope face (concrete, dead tree branch), no other structures observed.

BOTTOM

None observed

EROSION FEATURES (scour, undercutting, bare areas, piping, rills, gully):

TOP

- Some localized gullies located near house and barn area

FACE

- Some localized gullies located near house and barn area

BOTTOM

None observed

SLOPE SLIDE FEATURES (tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)**:**

TOP

None observed

FACE

- Some trees slightly tilting (likely long-term slope creep). No signs of instability.

BOTTOM

None observed

GEI Consultants

Inspection Location - West Tributary, Northern Slope of Valley Wall (From Mayfield Road to Existing Barns)

SLOPE RATING FORM

Site Location: Tullamore Employment Lands
Property Owner: ______
Inspected By: Bo Hwang
File No: 2100975
Inspection Date: January 11, 2022
Weather: -22C Clear

				Rating Value	
1.	**SLOPE INSPECTION**				
		Degrees	***Horiz. : Vert.***		
	a)	18 or less	3 : 1 or flatter	0	☒
	b)	18 to 26	2 : 1 to 3 : 1	6	☐
	c)	more than 26	steeper than 2 : 1	16	☐
2.	**SOIL STRATIGRAPHY**				
	a)	Shale, Limestone, Granite (Bedrock)		0	☐
	b)	Sand, Gravel		6	☐
	c)	Glacial Till		9	☒
	d)	Clay, Silt		12	☐
	e)	Fill		16	☐
	f)	Leda Clay		24	☐
3.	**SEEPAGE FROM SLOPE FACE**				
	a)	None or Near bottom only		0	☒
	b)	Near mid-slope only		6	☐
	c)	Near crest only or from several levels		12	☐
4.	**SLOPE HEIGHT**				
	a)	2 metres or less		0	☐
	b)	2.1 to 5 metres		2	☐
	c)	5.1 to 10 metres		4	☒
	d)	Greater than 10 metres		8	☐
5.	**VEGETATION COVER ON SLOPE FACE**				
	a)	Well vegetated; heavy shrubs or forested with mature trees		0	☐
	b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs		4	☒
	c)	No vegetation; bare		8	☐
6.	**TABLELAND DRAINAGE**				
	a)	Tableland flat, no apparent drainage over slope		0	☐
	b)	Minor drainage over slope, no active erosion		2	☐
	c)	Drainage over slope, active erosion, gullies		4	☒
7.	**PROXIMITY OF WATERCOURSE TO SLOPE TOE**				
	a)	15 metres or more from slope toe		0	☒
	b)	Less than 15 metres from slope toe		6	☐
8.	**PREVIOUS LANDSLIDE ACTIVITY**				
	a)	No		0	☒
	b)	Yes		6	☐

	SLOPE INSTABILITY RATING	RATING VALUE TOTAL	INVESTIGATION REQUIREMENTS
1.	Low potential	<24	Site inspection only, confirmation, report letter.
2.	Slight potential	25-35	Site inspection and surveying, preliminary study, detailed report.
3.	Moderate potential	>35	Boreholes, piezometers, lab tests, surveying, detailed report.

TOTAL 21

NOTES:
a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe; the potential for toe erosion and undercutting should be evaluated in detail and, protection provided if required.

SLOPE INSPECTION FORM

File No: 2100975

File Name: Tullamore Employment Lands

Inspection Date: Jan 11/22

Inspected By (name): Bo Hwang

Weather (circle): ☒ sunny ☐ partly cloudy ☐ overcast ☐ calm ☐ breezy ☐ windy

☒ clear ☐ fog ☐ rain ☐ snow ☒ cold ☐ cool ☐ warm ☐ hot

Est. Air Temp. (°C): -25C

Site Location / Directions (describe main roads, features)**:**

Inspection Location - West Tributary, Northern Slope of Valley Wall (From Barns to Torbram Road)

Site Location Sketch:

Property Ownership (name, address, phone)**:**

Legal Description:

Lot 18

Concession 16

Township Caledon

County Peel

Watershed: West Humber River

Governing Regional Body: Town of Caledon

Governing Conservation Authority: TRCA

Current Land Use (circle and describe)**:**

☐ Vacant – Field, bush, woods, forest, wilderness, tundra

☐ Passive – Recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools

☒ Active – Habitable structures, residential, commercial, industrial, warehousing, storage

☐ Infrastructure/Public Use – Stadiums, hospitals, schools, bridges, high voltage power lines, waste management sites

SLOPE DATA

Height ☐ 3 - 6 m ☒ 6 - 10 m ☐ 10 - 15 m ☐ 15 - 20 m ☐ 20 - 25 m ☐ 25 - 30 m ☐ >30 m

Estimated height (m): 6 to 11.5 m

Inclination / Shape ☐ 4:1 or flatter (25% / 14°) ☐ Up to 3:1 (33% / 18.5°) ☐ Up to 2:1 (50% / 26.5°) ☒ Up to 1:1 (100% / 45°) ☐ Up to 0.5:1 (200% / 63.5°) ☐ Steeper than 0.5:1 (>63.5°)

Usually flatter than 2:1, but as steep as 1.4:1 in some localized areas.

SLOPE DRAINAGE (describe):

TOP

- Tableland (Farmland) slopes gently towards the slope.

FACE

- Mostly sheet drainage. There are two locations west of the barns that extend from the top to bottom of the slope and appear to be historic drainage features (shallow gullies) from tableland runoff.

BOTTOM

- Creek/Floodplain

SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types):

TOP

- Topsoil and some Earth Fill (Farmland) over Glacial Till.

FACE

- Topsoil over Silty Sand Glacial Till

BOTTOM

- Floodplain (Topsoil, Glacial Till and some Sand)

WATER COURSE FEATURES (circle and describe)**:**

SWALES, GULLIES, DITCHES, CHANNELS

STREAMS, CREEKS, RIVERS

PONDS, BAYS, LAKES

- Tributary of West Humber River flows past the slope, generally adjacent to the slope toe (active erosion observed).

SPRINGS, SEEPS, MARHSY GROUND

- Some localized marshy ground in floodplain

VEGETATION COVER (grasses, weeds, shrubs, saplings, trees):

TOP

- Grasses and weeds (Farm Land)

FACE

- Very well vegetated with large trees (vertical to slightly leaning trees)
- Some undergrowth

BOTTOM

- Well vegetated with trees and shrubs/ some undergrowth

STRUCTURES (buildings, walls, fences, sewers, roads, stairs, decks, towers):

TOP

Generally vacant farmland but some barns and dwellings at the east and west side of the slope.

FACE

None observed

BOTTOM

None observed

EROSION FEATURES (scour, undercutting, bare areas, piping, rills, gully):

TOP

There are two locations west of the barns that extend from the top to bottom of the slope and appear to be historic drainage features (shallow and wide gullies) from tableland runoff. No other signs of concentrated runoff observed along most of the slope.

FACE

- Some exposed roots near bottom of slope

BOTTOM

- Exposed roots and undercutting along the creek bank (active erosion).

SLOPE SLIDE FEATURES (tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)**:**

TOP

None observed

FACE

None observed

BOTTOM

- Some bent trees along the creek bank (likely from erosion).

GEI Consultants

Inspection Location - West Tributary,
Northern Slope of Valley Wall (From
Barns to Torbram Road)

SLOPE RATING FORM

Site Location: Tullamore Employment Lands
Property Owner: ____________
Inspected By: Bo Hwang
File No: 2100975
Inspection Date: January 11, 2022
Weather: -22C Clear

				Rating Value	
1.	**SLOPE INSPECTION**				
		Degrees	***Horiz. : Vert.***		
	a)	18 or less	3 : 1 or flatter	0	☐
	b)	18 to 26	2 : 1 to 3 : 1	6	☐
	c)	more than 26	steeper than 2 : 1	16	☒
2.	**SOIL STRATIGRAPHY**				
	a)	Shale, Limestone, Granite (Bedrock)		0	☐
	b)	Sand, Gravel		6	☐
	c)	Glacial Till		9	☒
	d)	Clay, Silt		12	☐
	e)	Fill		16	☐
	f)	Leda Clay		24	☐
3.	**SEEPAGE FROM SLOPE FACE**				
	a)	None or Near bottom only		0	☒
	b)	Near mid-slope only		6	☐
	c)	Near crest only or from several levels		12	☐
4.	**SLOPE HEIGHT**				
	a)	2 metres or less		0	☐
	b)	2.1 to 5 metres		2	☐
	c)	5.1 to 10 metres		4	☐
	d)	Greater than 10 metres		8	☒
5.	**VEGETATION COVER ON SLOPE FACE**				
	a)	Well vegetated; heavy shrubs or forested with mature trees		0	☒
	b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs		4	☐
	c)	No vegetation; bare		8	☐
6.	**TABLELAND DRAINAGE**				
	a)	Tableland flat, no apparent drainage over slope		0	☐
	b)	Minor drainage over slope, no active erosion		2	☐
	c)	Drainage over slope, active erosion, gullies		4	☒
7.	**PROXIMITY OF WATERCOURSE TO SLOPE TOE**				
	a)	15 metres or more from slope toe		0	☐
	b)	Less than 15 metres from slope toe		6	☒
8.	**PREVIOUS LANDSLIDE ACTIVITY**				
	a)	No		0	☒
	b)	Yes		6	☐

TOTAL 43

	SLOPE INSTABILITY RATING	RATING VALUE TOTAL	INVESTIGATION REQUIREMENTS
1.	Low potential	<24	Site inspection only, confirmation, report letter.
2.	Slight potential	25-35	Site inspection and surveying, preliminary study, detailed report.
3.	Moderate potential	>35	Boreholes, piezometers, lab tests, surveying, detailed report.

NOTES:
a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe; the potential for toe erosion and undercutting should be evaluated in detail and, protection provided if required.

SLOPE INSPECTION FORM

File No: 2100975
File Name: Tullamore Employment Lands
Inspection Date: Jan 11/22
Inspected By (name): Bo Hwang
Weather (circle): ☒ sunny ☐ partly cloudy ☐ overcast ☐ calm ☐ breezy ☐ windy
☒ clear ☐ fog ☐ rain ☐ snow ☒ cold ☐ cool ☐ warm ☐ hot
Est. Air Temp. (°C): -25C

Site Location / Directions (describe main roads, features)**:**
East Tributary, including the Upper and Lower Ponds

Site Location Sketch:

Property Ownership (name, address, phone)**:**

Legal Description:
Lot 18
Concession 16 E.H.S (CHING)
Township Caledon
County Peel

Watershed: West Humber River
Governing Regional Body: Town of Caledon
Governing Conservation Authority: TRCA
Current Land Use (circle and describe)**:**
☐ Vacant – Field, bush, woods, forest, wilderness, tundra
☒ Passive – Recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools
☐ Active – Habitable structures, residential, commercial, industrial, warehousing, storage
☐ Infrastructure/Public Use – Stadiums, hospitals, schools, bridges, high voltage power lines, waste management sites

SLOPE DATA

Height
☒ 3 - 6 m ☐ 6 - 10 m ☐ 10 - 15 m ☐ 15 - 20 m
☐ 20 - 25 m ☐ 25 - 30 m ☐ >30 m
Estimated height (m): 3 to 5 m

Inclination / Shape
☐ 4:1 or flatter (25% / 14°) ☒ Up to 3:1 (33% / 18.5°) ☐ Up to 2:1 (50% / 26.5°)
☐ Up to 1:1 (100% / 45°) ☐ Up to 0.5:1 (200% / 63.5°) ☐ Steeper than 0.5:1 (>63.5°)

SLOPE DRAINAGE (describe):

TOP

- Tableland slopes gently towards the slope. Drainage features outlet into the tributary.

FACE

- Sheet drainage

BOTTOM

- Wetland/ponds

SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types):

TOP

- Topsoil and some Earth Fill over Glacial Till

FACE

- Topsoil over Glacial Till
- The embankment dams consist entirely of earth fill

BOTTOM

- Marsh/wetland and pond (glacial till)

WATER COURSE FEATURES (circle and describe)**:**

SWALES, GULLIES, DITCHES, CHANNELS

STREAMS, CREEKS, RIVERS

PONDS, BAYS, LAKES

- Upper and lower ponds, on-line with the tributary.

SPRINGS, SEEPS, MARHSY GROUND

Marshy ground within the tributary and surrounding both ponds.

VEGETATION COVER (grasses, weeds, shrubs, saplings, trees):

TOP

- Grasses and weeds

FACE

- Well vegetated with trees and shrubs
- Some undergrowth

BOTTOM

- Dense grasses and weed
- Pond

STRUCTURES (buildings, walls, fences, sewers, roads, stairs, decks, towers):

TOP

None on the tableland within the property limits (industrial lands on the opposite tableland).

FACE

None observed

BOTTOM

- Steel culvert (control overflowing) at dam areas, otherwise no structures.

EROSION FEATURES (scour, undercutting, bare areas, piping, rills, gully):

TOP

None observed

FACE

None observed

BOTTOM

- Bare areas and undercutting noted at inlet culvert areas (washout)

SLOPE SLIDE FEATURES (tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)**:**

TOP

None observed

FACE

None observed

BOTTOM

- Slumps and scarps noted around culvert inlet of the lower pond.

GEI Consultants

East Tributary and Upper / Lower Ponds

SLOPE RATING FORM

Site Location: Tullamore Employment Lands
Property Owner:
Inspected By: Bo Hwang

File No: 2100975
Inspection Date: January 11, 2022
Weather: -22C Clear

				Rating Value	
1.	**SLOPE INSPECTION**				
		Degrees	***Horiz. : Vert.***		
	a)	18 or less	3 : 1 or flatter	0	☐
	b)	18 to 26	2 : 1 to 3 : 1	6	☒
	c)	more than 26	steeper than 2 : 1	16	☐

2.	**SOIL STRATIGRAPHY**			
	a)	Shale, Limestone, Granite (Bedrock)	0	☐
	b)	Sand, Gravel	6	☐
	c)	Glacial Till	9	☒
	d)	Clay, Silt	12	☐
	e)	Fill	16	☐
	f)	Leda Clay	24	☐
3.	**SEEPAGE FROM SLOPE FACE**			
	a)	None or Near bottom only	0	☒
	b)	Near mid-slope only	6	☐
	c)	Near crest only or from several levels	12	☐
4.	**SLOPE HEIGHT**			
	a)	2 metres or less	0	☐
	b)	2.1 to 5 metres	2	☒
	c)	5.1 to 10 metres	4	☐
	d)	Greater than 10 metres	8	☐
5.	**VEGETATION COVER ON SLOPE FACE**			
	a)	Well vegetated; heavy shrubs or forested with mature trees	0	☐
	b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs	4	☒
	c)	No vegetation; bare	8	☐
6.	**TABLELAND DRAINAGE**			
	a)	Tableland flat, no apparent drainage over slope	0	☒
	b)	Minor drainage over slope, no active erosion	2	☐
	c)	Drainage over slope, active erosion, gullies	4	☐
7.	**PROXIMITY OF WATERCOURSE TO SLOPE TOE**			
	a)	15 metres or more from slope toe	0	☐
	b)	Less than 15 metres from slope toe	6	☒
8.	**PREVIOUS LANDSLIDE ACTIVITY**			
	a)	No	0	☒
	b)	Yes	6	☐

TOTAL 27

	SLOPE INSTABILITY RATING	RATING VALUE TOTAL	INVESTIGATION REQUIREMENTS
1.	Low potential	<24	Site inspection only, confirmation, report letter.
2.	Slight potential	25-35	Site inspection and surveying, preliminary study, detailed report.
3.	Moderate potential	>35	Boreholes, piezometers, lab tests, surveying, detailed report.

