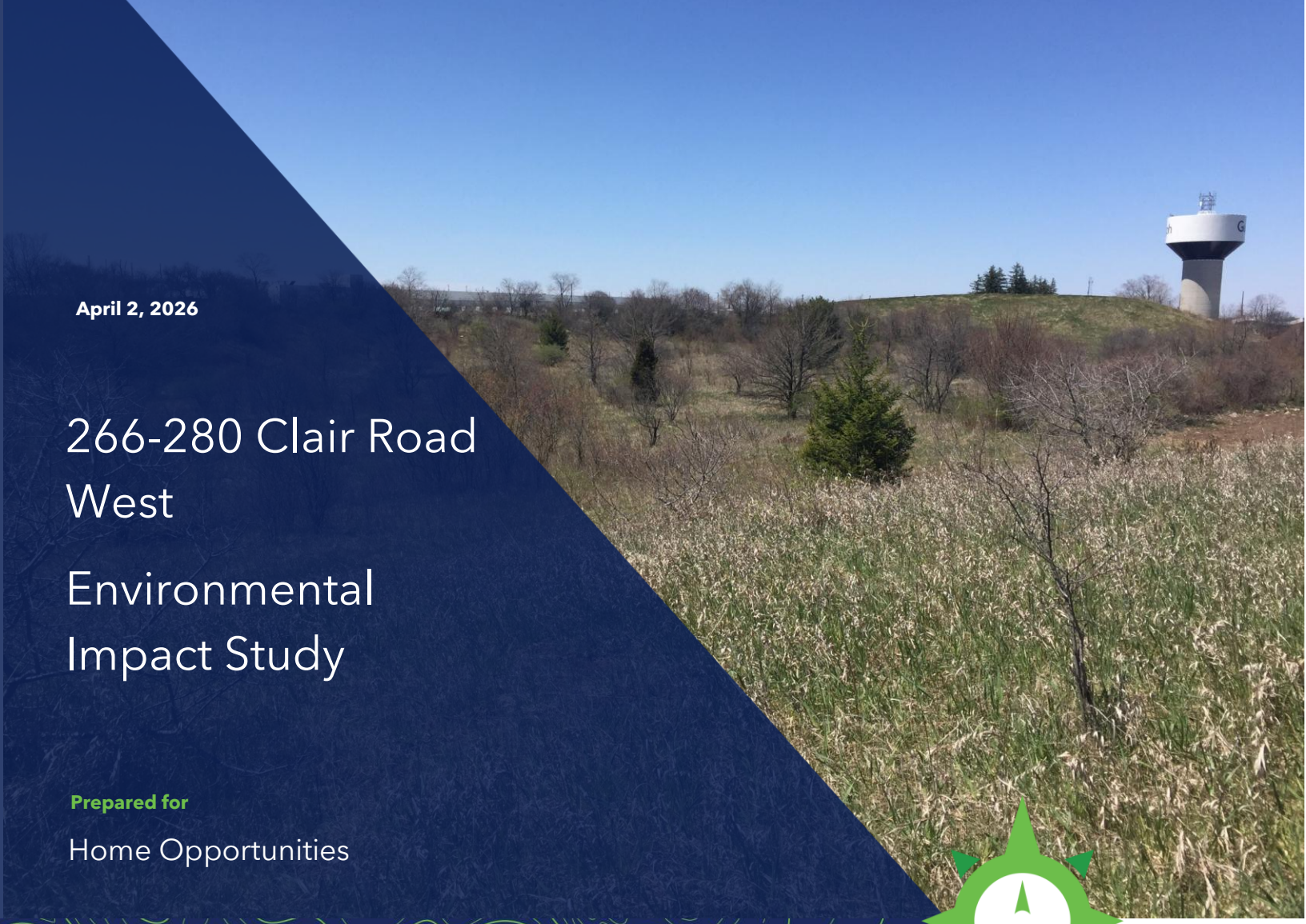

April 2, 2026

266-280 Clair Road West

Environmental Impact Study

Prepared for

Home Opportunities

north-south ENVIRONMENTAL

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1. Introduction

1.1. Study Area and Site Context

North-South Environmental Inc. (NSE) has been retained by Home Opportunities to complete an Environmental Impact Study (EIS) to assess the impact of a proposed residential development at 266-280 Clair Road West (herein referred to as "280 Clair Road West"), located in the southeastern section of the City of Guelph ('the City'), on the southeast side of Clair Road, in between Gordon Road and Highway 6. The 'subject property' is comprised of the privately-owned land parcels at 280 Clair Road, as well as two smaller City-owned parcels at 266 Clair Road (**Figure 1** in **Appendix 1**). The subject property is approximately 8.7 ha and is currently composed of three small agricultural fields, hedgerows, and early successional / cultural vegetation communities.

The requirement for an Environmental Impact Study (EIS) at this location is triggered by the presence of the following environmental features adjacent (within 120 m) to the subject property (based on the City of Guelph Official Plan Schedules):

- Ecological Linkage; and
- Significant portion of the Paris-Galt Moraine (Significant Landform)

In accordance with the City of Guelph Official Plan (OP), development is not permitted on lands adjacent to natural heritage features and areas, unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated through an EIS that there will be no negative impacts on the natural features or on their ecological functions. The subject property and adjacent lands, defined as lands within 120 m of the subject property, represent the study area (**Figure 1** in **Appendix 1**).

1.2. Agency Consultation

A draft Terms of Reference (TOR) for this EIS was submitted to the City on September 11, 2024. After initial comments were received on September 18, 2024, the final TOR was confirmed in consultation with the City. The approved TOR and the associated communication with the City are included in **Appendix 2**. First submission of the EIS was completed on November 28, 2024. Following the first submission comments were received from the City's Environmental Planning Department on February 21, 2025. Further comments were received regarding the EIS on November 28, 2025, after the city received the Planning Justification Report (July 2025). Comments provided by the City received on February 21, 2025, and November 28, 2025, are included in **Appendix 2**. NSE has provided responses to the City's comments to facilitate review of the EIS in a comment-response matrix included in **Appendix 2**.

Consultation with the Ministry of the Environment, Conservation, and Parks (MECP) had been initiated.

NSE submitted an Information Gathering Form (IGF) on June 17, 2025; initial comments were provided by the MECP on September 16, 2025. NSE recently received a letter from the MECP on March 30, 2026 related to the enactment of the Species Conservation Act (**Appendix 2)**.

Note that a separate Tree Inventory and Preservation Report has been prepared by NSE and submitted concurrently with this EIS.

2. Regulatory and Planning Context

Federal and provincial legislation, and provincial and municipal plans guide development on the subject lands that are described below and will form the basis upon which legislative and policy recommendations and conclusions will be made.

2.1. Federal Legislation

2.1.1. Species at Risk Act

2.1.1.1. Policy Overview

The federal *Species at Risk Act* (SARA, 2002) provides legal protection for federally listed SAR on federally owned lands; for aquatic species; and for any federally listed SAR anywhere they occur (including private lands, provincial and territorial lands) when the species is also protected by the MBCA. Species and habitat of species listed on Schedule 1 of SARA are protected from harm or destruction. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recommends species to be listed on Schedule 1 of SARA.

2.1.1.2. Relevance to the Study Area

The Subject Property does not include any federal lands. Presence of bird species protected under the MBCA and listed under SARA would trigger potential approvals and/or permitting under SARA. No aquatic habitat is present within the study area, therefore, protections afforded to aquatic SAR are not relevant.

2.1.2. Fisheries Act

2.1.2.1. Policy Overview

The *Fisheries Act* (1985) is in place to maintain healthy, sustainable and productive Canadian fisheries through the prevention of pollution, and the protection of fish and their habitat. and applies to all Canadian freshwater and marine fisheries waters. The *Fisheries Act* defines fish habitat as *"spawning grounds and other areas, including nursery, rearing, food supply and mitigation areas, on which fish depend directly or indirectly in order to carry out their life processes"* [subsection (2)1].

Under the current iteration of the Act, 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 2019). Protection provisions for fish and fish habitat exist in the form of standards, codes of practice, and guidelines for projects in and near water. These provide guidance on how to avoid and mitigate impacts to fish and fish habitat and comply with the *Fisheries Act* to avoid causing the death of a fish or HADD of fish habitat from your work, undertaking or activity.

The federal *Fisheries Act* regulates the harm and destruction of fish and fish habitat in Canadian waterways. Under the *Fisheries Act*, certain work, undertakings or activities taking place in or near water that occur within or near water may require review or authorization from the Department of Fisheries and Oceans (DFO). The DFO encourages proponents to implement measures to avoid impacts to fish and fish habitat. If avoidance is not possible, the DFO recommends mitigating impacts to fish and fish habitat and has prepared codes of practice for common works, undertakings and activities.

2.1.2.2. Relevance to the Study Area

No fish habitat is present. Consultation with the DFO is not required.

2.1.3. Migratory Birds Convention Act

2.1.3.1. Policy Overview

The *Migratory Birds Convention Act* (MBCA 1994) and *Migratory Birds Regulations*, (MBR 2022) protect most species of migratory birds and their nests and eggs. Under the MBR, it is prohibited to damage, destroy, disturb or remove migratory bird nests when they contain a live bird or viable egg and prohibit the deposit of harmful substances in waters and areas frequented by migratory birds.

For 18 species of migratory birds identified on Schedule 1, the MBR provides year-round nest protection until they can be deemed abandoned. Schedule 1 includes certain migratory birds who either re-use their own nests from one year to the next (colonial species), or whose nests are commonly re-used by other species of migratory bird species, like Pileated Woodpeckers. If the nest of a Schedule 1 species has not been occupied by a migratory bird for the entirety of the waiting time indicated in the MBR 2022, it is considered to be abandoned, and no longer has high conservation value for migratory birds.

2.1.3.2. Relevance to the Study Area

Bird species protected under the MBCA are known to use the study area. Avoidance and mitigation measures are required to avoid contravening the MBCA and its Regulations. Recommendations are provided in **Section 8**.

2.2. Provincial Legislation

2.2.1. Species Conservation Act (2025)

2.2.1.1. Overview

The *Species Conservation Act* (SCA; 2025) protects Species at Risk (SAR) and their habitats in Ontario. The SCA came into effect on March 30, 2026. The SCA identifies the purposes of the Act are to:

a) to identify species at risk based on the best available scientific information, including information obtained from community knowledge and Indigenous traditional knowledge; and
b) to provide for the protection and conservation of species while taking into account social and economic considerations, including the need for sustainable economic growth in Ontario.

Section 16 of the SCA prohibits any activity that results or is likely to result in:

a) the killing, harming, capturing or taking of a member of a species that is listed on the Protected Species in Ontario List, or
b) damage to or destruction of the habitat of a species that is listed on the Protected Species in Ontario List

The SCA follows a registration first approach to species on the Protected Species in Ontario List (O. Reg. 60/26). Section 16 activities are considered registerable activities except for those prescribed for the purpose of section 16 (2) which require a permit. Persons engaging in registered activities will be required to register their activities and follow the rules set out in O. Reg. 75/26. Accepted activities are those that can go ahead without registration or without a permit as per O. Reg. 61/26.

Should species listed in the Protected Species in Ontario List be encountered, impacts to the species or its habitat can be avoided or mitigated through a number of avenues. These include avoidance (e.g., through design modifications or timing of works), by registering the activity with the province, or by obtaining an Overall Benefit Permit.

2.2.1.2. Relevance to the Study Area

Species that are protected under the SCA have potential to occur within the study area. This is further discussed in **Section 5.2**.

2.2.2. Provincial Planning Statement (2024)

2.2.2.1. Policy Overview

The Provincial Planning Statement (PPS; 2024), was issued pursuant to the *Planning Act*. All municipal decisions must be consistent with the PPS.

Section 4 provides direction for the wise use and management of resources, including the protection of natural areas and features. Natural heritage policies are described in Section 4.1.

Section 4.1.1 states that "natural features and areas shall be protected for the long term."

Section 4.1.2 of the PPS outlines protection needs related to biodiversity and connectivity, including protection of both ecological features and function required to maintain biodiversity and functional ecological connectivity.

Section 4.1.4 lists significant natural heritage features where development and site alteration are not permitted, including:

- Significant wetlands in Ecoregions 5E, 6E and 7E, and
- Significant coastal wetlands.

Section 4.1.5 lists significant natural heritage features where development and site alteration are not permitted, unless it has been demonstrated that there will be no *negative impact* on the natural features or their *ecological functions*, including:

- Significant woodlands in Ecoregions 6E and 7E,
- Significant valleylands in Ecoregions 6E and 7E,
- Significant wildlife habitat,
- Significant areas of natural and scientific interest (ANSI), and
- Coastal wetlands in Ecoregion 5E, 6E and 7E (that are not subject to policy 4.1.4)

Section 4.1.7 states that development and site alteration shall not be permitted in habitat of endangered and threatened species, except in accordance with provincial and federal requirements.

Section 4.1.8 states that development and site alteration are not permitted on adjacent lands to the natural heritage features and areas identified in policies 4.1.4, 4.1.5, and 4.1.6 (fish habitat) unless the *ecological function* of the adjacent lands has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions*.

2.2.2.2. Relevance to the Study Area

The following features are absent: significant wetland, significant coastal wetland, non-significant coastal wetland, significant woodland, significant valleyland, significant areas of natural and scientific interest, and fish habitat.

The following features are present: habitat of endangered and threatened species (Eastern Meadowlark – Confirmed; SAR bats – Candidate [potentially present]).

Habitat for endangered and threatened species are discussed in **Section 5.2**.

2.2.3. Clean Water Act (2006)

2.2.3.1. Policy Overview

Ontario's *Clean Water Act* affords protection to source drinking water in Ontario by granting regulatory authority to Source Protection Committees through the creation of Source Protection Plans (SPPs). Source water in the Grand River watershed is protected by the policies in the Grand River SPP prepared by the Lake Erie Source Protection Region (2021).

2.2.3.2. Relevance to the Study Area

The subject property is located within a Wellhead Protection Area (WHPA) and development on site must therefore adhere to the relevant policies within the Grand River SPP. The proposed development is residential and does not fall under restricted land uses within the Grand River SPP.

2.2.4. Conservation Authorities Act

2.2.4.1. Policy Overview

In Ontario, conservation authorities (CA's) develop and deliver resource management programs that safeguard watersheds. They are governed by the *Conservation Authorities Act* (1990), which is administered by the MNRF. The purpose of this Act is to provide for the organization and delivery of programs and services that further the conservation, restoration, development, and management of natural resources in watersheds in Ontario.

The Grand River Conservation Authority (GRCA) has the responsibility to regulate activities in natural and hazardous areas (i.e., streams, floodplains, wetlands, areas in and near rivers, slopes and a lakes shoreline), or in proximity to these areas. Previous to April 1, 2024, GRCA's regulation was O. Reg 150/06, issued under the *Conservation Authorities Act*. As of April 1, 2024, the regulation for all of Ontario's CA's is O. Reg 41/24.

Under O. Reg 41/24, any development or site alteration within a regulated area requires a permit from the local conservation authority. The regulated area limit ('regulation limit') is a 30 m setback from regulated wetlands. The regulated area limit along stream valleys is variable and depends on site characteristics (e.g., floodplain extent, meander belt extent).

Per Section 28.1 (1) of the *Conservation Authorities Act*:

> *A Conservation Authority may issue a permit to a person to engage in an activity that would otherwise be prohibited, if, in the opinion of the authority,*
>
> *a) the activity is not likely to affect the control of flooding, erosion, dynamic beaches, or unstable soil or bedrock;*

b) the activity is not likely to create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property; and

c) *any other requirements that may be prescribed by the regulations are met.*

2.2.4.2. Relevance to the Study Area

The subject property is fully outside of the GRCA mapped regulated area. No wetlands are present in the study area. A permit from GRCA is not required.

2.3. Municipal Policies

2.3.1. City of Guelph Official Plan (February 2022 Consolidation)

2.3.1.1. Policy Overview

The City's Official Plan (OP) provides direction on matters of municipal interest, such as Natural Heritage policies for protection of natural features under Section 4.1. The policies under Section 4.1 "aim to strike a balance between protection of the Natural Heritage System and limited compatible development".

Adjacent lands "are those lands contiguous to a specific natural heritage feature or area where it is likely that development or site alteration would have a negative impact on the natural heritage feature or area". Development in Adjacent lands triggers the need for an EIS or other environmental assessment. Requirements related to buffers and adjacent lands, where applicable, are identified in Table 4.1 (under Section 4.1.1.11).

Section 4.1.2 describes the general permitted uses within the NHS and buffers. Generally, development and site alteration are not permitted within the NHS and buffers with some exceptions. Moreover, this section reiterates that permitted development adjacent to the NHS is required to demonstrate in an EIS (or other report) in consultation with applicable authorities that there will be no negative impact on the NHS and ecological and hydrological functions.

Section 4.1.3 describes objectives, criteria for designation and policies for Significant Natural Areas and their buffers, including Significant Landforms (Section 4.1.3.8) and Significant Wildlife Habitat (including Ecological Linkages) (Section 4.1.3.9).

Section 4.1.4 describes objectives, criteria for designation and policies for Natural Areas.

2.3.1.2. Relevance to the Study Area

Under the Guelph Official Plan, the subject property is mapped as Industrial and as Significant Natural Areas and Natural Areas on Schedule 2: Land Use Plan.

Natural heritage features present within or adjacent to the subject property include (as identified on the City's OP Schedules):

- Significant Natural Areas:
  - Ecological Linkage
  - Significant Landform (Significant Portions of the Paris-Galt Moraine)

The subject property is zoned as Industrial (B) and Natural Heritage System (NHS) under the City of Guelph Zoning By-law (2023)-20790.

3. Methodology

3.1. Background and Secondary Source Review

The background review includes the following sources:

- Background review of land designations (i.e., provincially significant wetlands (PSWs), Areas of Natural and Scientific Interest (ANSIs), etc.), land types and landforms, and Species at Risk (SAR) or locally significant species
  - Ministry of Natural Resources and Forestry (MNRF) /Natural Heritage Information Centre (NHIC) screening for Species At Risk (SAR) along with documented communications with appropriate governing agencies via Information Request
- Review of available background studies/reports
  - Soil Survey of Wellington County Ontario (Hoffman and Matthews 1963)
  - The Physiography of Southern Ontario, 3rd Ed. (Chapman and Putnam 1984)
  - City of Guelph Natural Heritage Strategy: Terrestrial Inventory & Natural Heritage System (Dougan & Associates and Snell & Cecile Environmental Research 2009)
  - City of Guelph Private Tree By-law 19058 (City of Guelph 2010)
  - Environmental Impact Study for 132 Clair Road (NSE 2015)
  - Clair-Maltby Secondary Plan and Master Environmental Servicing Plan Comprehensive Environmental Impact Study (Wood 2022)
- Review of online species atlases and records;
  - Atlas of the Breeding Birds of Ontario (OBBA 2007)
  - Ontario Reptile and Amphibian Atlas (Online)
  - eBird Canada (Online)
  - Ontario Butterfly Atlas (Online)
  - iNaturalist (Online)
- Review of technical guidance documents
  - Natural Heritage Reference Manual (OMNR 2010)
  - Significant Wildlife Habitat (SWH) Technical Guide (MNRF 2000)
  - Significant Wildlife Habitat (SWH) Criteria Schedules for Ecoregion 6E (MNRF 2015)

- City of Guelph Tree Technical Manual (2019)

3.2. Field Studies

3.2.1. Field Survey Dates

The following sections outline the methodology for the biological field program executed within the study area. **Table 1** summarizes the dates and survey types, and the staff involved with each visit. Location of surveys are illustrated on **Figure 2** in **Appendix 1**.

Table 1. Summary of Field Surveys, Timing, and Staff

Date	Time	NSE Staff	Purpose	Weather Conditions[1]
25 Oct 2019	-	Pauline Catling	Botanical Survey	NA
27 Apr 2020	11:30-13:45	Pauline Catling	Botanical Survey, Snake Survey	T=10-13˚C, W=1, C=10%
13 May 2020	11:45-15:05	Pauline Catling	Snake Survey	T=9-15˚C, W=2, C=0%
27 May 2020	06:20-08:40	Grace Pitman	Breeding Bird Survey, Snake Survey	T=18˚C, W=1, C=25%
29 June 2020	06:05-06:40	Sal Spitale	Breeding Bird Survey	T=20˚C, W=2, C=0%
11 August 2020	08:10-12:20	Izabela van Amelsvoort	Botanical Survey, Snake Survey	T=23˚C, W=1, C=15%
16, 18 September 2024	-	Devin Bettencourt, Patrick Strzalkowski	Tree Inventory	NA
April 30, 2025		Patrick Strzalkowski	Bat Maternity Habitat Assessment	NA
June 19, 2025	20:00-6:00 (Recording Period)	Patrick Strzalkowski	Bat Acoustic Monitor Deployment	NA
July 2, 2025	20:00-6:00 (Recording Period)	Patrick Strzalkowski	Bat Acoustic Monitor Retrieval	NA

1. T=Temperature; W=Wind (Beaufort Scale); C=Cloud Cover

3.2.2. Ecological Land Classification / Flora

A field visit on October 25, 2019, to define the vegetation community mapping (according to Ecological Land Classification [ELC] for Southern Ontario: First Approximation and Its Application (Lee et al. 1998), with the intent to confirm presence / absence of new features / communities.

Flora surveys were completed in the fall on October 25, 2019, in the spring on April 27, 2020, and in the summer on August 11, 2020.

3.2.3. Breeding Bird Surveys

Two breeding bird surveys were completed following Forest Bird Monitoring Program protocols (Konze and McLaren 1997). The surveys include an area search throughout the subject property using Breeding Bird Atlas protocols. In 2020, point counts at three stations within the subject property were conducted. Station 1 was in the northwest of the property, within the agricultural field, station 2 was in the cultural savannah, near the southern corner, and station 3 was in the cultural thicket, north of the eastern agricultural fields (**Figure 2** in **Appendix 1**). The surveys were completed within appropriate timing windows (first completed between May 24 and June 15 and second of these surveys completed no sooner than seven days from the first survey, between June 15 and July 10). Surveys were completed in the morning between a half-hour before sunrise and 10:00 am during suitable weather conditions. Actual dates and times of the surveys are shown in **Table 1**. Breeding evidence was evaluated using the following guidelines (OBBA 2001):

> "Possible breeding" is indicated by the presence of a singing male (or breeding calls heard) in suitable habitat or the presence of a bird observed in suitable breeding habitat in its breeding season.
>
> "Probable breeding" is defined as an observation of any of the following: (1) a pair in breeding season in suitable habitat, (2) permanent territory presumed through registration of territorial song on at least two days, a week or more apart, at the same place or (3) courtship or display between a male and a female or two males, including courtship feeding or copulation; visiting probable nest site; agitated behaviour or anxiety calls of an adult; brood patch on an adult female or cloacal protuberance on an adult male; nest building or excavation of a nest hole.
>
> "Confirmed breeding" is defined as observation of any of the following: (1) a distraction display or injury feigning; (2) used nest or egg shell found (occupied or laid within the period of the study); (3) recently fledged young or downy young, including young incapable of sustained flight; (4) adults entering or leaving nest site in circumstances indicating occupied nest (e.g., adult carrying fecal sac; adult carrying food for young), or (5) nest containing eggs, or nest with young seen or heard.

3.2.4. Reptile Surveys

Area searches for determining probable absence of reptiles were conducted according to MNRF Guelph District's Milksnake Survey Protocol (MNRF 2013). These surveys involved walking transects and actively searching for snake species by looking under and turning over potential cover objects by hand. Three surveys were conducted (at least two weeks apart) between April and late June (**Table 1**). Environmental conditions were documented as part of reptile surveys to demonstrate suitability of field days, sunny days when air temperature is between 8°C and 25°C or overcast days when air temperature is above 15°C.

All field surveys conducted involved recording of any incidental observation of reptiles.

3.2.5. Monarch and Yellow-banded Bumblebee Observations

The City of Guelph has noted the potential for Monarch (*Danaus plexippus*) and Yellow-banded Bumblebee (*Bombus terricola*) to occur on the subject property. Any incidental observations of Monarch were recorded and described during all field inventories. Patches of milkweed (*Asclepias syriaca*), host plants for Monarch, were noted during vegetation inventories.

Although no targeted surveys were proposed for the Yellow-banded Bumblebee, general observations of pollinator (including bumblebee) activity were noted during all field inventories.

3.2.6. Bat Habitat and Acoustic Monitoring

3.2.6.1. Bat Habitat Assessment

Bat habitat assessment data determines whether wooded features are candidate significant wildlife habitat (SWH) for bat maternity roosting or provide conditions favourable for SAR bats. The presence of a minimum snag density (10/ha) is considered an indicator of higher-quality bat maternity roost SWH.; SAR bat habitat, regardless of quality, is protected under the SCA, 2025.

The Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015) considers trees or snags at least 25 cm diameter-at-breast-height (DBH) in deciduous forests and swamps and mixed forests and swamps (i.e., ELC communities: FOD, FOM, SWD, SWM) suitable bat maternity colony habitat. The Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF 2017) considers any coniferous, deciduous, or mixed wooded ecosites, including treed swamps, that include trees at least 10 cm DBH should be considered suitable maternity roost habitat for SAR.

Surveys were conducted by applying MNRF guidelines for "Bats and Bat Habitats: Guidelines for Wind Power Projects" (MNR 2011), "MNRF Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis and Tri-Coloured Bat" (MNRF 2017), in combination with guidance from MECP.

Bat roost habitat (i.e., tree cavities, snags) surveys were completed in Cultural Savannah (CUS), and Cultural Thicket (CUT) communities within the Subject Lands. All trees equal to or greater than 10 cm DBH were visually inspected for suitable roost habitat on April 30, 2025 (leaf-off period). The location of each tree or snag containing suitable cavities, cracks, loose bark, and/or knot holes was recorded to determine number and placement of acoustic bat detectors.