NOTES:
a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe; the potential for toe erosion and undercutting should be evaluated in detail and, protection provided if required.

SLOPE INSPECTION FORM

File No: 2100975

File Name: Tullamore Employment Lands

Inspection Date: Jan 11/22

Inspected By (name): Bo Hwang

Weather (circle): ☒ sunny ☐ partly cloudy ☐ overcast ☐ calm ☐ breezy ☐ windy

☒ clear ☐ fog ☐ rain ☐ snow ☒ cold ☐ cool ☐ warm ☐ hot

Est. Air Temp. (°C): -25C

Site Location / Directions (describe main roads, features)**:**

West Tributary - Southern Slope of South Drainage Feature

Site Location Sketch:

Property Ownership (name, address, phone)**:**

Legal Description:

Lot 18

Concession 16

Township Caledon

County Peel

Watershed: West Humber River

Governing Regional Body: Town of Caledon

Governing Conservation Authority: TRCA

Current Land Use (circle and describe)**:**

☒ Vacant – Field, bush, woods, forest, wilderness, tundra

☐ Passive – Recreational parks, golf courses, non-habitable structures, buried utilities, swimming pools

☐ Active – Habitable structures, residential, commercial, industrial, warehousing, storage

☐ Infrastructure/Public Use – Stadiums, hospitals, schools, bridges, high voltage power lines, waste management sites

SLOPE DATA

Height
☒ 3 - 6 m ☐ 6 - 10 m ☐ 10 - 15 m ☐ 15 - 20 m
☐ 20 - 25 m ☐ 25 - 30 m ☐ >30 m
Estimated height (m): 2 to 4 m

Inclination / Shape
☐ 4:1 or flatter (25% / 14°) ☒ Up to 3:1 (33% / 18.5°) ☐ Up to 2:1 (50% / 26.5°)
☐ Up to 1:1 (100% / 45°) ☐ Up to 0.5:1 (200% / 63.5°) ☐ Steeper than 0.5:1 (>63.5°)

SLOPE DRAINAGE (describe):

TOP

- Tableland slopes gently towards the slope. Some rilling observed on the slope face / crest.

FACE

- Sheet drainage

BOTTOM

- Marshy ground/sheet drainage. Assumed to be a drainage feature that only conveys runoff during / after precipitation or snowmelt events.

SLOPE SOIL STRATIGRAPHY (describe, positions, thicknesses, types):

TOP

- Topsoil and some Earth Fill over Silty Sand Glacial Till.

FACE

- Topsoil over Silty Sand Glacial Till

BOTTOM

- Topsoil over Silty Sand Glacial Till

WATER COURSE FEATURES (circle and describe)**:**

SWALES, GULLIES, DITCHES, CHANNELS

Assumed to be a drainage feature that only conveys runoff during / after precipitation or snowmelt events.

STREAMS, CREEKS, RIVERS

PONDS, BAYS, LAKES

SPRINGS, SEEPS, MARHSY GROUND

- Bottom of slope: Tall weeds and grasses (dry), some marshy ground

VEGETATION COVER (grasses, weeds, shrubs, saplings, trees):

TOP

- Grasses and weeds (Farm Land)

FACE

- Well vegetated with tall grasses and some shrubs

BOTTOM

- Well vegetated with tall grasses and small trees

STRUCTURES (buildings, walls, fences, sewers, roads, stairs, decks, towers):

TOP

None observed

FACE

None observed

BOTTOM

None observed

EROSION FEATURES (scour, undercutting, bare areas, piping, rills, gully):

TOP

- Some localized rills and gullies

FACE

- Some localized rills and gullies continuing from top of slope

BOTTOM

None observed

SLOPE SLIDE FEATURES (tension cracks, scarps, slumps, bulges, grabens, ridges, bent trees)**:**

TOP

None observed

FACE

None observed

BOTTOM

None observed

West Tributary - Southern Slope
of South Drainage Feature

SLOPE RATING FORM

Site Location: Tullamore Employment Lands
Property Owner: ____________
Inspected By: Bo Hwang
File No: 2100975
Inspection Date: January 11, 2022
Weather: -22C Clear

				Rating Value	
1.	**SLOPE INSPECTION**				
		Degrees	***Horiz. : Vert.***		
	a)	18 or less	3 : 1 or flatter	0	☒
	b)	18 to 26	2 : 1 to 3 : 1	6	☐
	c)	more than 26	steeper than 2 : 1	16	☐
2.	**SOIL STRATIGRAPHY**				
	a)	Shale, Limestone, Granite (Bedrock)		0	☐
	b)	Sand, Gravel		6	☐
	c)	Glacial Till		9	☒
	d)	Clay, Silt		12	☐
	e)	Fill		16	☐
	f)	Leda Clay		24	☐
3.	**SEEPAGE FROM SLOPE FACE**				
	a)	None or Near bottom only		0	☒
	b)	Near mid-slope only		6	☐
	c)	Near crest only or from several levels		12	☐
4.	**SLOPE HEIGHT**				
	a)	2 metres or less		0	☐
	b)	2.1 to 5 metres		2	☒
	c)	5.1 to 10 metres		4	☐
	d)	Greater than 10 metres		8	☐
5.	**VEGETATION COVER ON SLOPE FACE**				
	a)	Well vegetated; heavy shrubs or forested with mature trees		0	☐
	b)	Light vegetation; Mostly grass, weeds, occasional trees, shrubs		4	☒
	c)	No vegetation; bare		8	☐
6.	**TABLELAND DRAINAGE**				
	a)	Tableland flat, no apparent drainage over slope		0	☐
	b)	Minor drainage over slope, no active erosion		2	☐
	c)	Drainage over slope, active erosion, gullies		4	☒
7.	**PROXIMITY OF WATERCOURSE TO SLOPE TOE**				
	a)	15 metres or more from slope toe		0	☐
	b)	Less than 15 metres from slope toe		6	☒
8.	**PREVIOUS LANDSLIDE ACTIVITY**				
	a)	No		0	☒
	b)	Yes		6	☐
				TOTAL 25	

	SLOPE INSTABILITY RATING	RATING VALUE TOTAL	INVESTIGATION REQUIREMENTS
1.	Low potential	<24	Site inspection only, confirmation, report letter.
2.	Slight potential	25-35	Site inspection and surveying, preliminary study, detailed report.
3.	Moderate potential	>35	Boreholes, piezometers, lab tests, surveying, detailed report.

NOTES: a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe; the potential for toe erosion and undercutting should be evaluated in detail and, protection provided if required.

Appendix J

Tree Inventory

Arborist Report and Tree Preservation Plan

Tullamore Employment Lands

Town of Caledon, Ontario

Submitted to:
Tullamore Industrial LP
75 Tiverton Court
Markham, ON
L3R 4M

Submitted by:
GEI Consultants Ltd.
100-75 Tiverton Court
Markham, ON
L3R 4M8
519-342-3488

February 2022, Updated April 2023
Project # 2100975

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AUTHOR INITIALS:SB

Document1

1. Introduction

GEI Consultants Ltd. (GEI) was retained by Tullamore Industrial LP to prepare an Arborist Report and Tree Preservation Plan (TPP) for the Tullamore Employment Lands in the Town of Caledon, Ontario (herein referred to as the Subject Lands; **Figure 1, Appendix A**). The Subject Lands are generally located north of Mayfield Road, west of Airport Road, east of Torbram Road and south of Old School Road. The Subject Lands consist primarily of actively managed agricultural fields, with two tributaries of the West Humber River flowing through the site, and Salt Creek traversing the northeast corner of the Subject Lands. The tributary closest to Torbram Road is located within the Greenbelt Planning Area and is designated as part of the Natural Heritage System (NHS) under the *Greenbelt Plan* (2017).

The proposed commercial and industrial development for the Subject Lands is preliminary (**Figure 1, Appendix A**), and the Draft Plan does not show specific locations of buildings, internal roadways or parking lots. A primary road network running north to south and east to west through the site is shown, along with stormwater management areas (SWMP) and designated Environmental Protection zones, plus the Greenbelt Planning Areas. Preliminary site statistics are summarized below:

- Blocks 1 to 8 to be developed with a total area of 144.996 ha;
- SWMPs with an area of 9.406 ha;
- Greenbelt Plan Area and Environmental Protection Areas with an area of 30.174 ha; and
- Total site area of 202.9 ha.

GEI completed a tree inventory on the Subject Lands in June 2021. Additional lands were purchased by the owner in 2022 and will be part of the second phase of the development. These areas are shown on **Figure 1, Appendix A**. This report presents the results of the tree inventory, excluding the additional lands that will be inventoried at Site Plan, identifies opportunities for tree preservation and protection, recommends measures to protect retainable trees, and proposes compensation for tree removals. The objective of the Tree Preservation Plan is to retain existing tree cover wherever feasible and to minimize the risk of injury to trees identified for protection. The preparation of this report was guided by the Town of Caledon *Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation* (2020).

2. Methodology

GEI completed a tree inventory within the Subject Lands on June 23–25 and June 27, 2021. All live trees with a diameter-at-breast-height (DBH) of 10 cm and greater were tagged and assessed. Trees in hedgerows were tallied. The locations for all inventoried trees were recorded in UTM coordinates using a sub-meter capable GPS unit or a handheld GPS unit, and the following information was noted: species, DBH, health category (biological, structural, and overall), crown radius, and notes regarding the assigned health category.

Tree health was categorized as good, fair, or poor. Trees categorized as “good” overall had at least 80% live canopy and showed no significant structural defects (e.g., weak limbs, girdling roots, stem lean) or evidence of biological damage (e.g., insect damage, fungal growth, leaf dieback). “Fair” trees were those with 50% to 80% live canopy and showed no significant structural or biological defects, or the tree had over 80% live canopy but did show some evidence of structural defects and/or biological damage. Trees categorized as “poor” were those with less than 50% live canopy and/or had significant structural defects and/or biological damage.

3. Tree Inventory

A total of 553 individual trees were mapped and assessed during this tree inventory and 76 trees in six hedgerows were tallied (**Figure 2, Appendix A**). **Table 1** (**Appendix B**) outlines the results of the tree inventory, including the tree identification number, species, DBH, crown radius, health category (biological, structural, and overall), notes regarding the assigned health category, recommendations for preservation or removal, and number of compensation trees required for removals. **Table 2** (**Appendix B**) outlines the results of the hedgerow tally, including the hedgerow identification number, species, DBH range, overall health category, recommendations for preservation or removal, and number of compensation trees required for removals.

The inventoried trees included 25 different species, including two hybrids. Of the 629 inventoried trees (including hedgerow trees), 124 (20%) are native to the Greater Toronto Area (TRCA 2017). Following analysis of anticipated impacts to the inventoried trees, it was determined that 5 individual trees and 15 trees in two hedgerows are recommended for preservation (for a total of 20 preservation trees). The remaining 548 individual trees and 61 trees in four hedgerows are recommended for removal (for a total of 609 removal trees) due to anticipated construction impacts. Further detail is provided in the following subsections.

3.1 Preservation Trees

Preservation trees are those that are located outside of the proposed construction footprint and are unlikely to be impacted by the proposed construction or can likely be preserved using tree protection measures, as described in **Section 4**. Of the 629 inventoried trees, 20 are preservation trees.

3.2 Removal Trees

Removal trees are those that are located within or in proximity to the proposed construction footprint and cannot be adequately protected. Of the 629 inventoried trees, 609 are removal trees. Compensation for removal trees is discussed in **Section 5**.

The proponent should ensure that the works are in conformance with the *Migratory Birds Convention Act, 1994* and the *Endangered Species Act, 2007*. Specifically, tree removals should comply with timing window restrictions with regards to the protection of nesting birds and species at risk bats. Where these timing windows cannot be avoided, it is recommended that a qualified ecologist conduct a nest search and bat habitat assessment prior to tree removals.

4. Tree Protection Program

GEI inventoried 629 trees within the Subject Lands. Of these, 20 are preservation trees. Preservation trees are separated from the proposed development by the Greenbelt Planning Area, and therefore do not require any additional tree protection measures.

5. Compensation Requirements

The Town of Caledon requires compensation for the removal of healthy trees 10 cm DBH and greater within tableland areas. **Table 3** below provides the ratio of tree replacements required for tree removals according to size, based on the Town of Caledon Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation (2020). Healthy trees were defined as those trees which were not assessed to be in poor condition for any of the biological, structural, and overall health categories.

Table 3 – Ratio of Tree Replacement for Private Trees

DBH of Tree to be Cut or Removed	Number of Replacement Trees Required	Number of Tree Removals	Number of Removal Trees Requiring Compensation	Number of Proposed Replacement Trees
10 – 20 cm	1	234	226	226
21 – 35 cm	2	177	166	332
36 – 50 cm	3	83	74	222
51 – 65 cm	4	23	17	68
> 65 cm	5	31	14	70
10 – 20 cm	1	234	226	226

Accordingly, a total of 918 trees are proposed to be planted as compensation for those removed through the construction of the proposed development.

Should it be determined that the compensation plantings will occur on site, a Landscape Plan showing compensation planting will be prepared by a Landscape Architect registered as a full member in good standing with the Ontario Association of Landscape Architects and submitted to the Town of Caledon. Compensation trees shall be native species to the TRCA watershed (TRCA 2017). If compensation plantings are unable to meet the required tree compensation numbers within the Subject Lands, compensation through cash-in-lieu may be considered at a rate as determined by the Town of Caledon.