3.2.6.2. Survey Conditions

MECP's Maternity Roost Survey (Forests/Woodlands) guideline document outlines proper procedures for performing bat maternity roost surveys within Ontario (MECP 2022). To confirm that bat maternity

roost habitat is absent within a woodland, ten suitable evenings of monitoring is required. Evenings begin sunset and continue for at least five hours. Evenings must be above 10˚C, with low winds (Beaufort Scale of 0-3), and without precipitation.

The closest weather station to the Subject Lands with hourly data was Guelph Turfgrass Institute (ID # 6143092). This station was approximately 5.75 km to the northwest of the Subject Lands.

3.2.6.3. Bat Acoustic Surveys

Survey station locations were selected based on the bat habitat assessment results. A total of three stations were identified on the Subject Lands Figure 5 (Appendix 1).

Acoustic surveys were conducted by applying protocols from MNR 2011, MNRF 2017 and general guidance from MECP. Passive acoustic recorders (Wildlife Acoustics Song Meter SM4BAT) were programmed to begin at sunrise and end recording at sunset, for a duration of approximately 8.5 hours. The recorders were deployed at sunset and sunrise, respectively for 10 consecutive evenings from June 19th to July 2nd, 2025. In addition, the SM4BAT passive recorder microphones were elevated approximately 2 m above the ground to reduce background noise and echo.

3.2.7. Incidental Wildlife

Incidental observations of all wildlife species (including mammals, birds, reptiles, amphibians, and insects) were recorded during all site visits.

3.2.8. Tree Inventory

A Tree Inventory and Tree Preservation Plan has been completed per the City of Guelph's Tree Technical Manual (2019). It has been provided under separate cover.

The Tree Inventory and Tree Preservation Plan includes:

- Inventory of all trees over 10 cm diameter at breast height (DBH), including size, form, species composition, health and risk assessment;
- Identify opportunities for transplanting smaller specimens of trees, where appropriate;
- Tree preservation plan specifying measures required for tree protection and monitoring during construction / development; and
- Measures for avoiding disturbance to any breeding birds during construction.

4. Characterization of the Natural Environment

This section of the EIS will describe the study area's biological and physical features. Two (2) levels of investigation will be used to describe different features, including (i) secondary sources (background review) as the primary source of information, and (ii) supplemental field inventories to confirm presence / absence of new features.

4.1. Past and Present Land Use, Adjacent Lands

A review of the earliest available aerial imagery, from 1954, shows that the subject property was two agricultural fields with a sparse hedgerow in between them. There were no natural vegetation communities present. All adjacent lands at this time were also agricultural fields (**Image 1**).

The subject property currently has three small agricultural fields, as well as a mix of cultural vegetation communities. There are no buildings on the property. Across Clair Road to the north of the subject property is single-family home subdivision. To the northeast is Bishop Macdonell Catholic High School, which includes several turfgrass football and soccer fields. To the east, the cultural savannah continues for about 150 m, and then there is Larry Pearson Park, which includes baseball diamonds, tennis courts and a playground. To the south, southwest, and west the cultural savannah also continues for about 150 m, where there is the start of an industrial area. A stormwater management pond occurs just southwest of the property. To the northwest there is a trail that follows the edge of a natural area and ecological linkage.

Image 1. Aerial Imagery of the Subject Property from 1954.

4.2. Physiography, Geology, and Soils

The subject property is located within a section of the physiographic region described as the Horseshoe Moraines (Chapman & Putnam 1984). The area has spillways which have resulted in broad

gravel and sand terraces and swampy floors. The area is very hilly, with sections of steep slopes and kettles. The subject property is located on Dumfries soil type, which is composed of a coarse, stony, sandy loam till, coming from predominantly limestone, dolostone, and red shale and is characterized as having good drainage and being 45 to 60 cm deep (Hoffman & Matthews 1963; Chapman & Putnam 1984).

The surficial geology of the subject property and surrounding area is mapped as glaciofluvial deposits (gravelly river deposits and delta topset facies) in the west to northwest, stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain in the south to southeast and ice-contact stratified deposits (sand and gravel, minor silt, clay and till) in the northeast (Ontario Geological Survey 2010; JLP 2024).

The southern part of the study area is located within the Paris-Galt Moraine area (JLP 2024).

4.3. Hydrology and Hydrogeology

The subject property area is located within the Ellis Creek-Speed River watershed and Hanlon Creek sub-watershed which eventually joins the Speed River. Regional groundwater flow in the area is in a northwest direction, towards the Speed River. It is expected that groundwater flow directions may vary locally from the regional flow directions due to various natural factors including local topography, submerged riverbeds, and engineering structures (JLP 2024).

According to the results of the groundwater level monitoring, the shallow groundwater flow direction across the subject property is interpreted to be varied from northwest to southwest, towards Hanlon Creek. The groundwater flow maps may need to be updated as groundwater monitoring progresses. A seasonal groundwater monitoring program is currently in progress at the subject property; groundwater monitoring has been ongoing since April 2024 (JLP 2024).

The estimated design infiltration rate based on infiltration rate testing for the subject property is 36 mm/hour (JLP 2024).

No wetlands occur on or within 120 m of the subject area. Closest mapped wetland is approximately 320 m to the southeast (Mill Creek Puslinch Wetland Complex).

The subject property is located within Wellhead Protection Area C, and within a mapped Significant Groundwater Recharge Area (with an unspecified vulnerability score). It is located outside the mapped highly vulnerable aquifer areas.

4.4. Aquatic and Fish Habitat

There are no surface water features present within the study area. There is no fish habitat present within the study area. The nearest surface water feature is a tributary of Hanlon Creek, which runs approximately 700 m northwest of the subject property.

4.5. Terrestrial Vegetation

4.5.1. Ecological Land Classification

Three natural vegetation communities and one anthropogenic community have been characterized and mapped according to Ecological Land Classification (ELC) protocols (Lee et al. 1998) (**Figure 2** in **Appendix 1**). Characterization of communities outside of the subject property is based on desktop review (not field verified). Vegetation communities include:

- Mineral Cultural Meadow Ecosite (CUM1)
- Mineral Cultural Thicket Ecosite (CUT1)
- Mineral Cultural Savannah Ecosite (CUS1)
- Agricultural Field (AGR)

4.5.1.1. Mineral Cultural Meadow Ecosite (CUM1)

There are two Cultural Meadows adjacent to the northern agricultural field. One field (0.75 ha) extends to the east, occurring on both the 280 Clair Road and 266 Clair Road parcels. The other extends west of the agricultural field (0.3 ha occurring on the subject property but extending further beyond the subject property). These two meadows have a low (2-10 m) and sparse (<10% cover) canopy layer of European Buckthorn (*Rhamnus cathartica*) and Staghorn Sumac (*Rhus typhina*). There are also very occasional Manitoba Maples (*Acer negundo*), Willows (*Salix* sp.), and Russian Olive (*Elaeagnus angustifolia*). The understorey is composed of European Buckthorn, Red Raspberry (*Rubus idaeus*), Riverbank Grape (*Vitis riparia*), and Mullein (*Verbascum thapsus*), 1-2 m tall and with 10% cover. The ground layer is dominated by Canada Goldenrod (*Solidago canadensis*) and Smooth Brome (*Bromus inermis*). Associate species include Queen Anne's Lace (*Daucus carota*), White Sweet-clover (*Melilotus albus*), Bull Thistle (*Cirsium vulgare*), Heath Aster (*Symphyotrichum ericoides*), Quackgrass (*Elymus repens*), and Tufted Vetch (*Vicia cracca*). The ground layer is dense, with greater than 60% cover and it includes vegetation less than 1 m tall.

4.5.1.2. Mineral Cultural Thicket Ecosite (CUT1)

The Cultural Thicket surrounds the larger of the two southern agricultural fields. It is 1.56 ha large. There is a sparse (<10% cover) of Manitoba Maple and American Basswood (*Tilia americana*), 10-25 m tall. The sub-canopy is dominated by shrubs, European Buckthorn, Tatarian Honeysuckle (*Lonicera tatarica*), and the occasional English Hawthorn (*Crataegus monogyna*). The shrubs in this layer are 2-10 m tall and cover more than 60% of the area. The understorey is also dominated by European Buckthorn and Tatarian Honeysuckle, Red-osier Dogwood (*Cornus sericea*) and European Red Currant (*Ribes rubrum*) are also present. This layer is 1-2 m tall and cover greater than 60% of the area. The most common species in the ground layer are Canada Goldenrod, Grey-stemmed Goldenrod (*Solidago nemoralis*), Early Goldenrod, New England Aster (*Symphyotrichum nova-angliae*), Viper's

Bugloss (*Echium vulgare*), Smooth Brome, and Kentucky Bluegrass (*Poa pratensis*). The ground layer is dense, cover greater than 60% of the area and it is less than 1 m tall.

4.5.1.3. Mineral Cultural Savannah (CUS1)

The Cultural Savannah is the largest natural community on the subject property, it is 3.36 ha (where it occurs on the subject property, occurring on both the 280 Clair Road and 266 Clair Road parcels) and extends onto adjacent lands to the southeast. The canopy is composed of scattered trees 10-25 m tall and with 25-35% cover. The common tree species include Common Apple (*Malus pumila*), Sugar Maple (*Acer saccharum*), Siberian Elm (*Fagus pumila*), American Beech (*Fagus grandiflora*), and Manitoba Maple. The subcanopy is composed of Siberian Elm, Manitoba Maple, American Ash (*Fraxinus americana*), and Riverbank Grape. The subcanopy is sparse (10-25% cover) and it is 2-10 m tall. The understorey is composed a variety of shrubs with sparse cover (10-25%) and they are 1-2 m tall. These shrubs include Tatarian Honeysuckle, Nannybery (*Viburnum lentago*), European Buckthorn, Red Raspberry, and Red-osier Dogwood. The ground layer is dense (>60% cover) with herbaceous species less than 1 m tall. These species include Smooth Brome, Kentucky Bluegrass, Grey-stemmed Goldenrod, Early Goldenrod, Heath Aster, Canada Goldenrod, Orange Hawkweed (*Pilosella aurantiaca*), Perennial Ryegrass (*Lolium perenne*), and Queen Anne's Lace.

4.5.2. Flora

Eighty-nine (89) flora species were recorded on the site, three of the species were only identified to the genus level (**Appendix 3, Table 1**). Of the species identified, 39 (45.3%) of the species are native, 47 (54.7%) are non-native. No SAR, provincially rare, or regionally rare (Riley 1989) species were noted on the site.

Due to the past and current disturbances of this property, many of the species are weedy and/or non-native, resulting in a low Floristic Quality Index (FQI) of 14.65 for all species and 21.22 for only native species. FQI is a measure of habitat specificity and the level of disturbance that species can tolerate (Oldham *et al.* 1995).

Black maple (*Acer nigrum*), which is considered significant within the City of Guelph was found within the subject property (on both the 280 Clair Road and 266 Clair Road parcels; **Figure 2** in **Appendix 1**). A total of ten Black Maples were recorded during the tree inventory, including nine above 10 cm DBH and one additional Black Maple under 10 cm DBH. This species is considered locally significant in Guelph (City of Guelph 2020). Early Goldenrod (*Solidago juncea*) was recorded in the cultural thicket and cultural savannah communities; this species is considered regionally rare in Wellington County (Frank and Anderson 2009).

4.5.3. Tree Inventory

A total of 365 trees above 10 cm DBH were surveyed, of which 308 occurred on the Subject Property and 57 appeared to occur as boundary / adjacent property trees. Of these, 69% are considered to be good to excellent health, 22% in fair health, and 10% poor, very poor or dead. The cumulative DBH of inventoried trees ranged from 10 to 79.5 cm. The largest single stemmed tree was a Black Cherry (*Prunus serotina*) with a DBH of 62 cm.

A total of 24 species were recorded during the tree inventory. The most abundant tree species were Scots Pine (*Pinus slyvestris*), Black Cherry, European Buckthorn, Common Pear (*Pyrus communis*) and Manitoba Mable.

For complete details of results, please refer to the Tree Inventory and Preservation Plan (NSE 2024).

4.6. Fauna

4.6.1. Birds

The breeding bird surveys recorded twenty-seven (27) species, with two more species recorded incidentally, for a total of twenty-nine (29) species (**Appendix 3, Table 2**). Of these species nine were recorded as probable breeding, twelve (12) as possible breeding, and eight (8) as observed (i.e., not likely breeding in the study area). No species were confirmed to be breeding due to a lack of visual evidence to confirm breeding. Nine (9) of the species recorded are locally significant in the City of Guelph and seven (7) are significant in Wellington County (**Table 2**).

Two (2) of the species are considered area sensitive, requiring larger tracts of habitat. These include Cooper's Hawk (*Accipiter cooperii*) and Eastern Meadowlark (*Sturnella magna*); however, only Eastern Meadowlark is expected to breed in the area due to the presence of suitable habitat.

Two SAR listed federally as Threatened (protected under the SARA): Eastern Meadowlark was recorded during both breeding bird surveys and is considered probably breeding in the study area (**Figure 2** in **Appendix 1**). Barn Swallow (*Hirundo rustica*) was recorded during both breeding bird surveys which suggests probable breeding evidence. However, no suitable nesting structure (e.g., building, culverts, bridges) are present on the subject property, as such it is using the study area for foraging.

Table 2 provides a list of regionally significant, area sensitive, and SAR breeding birds observed in the study area. These are also illustrated on **Figure 2** in **Appendix 1**.

Table 2. Regionally uncommon, area sensitive, or SAR breeding birds observed in the Study Area.

Scientific Name	Common Name	SARO[1]	SARA[2]	Wellington (regionally significant)	Guelph (locally significant)	Area Sensitive	Breeding Evidence[3]
Accipiter cooperii	Cooper's Hawk			X	X	TRUE	OB
Colaptes auratus	Northern Flicker			X	X		PO
Empidonax traillii	Willow Flycatcher			X	X		PR
Hirundo rustica	Barn Swallow		THR		X	FALSE	PO
Icterus galbula	Baltimore Oriole			X	X	FALSE	PO
Larus delawarensis	Ring-billed Gull			X	X	FALSE	OB
Spizella passerine	Field Sparrow			X	X	FALSE	PR
Sturnella magna	Eastern Meadowlark		THR	X	X	TRUE	PR
Tyrannus tyrannus	Eastern Kingbird				X	FALSE	PR

1. Species at Risk in Ontario, NAR=Not at Risk, SC=Special Concern, THR=Threatened; **2.** Species at Risk Act (federal), THR=Threatened; **3.** OB=Observed, no breeding evidence; PO=Possible, PR=Probable

4.6.2. Bats

4.6.2.1. Bat Habitat Assessment

A total of 34 trees were recorded to have potential bat habitat within Subject Lands. Summary data of trees with potential bat habitat is provide in **Table 1** of **Appendix 4**. Eight of the trees are considered poor quality habitat due to the presence of vines that cover the trunk or due to the marginal condition of the cavities, and other roost features. The locations of trees with potential bat habitat within the study area is illustrated on **Figure 3C** in **Appendix 1**.

4.6.2.2. Survey Weather

Acoustic recorders were deployed within the Subject Lands from the evening of June 19th to the morning of July 2nd, for a total of 12 evenings. Of those nights, five have been evaluated to be suitable (Error! Reference source not found. **of Appendix 4**). Nights that were unsuitable had a mean t emperature <10 ˚C, an average wind speed of >19 $km \cdot h^{-1}$, and/or precipitation. One of the evenings deemed suitable had rain within the first hour of the survey window. This means that the required five-hour survey window was still achieved and the evening is suitable.

4.6.2.1. Bat Acoustic Surveys

The bat acoustic recordings were analysed using Kaleidoscope software. Where possible, each recorded call was identified to species level. For those bat calls that could not be definitively identified to the species level, they were labeled as No ID.

Five bat species were identified within the Subject Lands:

- Eastern Red Bat (*Lasiurus borealis*) S4, endangered
- Hoary Bat (*Lasiurus cinereus*) S4, endangered
- Big Brown Bat (*Eptesicus fuscus*) S4, SWH indicator
- Silver-haired Bat (*Lasionycteris noctivagans*) S4, endangered
- Little Brown Myotis (*Myotis lucifugus*) S3, endangered

There were very few calls identified as Eastern Red Bat, as such these identifications are likely from infrequent foraging forays. It is unlikely that Eastern Red Bat is roosting within the study area. Three or more endangered bat species was recorded at all three acoustic recorders. Habitats where these recorders were deployed are considered SAR habitat. Additional details regarding endangered bat species and their habitat are discussed in more detail in **Section** Error! Reference source not found..

Detailed acoustic results are discussed for each of the eight stations in the list below and are summarised in **Table 3** within **Appendix 4**.

Recorder 2 was installed in a Cultural Savannah (CUS) adjacent to the Cultural Thicket (CUT), within the proposed development area. A total of 613 calls were recorded, and 425 of those calls could be identified to species: Big Brown Bat, Hoary Bat, Eastern Red Bat, and Silver-haired Bat.

Recorder 4 was installed in a Cultural Thicket (CUT), within the proposed development area. A total of 196 calls were recorded, and 140 of those calls could be identified to species: Big Brown Bat, Hoary Bat, Eastern Red Bat, Little Brown Myotis, and Silver-haired Bat.

Recorder 5 was installed in a Cultural Savannah (CUS) adjacent to the Cultural Meadow (CUM), within the proposed development area. A total of 1726 calls were recorded, and 1235 of those calls could be identified to species: Big Brown Bat, Hoary Bat, Eastern Red Bat, Little Brown Myotis, and Silver-haired Bat. Tricoloured Bat (*Perimyotis subflavus*) was also identified by Kaleidoscope Pro at the deployment location for ARU5; however, only two calls were noted. Based on the results of a Maximum Likelihood Estimation it is likely that these two calls were false positives (i.e., Tricoloured Bats are not present within the study area).

4.6.3. Reptile Surveys

No reptiles were observed incidentally or during any of the three surveys that were conducted.

4.6.4. Incidental Wildlife

Records of incidental wildlife were recorded during all site visits. The following five mammals were recorded during field surveys: Coyote (*Canis latrans*), Eastern Cottontail (*Sylvilagus floridanus*), Eastern Chipmunk (*Tamias striatus*), Northern Racoon (*Procyon lotor*), and White-tailed Deer (*Odocoileus virginianus*).

The following amphibians were recorded during field surveys: Spring Peeper (*Pseudacris crucifer*). One individual was recorded during the spring vegetation inventory in the cultural thicket community. The species is likely breeding in wetlands south of the subject property (320 m away).

The following insects were recorded during field surveys: Eastern Common Bumble Bee (*Bombus impatiens*) and Monarch.

Monarch is provincially listed as a Special Concern species and is considered locally significant within the City of Guelph. Although observed, Monarch is a habitat generalist. The study area does not provide critical habitat to support this species (no abundance of Milkweed plants).

4.7. Species at Risk (Threatened / Endangered)

Eastern Meadowlark (Threatened) was recorded during breeding bird surveys. Although available habitat is marginal due to the higher cover of shrubs and trees, Eastern Meadowlark can be found using savannah habitats where shrub and woody vegetation is below 35% cover (COSEWIC, 2013). As with many grassland bird species, the suitability of habitat for Eastern Meadowlark involves a combination of landscape and patch characteristics, where larger tracts of habitat are preferred over smaller fragments (COSEWIC, 2013). The minimum area required is estimated to be 5 ha (COSEWIC), Given the fragmented patch work of suitable habitat within the subject property, the species is likely breeding in the larger area of suitable habitat along the southern boundary of the subject property, and in cultural meadows west of the subject property.

Based on the results of the acoustic surveys, there is potential foraging habitat present for the four Endangered bat species listed below:

- Eastern Red Bat (*Lasiurus borealis*)
- Hoary Bat (*Lasiurus cinereus*)
- Silver-haired Bat (*Lasionycteris noctivagans*)
- Little Brown Myotis (*Myotis lucifugus*)

In addition, roost or maternity roost habitat may be present for Hoary Bat and Silver-haired Bat.

The quantity and frequency of the recorded calls indicate that foraging habitat is likely for Hoary Bat, Silver-haired Bat, and Little Brown Myotis. Eastern Red Bat was not recorded calling frequently and may be a transient forager.

The SAR screening table is attached as **Appendix 5**.

5. Evaluation of Significance, Constraints, and Buffers

5.1. Significant Areas of Natural and Scientific Interest (ANSI)

No Significant Areas of Natural and Scientific Interest (ANSIs) occur on or within 120 m of the subject property.

5.2. Habitat for Endangered and Threatened Species at Risk

As described in **Section 4.7**, Eastern Meadowlark (Threatened) was recorded during breeding bird surveys. Although available habitat on the subject property is marginal, the species likely utilizes habitat along the western and southern habitat areas within the study area and beyond.

It is likely that there is bat maternity roost habitat present within the cultural thicket and cultural savannah within the subject property, particularly within the portion of the cultural savannah at the northern corner of the proposed development area.

5.2.1. Policy Direction

5.2.1.1. Eastern Meadowlark

Eastern Meadowlark and their residence is protected by the SARA. A permit may be required for impacts to the habitat for Eastern Meadowlark in accordance with the SARA. Recognizing the federal government is responsible for reviewing and approving development that can adversely impact federally listed SAR and their habitat, it is recommended that the City make it a condition of approval that correspondence with Environment and Climate Change Canada (ECCC) be provided that confirms the proposed development is being undertaken in accordance with federal legislation, namely the SARA.

The nests of Eastern Meadowlark are also protected under the Migratory Bird Convention Act. Avoidance and mitigation measures are required to avoid contravening the MBCA and its Regulations.

5.2.1.2. Species at Risk Bats – Species Conservation Act

Roosting habitat of Endangered bat species is protected under the SCA. Under the SCA, activities that will adversely affect the habitat for SAR bats will require a registration of the activity. Prior to

undertaking the activity, the proponent will need to prepare a conservation plan, in accordance with Schedule 1 of the Act, prepared by a qualified professional. The conservation plan must be uploaded as part of the registration of the activity in the online Species Conservation Registry. The conservation plan will:

- Provide a clear description of the activity, timeline, and location (map included).
- Identification of affected species and habitats.
- Assessment of potential adverse effects during and after the activity.
- Detailed mitigation measures to reduce impacts as per Schedule 2 of the Act.
- Conservation measures if the activity will have residual adverse effects on species or their habitat, unless otherwise excepted, as outlined in Schedule 3 of the Act.

The conservation plan will also identify monitoring requirements to evaluate the effects of the activity on species and habitats outlined in their conservation plan, as well as the effectiveness of the mitigation measures and any observations of protected species. Monitoring is to continue until after the activity has ended and all mitigation or conservation measures have been implemented. Annual monitoring reports are to be prepared to summarize the previous year's monitoring results. If mitigation measures are found to be ineffective, actions must be taken to improve the effectiveness of the measures, and the conservation plans must be updated to reflect this.

5.3. Significant Wetlands

No wetlands occur on or within 120 m of the subject area. Closest mapped wetland is approximately 320 m to the southeast (Mill Creek Puslinch Wetland Complex).

5.4. Surface Water Features and Fish Habitat

There is no surface water present within the study area. There is no fish habitat present within the study area. The nearest surface water feature is a tributary of Hanlon Creek, which runs approximately 700 m northwest of the subject property.

5.5. Significant Woodlands

No woodlands or significant woodlands occur on or within 120 m of the subject property.

5.6. Significant Valleyland

No valleylands or significant valleylands occur on or within 120 m of the subject property.

5.7. Significant Landform

Although none occur within the subject property itself, a Significant Landform (Significant portion of the Paris-Galt Moraine) has been identified as bordering the southeast property boundary. Adjacent

Lands of the Significant Landform (which have a width 50 m adjacent to the feature) occur within the subject property (**Figure 3** in **Appendix 1**).

5.8. Significant Wildlife Habitat

A Significant Wildlife Habitat (SWH) assessment was completed by according to Ecoregion Criteria Schedules for Ecoregion 6E (MNRF 2015) and Appendix D of the City's EIS Guidelines. The study area does not contain any SWH in accordance with the Ecoregion Schedules (MNRF 2015).

In accordance with the City's EIS Guidelines, the following SWH types are present (**Figure 3** in **Appendix 1**):

Confirmed SWH:

- Ecological Linkage (discussed below in **Section 5.9**)

As discussed in Sections 4.6.2 and 4.7 bat maternity roost habitat is present within the subject property. However, no forested ecosites are present within the subject property, as such SWH for Bat Maternity Colonies is not present. Mitigation for the removal of any maternity roost trees will be addressed through adherence to timing windows for vegetation removal, planting of native trees and shrubs and the placement of rocket boxes. SWH Screening is presented in **Appendix 6**.

5.9. Ecological Linkage

In 2010, the City of Guelph adopted the Natural Heritage System Amendment per OPA 42. Through this amendment, a desktop study identified a 100 m-wide Ecological Linkage as running along the eastern boundary of the subject property (**Figure 3** in **Appendix 1**). The Ecological Linkage occupies approximately 4 ha of land on the subject property The mapping of the Ecological Linkage is currently overlain on an a cultural meadow , agricultural fields, cultural thicket, cultural savannah and a treed hedgerow. The agricultural fields and cultural meadow occupy approximately 1.7 ha of the Ecological Linkage. Throughout the Ecological Linkage, there were 306 trees over 10 cm dbh recorded during the tree inventory (documented in the Arborist Report prepared by NSE, November 2024). This equates to approximately 133 trees/ha within the cultural savannah, cultural thicket and treed hedgerow area.

The City's Official Plan policies (described below) allow for the realignment of a mapped Ecological Linkage in accordance with outlined conditions including maintaining functionality and connectivity.

The proposed development includes relocation of the Ecological Linkage to the western boundary of the subject property, as well as width refinement (**Figure 3** in **Appendix 1**).

5.9.1. Policy Direction

Section 4.1.3.9 of the City of Guelph Official Plan describes policies related to Ecological Linkages. *Ecological Linkages are a component of Significant Wildlife Habitat and are intended to facilitate the movement of flora and fauna between Significant Natural Areas and/or protected Habitat of Significant Species*.

5.9.1.1. Permitted Uses within an Ecological Linkage

Within this Section, policies 3, 5 and 10 identify permitted uses within Ecological Linkages.

> *(3) Development and site alteration shall not be permitted within Significant Wildlife Habitat (including Ecological Linkages) or the established buffers, where applicable, except for uses permitted by the General Permitted Uses of Section 4.1.2.*
>
> *(5) In addition to the General Permitted Uses of Section 4.1.2, the following additional uses may be permitted … subject to the requirements of 4.1.2.7 and 4.1.2.8, where it has been demonstrated through an EIS or EA … that there will be no negative impacts to the Significant Wildlife Habitat* [including Ecological Linkage] *or to its ecological functions:*
>
> *i) Essential linear infrastructure and their normal maintenance;*
>
> *ii) flood and erosion control facilities and their normal maintenance; and*
>
> *iii) water supply wells, underground water supply storage and associated small scale structures.*
>
> *(10) In addition to the General Permitted Uses of Section 4.1.2 and the policies in 4.1.3.9.5, the following uses may be permitted within Ecological Linkages, subject to the requirements under 4.1.2.8, where it has been demonstrated through an EIS or EA … that the functionality and connectivity of the Ecological Linkage will be maintained or enhanced:*
>
> *… ii) Essential transportation infrastructure and their normal maintenance; and*
>
> *iii) stormwater management facilities and structures and their normal maintenance.*

5.9.1.2. Policies Relating to Refinement of an Ecological Linkage

Policy 11 states: *The location of Ecological Linkages may be modified and/or width refined, without an amendment to this Plan provided it is demonstrated through an EIS or EA, to the satisfaction of the City, in consultation with the GRCA where appropriate, that:*

> *i) the Ecological Linkage is designed based on the most current conservation biology principles;*

ii) *proposed changes to the location or width of the Ecological Linkage will maintain or enhance functionality and connectivity between Significant Natural Areas and/or protected Habitat for Significant Species; and*

iii) *where a proposed refinement to the width of an Ecological Linkage would result in a width of less than 50 metres*" … conditions a through c must be satisfied.

Additional policies state:

(8) Ecological Linkages may incorporate lands that do not otherwise meet the criteria for protection in accordance with Significant Natural Areas or Natural Areas policies.

(9) Connectivity between Significant Natural Areas and/or protected Habitat for Significant Species shall be maintained, and where appropriate, enhanced, with Ecological Linkages.

5.9.2. Proposed Realignment

In 2010, the City of Guelph adopted the Natural Heritage System Amendment per OPA 42. Through this amendment, a desktop study identified a 100 m-wide ecological linkage as running along the eastern boundary of the subject property. The City's Official Plan policies (described above) allow for the realignment of a mapped Ecological Linkage in accordance with outlined conditions including maintaining functionality connectivity.

Environment Canada (2013) states, linkages and corridors designed to facilitate species movement between forested habitats should be between 50 and 100 m in width. This width is considered sufficient to facilitate the movement of forest-dwelling species (e.g., small and large mammals, birds and plants). Width may vary depending on length (shorter corridors may be narrower), and landscape scale (local linkages may be narrower than landscape-scale linkages). Literature identifies that linkages may be identified to correspond with / include existing natural areas, or areas which may be restored to a natural state.

In addition to landscape considerations, the form and function of the linkage should be designed in consideration of the target wildlife it is intended to support. The linkage on the subject property does not currently provide an ecological connection for amphibians moving between surface water features in proximity to each other (e.g., 240 m). From a broader landscape / natural heritage system perspective, the linkage could provide a connection for birds and mammals moving in a northwest-southeast direction between larger natural features and areas beyond the study area. Mammals currently utilizing the study area as a corridor between larger blocks of natural habitat likely include deer, coyotes, fox, and smaller mammals such as racoons, skunks, and opossums. As such, the form and function of the linkage should be designed to maintain refuge, foraging and cover for wildlife utilizing the linkage.

The proposed development includes relocation of the ecological linkage to the western boundary of the subject property, as well as width refinement from 100 m to 60 m (**Figure 3** in **Appendix 1**). North of Clair Road West, the linkage is recommended to be widened to the full available width (135 m) of the undeveloped property. Here, the linkage occurs between Residential land use to the east and Industrial land use to the west. South of Clair Road West, the linkage is proposed to be realigned along the western edge of the subject property and continue in a easterly direction through the southern property to connect with the Significant Natural Areas (the Natural Heritage System) to the south. This proposed realignment includes a width refinement to provide a 60 m wide linkage over a length of 616 m (450 m on the subject property with the remainder of the linkage south of the subject property). Functionally, where the linkage occurs adjacent to meadow and savannah communities, the natural area available to wildlife is wider than the 60 m wide ecological linkage designation illustrated on mapping. For example, the natural area immediately south of the subject property, at the rear of 950 Southgate Drive, provides greater than 250 m wide natural area which includes savannah associated with identified Significant Natural Areas. However, the mapped linkage illustrates the full length of the natural area to connect with another mapped Significant Natural Areas.

Where the proposed relocated linkage occurs on the subject property, it will be bound by the proposed Residential land use to the east and both vacant lot (cultural meadow) / Industrial land use to the west. Immediately south of Clair Road West, the proposed linkage is separated from Industrial land use by cultural meadow at a width of 40 m to 145 m over an approximate distance of 210 m. The proposed linkage is within 40 m of Industrial land use for a distance of 100 m. For the remaining 246 m, before it reconnects with the mapped Significant Natural Area to the south, the proposed linkage is again bound by cultural meadow to the west and is bound by cultural savannah south of the subject property.

Recognizing the realignment of the mapped Ecological Linkage will also be realigned on 950 Southgate Drive south of the subject property, Home Opportunities has entered into an agreement with the landowner of 950 Southgate Drive, where they have accepted the realignment of the linkage on their property. The agreement can be found in **Appendix 8**.

The proposed linkage refinement to 60 m width has considered target wildlife and is considered sufficient to provide for the movement of small and large mammals, birds, and seed dispersal for plants within and in habitats adjacent to the subject property. The recommended width of 60 m has considered the adjacent land uses and the need to have a sufficiently wide linkage to buffer impacts from adjacent land uses. Recognizing wildlife anticipated to use the linkage are urban adapted (i.e., are relatively tolerant of noise, light and other impacts from urban land uses), a 60 m wide linkage is considered ecologically appropriate.

In its current alignment (i.e., as mapped in the City's Official Plan schedules) on the subject property, the Ecological Linkage is currently overlain on a cultural meadow , agricultural fields, cultural thicket,

cultural savannah and a treed hedgerow. The agricultural fields and cultural meadow occupy approximately 1.7 ha of the Ecological Linkage. Throughout the current mapped Ecological Linkage, there are 306 trees over 10 cm dbh recorded during the tree inventory (documented in the Arborist Report prepared by NSE, November 2024). This equates to approximately 133 trees/ha within the cultural savannah, cultural thicket and treed hedgerow area.

While there will be removal of trees within the current mapped alignment of the Ecological Linkage, the proposed alignment of the Ecological Linkage will be entirely vegetated, including planting of trees and shrubs throughout. The density of trees planted will be closer to 500 trees/ha. While the proposed linkage is more narrow (60 m vs. the mapped 100 m by the City) and occupies 2.7 ha vs. the current mapped area of the Ecological Linkage on the subject lands, the density of 500 trees/ha over the 2.7 ha area will equate to 1,350 trees plus shrubs proposed for planting. Moreover, there will be a higher diversity of trees and shrubs proposed for planting within the Ecological Linkage than is currently found within the City's mapped Ecological Linkage. The net effect will be an area with a higher tree cover and higher biodiversity of tree and shrub species than is currently found on the subject property. The net effect will be an Ecological Linkage that enhances not only the function of the linkage, but the biodiversity of the area that contributes to the objectives of the Official Plan.

Restoration and plantings (including within the current agricultural field) will be undertaken to enhance the ecological function of the linkage. Discussed in **Section 7**, restoration work will include native vegetation (plantings, shrubs and trees) left in a free-to-grow state. Two naturalized / vegetated infiltration basins are proposed within the relocated linkage alignment (see description of proposed development in **Section 6**); these areas will also be planted with native vegetation and left in a free-to-grow state.

Where the proposed linkage occurs adjacent to the proposed residential development, **Section 8** describes mitigation measures proposed to minimize potential negative effects of noise and lighting associated with the proposed development, and potential encroachment associated with increased human presence. As described in **Section 5.14**, a buffer to the ecological linkage is not proposed. The linkage width has been identified in consideration of proposed adjacent land uses and associated impacts.

The ecological linkage will function to provide refugia for local wildlife and plants, and movement across the local-scale landscape. This function will be maintained and enhanced following the proposed linkage realignment. As such, the proposed ecological linkage realignment is in accordance with the City's OP policies.

Wildlife crossing surveys were not undertaken as part of EIS field surveys. Based on habitat availability in proximity to the linkage / crossing location, it is assumed that small and large mammals may be crossing at Clair Road (amphibians are not likely to occur given the lack of wetland habitat). A wildlife tunnel may be recommended as part of any future road redevelopment at Clair Road to facilitate

movement of small mammals and snakes (if present). Wildlife crossing signs or flashing lights may be installed to increase awareness of potential deer and medium to small mammal crossing. It is recommended that any future City works along Clair Road West consider the inclusion of eco-passages to provide safe crossing for small mammals, reptiles, etc. with design considerations informed by the City of Guelph Wildlife Crossing Guideline (2023).

5.10. Restoration Areas

A restoration area, as identified by the Guelph OP, occurs outside of the subject property but within the 120 m study area (**Figure 3** in **Appendix 1**).

5.11. Other Wetlands

No wetlands occur on or within 120 m of the subject area. The closest mapped wetland is approximately 320 m to the southeast (Mill Creek Puslinch Wetland Complex).

5.12. Cultural Woodlands

No woodlands or cultural woodlands occur on or within 120 m of the subject property.

5.13. Habitat of Significant Species (excluding Endangered and Threatened SAR)

Barn Swallow (Special Concern): One individual was recorded during breeding bird surveys. However, as discussed under **Section 4.5**, no suitable nesting structure (e.g., building, culverts, bridges) are present on the subject property. Foraging habitat, which includes farmland and open areas, is present within the subject property.

Monarch (Special Concern): Monarch is a habitat generalist. Though Common Milkweed was observed within the study area it was not abundant and as such does not provide critical habitat to support Monarch.

Habitat of Significant Species (according to EIS Guidelines Appendix H: Locally Significant Species List 2020) is associated with the following five additional species: Northern Flicker, Willow Flycatcher, Baltimore Oriole, Field Sparrow, Eastern Kingbird. These species were recorded throughout the three vegetation communities. Although observed, the subject property does not provide breeding habitat for Cooper's Hawk or Ring-billed Gull.

Black Maple, a locally significant tree species, was found along the northern edge of the property, with two individuals along the western edge of the CUS community.

Early Goldenrod was recorded in the cultural thicket and cultural savannah communities; this species is considered regionally rare in Wellington County (Frank and Anderson 2009).

Available species locations are mapped on **Figure 2** in **Appendix 1**.

5.14. Buffers

Natural heritage features identified on / adjacent to the subject property include Significant Landform and Ecological Linkage. No buffers are required for either of these features. As described in **Section 5.9.2**, the width of the proposed ecological linkage realignment has been proposed in consideration of adjacent land uses and associated impacts.

SWH, as defined by the City's EIS Guidelines, includes Confirmed habitat for Federal Species of Conservation Concern (Eastern Meadowlark) and Candidate habitat for Federal Species of Conservation Concern (SAR bats). Eastern Meadowlark is listed as threatened under the SARA and SAR bats and their habitat are protected under the provincial SCA. Notwithstanding the City's EIS Guidelines, section 4.1.3.9.1 iii) identifies Significant Wildlife Habitat as "the habitat for species of conservation concern (excluding Habitat of Endangered Species and Threatened Species)". Impacts to SWH are discussed in **Section 8**.

6. Proposed Development

6.1. Description of Proposed Development

Based on the current site plan, the proposed high-density residential development includes cluster townhouse buildings, apartment buildings, a parking structure, and associated driveway and greenspace areas (**Figure 4** in **Appendix 1**).

A passive stormwater management approach has been proposed within the proposed realignment of the ecological linkage (**Figure 4** in **Appendix 1**), which includes two infiltration basins. This approach is based on the hydrogeological report which had found a high rate of infiltration and lower groundwater table would support a more passive stormwater management approach (JLP 2024 and Counterpoint 2026). The Hydrogeological Investigation Report produced by JLP and the Counterpoint Land Development Memorandum can be found in **Appendix 7**.

There is no hard infrastructure required within the linkage for this stormwater management approach. Two small areas of Rip-Rap Treatment are located wholly outside of the proposed ecological linkage realignment. The Treatment will use Cable Concrete®, a mat of flat stones, which provides water permeability and vegetation growth.

Some minor grading and fill will be required during construction (largely within the agricultural field portion of the realigned linkage) (**Figure 4** in **Appendix 1**). Utilizing the site natural slopes and topography minimizes the extent of grading required to form the retention basins. Minimal fill is required around the north basin to create a berm that will be planted with native vegetation as with the rest of the linkage. The south basin will only require minor grading along its east edge to shape

the retention basin. The remaining areas in the environmental linkage will not be impacted by construction activities (JLP 2024 and Counterpoint 2026)).

The infiltration basins and any areas where disturbance of vegetation occurred within the linkage will be vegetated with native plants including trees, shrubs, herbaceous plants and graminoids.

On-site stormwater management infrastructure, which relies on infiltration and evapotranspiration, has been designed to meet the City's criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance, in alignment with discussions held with City staff (JLP 2024 and Counterpoint 2026). As the 100-year storm volumes are captured and retained on-site (no designated storm outlet), all applicable water balance criteria are being achieved on-site (JLP 2024 and Counterpoint 2026).

No trails or any other types of land use have been identified within the linkage realignment.

6.2. Avoidance Alternatives

Alternative site plan considerations included the current ecological linkage location, the proposed realignment of the linkage, and alternatives related to linkage width and alignment. The proposed ecological linkage realignment was informed through an ecological assessment to maintain the function of the linkage, as well as through consultation with the landowner to the South to ensure the realignment was acceptable. The ecological linkage provides habitat in terms of refugia for local wildlife and plants, and movement across the local-scale landscape. This function will be maintained and enhanced following the proposed linkage realignment.

Avoidance in terms of seasonal wildlife timing windows, exclusion fencing, etc. are discussed in **Section 7**.

7. Proposed Restoration and Enhancement

As part of the proposed development and proposed realignment of the ecological linkage, restoration and enhancement of the area of the realigned linkage is proposed

Vegetation communities currently occurring along the proposed realignment include agricultural field, cultural meadow, and cultural savannah. As previously described, two naturalized / vegetation infiltration basins (no hard infrastructure) are proposed within the relocated linkage. As part of this, minor grading and fill will be required; however, it is largely limited to the existing agricultural field (based on current designs).

Restoration and plantings (including within the current agricultural field) will be undertaken to maintain and enhance the function of the linkage. These will include native vegetation (plantings,

shrubs and trees) left in a free-to-grow state. It is recommended that trees and shrubs be planted at a density of 500 trees/ha each including a diversity of native deciduous and coniferous trees.

Based on contour information provided in the Hydrogeology report (JLP 2024), it has been interpreted that the subject property currently drains towards the area of the proposed linkage alignment. Current communities and vegetation are adapted to these drainage conditions. As described in **Section 4.2**, current soil conditions are course / porous.

It is NSE's understanding, through discussions with the engineer, the drawdown rate within proposed infiltration basins will be less than 48 hours in the event of a 100-year storm (based on an infiltration rate of 36 mm/hour; JLP 2024). As such, it is not expected that there will be a notable change in the soil moisture regime due to any infrequent flooding / water retention or the height of the water table in the linkage.

Native herbaceous plants and graminoids, shrubs and tree species will be chosen to suit the current biotic and abiotic (e.g., soil texture, soil moisture) conditions within the linkage. The current and anticipated soil moisture regime and soil texture will continue to support upland vegetation. However, recognizing the potential for flooding within the linkage, and the discharge of storm water into the linkage, species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin. The remaining areas within the linkage will be seeded/planted with upland species.

As described in **Section 8.6**, five Black Maples have been identified to be transplanted from the area of the proposed development into the realigned linkage. Additionally, Early Goldenrod will be seeded / planted.

As described in the Tree Inventory and Preservation Plan (2024), it was noted that tree and shrub planting activities had taken place in the east-most cultural meadow (CUM) community. It is our understanding that Trees for Guelph conducted planting in this area in previous years, prior to the proposal of development for the subject property. Many of these trees are below 10 cm DBH and have not been captured in the tree inventory. As these trees occur in an area of proposed development, NSE recommends that these planted trees and shrubs be considered for transplanting (where tree / shrub health allows) to the realigned ecological linkage.

Herbaceous seeding / planting throughout the linkage realignment will include pollinator-friendly species to promote habitat use by Monarch and Yellow-banded Bumblebee. There may also be an opportunity to promote pollinator gardens within the Community Garden identified as part of the proposed residential development.

A detailed enhancement / planting plan will be prepared as a condition of Draft Plan approval.

8. Impact Assessment, Avoidance and Recommended Mitigation

Potential impacts to the natural environment as a result of the proposed development may be short-term (i.e., occurring during construction and resolving a short time after construction) or long-term (i.e., lasting effects of construction or effects resulting from use of the subject property). Where impacts cannot be avoided, they can be minimized by incorporating mitigation measures into the project design and implementing mitigation measures during construction. The potential impacts of the project, avoidance alternatives, and the recommended mitigation measures to reduce net effects on the natural environment are summarized below.

8.1. Terrestrial Vegetation – Tree Removal

8.1.1. Impact Assessment

Terrestrial vegetation within the subject property will be removed to accommodate the proposed development, including cultural meadow, cultural thicket and cultural savannah. This also includes vegetation communities occurring on the 266 Clair Road land parcel and overlapping with the current ecological linkage location.

As part of this vegetation removal, as determined by the Tree Inventory and Protection Plan (NSE 2024, under separate cover), 306 trees greater than 10 cm DBH have been identified for removal to accommodate the proposed development. The most abundant tree species were Scots Pine, Black Cherry, European Buckthorn, Common Pear and Manitoba Mable. Subject to detailed design, additional tree removals may be identified due to additional impacts of grading / fill.

Terrestrial vegetation retained on site, especially trees, could be accidentally damaged during construction. Terrestrial vegetation retained on site, especially trees, could be indirectly harmed through soil compaction, increased impervious surfaces or pollutants such as de-icing salts.

8.1.2. Recommended Avoidance and Mitigation

Tree protection measures should be implemented as per the Tree Inventory and Protection Plan (submitted under separate cover, NSE 2024). Compensation plantings as per City of Guelph requirements (see NSE 2024) will be installed within the realigned ecological linkage.

Opportunities for tree relocation from the proposed development footprint will be considered where possible in addition to the planting of the relocated linkage with trees, shrubs and a native seed mix, as described in **Section 7**.

8.2. Surface Water and Groundwater

8.2.1. Impact Assessment

Impacts to groundwater can occur as a result of accidental spills during construction. In addition, vegetation removal, grading, and excavation during construction will leave soils exposed and vulnerable to erosion.

Long-term impacts to groundwater quality related to the residential development could include the release of fuel, oil, and other contaminants from parked vehicles; runoff or infiltration of road salt from winter property maintenance; and runoff or infiltration of fertilizers or herbicides.

Long-term impacts to groundwater without mitigation could include changes to pre-development infiltration values.

8.2.2. Recommended Avoidance and Mitigation

Design Considerations

On-site stormwater management infrastructure, which relies on infiltration and evapotranspiration, has been designed to meet the City's criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance, in alignment with discussions held with City staff (JLP 2024 and Counterpoint 2026). The proposed infiltration basins make use of the existing hummocky soil conditions which are suitable for at-source infiltration of precipitation, including 100-year storm events (Counterpoint, 2026). The proposed addition of two infiltration basins within the ecological linkage should maintain the existing drainage patterns and as a result infiltration values within the study area are unlikely to be significantly altered (Counterpoint, 2026). The proposed development meets all applicable infiltration guidelines through the creation of the infiltration basins; however, other Low Impact Development (LID) measures may be considered and implemented at the detailed design stage in order to reduce runoff to the basins (Counterpoint, 2026). Examples of possible LID measures include permeable pavements, bioswales, pipe exfiltration systems/infiltration galleries, soak away pits/infiltration trenches, rainwater harvesting cisterns, and rain gardens (Counterpoint, 2026). An Oil Grit Separator will be installed to treat storm water runoff and remove suspended solids prior to discharge into the basins.

During Construction

During construction mitigation includes:

<u>Erosion and Sediment Control Measures</u>

- Erosion and Sediment Control (ESC) measures should be used as required during construction. An ESC plan should be developed and submitted to the City for review. ESC

measures may include fabric silt fencing to prevent runoff of sediment. Netted erosion control blankets and other netted materials should not be used because they can pose an entanglement risk to snakes and other wildlife. ESC fencing will also double as exclusionary fencing to avoid encroachment of machinery into retained natural areas.

Regular monitoring of erosion control fences should be implemented to ensure fencing remains in working order and is repaired as needed.

Fuel and Related Substance Control Measures

Handling of potentially harmful substances (e.g., fuels, oils, etc.) should be conducted at least 30 m away from the future location of the linkage. A spill kit should be accessible anywhere where deleterious substances are stored or handled.

Post Occupancy

Post occupancy mitigation includes:

- Avoid or limit the use of de-icing salts in accordance with a Salt Management Plan.
- Avoid or limit the use of fertilizers and herbicides.
- Maintenance, cleaning and inspections of the Oil Grit Separator should be completed through the site's primary vehicle access and not through the linkage.

8.3. Migratory Bird Nesting Habitat

8.3.1. Impact Assessment

The removal of trees and other vegetation on the subject property could impact nesting birds. Most nesting birds are protected under the *Migratory Birds Convention Act* and its Regulations.

Nesting birds could be impacted during clearing / grading. In addition to destruction of habitat, noise, vibrations and light from construction activities could disturb birds and deter them from using their nests.

8.3.2. Recommended Avoidance and Mitigation

Clearing, grading, and tree removals should be conducted outside of the active bird nesting season (generally April 1 – August 31) to minimize the potential to contravene the *Migratory Birds Convention Act* and its Regulations. The nests of 18 protected species listed under Schedule 1 receive additional protections and are protected until they can be deemed abandoned. None of the 18 Schedule 1 species have suitable nesting habitat present within the study area.

If it is not possible to avoid vegetation clearing between April 1st and August 31st, a nest sweep should be conducted by a qualified biologist, and locations of any nests should be identified. If migratory

birds, their nests or eggs are encountered during the nest sweep, or subsequently during clearing /grading, all work shall cease and the contract administrator or environmental inspector be contacted for advice. Generally, a protective buffer will be placed around the nest and work will be prohibited within the buffer until the young have fledged.

8.4. Species at Risk

8.4.1. Impact Assessment

Four SAR (i.e., Endangered or Threatened) that are protected under the *Species Conservation Act* are known to be present and have suitable breeding or roosting habitat within the study area: Eastern Meadowlark, Little Brown Myotis, Hoary Bat, and Silver-haired Bat. Although available Eastern Meadowlark breeding habitat within the subject property is marginal, the nesting habitat for this species is found within the study area south of the subject property. The Cultural Thicket and Savannah are also considered relatively marginal roost habitat for Endangered bat species; however, suitable trees are present in both features, and all three species were identified within the study area.

8.4.1.1. Confirmed Eastern Meadowlark Habitat

Eastern Meadowlark (Threatened federally) was recorded during breeding bird surveys on and adjacent to the subject property. According to the Recovery Strategy for Eastern Meadowlark (ECCC, 2022) optimal habitat contains a high proportion of grass, moderate to high forb density, less than 25% combined coverage of trees and tall shrubs, and low percent cover of bare ground (<10%). As with many area-sensitive grassland bird species, the suitability of habitat for Eastern Meadowlark involves a combination of landscape and patch characteristics, where larger tracts of habitat are preferred over smaller fragments. The minimum area required is estimated to be 5 ha (COSEWIC, 2011). The habitat available within the subject property is fragmented by cropped agricultural fields (cumulative area of 2.1 ha) and has a higher proportion of tree and shrub cover (> 35%). While the subject property is over the 5 ha minimum area for core habitat described in the COSEWIC Assessment and Status Report (2011), and Eastern Meadowlark can be found using savannah habitats where shrub and woody vegetation is below 35% cover, the adjacent land uses (industrial buildings and a high school with sports fields) , higher cover of woody vegetation (> 35%), agricultural fields, and steeper slopes makes the subject lands suboptimal for nesting habitat for Eastern Meadowlark.. ,

The vegetation community south of the subject property is a larger, more continuous unit of habitat that is over 21 ha in area. While there is also a higher percentage of woody vegetation cover south of the subject property, the tree cover is lower making this more suitable nesting habitat. Given the fragmented nature of suitable habitat within the subject property, the species is likely breeding in the larger area of suitable habitat with more suitable vegetation south of the subject property. Due to the marginal nature of the habitat within the subject property, it is likely that it is used as supportive foraging and perching habitat.

The proposed development includes the removal of 2.17 ha of cultural savannah, 1.55 ha of cultural thicket, and 0.69 ha of cultural meadow on the subject property. As described, this 4.41 ha of land is considered marginal due to the matrix of agricultural fields and adjacent land uses.