6. Summary

GEI inventoried 629 trees within the Subject Lands, including 553 individual trees and 76 trees in six hedgerows. Through the preparation of this Arborist Report, it was determined that 5 individual trees and 15 trees in two hedgerows are recommended for preservation (for a total of 20 preservation trees). The remaining 548 individual trees and 61 trees in four hedgerows are recommended for removal (for a total of 609 removal trees) due to anticipated construction impacts. A total of 918 trees are proposed to be planted as compensation for those removed through the construction of the proposed development. Alternatively, compensation through cash-in-lieu may be considered at a rate as determined by the Town of Caledon.

Prepared By:	**Reviewed By:**
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c. Shelley Lohnes, Project Manager

REFERENCES AND BACKGROUND MATERIALS

Town of Caledon 2020. Terms of Reference for Arborist Reports, Tree Preservation Plans and Tableland Tree Removal Compensation, Version 1.0. Caledon, Town of Caledon ON: City of Oshawa. 7 pp.

TRCA 2017. Appendix 2: Flora Species for Entire TRCA Jurisdiction (2017). Toronto, ON: Toronto and Region Conservation Authority.

Appendix A

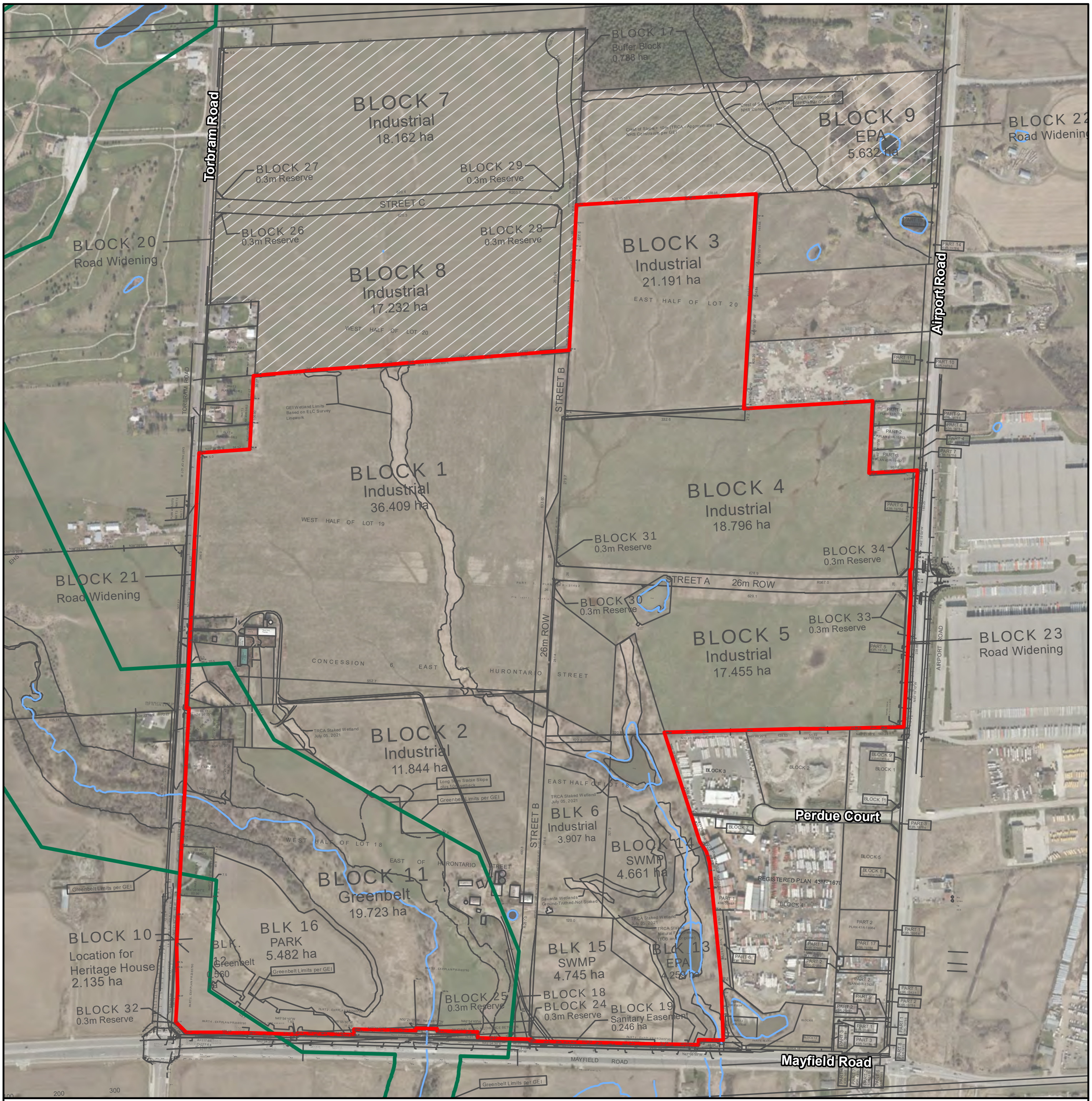
Figures

Figure 1: Proposed Development
Figure 2: Tree Inventory

Appendix B

Tables

Table 1: Tree Inventory
Table 2: Hedgerow Inventory



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Legend

🟥 Subject Lands (approximate)
▨ Phase 2 Lands
🟩 Greenbelt Planning Area
— Watercourse (TRCA)
☐ Waterbody (LIO)

Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 01
Proposed Development

0 100 m
1:10,000

N

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Savanta Division

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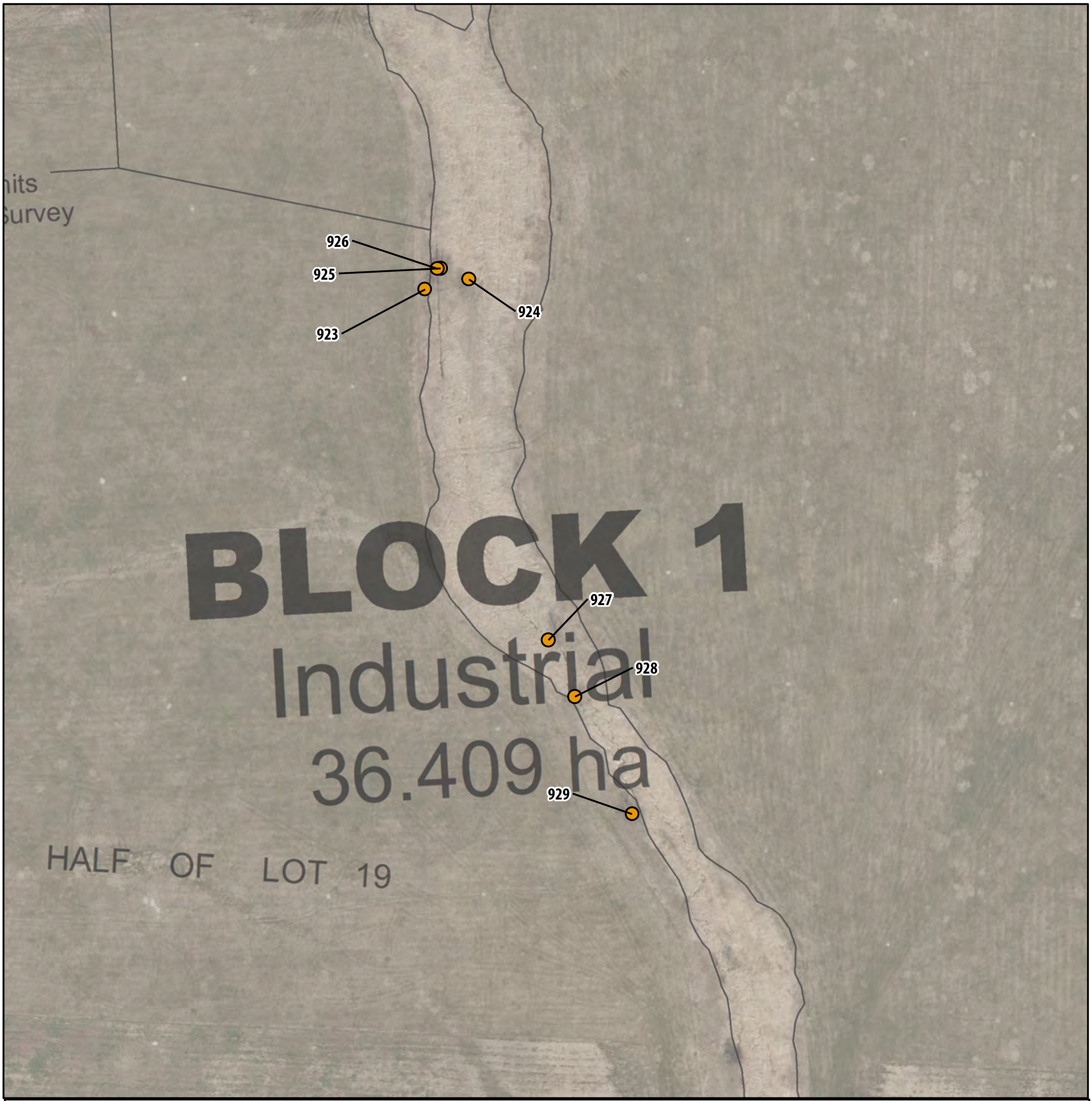

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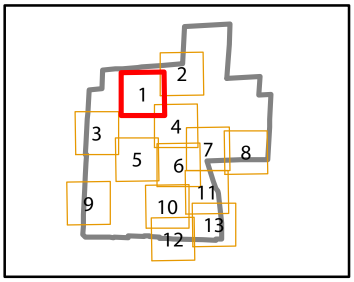
🟥 Subject Lands (approximate)

Tree Inventory

● Removal



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.1
Proposed Development

0 25 m
1:1,700

GEI Consultants
Savanta Division

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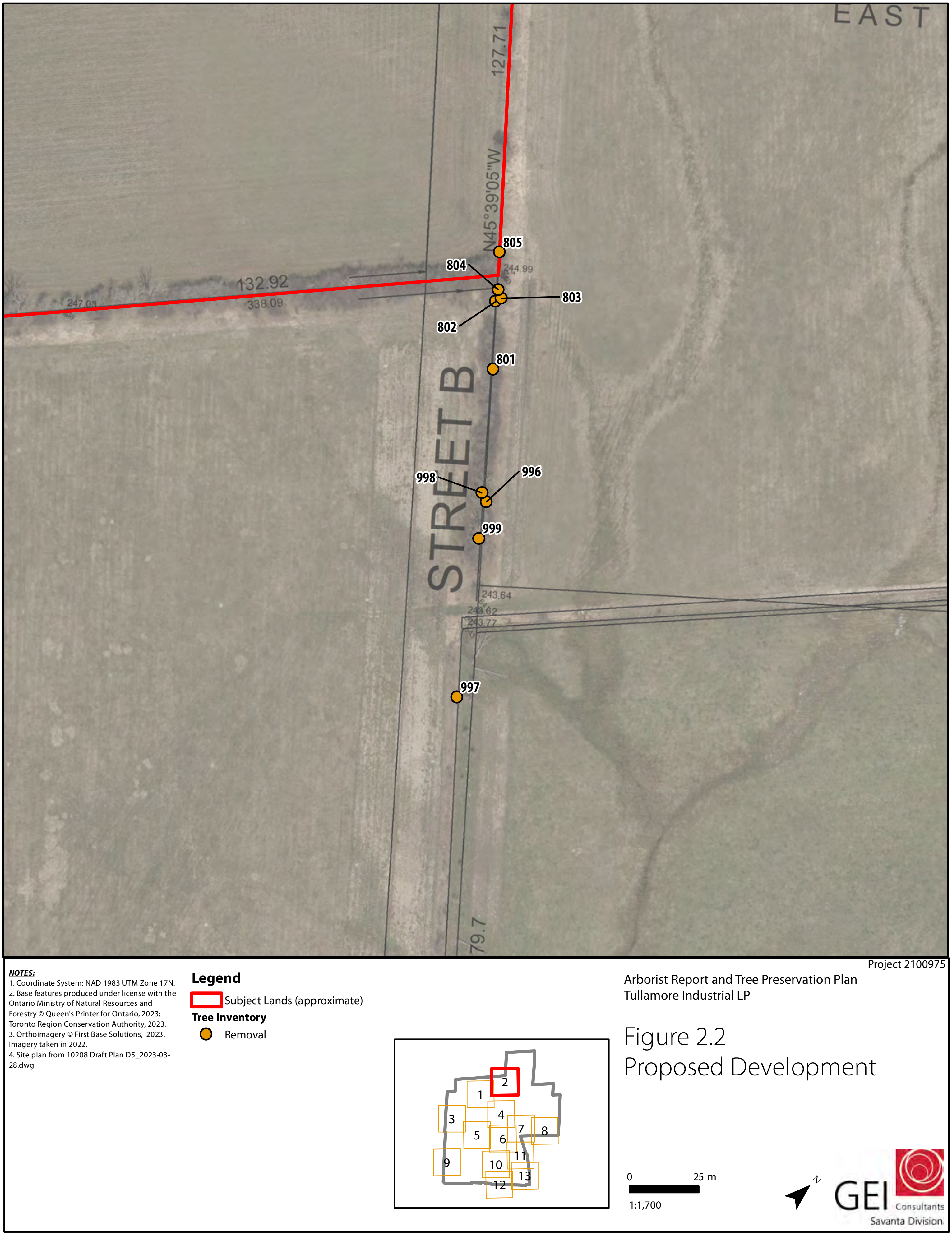

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Legend

🟥 Subject Lands (approximate)

Tree Inventory

● Removal

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.2
Proposed Development

GEI Consultants
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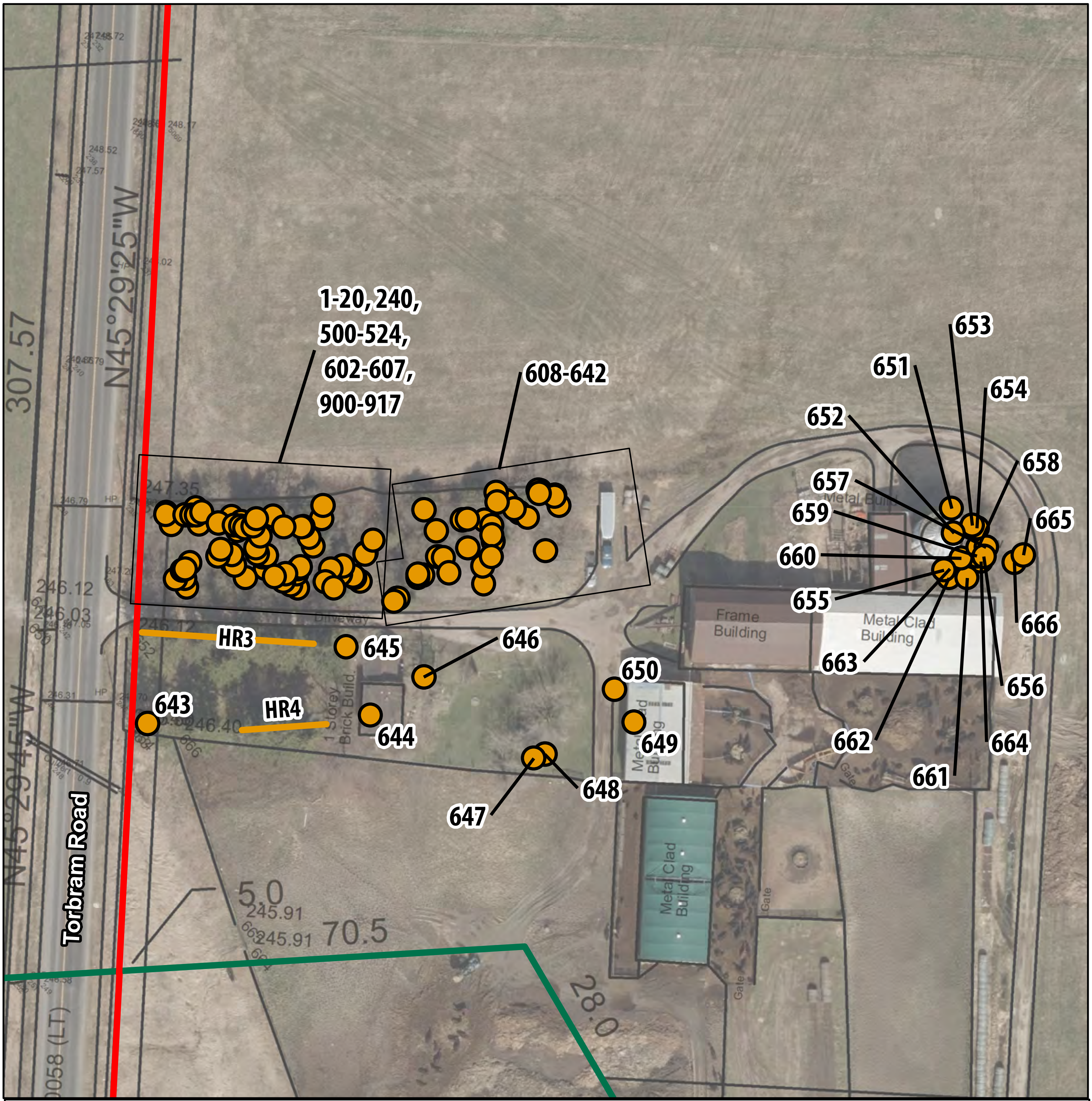

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Legend

🟥 Subject Lands (approximate)

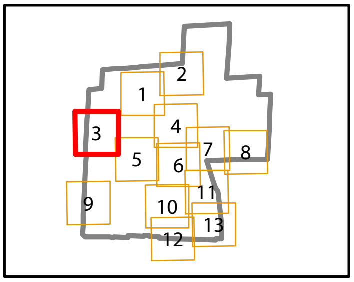
🟩 Greenbelt Planning Area

Tree Inventory

● Removal

Hedgerow Inventory

— Removal



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.3
Proposed Development

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1:1,000

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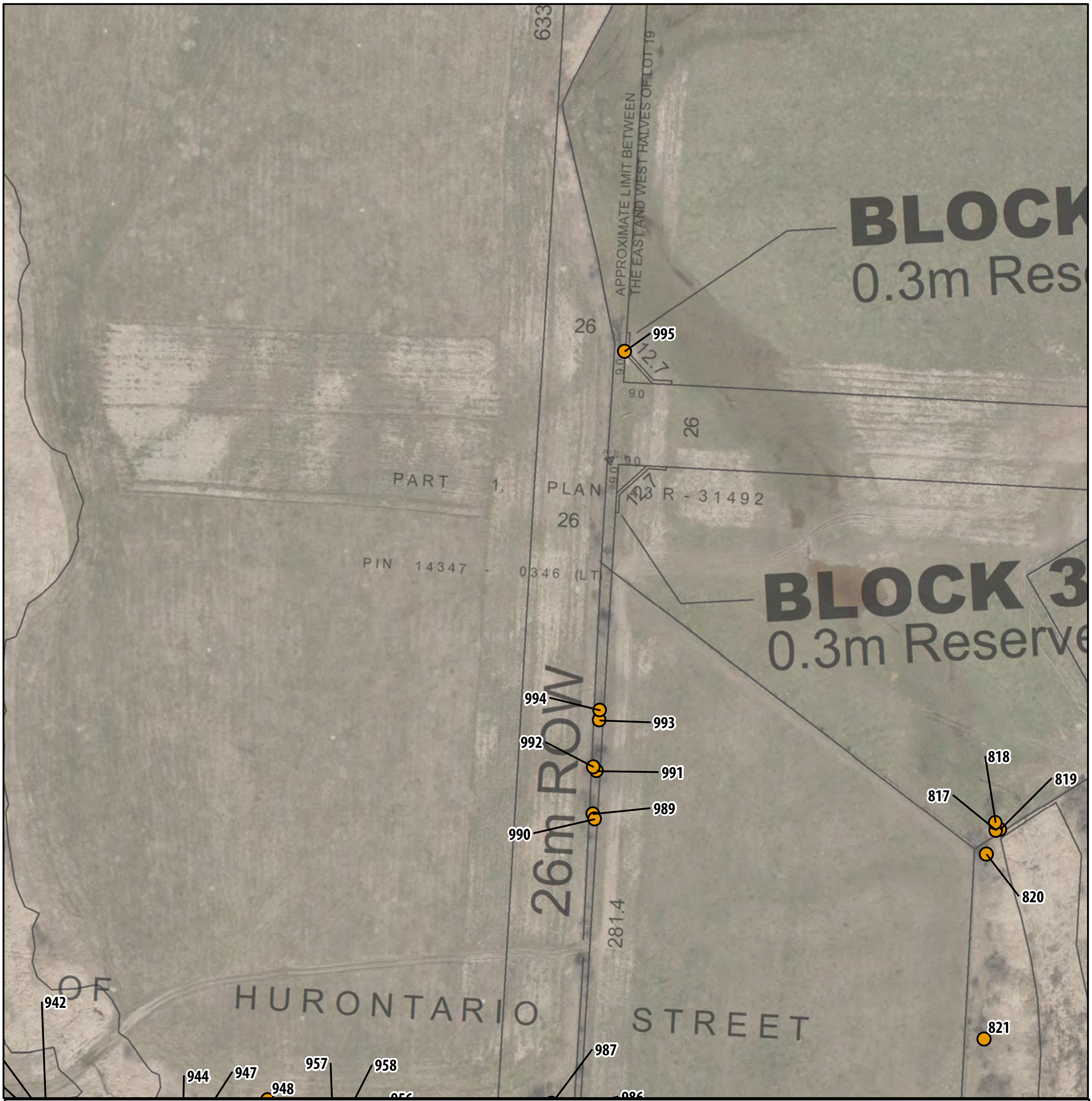

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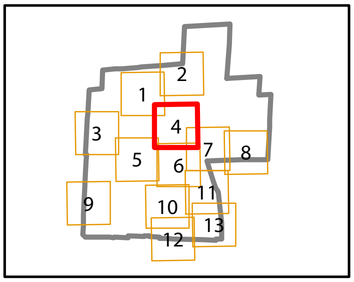
Legend

☐ Subject Lands (approximate)

Tree Inventory

● Removal



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.4
Proposed Development

0 25 m
1:1,700

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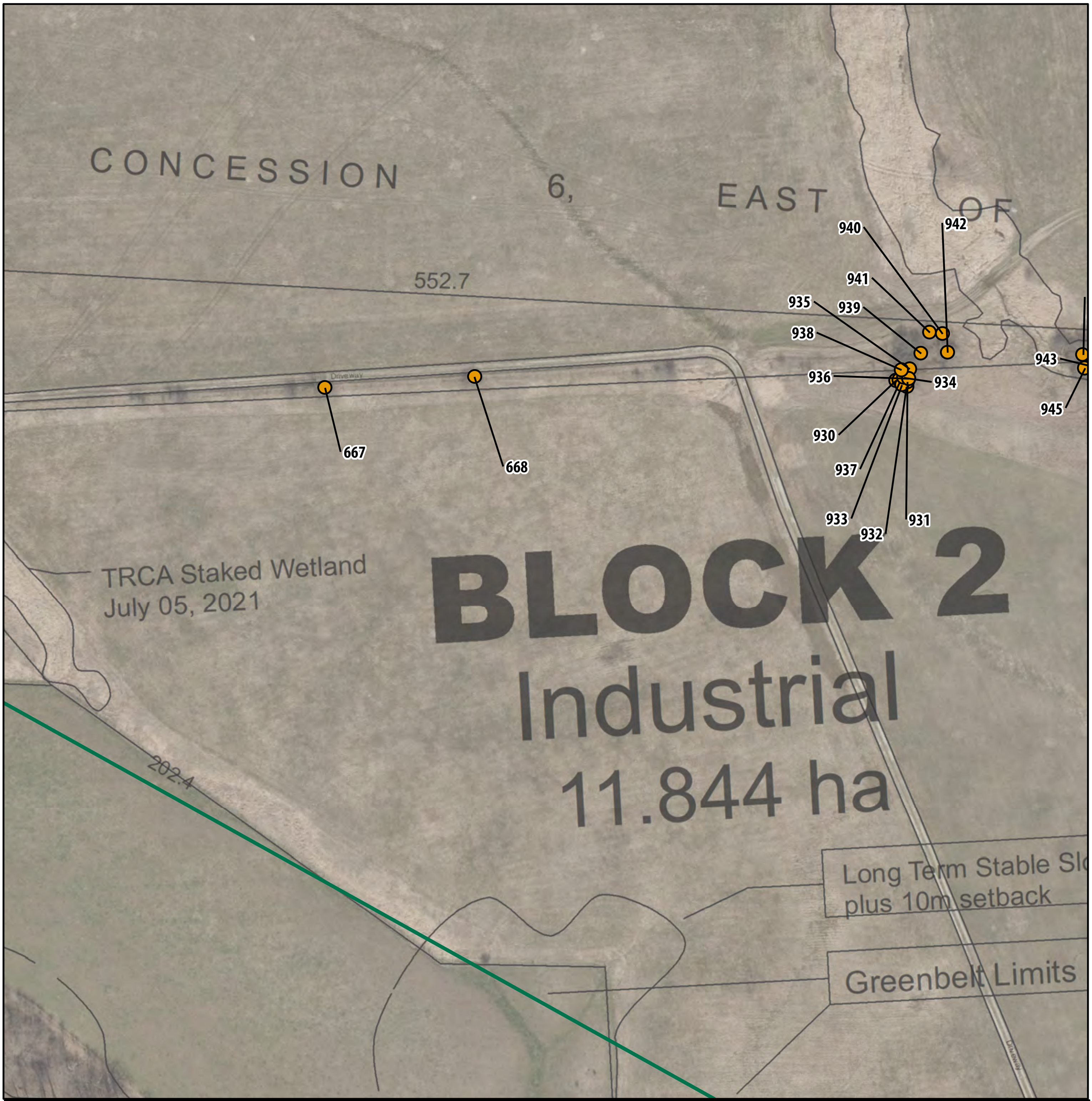

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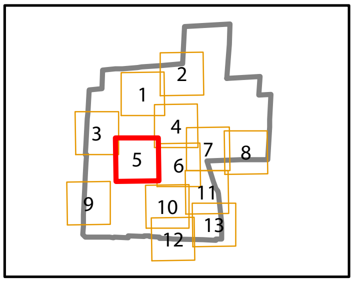
Legend

🟥 Subject Lands (approximate)
🟩 Greenbelt Planning Area

Tree Inventory

● Removal



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.5
Proposed Development

0 25 m
1:1,700

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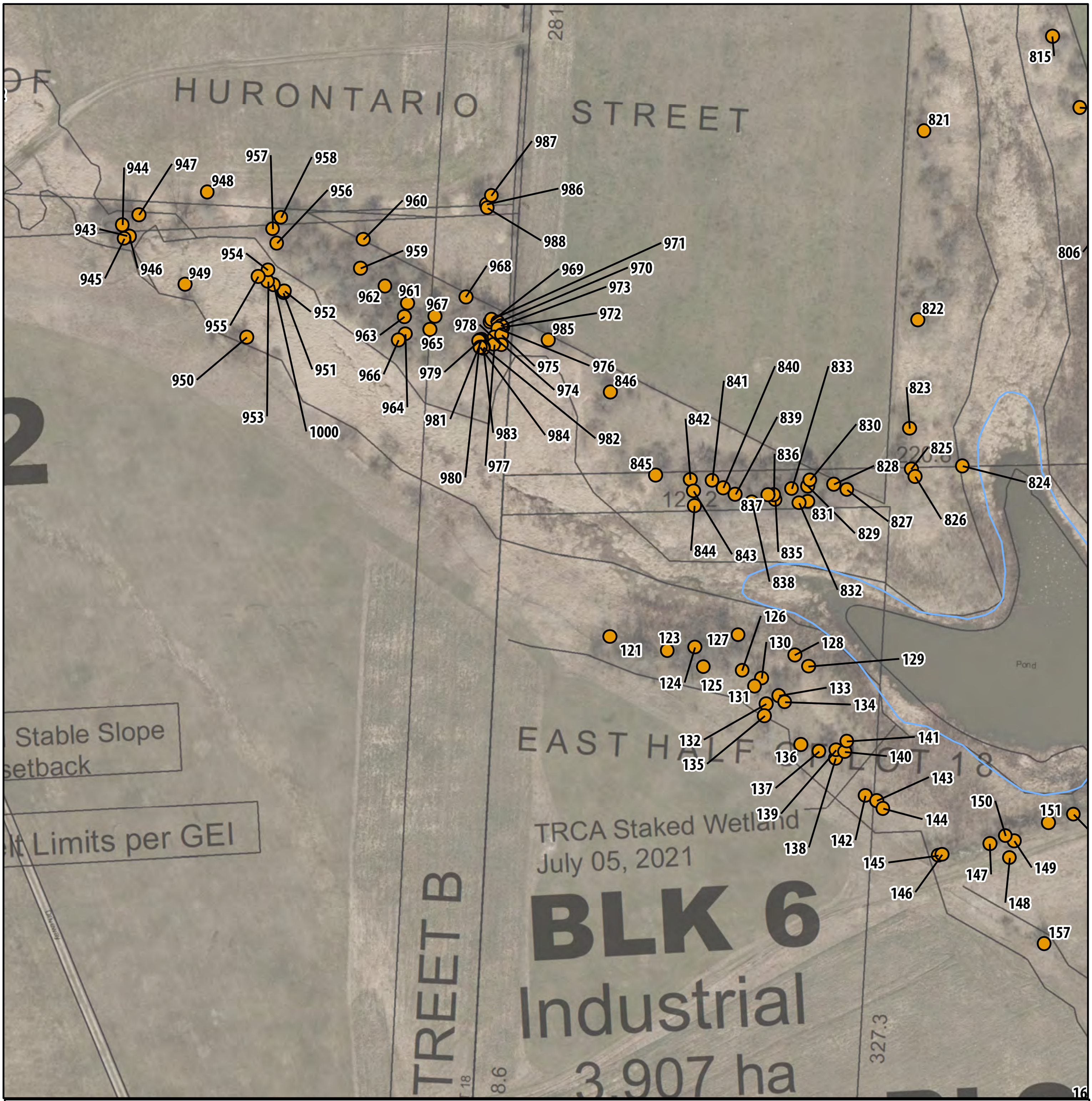