8.4.1.2. Confirmed Endangered Bat Habitat

It is likely that foraging and roost habitat is present for Little Brown Myotis, Hoary Bat, and Silver-haired Bat within the Cultural Savannah and Thicket which contains a mix of shrubs and trees. Impacts will include loss of roost habitat as a result of tree and shrub removal, and loss of foraging habitat as a result of the general development of the subject property. Potential direct impacts include tree and shrub removal if bats are present. Vegetation removals are discussed under Section 8.1. Recommended Avoidance and Mitigation

8.4.2. Recommended Avoidance and Mitigation

Eastern Meadowlark

Cultural savannah, thicket and meadow communities continue immediately west and south of the subject property and will continue to provide a patchwork of open / shrubby habitat (consistent with existing habitat conditions) suitable for Eastern Meadowlark (more than 18 ha of remaining habitat within the immediate area where Eastern Meadowlark were observed and more than 49 ha including the surrounding connected landscape; see **Figure 3** in **Appendix 1**). Use of this adjacent habitat by Eastern Meadowlark has been confirmed by NSE (2015) in association with the 132 Clair Road West Environmental Impact Study, and by Wood (2022) in association with the Clair-Maltby Secondary Plan.

That said, ECCC may require a permit be obtained to permit activities within the subject property that would result in the removal of naturally vegetated areas considering supporting habitat. Recognizing the federal government is responsible for reviewing and approving development that can adversely impact federally listed SAR and their habitat, it is recommended that the City make it a condition of approval that correspondence with ECCC be provided that confirms the proposed development is being undertaken in accordance with federal legislation, namely the SARA.

SAR Bats

Tree removals should occur outside of the active migratory bat season (i.e. no removal between April 1st and November 30th). Proposed enhancement of the ecological linkage realignment will include the installation of Rocket Bat Boxes and/or Brandon Bark Structures to provide habitat for roosting bats. In addition, trees proposed for planting include those that will support roosting habitat, including maples, and Shagbark Hickory. Habitat continues to be available in the large tracts of woody habitat which continue to the south of the subject property and to the east (beyond the recreation complex / Larry Pearson Park).

In accordance with the SCA, the details of the mitigation and habitat enhancement measures will be outlined in the conservation plan that will be uploaded as part of the registration of the activity in the online Species Conservation Registry. See **section 5.2.1.2** for further information on the contents of a conservation plan. It is recommended that the City make it a condition of approval that a record of the submission of the registration of activity be provided to the City to demonstrate compliance with provincial legislation, namely the SCA.

8.5. Significant Wildlife Habitat (Ecological Linkage)

8.5.1. Impact Assessment

There is no confirmed SWH in accordance with the SWH Ecoregion Schedule 6E; however, SWH in the form of an ecological linkage is present within the subject property, in accordance with the City of Guelph's Official Plan.

The proposed development includes relocation of the ecological linkage to the western boundary of the subject property, as well as width refinement from the mapped 100 m wide linkage to a 60 m wide linkage. Reducing of the width of the linkage has the potential to impact wildlife species relying on the linkage to move between natural features north of Clair Road and those located south of the subject lands.

Two naturalized / vegetated infiltration basins are proposed within the relocated linkage (see description of proposed development in **Section 6**). Storm water management facilities have the potential to impact the ecological function of the linkage.

Elevated levels of chloride from road salt can have an impact on the growth of vegetation within the infiltration basins located within the linkage.

Lights will be used to illuminate the residential development. The lights can negatively impact wildlife using the linkage as a movement corridor by leaving them vulnerable to predators. Increase in noise is also expected from increased human presence and vehicles which may discourage the use of the linkage by wildlife.

The presence of people and pets within the linkage can also impact the use of the linkage by target wildlife species.

8.5.2. Recommended Avoidance and Mitigation

As discussed in **Section 5.9**, the proposed linkage refinement to a 60 m width and recommended native vegetation and habitat features within the linkage has considered target wildlife species and adjacent land uses. The 60 m wide linkage is considered sufficient to support movement of small and large mammals, birds, and plants present within and in habitats adjacent to the subject property.

Two naturalized / vegetated infiltration basins (no hard infrastructure) are proposed within the relocated linkage alignment (see description of proposed development in **Section 6**). Restoration and plantings (including within the current agricultural field) will be undertaken to maintain and enhance the function of the linkage, including throughout the infiltration basin. Restoration / plantings are discussed in **Section 7** and will include native vegetation (shrubs, trees and a native seed mix of forbs and graminoids) left in a free-to-grow state. There will be no mowing or removal of any vegetation within the linkage as part of any future maintenance. Species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin.

A higher density of shrub and tree plantings are suggested along the eastern edge of the proposed ecological linkage realignment and on the western edge where the linkage occurs within 40 m of the adjacent Industrial land use, to buffer effects of noise and light associated with the proposed residential development.

Neither the Linkage nor any other area on the property is presently free from ambient light due to the surrounding development to the north (Clair Road with street lamps), west (industrial buildings with large lights in the parking lot adjacent to the natural area), and east (high school and Guelph South End Recreational Complex). As such, achieving a 0 lux lighting condition, as identified in the City of Guelph Lighting Guidelines for Lighting Plans, cannot be met under current conditions. It is recommended that dark-sky friendly lighting options and techniques are used wherever possible, and follow best practices such as those from the DarkSky Approved Luminaires program established by DarkSky International. For example, lighting should be angled away from the proposed ecological linkage, and downward pointing lights (shielded) should be used to minimize light spilling into the sky and ecological linkage.

A permanent chain-link fence (without gates) should be installed at the edge of the proposed ecological linkage to prevent encroachment by residents and their pets. In addition, educational signage should be posted at select locations to inform the public of the ecological sensitivity of the linkage.

8.6. Habitat of Significant Species (Excluding Endangered and Threatened Species)

8.6.1. Impact Assessment

As discussed in **Section 5.13**, five locally significant bird species (additional to SAR species discussed earlier), are possible or confirmed breeders in the study area, including: Northern Flicker, Willow Flycatcher, Baltimore Oriole, Field Sparrow, and Eastern Kingbird. These species were recorded throughout the three cultural vegetation communities.

Monarch, a locally significant species and provincially listed as Species Concern was recorded but is considered a habitat generalist. The study area does not provide critical habitat to support this species (no abundance of Milkweed plants).

Early Goldenrod was recorded in the cultural thicket and cultural savannah communities; this species is considered regionally significant in Wellington County (Frank and Anderson 2009).

The proposed development includes the removal of 2.17 ha of cultural savannah, 1.55 ha of cultural thicket, and 0.69 ha of cultural meadow.

A total of ten Black Maples were recorded. This species is considered locally significant in Guelph (City of Guelph 2020). A total of five Black Maple trees are identified for removal (NSE 2024).

8.6.2. Recommended Avoidance and Mitigation

Proposed seeding / planting activities within the proposed ecological linkage realignment (see **Section 7**) includes restoration of 0.77 ha of agricultural field to cultural thicket / savannah habitat. Early Goldenrod seeding / planting will be included in the ecological linkage enhancement plan.

Cultural savannah, thicket and meadow communities continue immediately west and south of the subject property and will continue to provide a network of open / shrubby habitat (consistent with existing habitat conditions) suitable for listed breeding birds, Monarch, Black Maple and Early Goldenrod (approximately 16 ha of remaining habitat).

A total of five young Black Maple trees are proposed to be transplanted to the proposed ecological linkage realignment. Tree size ranges from 6.5 to 15.5 cm in DBH, all considered to be in excellent condition at the time of the tree inventory. Trees transplanted should follow the latest version of the American National Standards Institute for Tree Care Operations (ANSI A300) (TCIA 2018). Black Maple will also be included as a planted species in the ecological linkage enhancement plan.

Herbaceous seeding / planting throughout the linkage realignment will also include pollinator-friendly species to promote habitat use by Monarch and Yellow-banded Bumblebee. There may also be an opportunity to promote pollinator gardens within the Community Garden identified as part of the proposed residential development.

8.7. Significant Landform

8.7.1. Impact Assessment

Although none occur within the subject property itself, a Significant Landform (Significant portion of the Paris-Galt Moraine) has been identified as bordering the southeast property boundary. Adjacent Lands of the Significant Landform (which have a width 50 m adjacent to the feature) occur within the subject property. The moraine is important for source water.

On-site stormwater management infrastructure, which relies on infiltration and evapotranspiration, has been designed to meet the City's criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance, in alignment with discussions held with City staff (Counterpoint 2024).

There will be no site alteration activities such as fill, grading and excavation that would change the landform and natural vegetative characteristics of the significant landform. No negative impacts are expected to groundwater as per the Hydrogeological Report prepared by JLP (2024).

8.7.2. Recommended Avoidance and Mitigation

See recommended mitigation measures for impacts to groundwater under **Section 8.2**.

8.8. General Best Construction Practices

Typical construction mitigation measures that should be incorporated into a detailed construction mitigation plans are outline

d below and should be included in the detailed design for the site development.

- Clearly demarcate work limits at outset of construction and minimize unnecessary vegetation clearing.
- Ensure that all vehicles and construction machinery are cleaned and maintained as per Clean Equipment Protocol for Industry (Halloran et al. 2013) prior to arrival on Site and prior to departing Site to prevent the introduction or spread of pollutants or exotic invasive species.
- All construction materials, excess materials and debris should be removed and appropriately disposed of following construction.
- The Contractor will ensure that all mitigation measures are implemented properly, maintained, and repaired and remedial measures are initiated in a timely manner where warranted.

9. Monitoring Plan

During-construction monitoring will be conducted by a contract administrator or environmental inspector to ensure implementation of mitigation measures including ESC fencing, spill management, and migratory bird protection (per the MBCA and its Regulations).

Restoration and enhancement in the proposed ecological linkage realignment will involve tree and shrub planting and seeding activities. Post-installation health monitoring and tree / shrub replacements will occur for two years post-installation, or as directed by the City. Monitoring is expected to include:

- Plot-based vegetation monitoring to document:

    - Survivorship
    - Plant species richness
    - Invasive species
- Recommendations for adaptive management, including:
    - Invasive species management for a period of three years post planting of linkage
    - Replacement of planting deficiencies within the two-year warranty period
    - Reseeding bare areas that are >10 m^2
- Anthropogenic refuse and encroachment
- Incidental wildlife observations
- Annual reports submitted to the City by March 1st of the year following monitoring.

Note: Vegetating monitoring plots should cover 10% of the linkage area.

Details of the monitoring plan should be provided as a condition of approval of the site plan

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10. Policy Conformity

Table 3 provides an overview of conformity with applicable Federal, Provincial, Municipal and Conservation Authority policies.

Table 3. Summary of Policy Conformity

Legislation or Policy Document	Policy Review and Comments	Conformity
Species at Risk Act	Eastern Meadowlark habitat confirmed within the study area. It is recommended that the City make it a condition of approval that correspondence with ECCC be provided to demonstrate the proposed development will be in accordance with federal legislation.	Yes, with correspondence from ECCC.
Fisheries Act	No fish habitat present.	Yes
Migratory Bird Convention Act	Vegetation clearing should not occur during the active bird breeding season (between April 1 and August 31) to mitigate contravening the MBCA. Active nests are protected at any time, including outside of the bird breeding season. If an active nest is found, the nest must be retained and protected with a buffer until young have fledged the nest.	Yes, with recommended avoidance and mitigation
Species Conservation Act	SAR bats. - Foraging and roosting habitat for Little Brown Myotis, Hoary Bat, and Silver-haired Bat - Foraging habitat for Eastern Red Bat SAR Bats: The activity will need to be registered as per the SCA. It is recommended that the City make it a condition of approval that confirmation of registration of the activity be provided in accordance with provincial requirements, namely the SCA. Any removal of potential bat habitat trees should occur outside of the migratory bat active season (i.e., should not occur between April 1 and November 30).	Yes
Provincial Planning Statement	Policy 4.1.7 does not permit development in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements. Please see policy review and comments pertaining to the Species at Risk Act, Migratory Birds Convention Act and the Species Conservation Act.	Yes
City of Guelph Official Plan	An EIS has been prepared per the requirement of Section 4.1 of the Guelph Official Plan as development and site alteration is proposed within the Natural Heritage System or on adjacent lands to natural heritage features and/or areas. This Environmental Impact Study has been prepared in accordance with the City of Guelph's EIS guidelines and the approved Terms of Reference. With appropriate design and mitigation measures the proposed development will have no negative impact on the NHS and its ecological functions. Significant Habitat for Provincially Endangered and Threatened Species – Policy 4.1.3.3.1 notes the criterion for designation as "the Habitat of Endangered Species and Threatened Species as approved by provincial government". It should be noted that Eastern Meadowlark is no longer listed in O. Reg. 60/26 on the Protected Species in Ontario List. As such, policy 4.1.3.3 does not apply to Eastern Meadowlark Species at Risk Bats - Confirmed: Any removal of potential bat habitat trees should occur outside of the active bat season (i.e., should not occur between April 1 and November 30). Habitat continues to be available in the large tracts of woody habitat which continue to the south of the subject property and to the east. Rocket boxes will be installed and native trees and shrubs will be planted within the ecological linkage. Registration of the activity related to removal of habitat for the proposed development will be submitted to the Species Conservation Registry which will include the conservation plan.	Yes, with recommended avoidance and mitigation

Legislation or Policy Document	Policy Review and Comments	Conformity
	Ecological Linkage: Section 4.1.3.9 of the OP provides direction for the protection of Ecological Linkages including permitted uses within Ecological Linkages and considerations for their modification through an EIS. The EIS has proposed a refinement to the linkage that includes relocation and reduction in width from 100 m to 60 m. The design of the Linkage and mitigation proposed will ensure that the ecological connection through the property will be maintained and enhanced (see **Section 5.9**). In addition, the EIS has recommended that the City consider mitigative measures to reduce wildlife-vehicle interactions. Significant Landform: Section 4.1.3.8 of the OP prohibits development within Significant Landforms and restricts development on adjacent lands (i.e., within 50 m) unless it can be demonstrated that there will be no negative impacts to the Hummocky Topography of the Significant Landform, or to its ecological or hydrologic functions. The development will not impact the hummocky topography of the Significant Landform. Ecological functions associated with the Significant Landform are associated with the vegetation that supports ecological functions including habitat for Federal Species The proposed development will not threaten the health and integrity of the ecological or hydrologic functions of the Significant Landform.	
City of Guelph Zoning By-law	The property will require a rezoning from Industrial to Residential to accommodate residential development. Rezoning will also be required to relocate the ecological linkage from the eastern to the western boundary of the subject property.	Yes, pending approval of the Zoning By-law Amendment
City of Guelph Tree By-law	A tree inventory and tree preservation plan has been prepared in accordance with the City's Tree Technical Manual (2019). Further details are presented in the Tree Inventory and Preservation Plan under separate cover (NSE 2024).	Yes, with implementation of tree protection measures and compensation plantings
Clean Water Act	The subject property is located within WHPA-C and within a mapped Significant Groundwater Recharge Area. It is located outside the mapped highly vulnerable aquifer areas. The proposed development must therefore conform with relevant policies in Section 8.2 of the Grand River SPP (Lake Erie Source Protection Region, 2021).	Yes
GRCA Regulation	No GRCA-regulated areas or features are present.	Yes

11. Summary of Recommendations

It is recommended that the mitigation measures described in **Section 8** be incorporated into the site plan and/or implemented during construction, and/or post construction, as appropriate. A summary of these recommendations is provided below:

The following design considerations have been / will be incorporated into the site plan:

1. Impermeable surfaces should be minimized to promote groundwater infiltration.
2. Low impact development (LID) features (such as swales) should be considered to promote groundwater infiltration.
3. A permanent chain-link fence (without gates) will be installed at the edge of the proposed ecological linkage realignment to prevent encroachment.
4. A Stormwater Management Plan will inform the design in accordance with City of Guelph requirements.
5. The required replacement trees as compensation for removed trees should be incorporated into the restoration / enhancement plan. Please refer to the Tree Inventory and Preservation Plan (NSE 2024).
6. The landscape plan for green spaces within the proposed residential development should make use of native plant species where possible.
7. A landscape plan should be prepared for the linkage and should include a higher density of plantings adjacent to the proposed residential development, plant species tolerant of occasional flooding and elevated salt levels within the lower elevation of the infiltration basin, and only consist of native tree, shrubs and a seed mix appropriate for ecoregion 7e and 6e.
8. Light pollution should be minimized through use of downward facing lighting.
9. Impervious surfaces should be minimized by maximizing landscaped area and using permeable surface treatments.
10. Preparation of educational signage to erect adjacent to the linkage to inform the public about the sensitivity of the linkage.

The following recommendations should be implemented during construction:

11. If SAR or other wildlife that enter the active construction zone, the contract administrator should allow the wildlife to leave on their own accord. If this is not possible, a qualified biologist should be contacted for advice.
12. Tree protection measures as described in the Tree Inventory and Preservation Plan (NSE 2024) should be implemented.
13. An Erosion and Sedimentation Plan should be developed and implemented. Netted erosion control blankets and other netted materials will not be used because they can pose an entanglement risk to snakes and other wildlife.

14. A Spills Management Plan should be developed and implemented. This Plan should identify a safe storage and refilling locations. A spill kit should be kept on site. All spills should be reported immediately to the Spills Action Centre.
15. Vegetation clearing should occur outside of the active nesting season for birds (i.e., not between April 1 – August 31). If this is not possible, to reduce the potential to contravene the MBCA and its Regulations, due diligence bird nest searches are recommended within 48 h of clearing.
16. Tree removals should occur outside of the active bat season (i.e. not removed between April 1 and November 30).
17. Rocket Bat Boxes and/or Brandon Bark Structures should be installed within the linkage realignment to provide habitat for roosting bats.

The following recommendations should be considered at occupancy:

18. Avoid or limit the use of de-icing salts.
19. Avoid or limit the use of fertilizers and herbicides

The following are recommended as conditions of approval of the plan of subdivision:

20. That correspondence with Environment and Climate Change Canada (ECCC) be provided that confirms the proposed development is being undertaken in accordance with federal legislation, namely the SARA.
21. That confirmation of registration of the activity be provided in accordance with provincial requirements, namely the SCA.

12. Summary and Conclusions

NSE was retained by Home Opportunities to complete EIS to assess the impact of a proposed residential development at 280 Clair Road West (the subject property). The subject property is composed of three small agricultural fields, hedgerows, and early successional / cultural vegetation communities. An EIS was required due to the presence of an Ecological Linkage on the subject property and a Significant Landform within 50 m of the subject property.

In accordance with the City of Guelph Official Plan (OP), development is not permitted on lands adjacent to natural heritage features and areas, unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated through an EIS that there will be no negative impacts on the natural features or on their ecological functions.

The EIS has undertaken field work and considered the ecological function of the subject property in general and the linkage specifically. Through the assessment undertaken, and in consideration of the target wildlife species, the width of the linkage was reduced from 100 m to 60 m ensuring that the

linkage would continue to provide a functional connection for target wildlife species. The EIS also considered the impact of realigning the linkage on the southwest border of the subject property, and the impact of the proposed development on the linkage, including the discharge of stormwater into infiltration basins within the linkage and the increased occupancy of the residents resulting from the proposed development. The ecological function of the linkage is proposed to be enhanced through planting of native vegetation, and mitigation is proposed in the form of chain link fencing to restrict access to the linkage by people and pets.

Note that a separate Tree Inventory and Preservation Report has been prepared by NSE and submitted concurrently with this EIS to address requirements for tree compensation as per the City of Guelph Tree By-law.

Four SAR (i.e., Endangered or Threatened) that are protected under the *Species Conservation Act* are known to be present and have suitable breeding or roosting habitat within the study area: Eastern Meadowlark, Little Brown Myotis, Hoary Bat, and Silver-haired Bat. A registration of activity will be required to be submitted to the Species Conservation Registry.

Now that Eastern Meadowlark is no longer protected provincially, consultation with ECCC will be required to determine if a permit is required for development within the habitat of Eastern Meadowlark in accordance with the SARA.

Avoidance and mitigation measures have been proposed to ensure the proposed development will not result in a negative impact. If the recommended mitigation measures are properly implemented, the proposed development will conform with the applicable federal and provincial legislation and provincial and municipal natural heritage policies.

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APPENDIX 1 | Figures

Figure 1 | Subject Property and Study Area
280 Clair Rd., Guelph

Legend

- Subject Property (8.73 ha)
- Study Area (Subject Property +120m)

0 100 200 Meters

Project Number	Date:	
24-1421	2024-11-25	

north-south ENVIRONMENTAL

Figure 2 | Ecological Land Classification and Species Observations

280 Clair Rd., Guelph

Legend

- Subject Property (8.73 ha)
- Study Area (Subject Property +120m)
- Breeding Bird Survey Locations

Species at Risk - Threatened

- Eastern Meadowlark

Species at Risk - Special Concern

- Barn Swallow
- Monarch

Regionally and Locally Significant Species

- Northern Flicker
- Baltimore Oriole
- Field Sparrow
- Ring-billed Gull
- Willow Flycatcher

Locally Significant Species

- Eastern Kingbird
- Black Maple
- Ecological Land Classification

Vegetation Communities

AG - Agricultural Lands
CUM - Cultural Meadow
CUS - Cultural Savannah
CUT - Cultural Thicket
SWMP - Stormwater Management Pond

0 100 Meters

Project Number	Date:	
24-1421	2024-11-25	

north-south ENVIRONMENTAL

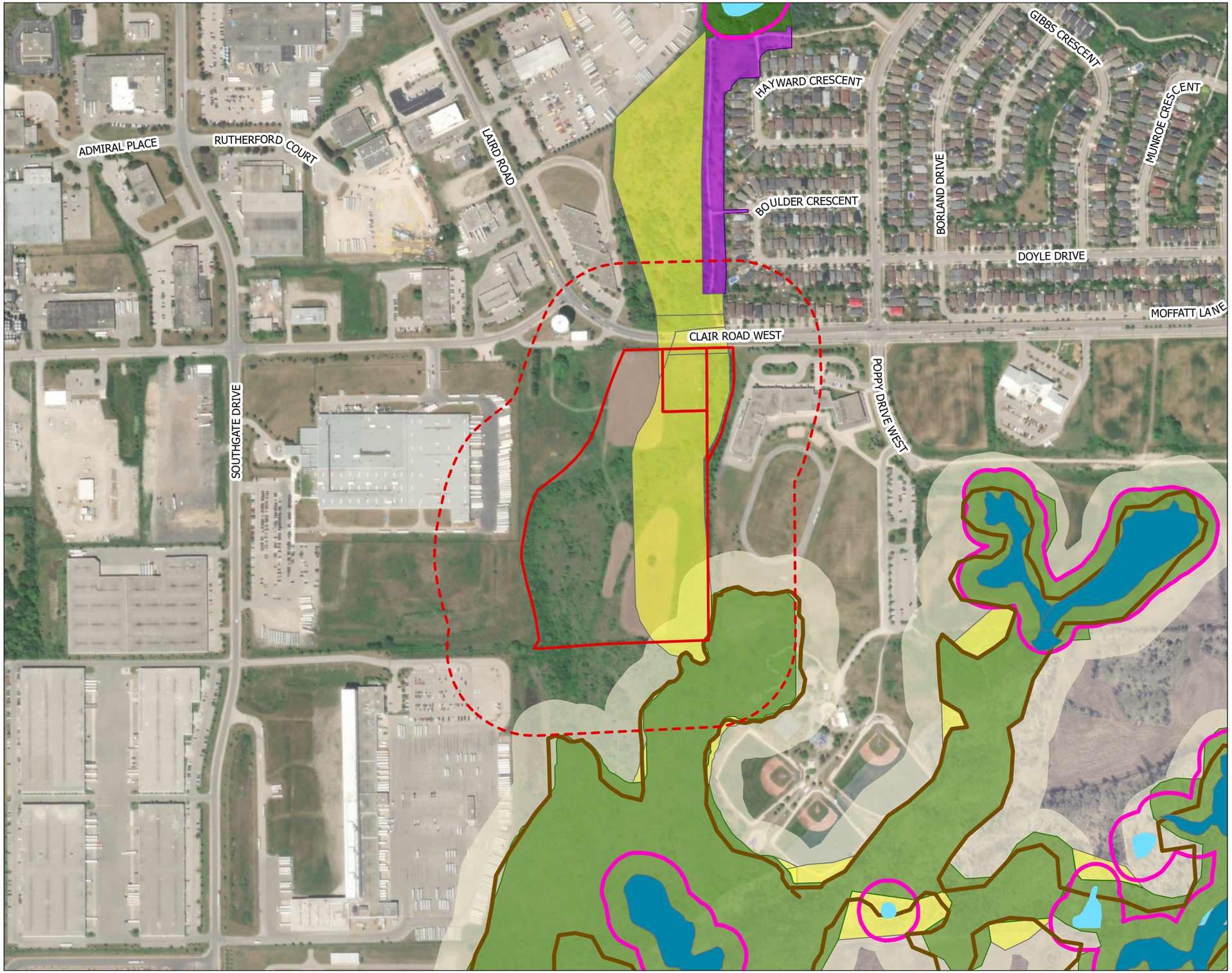


Figure 3A | Natural Heritage Constraints

280 Clair Rd., Guelph

Legend

- Subject Property (8.73 ha)
- Study Area (Subject Property +120m)
- GRCA Regulation Limit

Wetlands (Source: LIO)

- Provincially Significant Wetlands
- Wetlands (Source: GRCA)

Natural Heritage System

- Significant Natural Areas
- Significant Landform
- Adjacent Lands to Significant Landform
- Restoration Areas
- Ecological Linkage