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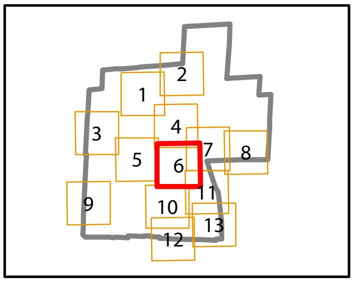
Legend

🟥 Subject Lands (approximate)

▭ Waterbody (LIO)

Tree Inventory

● Removal



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.6
Proposed Development

0 25 m

1:1,700

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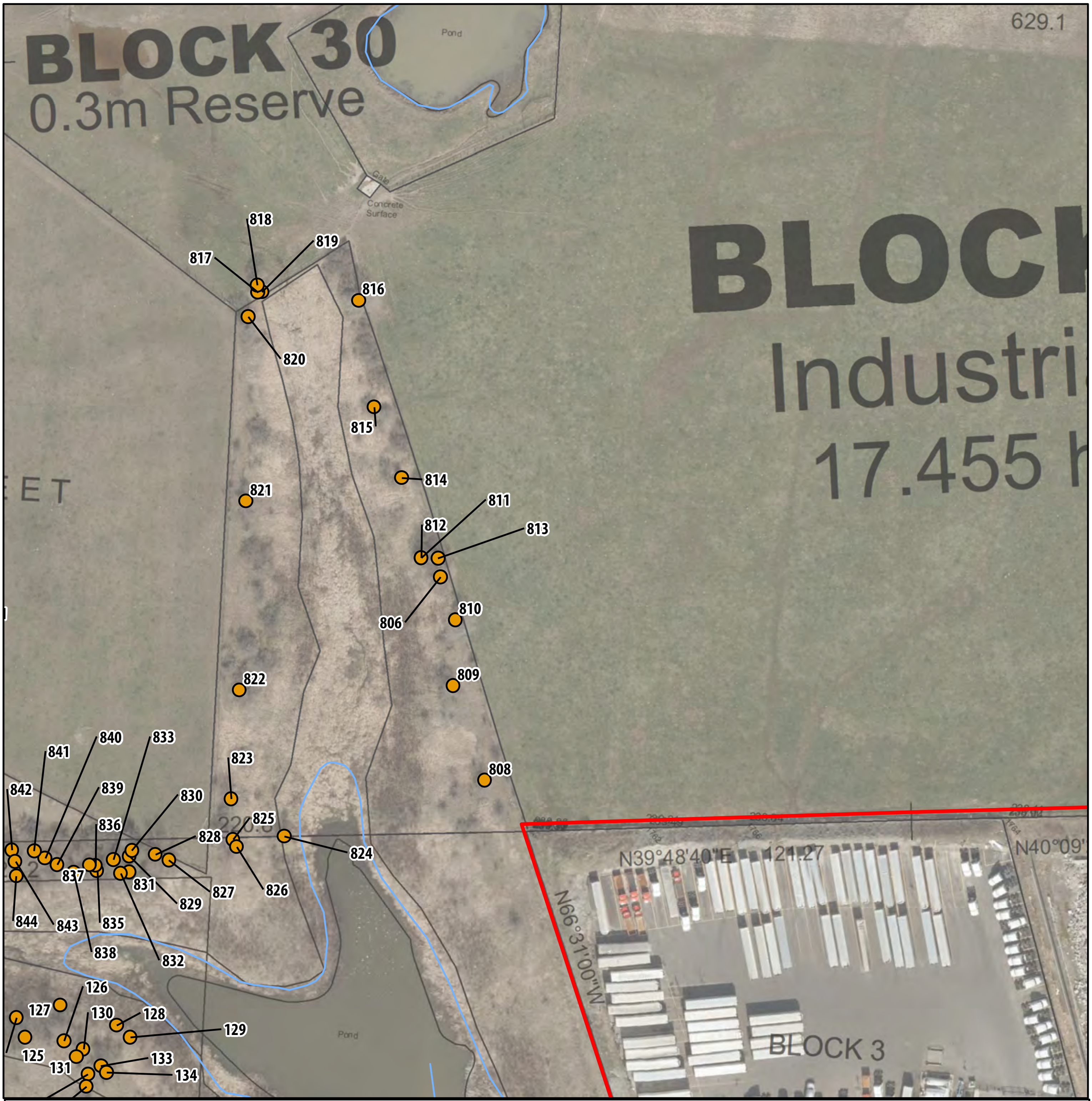

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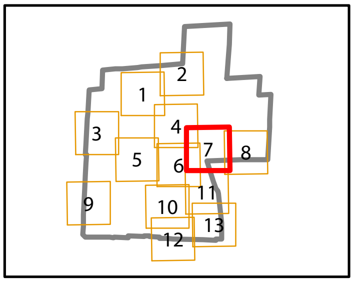
Legend

🟥 Subject Lands (approximate)
— Watercourse (TRCA)
▭ Waterbody (LIO)

Tree Inventory

● Removal



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Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.7
Proposed Development

0 25 m
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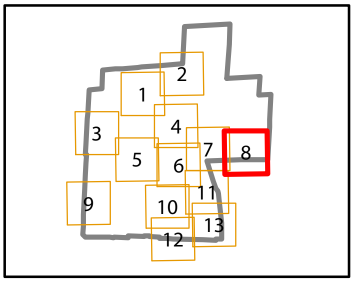
🟥 Subject Lands (approximate)

Tree Inventory

● Removal



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.8
Proposed Development

0 25 m

1:1,700

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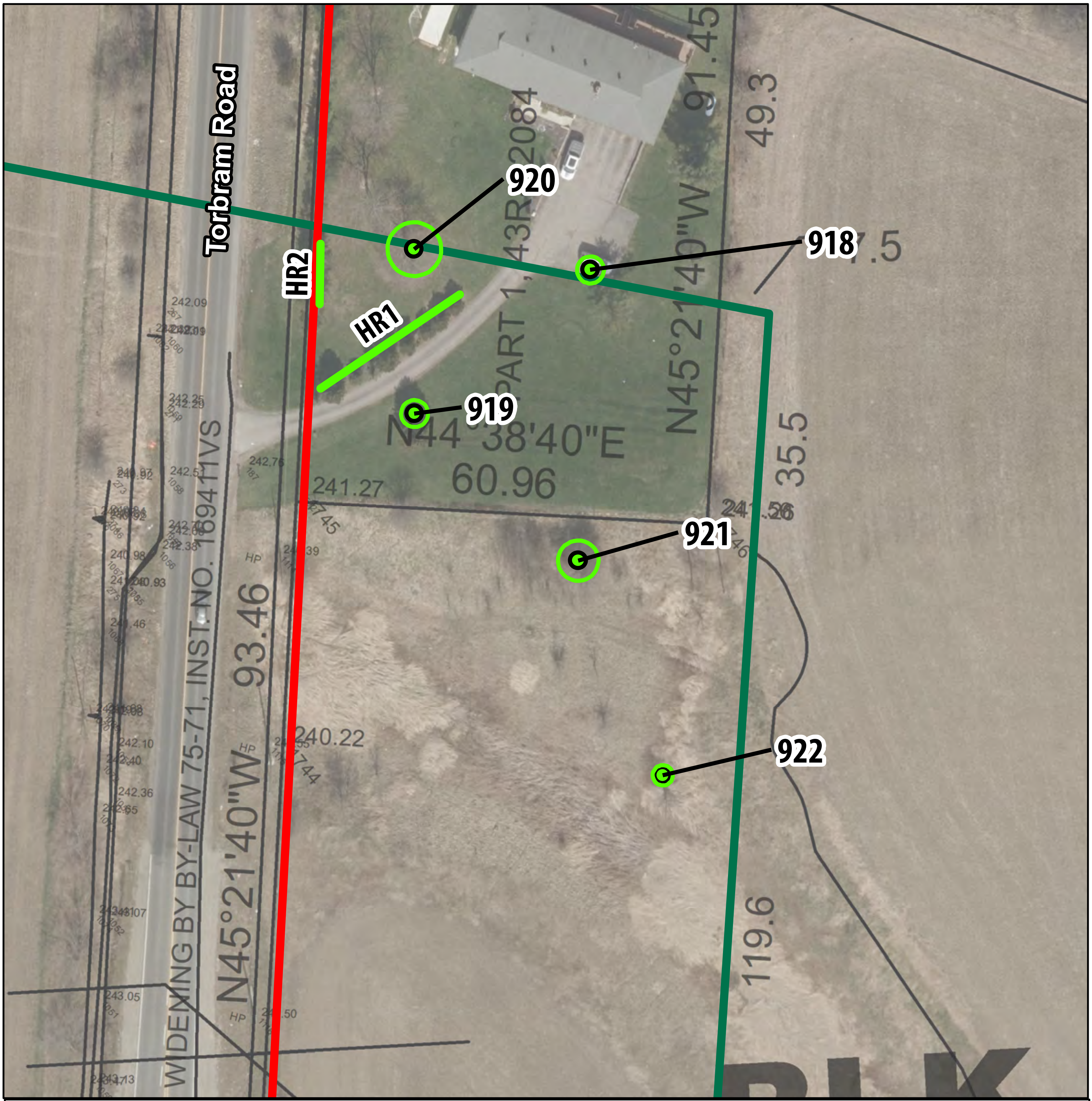

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Legend

🟥 Subject Lands (approximate)

🟩 Greenbelt Planning Area

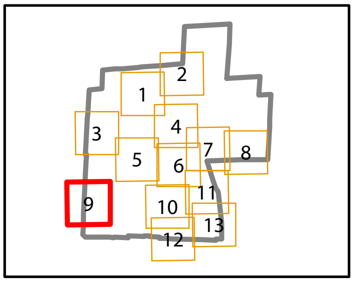
☐ Tree Protection Zone

Tree Inventory

● Preservation

Hedgerow Inventory

— Preservation



Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.9
Proposed Development

0 25 m

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Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.10
Proposed Development

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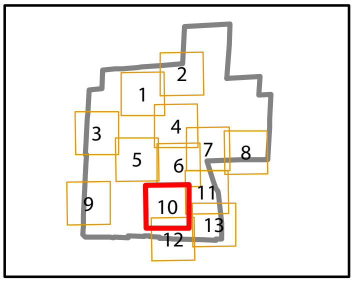
Legend

🟥 Subject Lands (approximate)
🟩 Greenbelt Planning Area
— Watercourse (TRCA)
▭ Waterbody (LIO)

Tree Inventory

● Removal



0 25 m

1:1,700

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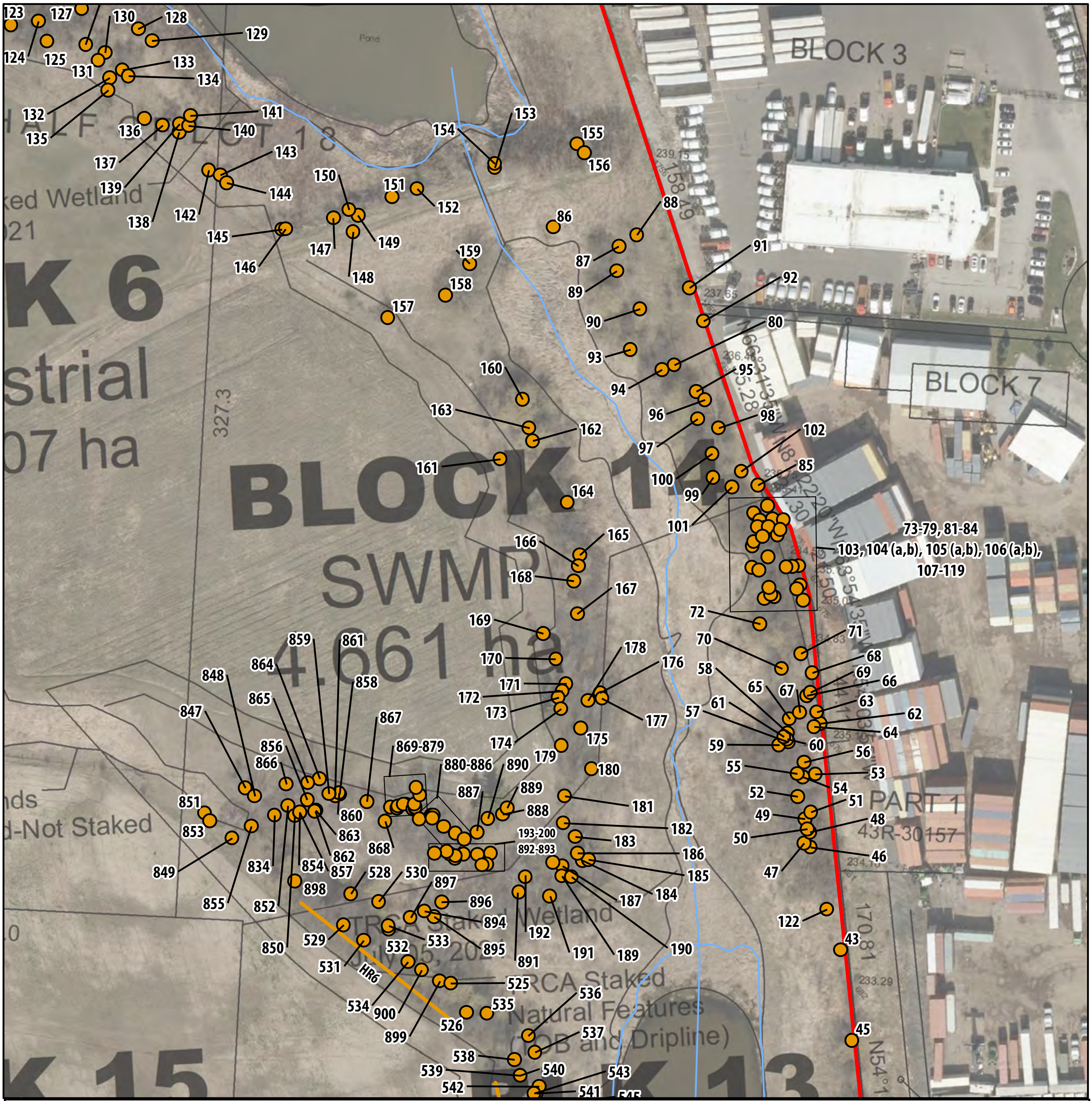