0 100 200 300 Meters

Project Number	Date:	
24-1421	2025-02-14	

north-south ENVIRONMENTAL

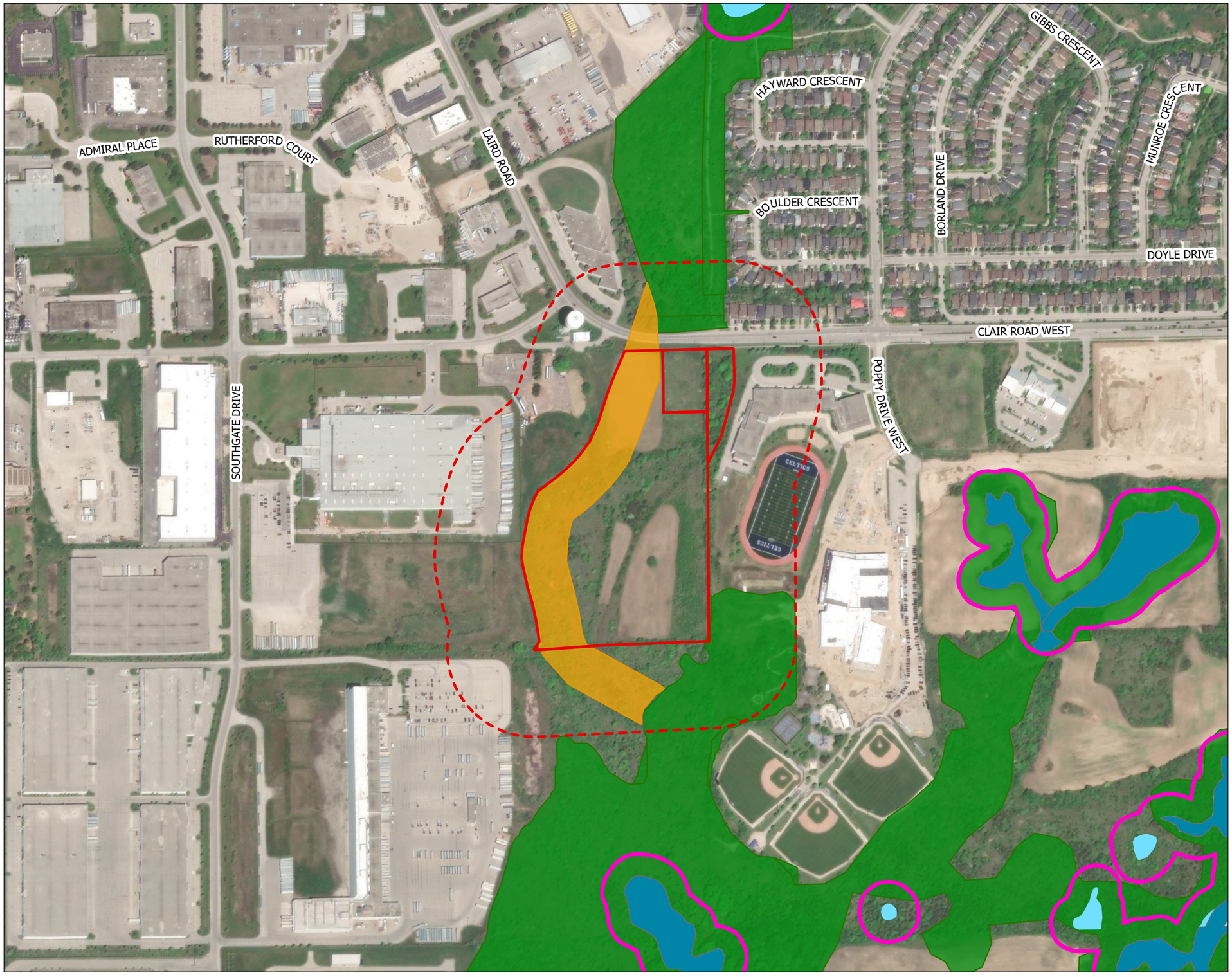


Figure 3B | Natural Heritage Constraints

280 Clair Rd., Guelph

Legend

- Subject Property (8.73 ha)
- Study Area (Subject Property +120m)
- GRCA Regulation Limit
- Provincially Significant Wetlands (MNRF)
- Wetlands (GRCA)
- Natural Heritage System
- Proposed Realignment of Ecological Linkage (60 m width)

0 100 200 300 Meters

Project Number	Date:	
24-1421	2026-03-04	

north-south ENVIRONMENTAL

Figure 3C | Eastern Meadowlark Primary and Contributing Habitat

280 Clair Rd., Guelph

Legend

Subject Property (8.73 ha)

Study Area (Subject Property +120m)

SAR Habitat

SAR Bat Maternity Roost Habitat (Hoary and Silver-haired Bat)

Eastern Meadowlark Habitat

Contributory Habitat: i) habitat which either does not meet minimum size/ dimension criteria, or ii) non-preferred habitat types which contribute to the open character of 'open country' habitat requirements (e.g., agricultural fields, open ponds) which may be used for foraging but not breeding.

Core (Primary) Habitat: preferred habitat types (i.e. savannah habitats where shrub and woody vegetation is below 35% cover (COSEWIC, 2013), which meet the minimum 5 ha size requirement, with minimum 200 x 200 m dimensions.

0 100 200 Meters

Project Number	Date:	
24-1421	2026-03-13	

north-south ENVIRONMENTAL

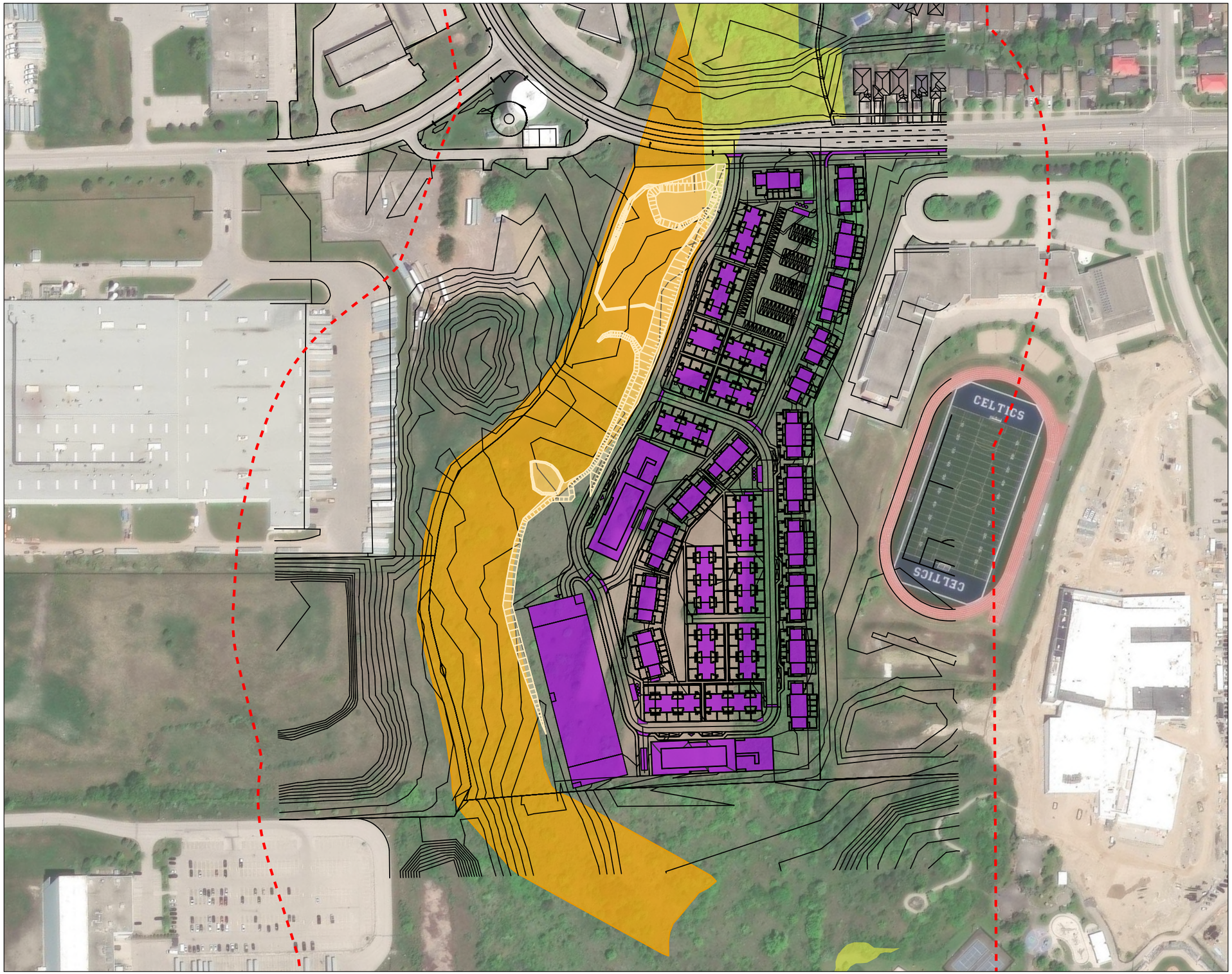


Figure 4 | Proposed Development
280 Clair Rd., Guelph

Legend

- Study Area Boundary - 120m Buffer
- Ecological Linkage
- Proposed Realignment of Ecological Linkage (60m width)
- Proposed Structures
- Grading
- Site Plan

0 50 100 150 Meters

Project Number	Date:	
24-1421	2026-03-27	

north-south ENVIRONMENTAL

Figure 5 | Acoustic Summary

280 Clair Rd

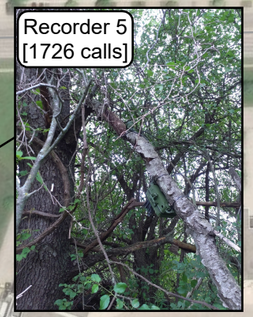
CLAIR ROAD WEST

CLAIR ROAD WEST

CLAIRFIELDS DRIVE WEST

POPPY DRIVE WEST

Recorder 5
[1726 calls]



Recorder 2
[613 calls]

Recorder 4
[196 calls]

All Species	
Hour of Day	# of Calls
20	1
21	582
22	217
23	306
0	179
1	177
2	111
3	90
4	260
5	608
6	4
Total:	2535

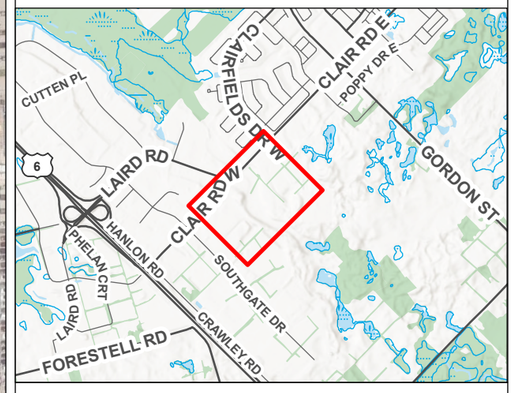
Legend

Subject Property

Acoustic Recorder (Bats) - Summary from June 19, 2025 - July 2, 2025

- EPTFUS - Big Brown Bat
- LASCIN - Hoary Bat
- LASNOC - Silver-haired Bat
- MYOLUC - Little Brown Myotis

Pie Charts display recording summaries for each species where >10 bat calls were recorded



0 50 100 150 Meters

Project Number	Date:
24-1421	2026-03-12

north-south ENVIRONMENTAL

APPENDIX 2 | Terms of Reference and Agency Communication

September 9, 2024

Draft Terms of Reference for Environmental Impact Study

280 Clair Road West
Guelph, Ontario

Prepared for

John Farley, Home Opportunities

north-south ENVIRONMENTAL

North-South Environmental Inc. • 101B King Street West • Cambridge, Ontario • N3H 1B5

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1. Introduction

North-South Environmental Inc. (NSE) has been retained by Home Opportunities to complete an Environmental Impact Study (EIS) to assess the impacts of a proposed development located at 280 Clair Road West (part of Lot 11, Concession 7, Geographic Township of Puslinch) in the City of Guelph. The subject property consists of 8.7 ha of land bound by Clair Road West to the north, Bishop MacDonnell Catholic High School to the east, industrial properties to the west and greenfield area to the south (**Figure 1**).

The purpose of the EIS is to characterize the existing conditions and assess potential impacts to the natural areas within and immediately adjacent to the proposed development. The EIS will assess the significance of the adjacent features identified as part of the City's Natural Heritage System, determine the potential for occurrences of Species at Risk (SAR) and/or the habitat of SAR, and assess the presence of any Significant Wildlife Habitat.

Subsequent to the determination of the preferred design, potential impacts to any Natural Heritage Features and/or functions and their associated buffers shall be evaluated. The EIS will identify potential constraints, assess impacts, and provide protection and mitigation recommendations to minimize any adverse effects to the Natural Heritage System and associated features and functions.

The following contents have been prepared according to the City of Guelph EIS Draft Guidelines (2020) and in consultation with the City of Guelph Official Plan and Schedules (City of Guelph 2001, consolidated February 2022).

In accordance with the City of Guelph EIS Draft Guidelines (2020), the introduction Section of the EIS will include:

- Description of the subject property (e.g., natural features and areas, land covers, existing hard surfaces, buildings, etc.);
- Description of the type and scale of the development proposal (e.g., any required servicing, infrastructure upgrades, stormwater management (SWM) facilities, etc.);
- Description of the historical and present uses of the subject property;
- Description of the site context/Study Area and the subject property's relationship to the surrounding landscape; and
- Map(s) of the development location, subject property and Study Area (including orthographic map with known natural heritage features/areas overlaid).

1.1. Study Area

The Study Area shall encompass the subject property and include adjacent lands that might reasonably be directly or indirectly affected by the proposed development. To the extent that is permitted by

adjacent land-owners, the area within 120 m of the edge of the proposed development shall be included for evaluation under this EIS. In the event that access is not granted for these lands, then NSE shall use the best available information from assembled background documents, mapping, and agency consultation to inform the contents of the EIS with respect to the adjacent lands.

1.2. Planning Context

Plans, policies and legislation relating to natural heritage that will be considered include the following:

- Provincial Policy Statement (2024)
- City of Guelph Official Plan (2001, consolidated February 2022)
- Endangered Species Act (2007)
- Species at Risk Act (2002)

It has been noted that Grand River Conservation Authority regulated lands do not overlap with the subject property.

The relevant natural heritage provincial and municipal policies and regulations will be reviewed. The proposed development will be assessed with respect to conformity with the relevant natural heritage policies. In accordance with the City of Guelph EIS Draft Guidelines (2020), this section shall also include:

- Current land use designation and zoning for the subject property and for the adjacent lands;
- Identification of required development applications; and
- Map(s) of the development location and extent of the area to be studied including Zoning/Land Use.

2. Background Review

A background review will include, but will not be limited to, the following sources:

- Background searches for designated significant features (i.e. provincially significant wetlands (PSW), Areas of Natural and Scientific Interest (ANSIs), etc.), land types and landforms, and Species at Risk (SAR) or locally significant species;
    - Ministry of Natural Resources and Forestry (MNRF) /Natural Heritage Information Centre (NHIC) screening for SAR (Online; 2019);

- Review of available background studies/reports;
    - City of Guelph Natural Heritage Strategy: Terrestrial Inventory & Natural Heritage System (Dougan & Associates and Snell & Cecile Environmental Research 2009);
    - City of Guelph Private Tree By-law 19058 (City of Guelph 2010);

  - Hanlon Creek Watershed Plan (Marshall Macklin Monaghan Limited and LGL Limited 1993);
  - Hanlon Creek State of the Watershed Study (Planning and Engineering Initiatives, et al. 2004);
  - South Guelph Secondary Plan Area Scoped EIS (LGL Limited 1998);
  - Environmental Impact Study for 132 Clair Road (NSE 2015);
  - Atlas of the Breeding Birds of Ontario (Online; 2019);
  - iNaturalist (Online; 2019);
  - eBird Canada (Online; 2019);
  - Ontario Butterfly Atlas (Online; 2019);
  - Soil Survey of Wellington County Ontario (Hoffman and Mathews 1963);
  - The Physiography of Southern Ontario, 3rd Ed. (Chapman and Putnam 1984);

- Review of technical guidance documents;
  - Natural Heritage Reference Manual (OMNR 2010);
  - Significant Wildlife Habitat Technical Guide (OMNR 2000); and
  - Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015).

Ultimately, this section of the EIS shall identify relevant information from existing studies, plans, databases, and other sources to be analyzed as part of the EIS.

3. Characterizing the Natural Environment (Approach and Methodology)

In accordance with the City of Guelph EIS Draft Guidelines (2020), this section of the EIS will describe the Study Area's biological and physical features and functions and assess their significance and sensitivity to disturbance. Two (2) levels of investigation will be used to describe different features, including (i) secondary sources (compiling information from existing documents, see Section 2 above) and (ii) detailed field inventories as outlined below. The timing and level of investigation undertaken for different features have been explained and justified. This section will also describe the historical and existing land uses of the Study Area.

3.1. Natural Heritage Features

A constraint analysis based on a review of background documents and a site reconnaissance visit was undertaken by NSE in fall 2019. Results of the Natural Heritage Features assessment, which included consultation with the City's Environmental Planner, are described below. The constraint analysis was used to inform the context for the investigations and contribute to the development of the TOR for this EIS.

3.1.1. Significant Areas of Natural and Scientific Interest (ANSI)

None known to the Study Area. This feature will not be assessed.

3.1.2. Significant Habitat of Endangered and Threatened Species

The 132 Clair Road EIS (NSE 2015) notes that a single observation each of Eastern Meadowlark (*Sturnella magna*) and Bobolink (*Dolichonyx oryzivorus*) were documented on lands immediately adjacent to the subject property. The habitat for these species on the subject property is marginal, as they typically require grassland/meadow with a mix of forb and graminoid species, with little to no woody vegetation, particularly larger trees. The open habitat on the subject property has a higher density of woody vegetation than is typical of suitable habitat for Eastern Meadowlark and Bobolink.

The eBird Field Checklist for Guelph - Dragonfly Park Hills (within 1 km of the Study Area) lists occurrences of Chimney Swift (*Chaetura pelagica*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Eastern Meadowlark and Bobolink. There is no habitat for Chimney Swift, Bank Swallow or Barn Swallow on the subject property. As noted in the previous paragraph, marginal habitat is present for Eastern Meadowlark and Bobolink.

3.1.3. Significant Wetlands and Other Wetlands

None known to the Study Area. This feature will not be assessed.

3.1.4. Surface Water Features and Fish Habitat

There is no evidence of aquatic habitat present within the Study Area, nor is there any information supporting the presence of Fish Habitat within the Study Area. This feature will not be assessed.

3.1.5. Significant Woodlands

None known to the Study Area. This feature will not be assessed.

3.1.6. Significant Valleylands

None known to the Study Area. This feature will not be assessed.

3.1.7. Significant Landform

Although none occur within the subject property itself, a Significant Landform has been identified as bordering the southeast property boundary. Adjacent Lands of the Significant Landform (which have a width 50 m adjacent to the feature) would occur within the subject property (**Figure 3**).

3.1.8. Significant Wildlife Habitat (including Ecological Linkages)

The preliminary Significant Wildlife Habitat screening follows the template set out in Appendix C to the City of Guelph's EIS Draft Guidelines and is included in **Appendix A** as part of NSE's constraint analysis.

This table is considered a living document; it shall be updated and revised based on the results of field studies and any additional information that becomes available throughout the life of the EIS. One Significant Wildlife Habitat feature was identified as occurring within the subject property: Animal Movement Corridor (Ecological Linkage). Ecological Linkages have been identified within the City's Official Plan (City of Guelph 2018) and overlaps the eastern edge of the subject property (**Figure 3**). The Ecological Linkage runs from the north of Clair Road to one of the branches of the Significant Landform (Paris-Galt Moraine).

Additionally, two candidate Significant Wildlife Habitat types were identified: Reptile (Snake) Hibernacula, and Shrub / Early Successional Breeding Bird habitat (**Figure 3**). It is unlikely that the rock piles observed during the reconnaissance field visit will support reptile hibernacula, which typically occurs more than 1 m below the surface (i.e., below the frost line). There is a potential that due to the larger continuous shrub habitat that extends south of the subject property, bird species relying on shrub habitat will be present. The size of the habitat and number of species recorded will need to be evaluated during the EIS to confirm presence of this Significant Wildlife Habitat type.

3.1.9. Restoration Areas

None known to the Study Area. This feature will not be assessed.

3.1.10. Habitat of Significant Species

No Habitat of Significant Species is known to the Study Area. A number of species identified under the City of Guelph's Locally Significant Species List (2012) have been identified in the vicinity of the Study Area. Consideration for these species and their habitats is represented in the field program (through breeding bird surveys, reptile surveys, and three-season floral inventories) as part of this EIS.

3.1.11. Cultural Woodlands

None known to the Study Area. This feature will not be assessed.

3.2. Biophysical Characterization

NSE will characterize known surface water and groundwater features in the Study Area as well as outline the regional and local hydrogeology. A description of the following shall be included:

- Geomorphological and topographic features;
- Surficial and bedrock geology, as well as soil types, as they relate to drainage and infiltration in the study area;
- Hydrogeological conditions;
- Surface and groundwater features onsite, within adjacent lands and in the surrounding area;
- Recharge and discharge zones, including seepage areas and springs, if present;

- Existing catchment areas, drainage patterns, watercourses and drainage basin boundaries; and
- Flood-related hazards (i.e., floodplains) (including mapping of these natural hazards).

3.2.1. Significant Landform

Although none occur within the subject property itself, a Significant Landform has been identified as bordering the southeast property boundary. Adjacent Lands of the Significant Landform (which have a width 50 m adjacent to the feature) overlap with the subject property (**Figure 3**). The impact assessment will consider the Significant Landform.

3.3. Fauna

3.3.1. Breeding Bird Survey

Two breeding bird surveys will be completed following Forest Bird Monitoring Program protocols (Konze and McLaren 1997). These surveys will be completed in the morning between a half-hour before sunrise and 10:00 am during suitable weather conditions. The surveys include an area search throughout the subject property using Breeding Bird Atlas protocols. Breeding evidence will be evaluated using the following guidelines (Ontario Breeding Bird Atlas 2001):

> "Possible breeding" is indicated by the presence of a singing male (or breeding calls heard) in suitable habitat or the presence of a bird observed in suitable breeding habitat in its breeding season.
>
> "Probable breeding" is defined as an observation of any of the following: (1) a pair in breeding season in suitable habitat, (2) permanent territory presumed through registration of territorial song on at least two days, a week or more apart, at the same place or (3) courtship or display between a male and a female or two males, including courtship feeding or copulation; visiting probable nest site; agitated behaviour or anxiety calls of an adult; brood patch on an adult female or cloacal protuberance on an adult male; nest building or excavation of a nest hole.
>
> "Confirmed breeding" is defined as observation of any of the following: (1) a distraction display or injury feigning; (2) used nest or egg shell found (occupied or laid within the period of the study); (3) recently fledged young or downy young, including young incapable of sustained flight; (4) adults entering or leaving nest site in circumstances indicating occupied nest (*e.g*, adult carrying fecal sac; adult carrying food for young), or (5) nest containing eggs, or nest with young seen or heard.

3.3.2. Reptile Surveys

Features that may be associated with reptile hibernacula may be present within the Study Area. NSE will review these features and assess their potential for candidate hibernacula for reptiles. Should the features be considered potential for hibernacula then NSE will conduct targeted surveys in the spring

for emerging snakes to determine if any of the structures are being used as hibernacula. Where suitable structures are present, the area will be slowly walked (under suitable weather conditions and at times advantageous for the observation of basking reptiles), scanning for snakes (using binoculars).

Area searches for reptile habitat in and around the potential hibernacula will be conducted according to MNRF Guelph District's Milksnake Survey Protocol (June 2013). These surveys involve walking transects and actively searching for snake species by looking under and turning over potential cover objects by hand. Three surveys will be conducted (at least two weeks apart) between April and late June.

Environmental conditions will be documented as part of reptile surveys to demonstrate suitability of field days.

Incidental observations of reptiles will be recorded and described during all field inventories.

3.3.3. Monarch and Yellow-banded Bumblebee Observations

The City of Guelph has noted the potential for Monarch (*Danaus plexippus*) and Yellow-banded Bumblebee (*Bombus terricola*) to occur on the subject property. Any incidental observations of Monarch will be recorded and described during all field inventories. Patches of milkweed (*Asclepias syriaca*), host plants for Monarch, will be noted during vegetation inventories.

Although no targeted surveys are proposed for the Yellow-banded Bumblebee, general observations of pollinator (including bumblebee) activity will be noted during all field inventories. This species will be managed for through potential compensation measures (e.g., promoting pollinator habitat in buffer areas, including the Ecological Linkage).

3.4. Vegetation and Ecological Land Classification

Vegetation communities within the Study Area and on adjacent lands will be characterized and mapped according to ELC protocols (Lee et al. 1998). ELC undertaken in 2020 (**Figure 2**) revealed three vegetation units on the subject property including cultural meadow (CUM), cultural thicket (CUT) and cultural savannah (CUS).

Three-season botanical inventories are proposed to encompass all floral growing seasons to complement the existing fall inventory and complete the three-season floristic characterization. Relative abundance of each species will be recorded, and significant species and/or plant populations will be documented using a GPS unit. Results of all three seasons of assessments will be summarized in an annotated checklist and included in the EIS as a table.

3.5. Ecological Connections, Linkages, and Landscape Functions

The natural heritage features on and off the subject property will be assessed at a landscape scale through a review of secondary sources in order to evaluate potential linkage functions and evaluate ecological connections for wildlife movement. An existing Ecological Linkage is identified under the City's Official Plan (City of Guelph 2022) as overlapping the eastern edge of the subject property (**Figure 3**). This Linkage runs from the north of Clair Road to one of the branches of the Significant Landform (Paris-Galt Moraine).

The proposed development includes relocation and refinement of the existing Ecological Linkage to the western boundary of the subject property, and a width refinement to 60 m. City of Guelph Official Plan policies allow for the realignment of a mapped Ecological Linkage in accordance with outlined conditions including maintaining functionality and connectivity. Detailed rationale for the linkage realignment will be provided in the EIS.

3.6. Habitat for Significant Species

This section will evaluate all identified natural heritage features and areas, and associated ecological functions (in the study area, and in particularly in the subject property) and screen them against the in effect and applicable policies and guidelines to confirm whether or not they are considered "significant" in the City of Guelph.

The presence of significant species and their habitats shall be verified through the EIS. The City of Guelph's Locally Significant Species List (2012) provides a list of locally significant species and includes both flora and fauna. All significant species will be identified and form part of the analysis regarding habitat protection for these species.

3.7. Tree Inventory and Preservation Plan

A Tree Inventory and Tree Preservation Plan will be completed per the City of Guelph's Tree Technical Manual (2019). The plan shall include as a minimum:

- Inventory of all trees over 10 cm dimeter at breast height (DBH), including size, form, species composition, health and risk assessment;
- Identify opportunities for transplanting smaller specimens of trees, where appropriate;
- Tree preservation plan specifying measures required for tree protection and monitoring during construction / development; and
- Measures for avoiding disturbance to any breeding birds during construction.

4. Data Analysis

In accordance with the City of Guelph's Draft EIS Guidelines (2020), this section shall include:

- Evaluation of significance;
  Assessment of opportunities and constraints;
- Impact assessment;
- Evaluation of alternatives;
- Recommended mitigation measures (including opportunities for enhancement, restoration, and/or compensation); and
- Environmental policy analysis.

4.1. Evaluation of Significance

The data obtained from the field investigations and review of background studies will be evaluated in order to determine sensitivity of features and functions. The criteria for determining significant features and functions (e.g. Significant Woodlands, Significant Wildlife Habitat, etc.) will be evaluated according to the following guiding documents:

- Natural Heritage Reference Manual (OMNR 2010);
- Significant Wildlife Habitat Technical Guide (OMNR 2000);
- Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015); and
- City of Guelph Official Plan (consolidation February 2022).

NSE shall review the policy and legislative framework for the site. All significant features within the study area will be illustrated on a figure. This section of the EIS will also include a discussion and analysis regarding opportunities and constraints, and will:

- Identify all the constraints to potential development related to natural heritage features and areas identified for protection, as well as natural hazards, including their respective buffers and setbacks;
- Identify opportunities for development on the subject property that work within the limitations of the site-specific constraints; and
- Identify opportunities for restoration, enhancement and/or stewardship opportunities.

NSE shall prepare maps showing:

- Vegetation communities overlaying aerial photography; and
- Significant features and constraints to site plan development.

4.2. Identifying and Assessing the Impacts of the Proposal

This section of the EIS will identify the natural heritage features and hydrologic features that might be negatively impacted by the subject property's proposed development. This section will also describe potential negative impacts (direct and indirect) in terms of their magnitude, area affected and likely duration.

In particular, this section will:

- Provide a detailed description of the proposed development as it related to elements of the development that may impact the natural heritage features and areas identified for protection, and/or their ecological functions;
- Assess potential impacts to hydrological functions;
- Evaluate potential impacts to SAR and/or their habitat;
- Describe direct, indirect, short-term, and long-term impacts with particular emphasis on the following:
    - Tree/vegetation removal (if any);
    - Significant Landform;
    - Ecological Linkages;
    - Reptile over-wintering; and
    - Locally significant avifauna and their habitats.

4.3. Avoiding Impacts and Evaluating Alternative Mitigation Measures

Avoiding negative impacts is preferred over mitigation. Ways of avoiding impacts will be recommended and may consider alternatives to the proposed development, where feasible. Where adverse impacts are unavoidable, a range of mitigation measures to reduce or minimize significant impacts will be recommended. The relative effectiveness of implementing these measures will be estimated and the extent of any remaining impacts discussed.

This section will also include the following:

- A description of any proposed restoration recommendations for impacts that cannot be mitigated or disturbed areas; and
- A description of other mitigation or compensation measures proposed to eliminate, reduce or off-set impacts such as tree removal.

5. Monitoring

If appropriate, the EIS will include recommendations for short- or long-term management, conservation, enhancement, and/or the monitoring of significant environmental features and/or functions within the Study Area and/or adjacent lands. The scope of any proposed monitoring plan and types of monitoring being proposed will be determined through assessment of features and ecological functions, sensitivity of features, and impacts resulting from the proposed development.

6. Conclusion

This section will summarize the potential negative impacts associated with the proposed development and the recommended measures to avoid or mitigate these impacts. Enhancements may also be suggested. Recommendations will be as specific as possible, and may include:

- A modification of the concept plan;
- Construction requirements or constraints;
- A requirement for appropriate buffers/setbacks or other environmental protection measures; and
- An integral component of detailed designs or site plans, such as:
    - Tree protection plan,
    - Erosion and sediment control plan, and/or
    - Restoration/enhancement measures.

7. References

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City of Guelph. 2001. The City of Guelph Official Plan. February 2022 Consolidation.

Dougan & Associates and Snell & Cecile Environmental Research. 2009. City of Guelph Natural Heritage Strategy. Phase 2: Terrestrial Inventory & Natural Heritage System. Final Report.

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LGL Limited. 1998. South Guelph Secondary Plan Area Scoped EIS. 56 pp.

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Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E. 38 pp.

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Ontario Butterfly Atlas. 2019. Accessed Online: http://www.ontarioinsects.org/atlas_online.htm

Ontario Ministry of Municipal Affairs and Housing. 2014. Provincial Policy Statement 2014. 50 pp.

Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide. 151 pp.

Ontario Ministry of Natural Resources (OMNR). 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition. 248 pp.

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Figure 1 | Subject Property
280 Clair Rd., Guelph

Legend

Subject Property (8.73 ha)

0 100 Meters

Project Number	Date:	
24-1421	2024-09-10	

north-south ENVIRONMENTAL

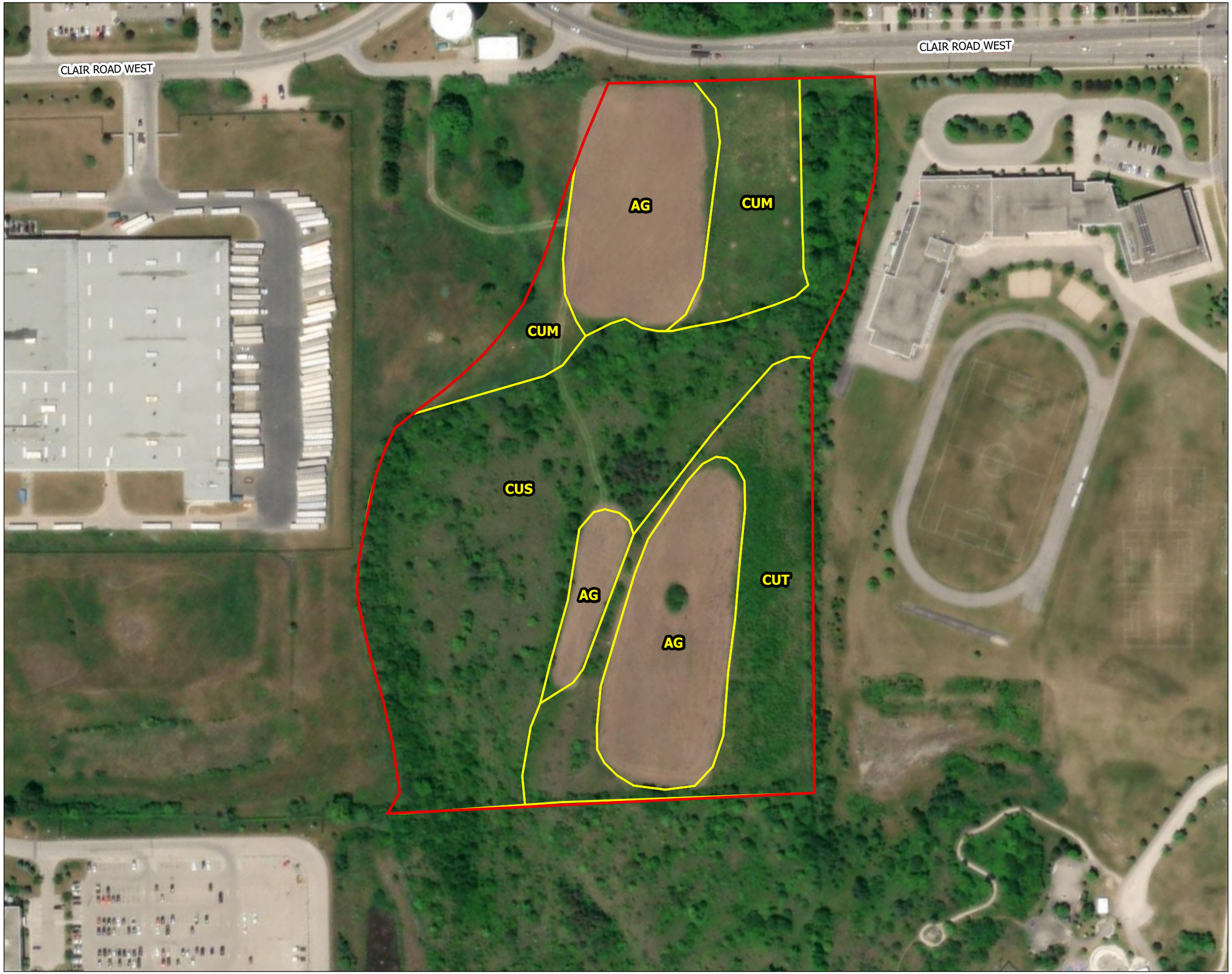

Figure 2 | Preliminary Ecological Land Classification
280 Clair Rd., Guelph

Legend

Subject Property (8.73 ha)

Ecological Land Classification

Vegetation Communities
AG - Agricultural Lands
CUM - Cultural Meadow
CUS - Cultural Savannah
CUT - Cultural Thicket

0 100 Meters

Project Number	Date:	
24-1421	2024-09-10	

north-south ENVIRONMENTAL

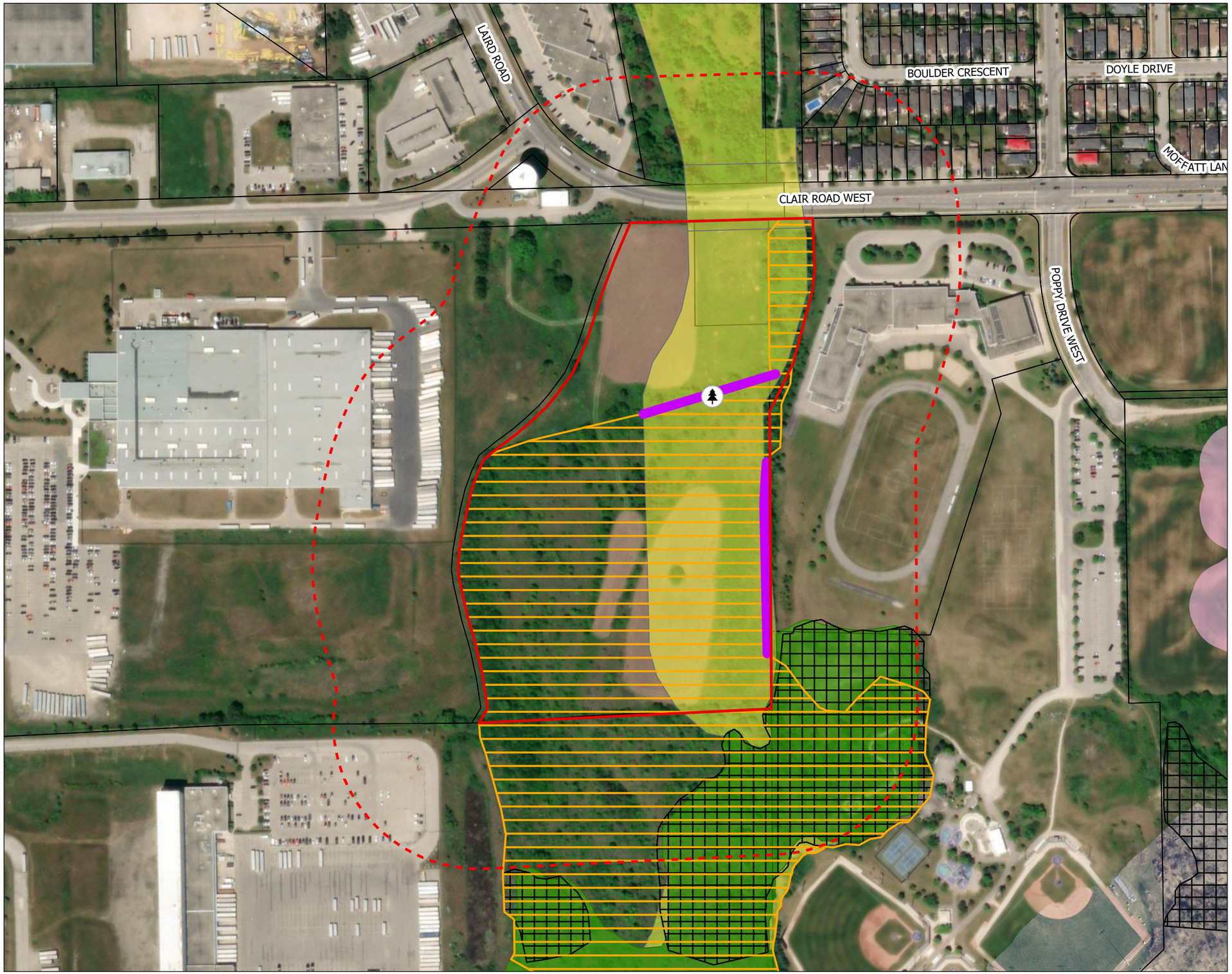

Figure 3 | Preliminary Constraint Map
280 Clair Rd., Guelph

Legend

- Subject Property (8.73 ha)
- Subject Property 120m Buffer
- Approximate Lot Lines
- Significant Natural Areas
- Ecological Linkages
- Significant Landform
- Candidate Shrub/Early Successional Breeding Bird Habitat
- Candidate Reptile (Snake) Hibernacula - Hedgerows with Rock Piles
- GRCA Regulation Limit
- Black Maple, Locally Significant Species

0 100 200 Meters

Project Number	Date:	
24-1421	2024-09-10	

north-south ENVIRONMENTAL

APPENDIX 1 | Significant Wildlife Habitat Screening Table

Appendix A. Significant Wildlife Habitat Screening Table

Significant Wildlife Habitat Type	Known or Candidate SWH present within or adjacent to the Subject Property?	Rationale (Habitat Presence or Absence)	Field studies required?
Seasonal Concentration Areas			
Deer Yarding Areas (as identified by MNRF)	None identified by the MNRF	Habitat not believed to be present. Figure 11 of the City of Guelph Terrestrial Inventory & Natural Heritage System Final Report (Dougan & Associates Incorporated and Snell & Cecile Environmental Research 2009) indicates that Deer Wintering Areas are not present within the Subject Property.	No
Deer Winter Concentration Areas (as identified by MNRF)	None identified by the MNRF	Habitat not believed to be present	No
Colonial Bird Nesting Habitat: • tree/shrub • cliff/bank • ground	None	Habitat not believed to be present. Great Blue Heron has been identified within 1 km (eBird).	Surveys for breeding birds shall be completed as part of the EIS
Waterfowl Stopover and Staging Areas: • Aquatic • Terrestrial	None	No fields with evidence of standing water in spring. No aquatic habitats present.	No
Waterfowl Over Wintering Areas (as identified by MNRF)	None identified by the MNRF	Habitat not believed to be present	No
Raptor Wintering (Feeding and Roosting) Areas	None on Subject Property	American Kestrel, Red-tailed Hawk and Northern Harrier observed within 1 km (eBird)	No
Turtle Wintering Areas	No	No permanent waterbodies or large wetlands with deep water within 120 m of Subject Property	No
Reptile (Snake) Hibernacula	Potential Candidate SWH	Rock piles present on Subject Property. Although they are likely to be anthropogenic (piled fieldstones created when the agricultural fields were dug up), additional surveys are required to confirm this. No areas of broken or fissured rocks were observed.	Rock piles on Subject Property shall be investigated in situ for candidacy as hibernacula; Emergence surveys as appropriate
Bat Hibernacula	None	No caves, mine shafts, underground formations/foundations, crevices, or Karst observed	No
Bat Maternity Colonies	None	No mature to over-mature mixed/deciduous stands with large diameter dead or dying trees with cavities	No

Significant Wildlife Habitat Type	Known or Candidate SWH present within or adjacent to the Subject Property?	Rationale (Habitat Presence or Absence)	Field studies required?
Rare Vegetation Communities			
Alvar	None	Habitat not believed to be present	No
Prairie	None	Habitat not believed to be present	No
Savannah	None	Habitat not believed to be present	No
Rare Forest Types	None	Habitat not believed to be present	No
Cliff/ Talus	None	Habitat not believed to be present	No
Rock Barrens	None	Habitat not believed to be present	No
Sand Barrens	None	Habitat not believed to be present	No
Other Rare Vegetation Types, including Old Growth Forest	None	Habitat not believed to be present	No
Specialized Habitats for Wildlife			
Waterfowl Nesting Area	None	Habitat not believed to be present	No
Bald Eagle and Osprey nesting, foraging and Perching Habitat	None	Habitat not believed to be present	No
Woodland Raptor Nesting Habitat	None	No Intermediate-aged to mature forests on Subject Property or within 120 m	No
Amphibian Breeding Habitat: • Woodland • Wetland (includes bullfrog concentration areas)	None	No breeding pools within or adjacent to woodlands on Subject Property or within 120 m of the Subject Property	No
Turtle Nesting Habitat	None	Agricultural Lands provide exposed mineral soil areas on Subject Property; however, no open water or wetlands are located close by.	No
Woodland/Specialized Raptor Nesting	None	No Intermediate-aged to mature forests within or adjacent to the Subject Property	No
Bald Eagle Wintering Areas	None	Habitat not believed to be present	No

Significant Wildlife Habitat Type	Known or Candidate SWH present within or adjacent to the Subject Property?	Rationale (Habitat Presence or Absence)	Field studies required?
Seeps and Springs	None	Subject Property are not predominantly forested	No
Wildlife Movement Corridors			
Animal Movement Corridors (including Ecological Linkages) - Deer Movement Corridors - Amphibian Movement Corridors - Other Wildlife Movement Corridors	Confirmed SWH	City of Guelph's Natural Heritage System identifies Ecological Linkages on the Subject Property	No
Habitats of Species of Conservation Concern			
Marsh Bird Breeding Habitat	None	Habitat not believed to be present	No marsh-specific monitoring protocols targeted for birds are planned Surveys for breeding birds shall be completed as part of the EIS
Woodland Area-Sensitive Breeding Habitat	None	No forest stands (large, mature >60 years) or woodlots (>30 ha) apparent within the Subject Property or within 120 m of the Subject Property	No
Open Country Bird Breeding Habitat	None	Limited grassland areas (natural/cultural >30 ha) appear in aerial imagery within the Subject Property or within 120 m of the Subject Property	Surveys for breeding birds shall be completed as part of the EIS
Shrub / Early Successional Breeding Bird habitat	Potential Candidate SWH	Large field areas succeeding to shrub and thicket habitats >10 ha appear in aerial imagery overlapping the Subject Property and adjacent lands	Surveys for breeding birds shall be completed as part of the EIS
Terrestrial Crayfish Habitat	None	Habitat not believed to be present	No
Global Species of Conservation Concern (i.e., G1, G2 and G3) as identified by the NHIC	None	No recent records of Global Species of Conservation Concern identified by NHIC	No
Federal Species of Conservation Concern (i.e., listed as endangered, threatened or special concern federally)	None	NHIC lists Northern Map Turtle and Eastern Ribbonsnake, both Special Concern; however, records are from 1924 and 1990, respectively. Regardless, suitable habitat does not appear to be present within the Subject Property or within 120 m of the Subject Property	No

Significant Wildlife Habitat Type	Known or Candidate SWH present within or adjacent to the Subject Property?	Rationale (Habitat Presence or Absence)	Field studies required?
Provincial Species of Conservation Concern (i.e., listed as special concern provincially or S1, S2 or S3 by the NHIC)	None	NHIC lists Northern Map Turtle and Eastern Ribbonsnake, both Special Concern; however, records are from 1924 and 1990, respectively. The City of Guelph has also indicated that a more recent record of Eastern Ribbonsnake has been recorded on a nearby property at 132 Clair Road West. Eastern Ribbonsnake is semi-aquatic and is most often found along the edges of shallow ponds, streams, marshes and other wetlands bordered by dense vegetation. Suitable habitat does not appear to be present within the Subject Property or within 120 m of the Subject Property. Monarch and Yellow-banded Bumblebee have been noted by the City of Guelph as potentially occurring within the Subject Property.	Incidental observations of Monarch and Yellow-banded Bumblebee will be recorded. Patches of Milkweed will be noted as potential SWH for Monarch.

From:	Ryan Hamelin
To:	Izabela van Amelsvoort
Cc:	Ryan Mallory; Anand Shah; Jane Gurney
Subject:	RE: EIS for 280 Clair Road W - Confirm TOR SoW
Date:	Wednesday, September 18, 2024 1:09:48 PM
Attachments:	image001.png image002.png image003.png image004.png image005.png image006.png

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Hello Izabela,

Thank you for providing the Draft EIS Terms of Reference for 280 Clair Rd W. I have provided combined comments below from Parks Planning and Environment Planning.

Comments:

1. The ToR references the City's EIS Guidelines as a Draft; however, the guidelines have been updated and published and are no longer a draft version.
    - Relatedly, some of the referenced sections of the EIS Guidelines have changed. For example, the ToR references Appendix C of the guidelines as the Significant Wildlife Habitat screening table, however, that information is now in Appendix D.

2. The ToR references an older version of the City of Guelph Official Plan. The Current Official Plan is the February 2024 consolidation.

3. The Terms of Reference discusses the proposed Ecological Linkage width and location refinements. Please note the related OMB Minutes of Settlement (2013) regarding the criteria of linkage refinements. The EIS must demonstrate how any proposed Linkage change meets the OMB settlement requirements. Some initial concerns and considerations relating to the proposed linkage changes are:

    - The proposed linkage alignment will not directly connect to the identified Natural Heritage System on the property to the south.
    - The proposed alignment will result in the linkage being located between High-Density Residential and Industrial rather than next to Open Space and recreational facilities. Based on the proposed linkage location, the adjacent land uses will have impacts associated with light and noise that must be addressed in the EIS.
    - The proposed reduced width from 100m to 60m may not be appropriate based on adjacent land uses.

4. The EIS shall provide recommendations on restoration and enhancements of the linkage. Robust linkage enhancements may help justify reduced linkage widths.

5. A feature-based water balance will be required as part of the EIS. The hydrology of the linkage and any water being directed to the linkage must be considered.
    - Any proposed restoration and enhancements of the linkage must be consistent with

the proposed hydrology.
- If the EIS is completed before detailed hydrological studies and stormwater management plans are available, the EIS can provide a preliminary water balance analysis. A preliminary water balance analysis must include details of the relevant Stormwater Management and Infiltration policies and provide recommendations on a proposed stormwater management strategy and water balance targets that can be implemented during the detailed design and Site Plan.

6. The EIS shall provide an evaluation of the preliminary trail design and alignment. The trail alignment shall follow applicable environmental policies in the Official Plan and standards in the Guelph Trails Master Plan.

7. The EIS shall discuss appropriate buffer strips and property demarcation between the open-space and the proposed development. City owned lands shall be appropriated buffered on the private property and demarcation provided in accordance with the City's demarcation policy (black vinyl coated chain link fence or demarcation bollards where appropriate).

Updated Terms of Reference do not need to be submitted, but please append these comments to the EIS.

Please let me know if you have any questions or want to discuss any comments.

Regards,

Ryan Hamelin

Ryan Hamelin,
Environmental Planner
Infrastructure, Development and Environment, **Planning and Building Services**
City of Guelph
T 519-822-1260 x 2718
ryan.hamelin@guelph.ca

From: Ryan Hamelin
Sent: Friday, September 13, 2024 3:24 PM
To: Izabela van Amelsvoort <ivanamelsvoort@nsenvironmental.com>; Jane Gurney <Jane.Gurney@guelph.ca>
Cc: Ryan Mallory <Ryan.Mallory@guelph.ca>; Anand Shah <Anand.Shah@guelph.ca>

INTERNAL MEMO

DATE February 21, 2025

TO **Anand Shah, Planner III**

FROM Ryan Hamelin, Environmental Planner
DIVISION Infrastructure, Development and Enterprise
DEPARTMENT Planning and Building Services

SUBJECT **280 Clair Road West– pre-submission. Proposed Official Plan & Zoning By-law Amendment**

Proposal

The proposed Official Plan Amendment and Zone By-law Amendment is to develop the lands at 280 Clair Road West as high-density residential. The proposed development includes a mix of high-rise residential buildings, townhouse blocks, and an associated parking structure. Two large infiltration basins within the Ecological Linkage are proposed to meet water balance and stormwater requirements.

The proposed development will require rezoning the lands from industrial to residential, a land swap with the City, and the realignment of the on-site Ecological Linkage.

The subject property contains a National Heritage System consisting of an Ecological Linkage and a candidate Species at Risk habitat.

Materials Reviewed
Environmental Planning staff have reviewed the following reports from the submission of the above-noted application:

- Planning Justifications Report. 266-280 Clair Road West, Guelph. Prepared for: Home Opportunities and 2742707 Ontario Limited. Prepared by: GSP group. December 2024.

- Functional Servicing and Stormwater Management Report. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counterpoint Land Development and Dillon Consulting. November 20, 2024.

- Environmental Impact Study. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: North South Environmental. November 28, 2024.

- Site Grading Plan. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counter Point Engineering. November 20, 2024.

- Site Grading Plan. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counter Point Engineering. November 20, 2024

- Storm Drainage Plan. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counter Point Engineering. November 20, 2024.

Comments

1. Required: The EIS did not satisfactorily demonstrate how the applicable policies to refine the width and location of the Ecological Linkage have been fully met. I recommend that a revised version of the EIS include a table showing how all relevant policies of Official Plan Section 4.1.3.9 have been addressed. Further information is provided below (comments 2-9).

2. Required: The proposed Ecological Linkage does not provide a continuous connection to the Natural Heritage System south of the subject property. The City cannot impose a new Natural Heritage System Ecological Linkage mapping change on the adjacent property owners to maintain the linkage connection. The Ecological Linkage will either need to be revised on the subject property to maintain the connection with the Natural Heritage System to the south, or the adjacent property owner will need to agree to the proposed Ecological Linkage changes on their property.