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Legend

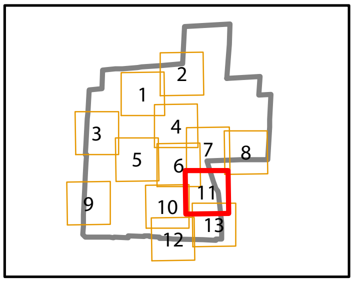
🟥 Subject Lands (approximate)
— Watercourse (TRCA)
☐ Waterbody (LIO)

Tree Inventory

● Removal

Hedgerow Inventory

— Removal



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.11
Proposed Development

0 25 m
1:1,700

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Savanta Division

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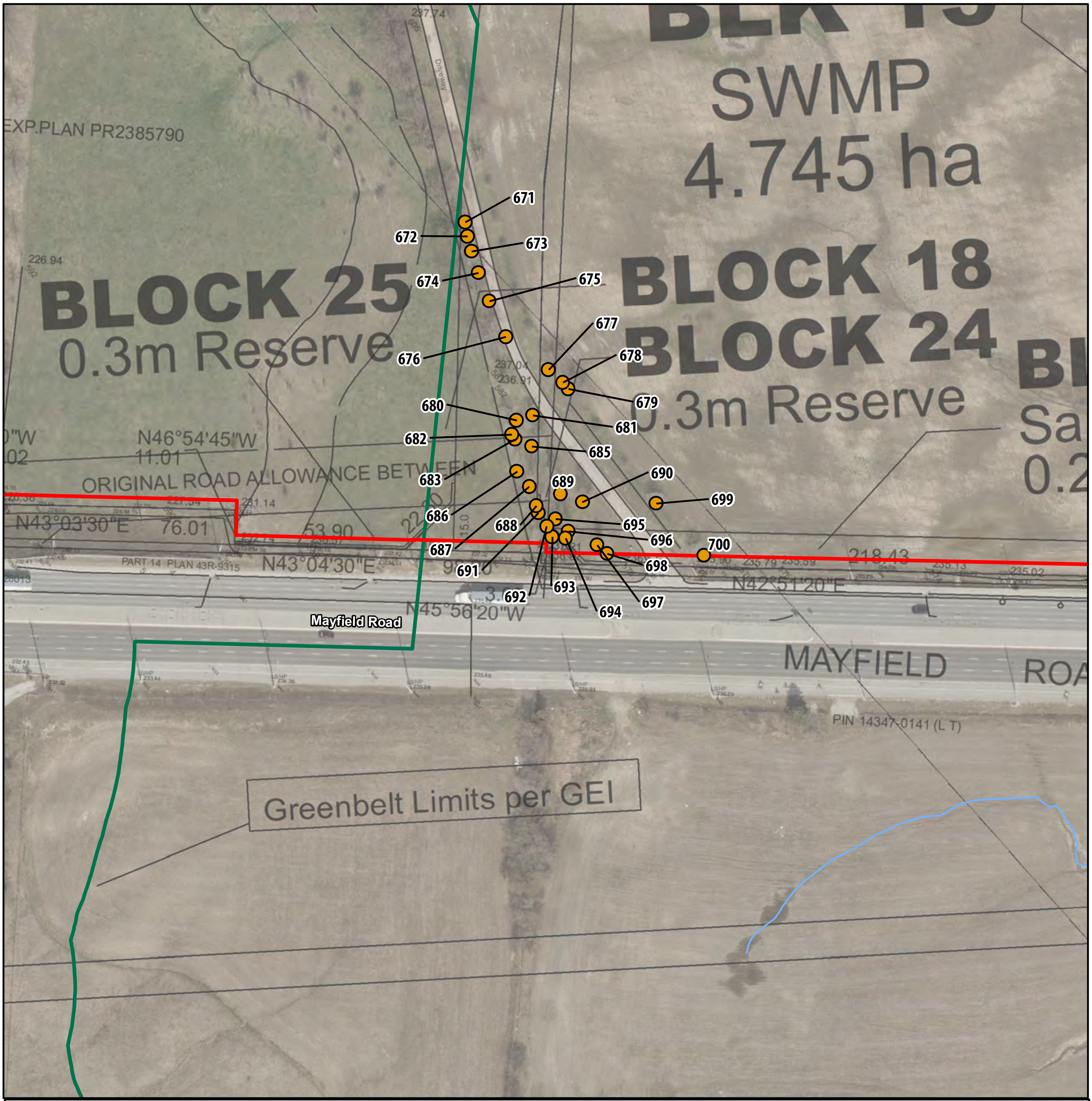

Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.12
Proposed Development

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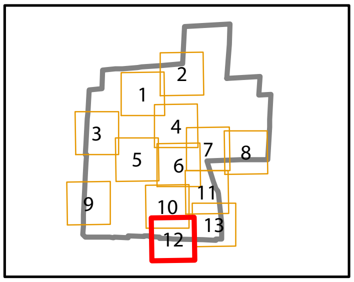
Legend

🟥 Subject Lands (approximate)
🟩 Greenbelt Planning Area
— Watercourse (TRCA)

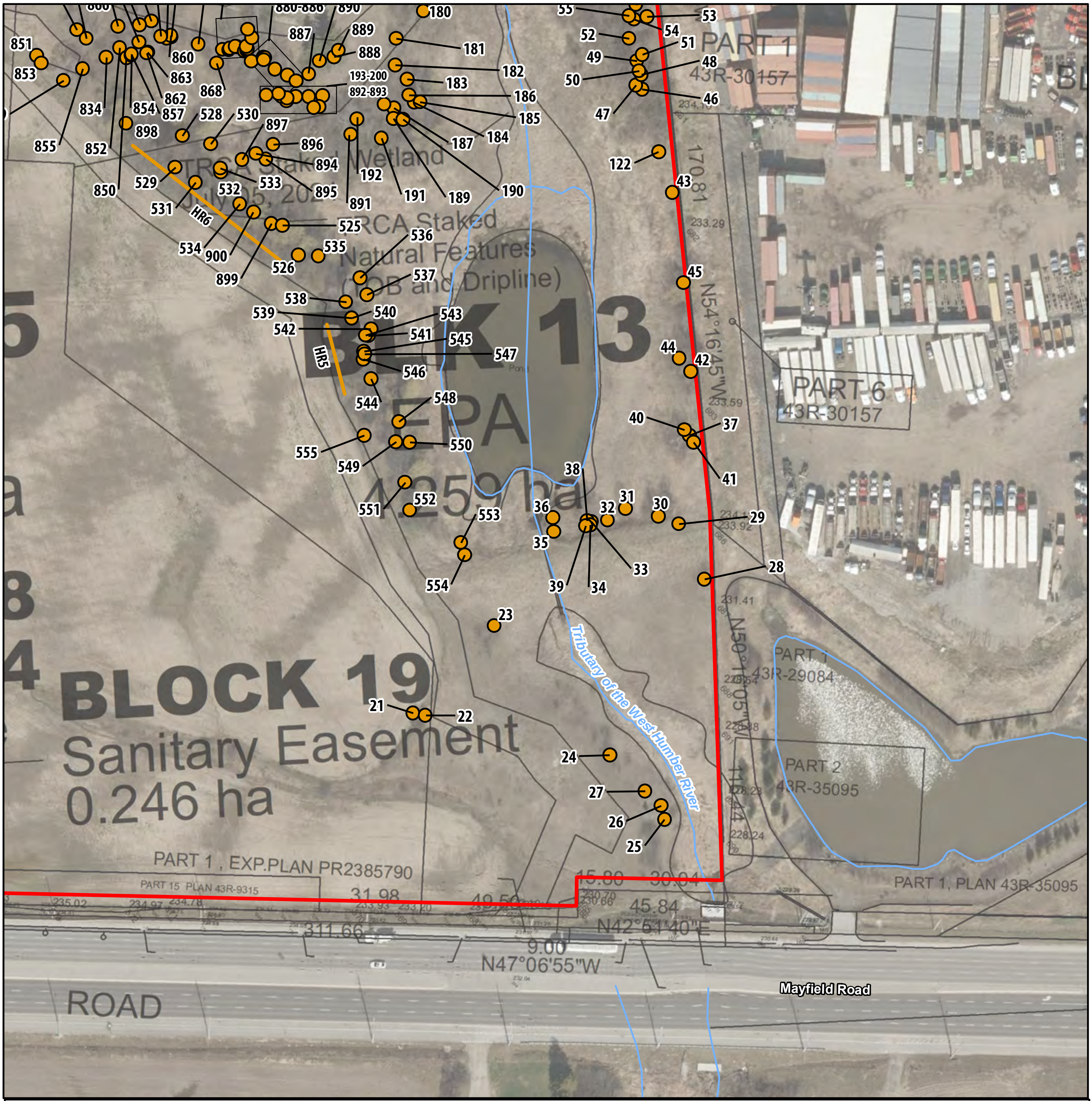
Tree Inventory

● Removal



0 25 m
1:1,700
N

GEI Consultants
Savanta Division



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, 2023; Toronto Region Conservation Authority, 2023.
3. Orthoimagery © First Base Solutions, 2023. Imagery taken in 2022.
4. Site plan from 10208 Draft Plan D5_2023-03-28.dwg

Legend

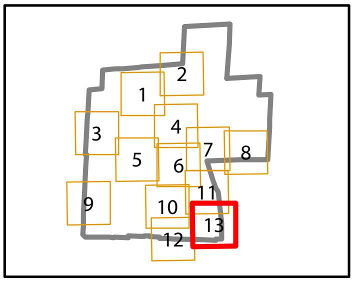
🟥 Subject Lands (approximate)
— Watercourse (TRCA)
☐ Waterbody (LIO)

Tree Inventory

● Removal

Hedgerow Inventory

— Removal



Project 2100975

Arborist Report and Tree Preservation Plan
Tullamore Industrial LP

Figure 2.13
Proposed Development

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1:1,700

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Savanta Division

Path: \\bos-pzcc-1\data_storage\Working\RICE GROUP\2100975 Tullamore Employment Lands\00_CAD\GIS\figures\report_figures\2021 06 28 arborist report and tpp\2100975_rpt_fig02_Tree Inventory.mxd Date Saved: Thursday, April 6, 2023

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius/ TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Number of Compensation Trees	Notes
1	Eastern White Cedar	*Thuja occidentalis*	29	23	18	0	0	0	1	Good	Good	Good	Removal	2	
2	Black Locust	*Robinia pseudoacacia*	32	32	0	0	0	0	3	Good	Good	Good	Removal	2	
3	Black Locust	*Robinia pseudoacacia*	20	20	0	0	0	0	3	Good	Good	Good	Removal	1	
4	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	1	Good	Good	Good	Removal	1	
5	Eastern White Cedar	*Thuja occidentalis*	32	28	10	12	0	0	1.5	Good	Good	Good	Removal	2	
6	Manitoba Maple	*Acer negundo*	14	14	0	0	0	0	2.5	Good	Good	Good	Removal	1	
7	Eastern White Cedar	*Thuja occidentalis*	17	17	0	0	0	0	1	Good	Good	Good	Removal	1	
8	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
9	Eastern White Cedar	*Thuja occidentalis*	37	27	25	0	0	0	3	Good	Good	Good	Removal	3	
10	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	1	
11	Manitoba Maple	*Acer negundo*	14	14	0	0	0	0	1.5	Fair	Fair	Fair	Removal	1	
12	Manitoba Maple	*Acer negundo*	21	17	12	0	0	0	2	Good	Good	Good	Removal	2	
13	Manitoba Maple	*Acer negundo*	32	22	18	15	0	0	2.5	Good	Good	Good	Removal	2	
14	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
15	Black Locust	*Robinia pseudoacacia*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
16	Black Locust	*Robinia pseudoacacia*	25	23	11	0	0	0	4	Good	Good	Good	Removal	2	
17	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	1	Good	Good	Good	Removal	1	
18	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	2	
19	Eastern White Cedar	*Thuja occidentalis*	15	15	0	0	0	0	1	Good	Good	Good	Removal	1	
20	Eastern White Cedar	*Thuja occidentalis*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	2	
21	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	1	
22	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	0.5	Good	Good	Good	Removal	2	
23	Common Apple	*Malus pumila*	19	15	12	0	0	0	2	Good	Good	Good	Removal	1	
24	Crack Willow	*Salix euxina*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	1	
25	White Spruce	*Picea glauca*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	1	Planted
26	White Spruce	*Picea glauca*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	1	Planted
27	White Spruce	*Picea glauca*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	1	Planted
28	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	2.5	Good	Good	Good	Removal	2	
29	Crack Willow	*Salix euxina*	47	34	33	0	0	0	2.5	Good	Fair	Fair	Removal	3	Snags and few cavities
30	Crack Willow	*Salix euxina*	43	43	0	0	0	0	3	Good	Good	Good	Removal	3	
31	Siberian Elm	*Ulmus pumila*	19	19	0	0	0	0	1.5	Good	Good	Good	Removal	1	
32	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	0.5	Good	Good	Good	Removal	1	
33	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	1	
34	Manitoba Maple	*Acer negundo*	34	19	17	22	0	0	4	Good	Good	Good	Removal	2	
35	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	1	Good	Fair	Good	Removal	1	2nd stem split off at base and died
36	Siberian Elm	*Ulmus pumila*	33	33	0	0	0	0	2	Good	Good	Good	Removal	2	
37	Crack Willow	*Salix euxina*	16	16	0	0	0	0	1.5	Good	Good	Good	Removal	1	
38	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1	Good	Good	Good	Removal	1	
39	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	1	Good	Good	Good	Removal	1	
40	Crack Willow	*Salix euxina*	52	30	32	27	0	0	2	Good	Fair	Good	Removal	4	
41	Crack Willow	*Salix euxina*	23	17	16	0	0	0	0.5	Good	Good	Good	Removal	2	
42	Crack Willow	*Salix euxina*	64	64	0	0	0	0	2.5	Good	Fair	Good	Removal	4	Middle of Buckthorn thicket
43	Carolina Poplar	*Populus xcanadensis*	16	16	0	0	0	0	1.5	Good	Good	Good	Removal	1	
44	Crack Willow	*Salix euxina*	37	37	0	0	0	0	1.5	Good	Good	Good	Removal	3	Middle of Buckthorn thicket
45	Crack Willow	*Salix euxina*	37	32	12	15	0	0	2.5	Fair	Poor	Fair	Removal	0	
46	Crack Willow	*Salix euxina*	57	42	39	0	0	0	3	Fair	Poor	Fair	Removal	0	Huge crack at base. One stem dead and breaking away.
47	Silver Maple	*Acer saccharinum*	19	15	11	0	0	0	1	Good	Good	Good	Removal	1	
48	Silver Maple	*Acer saccharinum*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
49	Crack Willow	*Salix euxina*	45	40	20	0	0	0	2.5	Good	Good	Good	Removal	3	
50	Silver Maple	*Acer saccharinum*	17	14	10	0	0	0	2	Good	Good	Good	Removal	1	
51	Crack Willow	*Salix euxina*	52	38	36	0	0	0	5	Good	Good	Good	Removal	4	
52	Silver Maple	*Acer saccharinum*	39	28	27	0	0	0	5	Good	Good	Good	Removal	3	
53	Crack Willow	*Salix euxina*	69	69	0	0	0	0	1	Poor	Poor	Poor	Removal	0	Splits just above DBH. Most lateral branches broken. Little green growth.
54	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	0.5	Fair	Poor	Poor	Removal	0	Bent and cracked from large Crack Willow falling on it.
55	Crack Willow	*Salix euxina*	39	32	23	0	0	0	1.5	Fair	Good	Good	Removal	3	
56	Norway Maple	*Acer platanoides*	20	15	13	0	0	0	1.5	Good	Good	Good	Removal	1	
57	Crack Willow	*Salix euxina*	27	27	0	0	0	0	2	Good	Good	Good	Removal	2	
58	Crack Willow	*Salix euxina*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	1	
59	Crack Willow	*Salix euxina*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	1	
60	Crack Willow	*Salix euxina*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	1	
61	Crack Willow	*Salix euxina*	62	52	34	0	0	0	3	Good	Good	Good	Removal	4	
62	Siberian Elm	*Ulmus pumila*	32	32	0	0	0	0	2	Good	Good	Good	Removal	2	
63	Siberian Elm	*Ulmus pumila*	39	28	22	16	0	0	4	Good	Good	Good	Removal	3	
64	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	1.5	Good	Good	Good	Removal	2	
65	Norway Maple	*Acer platanoides*	14	14	0	0	0	0	2	Good	Fair	Good	Removal	1	Bent and misshapen from large Crack Willow falling on it when young.
66	Siberian Elm	*Ulmus pumila*	10	10	0	0	0	0	1	Good	Good	Good	Removal	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius/ TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Number of Compensation Trees	Notes
67	Siberian Elm	*Ulmus pumila*	42	42	0	0	0	0	3.5	Good	Good	Good	Removal	3	
68	Siberian Elm	*Ulmus pumila*	43	40	16	0	0	0	1	Fair	Poor	Poor	Removal	0	
69	Norway Maple	*Acer platanoides*	28	28	0	0	0	0	2.5	Good	Good	Good	Removal	2	
70	Common Apple	*Malus pumila*	18	18	0	0	0	0	3	Good	Good	Good	Removal	1	
71	Siberian Elm	*Ulmus pumila*	28	28	0	0	0	0	2	Good	Good	Good	Removal	2	
72	Crack Willow	*Salix euxina*	99	68	52	49	0	0	4	Poor	Poor	Poor	Removal	0	Many broken twisted boles and limbs, snags, cavities, and damage
73	Silver Maple	*Acer saccharinum*	32	24	13	13	10	0	2.5	Good	Good	Good	Removal	2	
74	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	2	Good	Good	Good	Removal	2	
75	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
76	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	2	
77	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	2	Good	Good	Good	Removal	2	
78	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	0.5	Good	Good	Good	Removal	1	
79	Siberian Elm	*Ulmus pumila*	43	27	24	23	0	0	4	Good	Good	Good	Removal	3	
80	Common Apple	*Malus pumila*	17	13	11	0	0	0	2.5	Good	Good	Good	Removal	1	
81	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	1	
82	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	0.5	Good	Good	Good	Removal	2	
83	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	0.5	Good	Good	Good	Removal	1	
84	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	1	Good	Good	Good	Removal	2	
85	Siberian Elm	*Ulmus pumila*	34	34	0	0	0	0	1.5	Good	Good	Good	Removal	2	
86	Crack Willow	*Salix euxina*	25	23	10	0	0	0	1	Fair	Fair	Fair	Removal	2	
87	Common Apple	*Malus pumila*	24	24	0	0	0	0	3	Good	Good	Good	Removal	2	
88	White Elm	*Ulmus americana*	30	30	0	0	0	0	2	Good	Good	Good	Removal	2	
89	Crack Willow	*Salix euxina*	68	53	42	0	0	0	3.5	Fair	Poor	Poor	Removal	0	Snags, rot, cracks
90	Crack Willow	*Salix euxina*	33	13	18	20	14	0	3	Fair	Poor	Poor	Removal	0	Snags, rot, cracks, main boles have fallen. Current growth from lateral branches.
91	Siberian Elm	*Ulmus pumila*	40	22	20	13	15	18	4	Good	Good	Good	Removal	3	
92	Red Oak	*Quercus rubra*	29	29	0	0	0	0	3	Good	Good	Good	Removal	2	
93	Crack Willow	*Salix euxina*	19	19	0	0	0	0	1.5	Fair	Fair	Fair	Removal	1	
94	Crack Willow	*Salix euxina*	37	32	19	0	0	0	2.5	Fair	Fair	Fair	Removal	3	
95	Crack Willow	*Salix euxina*	86	72	47	0	0	0	4	Fair	Fair	Fair	Removal	5	Cavities, decay, snags
96	Common Apple	*Malus pumila*	17	17	0	0	0	0	2	Fair	Fair	Fair	Removal	1	
97	Crack Willow	*Salix euxina*	33	22	17	17	0	0	3	Fair	Poor	Fair	Removal	0	Main bole split and dead and fallen. Growth from lateral branches
98	Siberian Elm	*Ulmus pumila*	36	36	0	0	0	0	3	Fair	Fair	Fair	Removal	3	
99	White Willow x Weeping Willow	*Salix xsepulcralis*	83	83	0	0	0	0	4	Fair	Fair	Fair	Removal	5	
100	White Willow x Weeping Willow	*Salix xsepulcralis*	76	73	21	0	0	0	3	Fair	Poor	Poor	Removal	0	Much decay and snags
101	Crack Willow	*Salix euxina*	19	19	0	0	0	0	1.5	Good	Good	Good	Removal	1	
102	Common Apple	*Malus pumila*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
103	White Elm	*Ulmus americana*	34	34	0	0	0	0	2.5	Good	Good	Good	Removal	2	
104a	Common Apple	*Malus pumila*	21	21	0	0	0	0	4	Good	Good	Good	Removal	2	
104b	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1.5	Good	Good	Good	Removal	2	
105a	Silver Maple	*Acer saccharinum*	53	53	0	0	0	0	3.5	Good	Fair	Good	Removal	4	One large dead limb
105b	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1.5	Good	Good	Good	Removal	2	
106a	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
106b	Siberian Elm	*Ulmus pumila*	57	57	0	0	0	0	4	Good	Good	Good	Removal	4	
107	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	1.5	Good	Good	Good	Removal	2	
108	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	1	Good	Good	Good	Removal	1	
109	Siberian Elm	*Ulmus pumila*	12	12	0	0	0	0	1	Good	Good	Good	Removal	1	
110	Siberian Elm	*Ulmus pumila*	16	16	0	0	0	0	1	Good	Good	Good	Removal	1	
111	Siberian Elm	*Ulmus pumila*	34	21	27	0	0	0	1.5	Good	Good	Good	Removal	2	
112	Siberian Elm	*Ulmus pumila*	40	27	30	0	0	0	2	Good	Good	Good	Removal	3	
113	Siberian Elm	*Ulmus pumila*	33	33	0	0	0	0	1.5	Good	Good	Good	Removal	2	
117	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	1	Good	Good	Good	Removal	1	
118	Crack Willow	*Salix euxina*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	1	
119	Crack Willow	*Salix euxina*	51	46	23	0	0	0	2	Fair	Fair	Fair	Removal	4	Dead limbs
121	Siberian Elm	*Ulmus pumila*	12	12	0	0	0	0	0.5	Good	Good	Good	Removal	1	
122	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1	Good	Good	Good	Removal	2	
123	Siberian Elm	*Ulmus pumila*	43	43	0	0	0	0	1.5	Good	Good	Good	Removal	3	
124	Silver Maple	*Acer saccharinum*	29	18	15	13	12	0	3	Good	Good	Good	Removal	2	
125	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	1.5	Good	Good	Good	Removal	2	
126	Siberian Elm	*Ulmus pumila*	34	24	18	15	0	0	1.5	Good	Good	Good	Removal	2	
127	Crack Willow	*Salix euxina*	37	18	16	16	14	19	2	Fair	Fair	Fair	Removal	3	
128	Crack Willow	*Salix euxina*	18	18	0	0	0	0	2	Fair	Poor	Fair	Removal	0	
129	Crack Willow	*Salix euxina*	21	21	0	0	0	0	1.5	Good	Good	Good	Removal	2	
130	Siberian Elm	*Ulmus pumila*	34	26	22	0	0	0	0.5	Good	Good	Good	Removal	2	
131	Siberian Elm	*Ulmus pumila*	34	22	18	19	0	0	0.5	Poor	Poor	Poor	Removal	0	
132	Siberian Elm	*Ulmus pumila*	21	21	0	0	0	0	0.5	Fair	Fair	Fair	Removal	2	
133	Siberian Elm	*Ulmus pumila*	50	31	28	18	21	0	0.5	Good	Fair	Fair	Removal	3	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius/ TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Number of Compensation Trees	Notes
134	Siberian Elm	*Ulmus pumila*	15	11	10	0	0	0	0.5	Fair	Poor	Fair	Removal	0	
135	Siberian Elm	*Ulmus pumila*	35	35	0	0	0	0	1	Fair	Fair	Fair	Removal	2	
136	Siberian Elm	*Ulmus pumila*	43	28	22	16	12	12	1	Fair	Fair	Fair	Removal	3	
137	Siberian Elm	*Ulmus pumila*	29	23	18	0	0	0	0.5	Fair	Poor	Poor	Removal	0	
138	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
139	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
140	Siberian Elm	*Ulmus pumila*	16	16	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
141	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
142	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
143	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	1	
144	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	1	
145	Crack Willow	*Salix euxina*	21	21	0	0	0	0	0.5	Good	Good	Good	Removal	2	
146	Crack Willow	*Salix euxina*	25	23	11	0	0	0	0.5	Fair	Fair	Fair	Removal	2	
147	Crack Willow	*Salix euxina*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	1	
148	Crack Willow	*Salix euxina*	22	22	0	0	0	0	0.5	Good	Good	Good	Removal	2	
149	Crack Willow	*Salix euxina*	47	36	22	17	13	0	0.5	Fair	Fair	Fair	Removal	3	
150	Silver Maple	*Acer saccharinum*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
151	Crack Willow	*Salix euxina*	37	27	13	21	0	0	0.5	Fair	Fair	Fair	Removal	3	
152	White Elm	*Ulmus americana*	28	28	0	0	0	0	1	Good	Good	Good	Removal	2	
153	Crack Willow	*Salix euxina*	12	12	0	0	0	0	0.5	Good	Good	Good	Removal	1	
154	Crack Willow	*Salix euxina*	47	42	21	0	0	0	1	Good	Good	Good	Removal	3	
155	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
156	Crack Willow	*Salix euxina*	33	33	0	0	0	0	0.5	Good	Good	Good	Removal	2	
157	Siberian Elm	*Ulmus pumila*	34	34	0	0	0	0	1.5	Good	Good	Good	Removal	2	
158	Crack Willow	*Salix euxina*	94	56	49	43	38	0	3	Good	Fair	Good	Removal	5	
159	Crack Willow	*Salix euxina*	95	48	49	42	37	34	6	Good	Good	Good	Removal	5	
160	Crack Willow	*Salix euxina*	118	92	56	47	0	0	4	Fair	Poor	Fair	Removal	0	
161	Silver Maple	*Acer saccharinum*	39	27	22	18	0	0	2	Good	Good	Good	Removal	3	
162	Crack Willow	*Salix euxina*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	2	
163	Crack Willow	*Salix euxina*	72	72	0	0	0	0	5	Fair	Fair	Fair	Removal	5	
164	Crack Willow	*Salix euxina*	93	93	0	0	0	0	1.5	Fair	Poor	Poor	Removal	0	
165	Crack Willow	*Salix euxina*	88	88	0	0	0	0	1.5	Poor	Poor	Poor	Removal	0	Heavily cracked and broken. Little live growth.
166	Crack Willow	*Salix euxina*	37	28	24	0	0	0	1.5	Poor	Poor	Poor	Removal	0	Main bike fallen. All growth from lateral branches from fallen tree
167	Crack Willow	*Salix euxina*	47	47	0	0	0	0	1	Fair	Poor	Poor	Removal	0	Mostly cracked, broken and decaying
168	Crack Willow	*Salix euxina*	24	14	19	0	0	0	0.5	Poor	Poor	Poor	Removal	0	
169	Siberian Elm	*Ulmus pumila*	38	38	0	0	0	0	0.5	Fair	Fair	Fair	Removal	3	
170	Siberian Elm	*Ulmus pumila*	35	35	0	0	0	0	0.5	Good	Good	Good	Removal	2	
171	Siberian Elm	*Ulmus pumila*	42	28	21	23	0	0	1	Good	Good	Good	Removal	3	
172	Siberian Elm	*Ulmus pumila*	24	24	0	0	0	0	0.5	Fair	Fair	Fair	Removal	2	
173	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	0.5	Fair	Fair	Fair	Removal	2	
174	White Spruce	*Picea glauca*	46	46	0	0	0	0	1	Good	Good	Good	Removal	3	
175	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	0.5	Poor	Poor	Poor	Removal	0	
176	Common Apple	*Malus pumila*	39	22	28	16	0	0	1.5	Good	Good	Good	Removal	3	
177	Crack Willow	*Salix euxina*	76	53	28	33	33	0	1.5	Fair	Fair	Fair	Removal	5	
178	Siberian Elm	*Ulmus pumila*	36	28	22	0	0	0	1.5	Good	Good	Good	Removal	3	
179	Siberian Elm	*Ulmus pumila*	17	17	0	0	0	0	0.5	Good	Good	Good	Removal	1	
180	Crack Willow	*Salix euxina*	125	125	0	0	0	0	2	Good	Good	Good	Removal	5	
181	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	1	Good	Good	Good	Removal	2	
182	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Fair	Fair	Fair	Removal	1	
183	Norway Maple	*Acer platanoides*	32	32	0	0	0	0	4	Good	Good	Good	Removal	2	
184	Siberian Elm	*Ulmus pumila*	27	27	0	0	0	0	1.5	Good	Good	Good	Removal	2	
185	Siberian Elm	*Ulmus pumila*	31	31	0	0	0	0	1	Good	Good	Good	Removal	2	
186	Siberian Elm	*Ulmus pumila*	11	11	0	0	0	0	0.5	Good	Good	Good	Removal	1	
187	Siberian Elm	*Ulmus pumila*	13	13	0	0	0	0	0.5	Good	Good	Good	Removal	1	
188	Siberian Elm	*Ulmus pumila*	26	26	0	0	0	0	0.5	Good	Good	Good	Removal	2	
189	Silver Maple	*Acer saccharinum*	43	43	0	0	0	0	1.5	Good	Good	Good	Removal	3	
190	Crack Willow	*Salix euxina*	65	65	0	0	0	0	1.5	Poor	Poor	Poor	Removal	0	
191	Silver Maple	*Acer saccharinum*	37	32	19	0	0	0	1.5	Good	Good	Good	Removal	3	
192	Silver Maple	*Acer saccharinum*	44	44	0	0	0	0	2	Good	Good	Good	Removal	3	
193	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	1.5	Good	Good	Good	Removal	1	
194	Crack Willow	*Salix euxina*	46	46	0	0	0	0	1.5	Good	Good	Good	Removal	3	
195	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
196	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Good	Good	Removal	1	
197	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
198	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	1	Good	Good	Good	Removal	2	
199	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	1	Good	Good	Good	Removal	1	