3. Required: The proposed Ecological Linkage alignment includes an approximately 6.4 m wide City of Guelph-owned parcel to the west of the subject property. The City-owned parcel is currently zoned as industrial. The City has not agreed to incorporate this parcel into the Ecological Linkage. Please contact the City's Legal and Realty Services to confirm that this parcel can be included in the proposed Ecological Linkage corridor.

4. Required: It has not been satisfactorily shown how Official Plan Policies 4.1.3.9 (4, 9, 10, 11. ii) have been met. Specifically, it has not been demonstrated that the proposed development will have no negative impacts and/or maintain or enhance the functionality of the Ecological Linkage. Further detailed analysis and policy review are required regarding:
    a. Lighting: Although the EIS recommends minimizing light pollution and spillage into the NHS, it should be noted that Guelph's lighting policy will require a lighting level of 0 lux at the limit of the Natural Heritage System (i.e., Ecological Linkage). Based on the proximity of interior roads and buildings, it should be confirmed that this lighting condition can be met.
    b. Noise: The EIS references the potential negative effects of noise on the Ecological Linkage's function; however, little detail is provided on how impacts will be mitigated.
    c. Stormwater Management Infrastructure in the Ecological Linkage: There are extensive areas of stormwater management infrastructure in the Ecological Linkage. Further discussion is required on the impacts and compatibility of the stormwater management infrastructure with the objective of the Ecological Linkage. Specifically, there are concerns regarding wildlife movement, extensive areas of hydrologic change, extended stormwater detention areas with 44-hour drawdowns and 1.6m of flooding, impacts of soil and vegetation in the Ecological Linkages from a change in hydrology and contaminants (e.g., salt). The proposed area to be occupied by SWM infrastructure may need to be reduced to maintain the function of the Ecological Linkage.

5. Required: It is unclear if the entire extent of the proposed infiltration basins must be cleared of vegetation. Please clarify where vegetation clearing is proposed within the Ecological Linkage and which areas will be suitable for naturalization. Please provide details on the types of

naturalization that will be compatible with the different areas of the proposed stormwater infrastructure.

6. Required: To reduce the area of stormwater management infrastructure in the Ecological Linkage, Low Impact Development methods should be considered within the developed portion of the property.

7. Required: Please comment on the infiltration basins' long-term maintenance requirements and whether future vegetation removal will be required as part of maintenance.

8. Required: Although some properties west of the proposed Ecological Linkage are currently undeveloped, they are zoned industrial and are presumed to be developed as such in the future. Therefore, they should be considered industrial properties, not cultural meadows, when assessing impacts from adjacent land uses.

9. Required: The northern stormwater management basin within the Ecological Linkage is very close to Clair Road. A sufficient setback from Clair Road must be provided to facilitate the installation of a wildlife tunnel or crossing.

10. Required: As per section 4.1.3.9.13 of the Official Plan, the location where the Ecological Linkage meets Clair Road may be identified as a Wildlife Crossing. Please provide details on recommended mitigation measures to reduce wildlife-vehicle conflicts and facilitate wildlife movement within the Natural Heritage System.

11. Required: The subject property is in the Hanlon Creek Subwatershed. The EIS should include a review of the Hanlon Creek Watershed Plan (1993) and the Hanlon Creek State-of-the-Watershed Study (2004) and incorporate any recommendations and requirements where appropriate, specifically recommendations related to Greenspace Connectivity and Linkages.

12. Required: Based on EIS Figure 4, part of the proposed internal road network is within or immediately adjacent to the Ecological Linkage. All roads must be outside the Ecological Linkage, and there must be sufficient space between the road and the Ecological Linkage to allow for construction, desired landscaping, and normal maintenance.

13. Required: Based on EIS Figure 4, the furthest south structure is proposed to be located immediately adjacent to the Ecological Linkage. A sufficient area between the building and the Ecological Linkage is required to allow for construction, desired landscaping, and normal maintenance and operation.

14. Required: The Tree Inventory and Protection Plan was referenced but not provided. This information is required to assess the appropriateness of the proposed Ecological Linkage relocation, stormwater management strategy and required compensation. Please include it in the next submission.

15. Required: Candidate habitats for two species at risk, Easter Meadowlark and Bat species, were identified in the EIS. The EIS recommends that "Consultation with MECP could be a condition of Site Plan approval." However, the requirements for species protection, habitat protection and compensation must be determined as part of the rezoning and Ecological Linkage realignment process. Consultation with MNRF and guidance on protection requirements are required; details should be included in the next submission. Additionally, please comment on the candidate Species and Risk Habitat locations. From the figures provided, the SAR habitat appears to be primarily within the current Ecological Linkage alignment.

16. Required: The EIS must include a clear list of recommendations to be implemented through the Site Plan and associated Environmental Implementation Report (EIR). Some items to be included are:
    a. Restoration of Ecological Linkage;
    b. Inventory and transplanting/replacement of trees planted on City of Guelph property (266 Clair Rd);
    c. Noise and light mitigation;
    d. Fencing details; and
    e. SWM facility design and naturalization.

17. Note: The City's Stewardship group has conducted tree planting at the City-owned 266 Clair Road parcel between 2020 and 2024. A total of 1090 native trees and shrubs were planted on this parcel. The planted material is undersized and would not be subject to compensation under the Tree By-law. However, full compensation for these plantings is recommended by Environmental Planning as part of any land swap agreement in addition to the standard tree compensation requirements. A commitment to fully compensate for the loss of these plantings should be included in the EIS. Details can be confirmed through the Site Plan or any land swap agreement.

18. Note: The EIS indicates no trails are proposed within the linkage. It should be noted that revisions to add trails at a later planning stage may not be supported without an increase in linkage width.

19. Note: Section 3.1 of the Planning Justifications Report states, "Minor landscape enhancements are proposed to the linkage, including transplanting some trees from the eastern parts of the Subject Lands." Please note that a robust enhancement plan for the Ecological Linkage will be required to mitigate against the impacts of the proposed change in width and intensity of the adjacent land uses (i.e., industrial and high-density residential).

Conclusion:

Based on a review of the application materials, Environmental Planning does not support the proposed realignment of the Ecological Linkage and modifications to its width or the proposed Stormwater Management approach without fully addressing the above comments.

Should you have any questions about the above comments, please let me know.

Regards,

Ryan Hamelin

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INTERNAL MEMO

Guelph
Making a Difference

DATE November 28, 2025

TO **Anand Shah, Planner III**

FROM Ryan Hamelin, Environmental Planner
DIVISION Infrastructure, Development and Environment
DEPARTMENT Planning and Building Services

SUBJECT **266 and 280 Clair Road West – Proposed Official Plan Amendment & Zoning Bylaw Amendment**

Proposal

The proposed Official Plan Amendment and Zoning Bylaw Amendment are being pursued to facilitate high-density residential development on the lands municipally addressed as 266 and 280 Clair Road West. The proposed development includes a mix of high-rise residential buildings, townhouse blocks, and an associated parking structure. Two large stormwater management facilities are proposed within the realigned Ecological Linkage.

The proposed development cannot be accommodated through the existing zoning or designations and would require rezoning the lands from industrial to residential, a land swap with the City, and the realignment of the on-site Ecological Linkage.

The subject property contains a Natural Heritage System consisting of an Ecological Linkage and a candidate Species at Risk habitat.

Materials Reviewed
Environmental Planning staff have reviewed the following reports from the submission of the above-noted application:

- Planning Justification Report. 266-280 Clair Road West, Guelph. Prepared for: Home Opportunities and 2742707 Ontario Limited. Prepared by: GSP group. July 2025.
- Functional Servicing and Stormwater Management Report. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counterpoint Land Development and Dillon Consulting. November 20, 2024.
- Environmental Impact Study. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: North-South Environmental Inc., November 28, 2024.
- Site Grading Plan. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counter Point Engineering. November 20, 2024.
- Storm Drainage Plan. 280 Clair Road West, Guelph. Prepared for: Home Opportunities. Prepared by: Counterpoint Engineering. Last revised November 20, 2024.
- Arborist Report – Tree Inventory and Preservation Plan. 280 Clair Road West, Guelph. Prepared for: John Farley, Home Opportunities. Prepared by: North-South Environmental Inc. November 13, 2024.

- Urban Design Brief. 280 Clair Road West, Guelph. Prepared by: Architecture Unfolded. December 2024.

Comments

Ecological Linkage - Context: Ecological Linkages are part of the Natural Heritage System and are intended to facilitate the movement of flora and fauna between Significant Natural Areas. Ecological Linkages may incorporate lands that do not otherwise meet the criteria for protection under the Significant Natural Areas or Natural Areas policies. Ecological Linkages are 100 metres in width except where narrower linkages have been approved or identified.

1. Official Plan Policy Section 4.1.3.9 (11) ii) requires that 'proposed changes to the location or width of an Ecological Linkage will maintain or enhance functionality and connectivity'. The established Ecological Linkage is on the east side of the property and is 100m wide. The proposal is to relocate the Ecological Linkage to the west side of the property and reduce the width to 60m. The Environmental Impact Study (EIS) and supporting documents do not satisfactorily demonstrate that the functionality and connectivity of the proposed Ecological Linkage will be maintained or enhanced. Further information is provided below (See Comments 2-8).

2. The proposed alignment of the Ecological Linkage does not provide a continuous connection to the Natural Heritage System south of the subject property, whereas the current Ecological Linkage does provide connectivity to the Natural Heritage System to the south. Therefore, the proposed linkage does not maintain connectivity and does not meet the criteria for an Ecological Linkage.

3. The EIS references the potential negative effects of noise on the Ecological Linkage's function; however, little detail is provided on how impacts will be mitigated. The current Linkage alignment includes Industrial Lands, Institutional (i.e., school), and Open Space as adjacent land uses. Whereas, the proposed relocated Ecological Linkage would result in adjacent land uses of High-density Residential and Industrial, which would likely lead to greater noise impacts if not mitigated.

4. Official Plan Policy 4.1.3.9 (10) allow for 'stormwater management facilities and structures and their normal maintenance to be permitted in an Ecological Linkage, where it has been demonstrated through an EIS that the functionality and connectivity of the Ecological Linkage will be maintained or enhanced'.

   The proposed Functional Servicing and Stormwater Management Report (FSSWM), along with the EIS, fails to demonstrate that the proposed stormwater management (SWM) approach in the Ecological Linkage is consistent with this policy for the following reasons:

   a. The area of linkage occupied by the proposed infiltration basins is far too large and would substantially reduce the features, functions, and effectiveness of the Linkage. There is minimal information on the types of restoration of ecological functions that

could be implemented in infiltration basins; however, large-scale tree and vegetation planting is typically not appropriate within SWM infrastructure. Additionally, the level of water fluctuation, from dry to 1.6m of inundation, would limit the habitat quality and opportunities for restoration. The size of the infiltration basins is reported as 0.67 ha and 2.149 ha, for a total of 2.82 ha (according to the FSSWM), and they are almost entirely located within the proposed Ecological linkage.

Specifically, concerns regarding the extent of SWM in the Ecological Linkage include:

i. Impairments to wildlife movement.
ii. Extensive impacts to soil and vegetation from the proposed hydrologic change with extended stormwater detention time of 44 hours, 1.6m of inundation.
iii. Impacts on soil and vegetation from contaminants associated with stormwater (e.g., salt).

b. The long-term maintenance requirements of the infiltration basins are unclear but will likely require periodic disturbance, and vegetation removal and will therefore reduce their effectiveness as habitat and natural area within the Ecological Linkage.

c. Based on the material provided, it is unclear if the entire extent of the proposed infiltration basins must be cleared of vegetation. However, based on the proposed depth and expected duration of inundation, much of the vegetation within the infiltration basins is expected to be impacted. No analysis of this impact has been provided.

5. As per section 4.1.3.9.13 of the Official Plan, 'Where Ecological Linkages are located such that wildlife will need to cross a road, these areas shall also be identified as a wildlife crossings and mitigative measures may be required in accordance with the provisions of Section 4.1.5 (Wildlife Crossings)'. This policy has not been sufficiently addressed.

    a. Details on recommended mitigation measures to reduce wildlife-vehicle conflicts and facilitate wildlife movement within the Natural Heritage System have not been provided.

    b. The northern stormwater management basin within the Ecological Linkage is very close to Clair Road and does not provide a sufficient setback from Clair Road to facilitate the installation of an appropriate wildlife tunnel or crossing.

6. Based on Figure 4 of the EIS and the Stormwater Drainage Plan, the furthest south structure (i.e., parking structure) is proposed to be located immediately adjacent to the Ecological Linkage. Sufficient space between the building and the Ecological Linkage is required to accommodate construction, desired landscaping, and normal maintenance and operations. The location of this building is not supported.

7. Guelph's lighting policy requires a lighting level of 0 lux at the limit of the Natural Heritage System (i.e., Ecological Linkage). Although the EIS recommends minimizing light pollution and

spillage into the Ecological Linkage, no details have been provided. Given the proximity of interior roads and buildings to the proposed Ecological Linkage (i.e. immediately adjacent), it has not been demonstrated that the lighting policy requirements can be achieved with the current site configuration.

8. The Tree Inventory and Preservation Plan recommends substantial tree removal from within the current Ecological Linkage, including removing numerous large trees of native species and several specimens of the Locally Significant Black Maple. Given this context, a sufficient analysis has not been provided to demonstrate that the proposed relocation of the Ecological Linkage can maintain or enhance species composition and the urban canopy, consistent with Official Plan policy for maintaining or enhancing linkage functionality.

Stormwater Management:

9. There appear to be discrepancies in the Stormwater Management Plan regarding the reported size of the proposed infiltration basins and their depicted size. The Functional Servicing and Stormwater Management Report identifies the South Infiltration Basin as 0.67 ha, and the North Basin as 2.149 ha, for a total area of 2.22 ha. However, according to measurements from the Storm Drainage Plan, the basins' areas are depicted as approximately 0.49 ha and 0.97 ha, respectively, for a total area of 1.46 ha. This implies that the area of Ecological Linkage that the basins will occupy is underrepresented in the Storm Drainage Plan figure, or that the stormwater infrastructure may be undersized, and that the extent, frequency, and depth of inundation may be underestimated. Due to this discrepancy, the actual footprint and extent of associated impacts cannot be assessed.

10. Based on the Stormwater Drainage Plan, the sizing of the infiltration basins does not seem to account for run-off and inflow of water from the remainder of the Ecological Linkage, approximately 1.23 ha. Therefore, the proposed infiltration basins are potentially undersized.

Environmental Impact Study:

11. Official Plan Policy 4.1.3.3. (2) states, ‘Development and site alteration shall not be permitted in Habitat of Endangered and Threatened Species … except in accordance with provincial and federal requirements’. The EIS identified candidate habitats for Species at Risk (SAR), Eastern Meadowlark and Bat species. The EIS recommends that "Consultation with MECP could be a condition of Site Plan approval." However, the requirements for species protection, habitat protection and compensation must be determined as part of the proposed Official Plan Amendment and Zoning Bylaw Amendment. Consultation with MECP for guidance on protection and permitting requirements is needed; details of the consultation should be documented and provided to the City. Additionally, analysis is required of the locations of candidate Species at Risk Habitat with regard to their presence in the current Ecological Linkage versus the proposed Ecological Linkage, and whether the proposed linkage relocation will maintain or enhance the functions of the SAR habitat. Note: From the figures provided, the SAR habitat appears to be primarily within the current Ecological Linkage alignment.

12. Section 11 of the EIS includes several general recommendations, but must provide a clear list of specific recommendations and mitigation measures to be implemented. Details of proposed recommendations and mitigation measures need to be determined through an Environmental Implementation Report (EIR). Some items that would need to be included are:
    a. Planting and restoration within the proposed Ecological Linkage;
    b. Inventory and transplanting/replacement of trees planted on City of Guelph property (266 Clair Rd);
    c. Noise and light mitigation;
    d. Fencing details;
    e. SWM facility planting and restoration; and
    f. Any proposed monitoring.

Tree Inventory and Protection Plan

13. The Tree Inventory and Protection Plan mainly cover the portions of the site outside the proposed Ecological Linkage alignment. It's unclear whether additional trees within the proposed Ecological Linkage will need to be removed as part of any proposed grading and construction of the stormwater management infiltration basins. Additionally, the Tree Inventory and Protection Plan does not consider the impacts or required removal of trees from within the infiltration basins due to the proposed inundation.

14. The Tree Inventory and Protection Plan largely does not include trees from within the proposed linkage alignment; therefore, it is not possible to evaluate the relative difference, if any, in tree quality between the existing Ecological Linkage alignment and the proposed alignment. Several large native tree species occur in the current Ecological Linkage and are proposed for removal if the linkage is realigned. The provided inventory and analysis aren't sufficient to support the proposed relocation of the Ecological Linkage.

15. The Tree Inventory and Protection Plan indicates that a $500 per tree removed compensation could be paid for the required compensation. However, space for on-site compensation exists, and the City will require compensation plantings over cash-in-lieu where the opportunity exists. A commitment to plant compensation trees consistent with the requirements of the Tree Technical Manual is required.

Notes:

16. Note: The proposed Ecological Linkage alignment includes an approximately 6.4 m wide City of Guelph-owned parcel to the west of the subject property. The City-owned parcel is currently zoned as Industrial. It is unclear whether the proposed Zoning Bylaw amendment and Official Plan Amendment include that parcel, but that portion of City-owned property will also need to be rezoned and incorporated into the Ecological Linkage.

17. Note: The Tree Inventory and Protection Plan proposes the removal of, or impacts to, shared and neighbouring trees. Please note that it is the applicant's responsibility to gain permission from the shared owners of the trees before any removal or injury to the trees occurs.

18. Note: The Site Grading Plan doesn't show proposed grading at the location of Tree #62. This is a large Black Cherry tree with a 62 cm DBH, proposed for removal in the Tree Inventory and Protection Plan. Opportunities to retain this tree should be explored.

19. Note: The City's Natural Areas Stewardship group has conducted tree planting in the current Ecological Linkage alignment, at the City-owned 266 Clair Road parcel, between 2020 and 2024. A total of 1090 native trees and shrubs were planted on this parcel. The planted material is undersized and not subject to compensation under the Tree Bylaw. However, full compensation for these plantings is recommended by Environmental Planning as part of any land swap agreement in addition to the standard tree compensation requirements.

20. Note: The EIS indicates no trails are proposed within the linkage. It should be noted that revisions to add trails at a later planning stage may not be supported without an increase in linkage width.

21. Note: Section 3.1 of the Planning Justification Report states, "Minor landscape enhancements are proposed to the linkage, including transplanting some trees from the eastern parts of the Subject Lands." Please note that a detailed and robust enhancement plan for the Ecological Linkage will be required to mitigate the impacts of the proposed change in width and the intensity of the adjacent land uses (i.e., industrial and high-density residential), and to compensate for on-site tree removals.

Summary:

1. The provided material has not demonstrated the proposed Ecological Linkage alignment, or the reduction in width is consistent with Official Plan Policy Section 4.1.3.9 (11) ii) with respect to maintaining or enhancing functionality and connectivity of the Ecological Linkage.

2. The proposed realigned Ecological Linkage does not connect to the Natural Heritage System south of the property. It therefore fails to meet the function, intent and designation criteria of an Ecological Linkage and is inconsistent with Official Plan Policy Section 4.1.3.9 (11) ii).

3. The provided material has not demonstrated that a wildlife crossing can be provided at Clair Road and has not provided mitigation measures to reduce wildlife-vehicle conflicts in accordance with Official Plan Policy Section 4.1.3.9.13.

4. The material provided has not demonstrated that the proposed stormwater management infrastructures within the Ecological Linkage will maintain or enhance the functionality and connectivity of the Ecological Linkage consistent with Official Plan Policy Section 4.1.3.9 (10).

5. Due to the significant discrepancy in the reported size of the proposed infiltration basins between the Functional Servicing and Stormwater Management Report and their depictions in the Storm Drainage Plan, the actual footprint and extent of associated impacts cannot be assessed.

6. The provided Tree Inventory and Protection Plan does not adequately inventory all trees which the proposed work may impact, or assess the extent of impacts associated with the proposed Stormwater Management Plan.

Conclusion:

Based on a review of the application materials, Environmental Planning does not support the proposed realignment of the Ecological Linkage or modifications to its width, or the proposed Stormwater Management approach. Environmental Planning recommends refusal of the proposed Official Plan Amendments and Zoning ByLaw Amendments.

Should you have any questions about the above comments, please let me know.

Regards,

Ryan Hamelin

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Comment-Response Matrix

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
1	Required: The EIS did not satisfactorily demonstrate how the applicable policies to refine the width and location of the Ecological Linkage have been fully met. I recommend that a revised version of the EIS include a table showing how all relevant policies of Official Plan Section 4.1.3.9 have been addressed. Further information is provided in the below (comments 2-9).	Table showing how relevant policies of Official Plan Section 4.1.3.9 have been addressed is included and a more detailed discussion can be found in Section 5.9 and 8.5 of the EIS.
2	Required: The proposed Ecological Linkage does not provide a continuous connection to the Natural Heritage System south of the subject property. The City cannot impose a new Natural Heritage System Ecological Linkage mapping change on the adjacent property owners to maintain the linkage connection. The Ecological Linkage will either need to be revised on the subject property to maintain the connection with the Natural Heritage System to the south, or the adjacent property owner will need to agree to the proposed Ecological Linkage changes on their property.	After consultation with the property owner to the south at 950 Southgate Drive (Tim Hortons) an agreed upon realignment boundary has been established see Figure 3B. The agreement has been appended to the EIS in Appendix 8.
3	Required: The proposed Ecological Linkage alignment includes an approximately 6.4 m wide City of Guelph-owned parcel to the west of the subject property. The City-owned parcel is currently zoned as industrial. The City has not agreed to incorporate this parcel into the Ecological Linkage. Please contact the City's Legal and Realty Services to confirm that this parcel can be included in the proposed Ecological Linkage corridor.	Please see correspondence from March 18, 2026 from James Goodram, City of Guelph to Hugh Handy, GSP Group, which confirms the following: "*You do not require our authorization for the application. Any approvals would require subsequent agreements with the City should the application have merit and meet technical requirements etc.*" See Appendix 2 *JamesGoodramGuelph_CorrespndenceGSP_reCityLands_18Mar26*
4	Required: It has not been satisfactorily shown how Official Plan Policies 4.1.3.9 (4, 9, 10, 11. ii) have been met. Specifically, it has not been demonstrated that the proposed development will have no negative impacts and/or maintain or enhance the functionality of the Ecological Linkage. Further detailed analysis and policy review are required regarding:	Table showing how relevant policies of Official Plan Section 4.1.3.9 have been addressed is included and a more detailed discussion can be found in Section 5.9 and 8.5 of the EIS. See comment responses below (4a – 4c).
4a	Lighting: Although the EIS recommends minimizing light pollution and spillage into the NHS, it should be noted that Guelph's lighting policy will require a lighting level of 0 lux at the limit of the Natural Heritage System (i.e., Ecological Linkage). Based on the proximity of interior roads and buildings, it should be confirmed that this lighting condition can be met.	Neither the Linkage or any other area on the property is free from ambient light due to the surrounding development to the north (Clair Road with street lamps), west (industrial buildings with large lights in the parking lot adjacent to the natural area), and east (high school and Guelph South End Recreational Complex). As such, achieving a 0 lux lighting condition cannot be met under current conditions. Lighting will have consideration for the City of Guelph Lighting Guidelines for Lighting Plans, and follow best practices such as those from the DarkSky Approved Luminaires program established by DarkSky International.

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
4b	Noise: The EIS references the potential negative effects of noise on the Ecological Linkage's function; however, little detail is provided on how impacts will be mitigated.	As described in the EIS (Section 8.5.2), a higher density of shrub and tree plantings are suggested along the eastern edge of the proposed ecological linkage realignment and on the western edge where the linkage occurs within 40 m of the adjacent Industrial land use, to provide shelter and a buffering function for wildlife as part of mitigating the effects of noise and light associated with the proposed residential development. It should be recognized that there are limited mitigation measures that can be introduced in an urban setting to reduce the impacts of light and noise on natural features and areas. Moreover, any noise associated with a residential development in this location will not significantly exacerbate existing noise from surrounding lands. As such, there is not expected to be a negative impact resulting from noise originating from the proposed residential development.
4c	Stormwater Management Infrastructure in the Ecological Linkage: There are extensive areas of stormwater management infrastructure in the Ecological Linkage. Further discussion is required on the impacts and compatibility of the stormwater management infrastructure with the objective of the Ecological Linkage. Specifically, there are concerns regarding (i) wildlife movement, (ii) extensive areas of hydrologic change, (iii) extended stormwater detention areas with 44-hour drawdowns and 1.6m of flooding, (iv) impacts of soil and vegetation in the Ecological Linkages from a change in hydrology and contaminants (e.g., salt). The proposed area to be occupied by SWM infrastructure may need to be reduced to maintain the function of the Ecological Linkage.	(i) The ecological linkage will function to provide refugia for local wildlife and plants, and movement across the local-scale landscape. Restoration and plantings (including within the current agricultural field) will be undertaken to enhance the function of the linkage. These will include native vegetation (seeding, plantings of shrubs and trees) left in a free-to-grow state. This function will be enhanced following the proposed linkage realignment. As described in the EIS (Section 8.5.2): Restoration and plantings (including within the current agricultural field) will be undertaken to enhance the function of the linkage, including throughout the infiltration basin. There will be no mowing or removal of any vegetation within the linkage as part of any future maintenance. (ii) As described in the EIS (Section 7): Two naturalized / vegetation infiltration basins (no hard infrastructure) are proposed within the relocated linkage. As part of this, minor grading and fill will be required; however, it is largely limited to the existing agricultural field (based on current designs). As described in the EIS (Section 7): Based on contour information provided in the Hydrogeology report (JLP 2024), it has been interpreted that the subject property currently drains towards the area of the proposed linkage alignment. As described in Section 4.2 [of the EIS], current soil conditions are course / porous. As described in the EIS (Section 7): It is NSE's understanding, through discussions with the engineer, the drawdown rate within proposed South infiltration basin will be less than 43 hours in the event of a 100-year storm and the drawdown rate within the proposed North infiltration basin will be less than 19 hours in the event of a 100-year storm (based on a conservative infiltration rate of 36 mm/hour; JLP 2024, and Counterpoint, 2026). While there may be a minor change in the soil moisture regime due to infrequent flooding / water retention or the height of the water table in the linkage, vegetation proposed for planting in this area will be adapted to infrequent flooding. (iii) As described in the EIS (Section 7): Native herbaceous plants, shrubs and tree species will be chosen to suit the current and anticipated biotic and abiotic (e.g., soil texture, soil moisture) conditions within the linkage. The current and anticipated soil moisture regime and soil texture will continue to support upland vegetation. However, recognizing the potential for flooding within the linkage, and the discharge of storm water into the linkage, species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin. The remaining areas within the linkage will be seeded/planted with upland species.