Table 1: Tree Assessment

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH^1 (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius/ TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Number of Compensation Trees	Notes
200	Siberian Elm	*Ulmus pumila*	14	14	0	0	0	0	1	Good	Good	Good	Removal	1	
240	White Spruce	*Picea glauca*	29	29	0	0	0	0	2	Good	Good	Good	Removal	2	
500	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
501	White Spruce	*Picea glauca*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	1	
502	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	2	Good	Good	Good	Removal	1	
503	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	1	
504	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
505	White Spruce	*Picea glauca*	34	25	23	0	0	0	1.5	Good	Good	Good	Removal	2	
506	Eastern White Cedar	*Thuja occidentalis*	20	20	0	0	0	0	1.5	Good	Good	Good	Removal	1	
507	White Spruce	*Picea glauca*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
508	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	1	
509	Black Locust	*Robinia pseudoacacia*	22	22	0	0	0	0	1	Good	Good	Good	Removal	2	
510	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
511	White Spruce	*Picea glauca*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	2	
512	Eastern White Cedar	*Thuja occidentalis*	28	28	0	0	0	0	2	Good	Good	Good	Removal	2	
513	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	1	
514	Black Locust	*Robinia pseudoacacia*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	1	
515	Manitoba Maple	*Acer negundo*	19	14	13	0	0	0	2.5	Good	Fair	Fair	Removal	1	On lean
516	White Spruce	*Picea glauca*	20	20	0	0	0	0	1	Good	Good	Good	Removal	1	
517	Black Locust	*Robinia pseudoacacia*	13	13	0	0	0	0	2	Good	Good	Good	Removal	1	
518	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
519	Black Locust	*Robinia pseudoacacia*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
520	Manitoba Maple	*Acer negundo*	25	17	15	10	0	0	1	Good	Fair	Fair	Removal	2	Multiple stems, on lean
521	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1	Good	Good	Good	Removal	1	
522	Black Locust	*Robinia pseudoacacia*	17	17	0	0	0	0	1.5	Good	Good	Good	Removal	1	
523	White Spruce	*Picea glauca*	23	23	0	0	0	0	1.5	Good	Good	Good	Removal	2	
524	Eastern White Cedar	*Thuja occidentalis*	22	22	0	0	0	0	1.5	Good	Good	Good	Removal	2	
525	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	2	Good	Good	Good	Removal	1	
526	Crack Willow	*Salix euxina*	120	120	0	0	0	0	2	Poor	Poor	Poor	Removal	0	Dead and broken leaders, missing bark
528	Siberian Elm	*Ulmus pumila*	22	22	0	0	0	0	2	Good	Good	Good	Removal	2	
529	Crack Willow	*Salix euxina*	70	70	0	0	0	0	2.5	Good	Good	Good	Removal	5	
530	Crack Willow	*Salix euxina*	110	110	0	0	0	0	5	Poor	Poor	Poor	Removal	0	Dead and broken leaders, missing bark, cavities
531	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	2	Good	Good	Good	Removal	1	
532	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
533	Siberian Elm	*Ulmus pumila*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	1	
534	Crack Willow	*Salix euxina*	81	80	15	0	0	0	2	Poor	Poor	Poor	Removal	0	Main stem severely bent and split, one live regenerating stem
535	Common Pear	*Pyrus communis*	21	21	0	0	0	0	2	Good	Good	Good	Removal	2	
536	Crack Willow	*Salix euxina*	50	50	0	0	0	0	2.5	Poor	Poor	Poor	Removal	0	On lean, dead leaders and limb, cavity in stem, stem split
537	Crack Willow	*Salix euxina*	50	50	0	0	0	0	3	Poor	Poor	Poor	Removal	0	On lean, dead limb, cavity in stem, stem split
538	Siberian Elm	*Ulmus pumila*	45	45	0	0	0	0	2	Good	Good	Good	Removal	3	
539	Crack Willow	*Salix euxina*	22	22	0	0	0	0	2	Good	Good	Good	Removal	2	
540	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	2	
541	Siberian Elm	*Ulmus pumila*	23	23	0	0	0	0	2	Good	Good	Good	Removal	2	
542	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Good	Good	Good	Removal	1	
543	Siberian Elm	*Ulmus pumila*	45	45	0	0	0	0	2	Good	Good	Good	Removal	3	
544	Siberian Elm	*Ulmus pumila*	25	25	0	0	0	0	2	Good	Good	Good	Removal	2	
545	Siberian Elm	*Ulmus pumila*	18	18	0	0	0	0	2	Fair	Good	Fair	Removal	1	Epicormic branches
546	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Fair	Good	Fair	Removal	1	Epicormic branches
547	Siberian Elm	*Ulmus pumila*	20	20	0	0	0	0	2	Fair	Good	Fair	Removal	1	Epicormic branches
548	Crack Willow	*Salix euxina*	80	80	0	0	0	0	2	Poor	Poor	Poor	Removal	0	On lean, dead and broken leaders, missing bark, open wound
549	Siberian Elm	*Ulmus pumila*	30	30	0	0	0	0	2	Good	Fair	Fair	Removal	2	On lean
550	Crack Willow	*Salix euxina*	70	70	0	0	0	0	2	Poor	Poor	Poor	Removal	0	On lean, dead and broken leaders, stem split open
551	Crack Willow	*Salix euxina*	70	70	0	0	0	0	4	Poor	Poor	Poor	Removal	0	Dead and broken leaders, stem split open
552	Crack Willow	*Salix euxina*	90	90	0	0	0	0	1	Poor	Poor	Poor	Removal	0	Most of stem and crown missing, some live limbs
553	Manitoba Maple	*Acer negundo*	18	18	0	0	0	0	2	Good	Good	Good	Removal	1	
554	Silver Maple	*Acer saccharinum*	22	12	11	11	10	0	2	Good	Fair	Fair	Removal	2	Multiple stems
555	Cottonwood	*Populus deltoides*	30	30	0	0	0	0	2	Good	Good	Good	Removal	2	
602	White Spruce	*Picea glauca*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	2	
603	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
604	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1	Good	Good	Good	Removal	1	
605	White Spruce	*Picea glauca*	10	10	0	0	0	0	1	Good	Good	Good	Removal	1	
606	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Fair	Fair	Removal	1	On lean
607	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1	Good	Fair	Fair	Removal	1	On lean
608	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Fair	Fair	Removal	1	On lean
609	White Spruce	*Picea glauca*	30	30	0	0	0	0	1.5	Good	Good	Good	Removal	2	
610	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	1	On lean

Tree ID Number	Species Common Name	Species Scientific Name	Multi-stem DBH[1] (cm)	Stem 1 DBH (cm)	Stem 2 DBH (cm)	Stem 3 DBH (cm)	Stem 4 DBH (cm)	Stem 5 DBH (cm)	Crown Radius/ TPZ (m)	Biological Health	Structural Health	Overall Health	Recommended Action	Number of Compensation Trees	Notes
611	Manitoba Maple	*Acer negundo*	10	10	0	0	0	0	1	Good	Good	Good	Removal	1	
612	Manitoba Maple	*Acer negundo*	16	16	0	0	0	0	1.5	Good	Fair	Fair	Removal	1	On lean
613	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	1	On lean
614	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	3	Good	Fair	Fair	Removal	1	On lean
615	Manitoba Maple	*Acer negundo*	24	17	17	0	0	0	3	Good	Fair	Fair	Removal	2	On lean, codominant stems
616	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
617	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Good	Good	Removal	2	
618	Manitoba Maple	*Acer negundo*	16	12	10	0	0	0	1.5	Fair	Fair	Fair	Removal	1	Dead limb, missing bark
619	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
620	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Good	Good	Removal	1	
621	White Spruce	*Picea glauca*	23	23	0	0	0	0	1	Good	Good	Good	Removal	2	
622	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	1.5	Good	Good	Good	Removal	1	
623	Manitoba Maple	*Acer negundo*	22	22	0	0	0	0	2	Good	Fair	Fair	Removal	2	On lean
624	Manitoba Maple	*Acer negundo*	15	15	0	0	0	0	1.5	Good	Fair	Fair	Removal	1	On lean
625	Eastern White Cedar	*Thuja occidentalis*	18	18	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
626	Eastern White Cedar	*Thuja occidentalis*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
627	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Good	Good	Removal	2	
628	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	2	Good	Good	Good	Removal	1	
629	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Good	Good	Removal	1	
630	Eastern White Cedar	*Thuja occidentalis*	31	22	18	12	0	0	2	Good	Fair	Fair	Removal	2	On lean
631	Eastern White Cedar	*Thuja occidentalis*	30	30	0	0	0	0	2	Good	Fair	Fair	Removal	2	On lean
632	Manitoba Maple	*Acer negundo*	13	13	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
633	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
634	Eastern White Cedar	*Thuja occidentalis*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	1	On lean
635	Eastern White Cedar	*Thuja occidentalis*	23	15	14	10	0	0	2	Good	Fair	Fair	Removal	2	Rubbing against tree 634, multiple stems
636	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	2	Good	Fair	Fair	Removal	1	Rubbing against tree 635
637	Manitoba Maple	*Acer negundo*	27	27	0	0	0	0	2	Good	Good	Good	Removal	2	DBH approximate
638	Manitoba Maple	*Acer negundo*	12	12	0	0	0	0	1	Good	Good	Good	Removal	1	
639	Manitoba Maple	*Acer negundo*	11	11	0	0	0	0	1.5	Good	Good	Good	Removal	1	
640	Manitoba Maple	*Acer negundo*	28	20	20	0	0	0	1.5	Good	Fair	Fair	Removal	2	On lean, codominant stems
641	Manitoba Maple	*Acer negundo*	17	17	0	0	0	0	3.5	Fair	Fair	Fair	Removal	1	On lean
642	Manitoba Maple	*Acer negundo*	33	17	17	17	12	10	3.5	Fair	Fair	Fair	Removal	2	Suckering
643	Manitoba Maple	*Acer negundo*	16	12	10	0	0	0	3	Fair	Fair	Fair	Removal	1	Suckering
644	Silver Maple	*Acer saccharinum*	85	85	0	0	0	0	5	Good	Fair	Fair	Removal	5	Two stems (split above DBH), spreading limbs and branches
645	Manitoba Maple	*Acer negundo*	52	52	0	0	0	0	3	Good	Poor	Fair	Removal	0	Grown into fence, broken limb
646	Manitoba Maple	*Acer negundo*	75	75	0	0	0	0	3	Good	Fair	Fair	Removal	5	Codominant stems (split at DBH), knots in stem
647	Manitoba Maple	*Acer negundo*	57	45	35	0	0	0	3	Good	Poor	Fair	Removal	0	On lean, knots in stem, weak union
648	Manitoba Maple	*Acer negundo*	30	30	0	0	0	0	3	Good	Fair	Fair	Removal	2	On lean, knots in stem
649	Manitoba Maple	*Acer negundo*	46	22	22	28	13	13	4	Good	Fair	Fair	Removal	3	Multiple stems, twisted stems, limb rubbing with tree 650, dead limb

Table 2: Hedgerow Inventory

Hedgerow ID Number	Dominant Species Common Name	Dominant Species Scientific Name	Stem Count	Size (DBH)	Overall Health	Recommended Action
HR1	Blue Spruce and Austrian Pine	*Picea pungens & Pinus nigra*	9	10-20 cm	Good	Preservation
HR2	White Spruce	*Picea glauca*	6	10-30 cm	Good	Preservation
HR3	Norway Spruce	*Picea abies*	18	25-50 cm	Good	Removal
HR4	Norway Spruce	*Picea abies*	10	25-50 cm	Good	Removal
HR5	Siberian Elm	*Ulmus pumila*	8	10-30 cm	Good	Removal