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
5	Required: It is unclear if the entire extent of the proposed infiltration basins must be cleared of vegetation. (i) Please clarify where vegetation clearing is proposed within the Ecological Linkage and which areas will be suitable for naturalization. (ii) Please provide details on the types of naturalization that will be compatible with the different areas of the proposed stormwater infrastructure.	(i) As described in the EIS (Section 7): Two naturalized / vegetation infiltration basins (no hard infrastructure) are proposed within the relocated linkage. As part of this, minor grading and fill will be required; however, it is largely limited to the existing agricultural field (based on current designs). Extent of grading is identified on the Site Basin Figure in the memo from Counterpoint. The Tree Inventory and Preservation Plan (TIPP) shows grading plans overlaid with tree inventory results and aerial imagery (it is understood the TIPP was not included in the last submission). It is anticipated that the entire extent of the linkage will be suitable for naturalization. (ii) As described in the EIS (Section 7): Native herbaceous plants, shrubs and tree species will be chosen to suit the current and proposed biotic and abiotic (e.g., soil texture, soil moisture) conditions within the linkage. The current and anticipated soil moisture regime and soil texture will continue to support upland vegetation. However, recognizing the potential for flooding within the linkage, and the discharge of storm water into the linkage, species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin. The remaining areas within the linkage will be seeded/planted with upland species.
6	Required: To reduce the area of stormwater management infrastructure in the Ecological Linkage, Low Impact Development methods should be considered within the developed portion of the property.	As per the memo provided by Counterpoint (2026), at source LIDs are not required to meet municipal or provincial SWM regulations as the infiltration basins can treat the proposed development. However, at source LIDs can be contemplated at detailed design.
7	Required: Please comment on the infiltration basins' long-term maintenance requirements and whether future vegetation removal will be required as part of maintenance.	As described in the EIS (Section 8.5.2): There will be no mowing or removal of any vegetation within the linkage as part of any future maintenance.
8	Required: Although some properties west of the proposed Ecological Linkage are currently undeveloped, they are zoned industrial and are presumed to be developed as such in the future. Therefore, they should be considered industrial properties, not cultural meadows, when assessing impacts from adjacent land uses.	Noted – relevant EIS sections revised. No change to the EIS conclusions based on this revision.
9	Required: The northern stormwater management basin within the Ecological Linkage is very close to Clair Road. A sufficient setback from Clair Road must be provided to facilitate the installation of a wildlife tunnel or crossing.	The north infiltration basin has been shifted south to accommodate the installation of a wildlife tunnel crossing. It is currently set back over 10 m from the property line and can be moved further south as needed. Any future road width for Clair Road and the design of the wildlife crossing will inform the basin location and can be addressed once more information is provided and detailed design/site plan approval.

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
10	Required: As per section 4.1.3.9.13 of the Official Plan, the location where the Ecological Linkage meets Clair Road may be identified as a Wildlife Crossing. Please provide details on recommended mitigation measures to reduce wildlife-vehicle conflicts and facilitate wildlife movement within the Natural Heritage System.	As described in the EIS (Section 5.9.2): It is recommended that any future City works along Clair Road West consider the inclusion of eco-passages to provide safe crossing for small mammals, reptiles, etc. Considerations for Wildlife Crossing recommendations identified in section 5.9 of the EIS with reference to the City of Guelph Wildlife Crossing Guideline (2023). Additional note: Wildlife crossing surveys were not undertaken as part of EIS field surveys. Based on habitat availability in proximity to the linkage / crossing location, it is assumed that small and large mammals may be crossing at Clair Road (amphibians are highly unlikely to occur given the lack of wetland habitat). A wildlife tunnel may be recommended as part of any future road redevelopment at Clair Road to facilitate movement of small mammals and snakes (if present). Wildlife crossing signs or flashing lights may be installed to increase awareness of potential deer and medium to small mammal crossing. Any details for the construction of a wildlife crossing structure should follow the guidance from the City of Guelph Wildlife Crossing Guideline (2023).
11	Required: The subject property is in the Hanlon Creek Subwatershed. The EIS should include a review of the Hanlon Creek Watershed Plan (1993) and the Hanlon Creek State-of-the- Watershed Study (2004) and incorporate any recommendations and requirements where appropriate, specifically recommendations related to Greenspace Connectivity and Linkages.	Identified references were reviewed and incorporated, where appropriate.
12	Required: Based on EIS Figure 4, part of the proposed internal road network is within or immediately adjacent to the Ecological Linkage. All roads must be outside the Ecological Linkage, and there must be sufficient space between the road and the Ecological Linkage to allow for construction, desired landscaping, and normal maintenance.	Revisions to the grading have been made to accommodate a flat 2.0 m strip next to the internal road adjacent to the Linkage. This strip will provide the required space for maintenance and landscaping. The internal road configuration can be modified during detailed design/site plan approval should more space for landscaping be required.
13	Required: Based on EIS Figure 4, the furthest south structure is proposed to be located immediately adjacent to the Ecological Linkage. A sufficient area between the building and the Ecological Linkage is required to allow for construction, desired landscaping, and normal maintenance and operation.	The site plan has been updated in order to provide an appropriate setback (5m) from the Ecological Linkage. The proposed setback will now be sufficient for normal maintenance and operations. See figure 4.
14	Required: The Tree Inventory and Protection Plan was referenced but not provided. This information is required to assess the appropriateness of the proposed Ecological Linkage relocation, stormwater management strategy and required compensation. Please include it in the next submission.	Provided

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
15	Required: Candidate habitats for two species at risk, Easter Meadowlark and Bat species, were identified in the EIS. (i) The EIS recommends that "Consultation with MECP could be a condition of Site Plan approval." However, the requirements for species protection, habitat protection and compensation must be determined as part of the rezoning and Ecological Linkage realignment process. Consultation with MNRF and guidance on protection requirements are required; details should be included in the next submission. (ii) Additionally, please comment on the candidate Species and Risk Habitat locations. From the figures provided, the SAR habitat appears to be primarily within the current Ecological Linkage alignment.	Consultation with the MECP had been initiated. NSE submitted an IGF on June 17, 2025, initial comments were provided by the MECP on September 16, 2025, and NSE submitted responses to the comments on March 3, 2026. NSE received a letter from MECP on March 30th, stating that the activity is now subject to the SCA which came into effect on March 30th. Removal of the Cultural Thicket and Cultural Savannah communities within the subject property will result in the removal of suitable species at risk bat maternity roost habitat. The activity of habitat removal is considered a registerable activity in accordance with section 16 of the SCA. In accordance with the SCA, the details of the mitigation and habitat enhancement measures will be outlined in the conservation plan that will be uploaded as part of the registration of the activity in the online Species Conservation Registry. See **section 5.2.1.2** for further information on the contents of a conservation plan. Proposed enhancement of the ecological linkage realignment will include the installation of Rocket Bat Boxes and/or Brandon Bark Structures to provide habitat for roosting bats. In addition, trees proposed for planting include those that will support roosting habitat, including maples, and Shagbark Hickory. Habitat continues to be available in the large tracts of woody habitat which continue to the south of the subject property and to the east (beyond the recreation complex / Larry Pearson Park). It is recommended that the City make it condition of approval that proof of registration of activity be provided prior to removal of vegetation and site alteration on the subject property. Eastern Meadowlark is no longer protected under provincial legislation, namely the SCA. Eastern Meadowlark and its habitat continue to be protected under SARA. With the recent transition of responsibility for protection of Eastern Meadowlark from the ESA to the SARA, NSE has commenced consultation with ECCC to determine if a permit is required for activities that impact the habitat for Eastern Meadowlark on the subject property. It is recommended that the City make it a condition of approval that correspondence with ECCC be provided to demonstrate that the proposed development is being completed in accordance with the SARA. See section 5.2 of the EIS for details on SCA and SARA and Table 3 for policy conformity.
16	Required: The EIS must include a clear list of recommendations to be implemented through the Site Plan and associated Environmental Implementation Report (EIR). Some items to be included are: a. Restoration of Ecological Linkage; b. Inventory and transplanting/replacement of trees planted on City of Guelph property (266 Clair Rd); c. Noise and light mitigation; d. Fencing details; and e. SWM facility design and naturalization.	List of recommendations included in Section 11 of the revised EIS.

#	Environmental Planning Comments (R. Hamelin, February 21, 2025)	NSE Response (April 2026)
17	Note: The City's Stewardship group has conducted tree planting at the City-owned 266 Clair Road parcel between 2020 and 2024. A total of 1,090 native trees and shrubs were planted on this parcel. The planted material is undersized and would not be subject to compensation under the Tree By-law. However, full compensation for these plantings is recommended by Environmental Planning as part of any land swap agreement in addition to the standard tree compensation requirements. A commitment to fully compensate for the loss of these plantings should be included in the EIS. Details can be confirmed through the Site Plan or any land swap agreement.	Client confirmed their commitment to fully compensating for the removal of the “undersized” plantings.
18	Note: The EIS indicates no trails are proposed within the linkage. It should be noted that revisions to add trails at a later planning stage may not be supported without an increase in linkage width.	Understood
19	Note: Section 3.1 of the Planning Justifications Report states, "Minor landscape enhancements are proposed to the linkage, including transplanting some trees from the eastern parts of the Subject Lands." Please note that a robust enhancement plan for the Ecological Linkage will be required to mitigate against the impacts of the proposed change in width and intensity of the adjacent land uses (i.e., industrial and high density residential).	Noted – Enhancement Plan will be recommended through the Site Plan and associated Environmental Implementation Report (EIR).

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
	Ecological Linkage - Context: Ecological Linkages are part of the Natural Heritage System and are intended to facilitate the movement of flora and fauna between Significant Natural Areas. Ecological Linkages may incorporate lands that do not otherwise meet the criteria for protection under the Significant Natural Areas or Natural Areas policies. Ecological Linkages are 100 metres in width except where narrower linkages have been approved or identified.	Noted
1	Official Plan Policy Section 4.1.3.9 (11) ii) requires that 'proposed changes to the location or width of an Ecological Linkage will maintain or enhance functionality and connectivity'. The established Ecological Linkage is on the east side of the property and is 100m wide. The proposal is to relocate the Ecological Linkage to the west side of the property and reduce the width to 60m. The Environmental Impact Study (EIS) and supporting documents do not satisfactorily demonstrate that the functionality and connectivity of the proposed Ecological Linkage will be maintained or enhanced. Further information is provided below (See Comments 2-8).	As above (Table showing how relevant policies of Official Plan Section 4.1.3.9 have been addressed is included and a more detailed discussion can be found in Section 5.9 and 8.5 of the EIS.)
2	The proposed alignment of the Ecological Linkage does not provide a continuous connection to the Natural Heritage System south of the subject property, whereas the current Ecological Linkage does provide connectivity to the Natural Heritage System to the south. Therefore, the proposed linkage does not maintain connectivity and does not meet the criteria for an Ecological Linkage.	As above (After consultation with the property owner to the South (Tim Hortons) an agreed upon realignment boundary has been established that provides connectivity to the NHS to the South see Figure 3B.)

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
3	The EIS references the potential negative effects of noise on the Ecological Linkage's function; however, little detail is provided on how impacts will be mitigated. The current Linkage alignment includes Industrial Lands, Institutional (i.e., school), and Open Space as adjacent land uses. Whereas, the proposed relocated Ecological Linkage would result in adjacent land uses of High-density Residential and Industrial, which would likely lead to greater noise impacts if not mitigated.	As above (As described in the EIS (Section 8.5.2), a higher density of shrub and tree plantings are suggested along the eastern edge of the proposed ecological linkage realignment and on the western edge where the linkage occurs within 40 m of the adjacent Industrial land use, to provide shelter and a buffering function for wildlife as part of mitigating the effects of noise and light associated with the proposed residential development. Additional mitigation measures are not available for noise in an urban setting. Moreover, any noise associated with a residential development in this location will not significantly exacerbate existing noise from surrounding lands. As such, there is not expected to be a negative impact resulting from noise originating from the proposed residential development.)
4	Official Plan Policy 4.1.3.9 (10) allow for 'stormwater management facilities and structures and their normal maintenance to be permitted in an Ecological Linkage, where it has been demonstrated through an EIS that the functionality and connectivity of the Ecological Linkage will be maintained or enhanced'. The proposed Functional Servicing and Stormwater Management Report (FSSWM), along with the EIS, fails to demonstrate that the proposed stormwater management (SWM) approach in the Ecological Linkage is consistent with this policy for the following reasons:	See below responses

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
4a	The area of linkage occupied by the proposed infiltration basins is far too large and would substantially reduce the features, functions, and effectiveness of the Linkage. There is minimal information on the types of restoration of ecological functions that could be implemented in infiltration basins; however, large-scale tree and vegetation planting is typically not appropriate within SWM infrastructure. Additionally, the level of water fluctuation, from dry to 1.Gm of inundation, would limit the habitat quality and opportunities for restoration. The size of the infiltration basins is reported as 0.67 ha and 2.149 ha, for a total of 2.82 ha (according to the FSSWM), and they are almost entirely located within the proposed Ecological linkage. Specifically, concerns regarding the extent of SWM in the Ecological Linkage include: i. Impairments **to** wildlife movement. ii. Extensive impacts to soil and vegetation from the proposed hydrologic change with extended stormwater detention time of 44 hours,1.Gm of inundation. iii. Impacts on soil and vegetation from contaminants associated with stormwater (e.g., salt).	As above: (i) The ecological linkage will function to provide refugia for local wildlife and plants, and movement across the local-scale landscape. Restoration and plantings (including within the current agricultural field) will be undertaken to enhance the function of the linkage. These will include native vegetation (seeding, plantings of shrubs and trees) left in a free-to-grow state. This function will be enhanced following the proposed linkage realignment. As described in the EIS (Section 8.5.2): Restoration and plantings (including within the current agricultural field) will be undertaken to enhance the function of the linkage, including throughout the infiltration basin. There will be no mowing or removal of any vegetation within the linkage as part of any future maintenance. (ii) As described in the EIS (Section 7): Two naturalized / vegetation infiltration basins (no hard infrastructure) are proposed within the relocated linkage. As part of this, minor grading and fill will be required; however, it is largely limited to the existing agricultural field (based on current designs). As described in the EIS (Section 7): Based on contour information provided in the Hydrogeology report (JLP 2024), it has been interpreted that the subject property currently drains towards the area of the proposed linkage alignment. As described in Section 4.2 [of the EIS], current soil conditions are course / porous. As described in the EIS (Section 7): It is NSE's understanding, through discussions with the engineer, the drawdown rate within proposed South infiltration basin will be less than 43 hours in the event of a 100-year storm and the drawdown rate within the proposed North infiltration basin will be less than 19 hours in the event of a 100-year storm (based on a conservative infiltration rate of 36 mm/hour; JLP 2024, and Counterpoint, 2026). While there may be a minor change in the soil moisture regime due to infrequent flooding / water retention or the height of the water table in the linkage, vegetation proposed for planting in this area will be adapted to infrequent flooding. (iii) As described in the EIS (Section 7): Native herbaceous plants, shrubs and tree species will be chosen to suit the current and anticipated biotic and abiotic (e.g., soil texture, soil moisture) conditions within the linkage. The current and anticipated soil moisture regime and soil texture will continue to support upland vegetation. However, recognizing the potential for flooding within the linkage, and the discharge of storm water into the linkage, species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin. The remaining areas within the linkage will be seeded/planted with upland species.

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
4b	The long-term maintenance requirements of the infiltration basins are unclear but will likely require periodic disturbance, and vegetation removal and will therefore reduce their effectiveness as habitat and natural area within the Ecological Linkage.	As above: As described in the EIS (Section 7): Two naturalized / vegetation infiltration basins (no hard infrastructure) are proposed within the relocated linkage. As part of this, minor grading and fill will be required; however, it is largely limited to the existing agricultural field (based on current designs). There will be no mowing or removal of any vegetation within the linkage as part of any future maintenance. Extent of grading is identified on the Site Basin Figure in the memo by Counterpoint. The Tree Inventory and Preservation Plan (TIPP) shows grading plans overlaid with tree inventory results and aerial imagery (it is understood submission of the TIPP was missed). It is anticipated that the entire extent of the linkage will be suitable for naturalization. As described in the EIS (Section 7): Native herbaceous plants, shrubs and tree species will be chosen to suit the current and proposed biotic and abiotic (e.g., soil texture, soil moisture) conditions within the linkage. The current and anticipated soil moisture regime and soil texture will continue to support upland vegetation. However, recognizing the potential for flooding within the linkage, and the discharge of storm water into the linkage, species tolerant of infrequent short periods of standing water and elevated levels of chlorides (salts) will be selected for the lowest elevation of the infiltration basin. The remaining areas within the linkage will be seeded/planted with upland species.
4c	Based on the material provided, it is unclear if the entire extent of the proposed infiltration basins must be cleared of vegetation. However, based on the proposed depth and expected duration of inundation, much of the vegetation within the infiltration basins is expected to be impacted. No analysis of this impact has been provided.	As above (4b)
5	As per section 4.1.3.9.13 of the Official Plan, 'Where Ecological Linkages are located such that wildlife will need to cross a road, these areas shall also be identified as a wildlife crossings and mitigative measures may be required in accordance with the provisions of Section 4.1.5 (Wildlife Crossings)'. This policy has not been sufficiently addressed.	As above: A discussion on Wildlife Crossing recommendations is identified in section 5.9 of the EIS. It is recommended that any future City works along Clair Road West consider the inclusion of eco-passages to provide safe crossing for small mammals, reptiles, etc. Considerations for Wildlife Crossing recommendations identified in section 5.9 of the EIS with reference to the City of Guelph Wildlife Crossing Guideline (2023). Additional note: Wildlife crossing surveys were not undertaken as part of EIS field surveys. Based on habitat availability in proximity to the linkage / crossing location, it is assumed that small and large mammals may be crossing at Clair Road (amphibians are not likely to occur given the lack of wetland habitat). A wildlife tunnel may be recommended as part of any future road redevelopment at Clair Road to facilitate movement of small mammals and snakes (if present). Wildlife crossing signs or flashing lights may be installed to increase awareness of potential deer and medium to small mammal crossing. Any details for the construction of a wildlife crossing structure should follow the guidance from the City of Guelph Wildlife Crossing Guideline (2023).
5a	Details on recommended mitigation measures to reduce wildlife-vehicle conflicts and facilitate wildlife movement within the Natural Heritage System have not been provided.	As above: A discussion on Wildlife Crossing recommendations identified in section 5.9 of the EIS.

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
5b	The northern stormwater management basin within the Ecological Linkage is very close to Clair Road and does not provide a sufficient setback from Clair Road to facilitate the installation of an appropriate wildlife tunnel or crossing.	The north infiltration basin has been shifted south to accommodate the installation of a wildlife tunnel crossing. It is currently set back over 10 m from the property line and can be moved further south as needed. Any future road width for Clair Road and the design of the wildlife crossing will inform the basin location and can be addressed once more information is provided and detailed design/site plan approval.
6	Based on Figure 4 of the EIS and the Stormwater Drainage Plan, the furthest south structure (i.e., parking structure) is proposed to be located immediately adjacent to the Ecological Linkage. Sufficient space between the building and the Ecological Linkage is required to accommodate construction, desired landscaping, and normal maintenance and operations. The location of this building is not supported.	The site plan has been updated in order to provide an appropriate setback (5m) from the Ecological Linkage. The proposed setback will now be sufficient for normal maintenance and operations.
7	Guelph's lighting policy requires a lighting level of O lux at the limit of the Natural Heritage System (i.e., Ecological Linkage). Although the EIS recommends minimizing light pollution and spillage into the Ecological Linkage, no details have been provided. Given the proximity of interior roads and buildings to the proposed Ecological Linkage (i.e. immediately adjacent), it has not been demonstrated that the lighting policy requirements can be achieved with the current site configuration.	Neither the Linkage nor any other area on the property is presently free from ambient light due to the surrounding development to the north (Clair Road with street lamps), west (industrial buildings with large lights in the parking lot adjacent to the natural area), and east (high school and Guelph South End Recreational Complex). As such, achieving a 0 lux lighting condition cannot be met under current conditions. Lighting will have consideration for the City of Guelph Lighting Guidelines for Lighting Plans, and follow best practices such as those from the DarkSky Approved Luminaires program established by DarkSky International.
8	The Tree Inventory and Preservation Plan recommends substantial tree removal from within the current Ecological Linkage, including removing numerous large trees of native species and several specimens of the Locally Significant Black Maple. Given this context, a sufficient analysis has not been provided to demonstrate that the proposed relocation of the Ecological Linkage can maintain or enhance species composition and the urban canopy, consistent with Official Plan policy for maintaining or enhancing linkage functionality.	The Ecological Linkage occupies approximately 4 ha of land on the subject property The mapping of the Ecological Linkage is currently overlain on an a cultural meadow , agricultural fields, cultural thicket, cultural savannah and a treed hedgerow. The agricultural fields and cultural meadow occupy approximately 1.7 ha of the Ecological Linkage. Throughout the Ecological Linkage, there were 306 trees over 10 cm dbh recorded during the tree inventory (documented in the Arborist Report prepared by NSE, November 2024). This equates to approximately 133 trees/ha within the cultural savannah, cultural thicket and treed hedgerow area. While there will be removal of trees within the current mapped alignment of the Ecological Linkage, the proposed alignment of the Ecological Linkage will be entirely vegetated, including planting of trees and shrubs throughout. The density of trees planted will be closer to 500 trees/ha. While the proposed linkage is more narrow (60 m vs. the mapped 100 m by the City) and occupies 2.7 ha vs. the current mapped area of the Ecological Linkage on the subject lands, the density of 500 trees/ha over the 2.7 ha area will equate to 1,350 trees plus shrubs proposed for planting. Moreover, there will be a higher diversity of trees and shrubs proposed for planting within the Ecological Linkage than is currently found within the City's mapped Ecological Linkage. The net effect will be an area with a higher tree cover and higher biodiversity of tree and shrub species than is currently found on the subject property. The net effect will be an Ecological Linkage that enhances not only the function of the linkage, but the biodiversity of the area that contributes to the objectives of the Official Plan.
	Stormwater Management	

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
9	There appear to be discrepancies in the Stormwater Management Plan regarding the reported size of the proposed infiltration basins and their depicted size. The Functional Servicing and Stormwater Management Report identifies the South Infiltration Basin as 0.67 ha, and the North Basin as 2.149 ha, for a total area of 2.22 ha. However, according to measurements from the Storm Drainage Plan, the basins' areas are depicted as approximately 0.49 ha and 0.97 ha, respectively, for a total area of 1.46 ha. This implies that the area of Ecological Linkage that the basins will occupy is underrepresented in the Storm Drainage Plan figure, or that the stormwater infrastructure may be undersized, and that the extent, frequency, and depth of inundation may be underestimated. Due to this discrepancy, the actual footprint and extent of associated impacts cannot be assessed.	Please refer to the North and South Basin Figures in the memo provided by Counterpoint. The basins utilize the natural topography, therefore the size is dependent on the storm size and corresponding water levels. The referenced figures show the anticipated water levels for 2, 5 and 100-year storm events. The one in one-hundred-year storm event has a water area of 0.084 ha and 0.488 ha for the North and South basins, respectively. The space provided in the ecological linkage plus the high infiltration rates can accommodate above and beyond a 100-year storm event for the proposed development.
10	Based on the Stormwater Drainage Plan, the sizing of the infiltration basins does not seem to account for run-off and inflow of water from the remainder of the Ecological Linkage, approximately 1.23 ha. Therefore, the proposed infiltration basins are potentially undersized.	The Post-Development Drainage Plan was used to size the infiltration basins. This plan incorporates the entire environmental linkage. The existing topography of the proposed linkage can more than accommodate the SWM criteria for the proposed development.
	Environmental Impact Study	
11	Official Plan Policy 4.1.3.3. (2) states, 'Development and site alteration shall not be permitted in Habitat of Endangered and Threatened Species ... except in accordance with provincial and federal requirements'. The EIS identified candidate habitats for Species at Risk (SAR), Eastern Meadowlark and Bat species. The EIS recommends that "Consultation with MECP could be a condition of Site Plan approval." However, the requirements for species protection, habitat protection and compensation must be determined as part of the proposed Official Plan Amendment and Zoning Bylaw Amendment. Consultation with MECP for guidance on protection and permitting requirements is needed; details of the consultation should be documented and provided to the City. Additionally, analysis is required of the locations of candidate Species at Risk Habitat with regard to their presence in the current Ecological Linkage versus the proposed Ecological Linkage, and whether the proposed linkage relocation will maintain or enhance the functions of the SAR habitat. Note: From the figures provided, the SAR habitat appears to be primarily within the current Ecological Linkage alignment.	Consultation with the MECP had been initiated. NSE submitted an IGF on June 17, 2025, initial comments were provided by the MECP on September 16, 2025, and NSE submitted responses to the comments on March 3, 2026. NSE received a letter from MECP on March 30th, stating that the activity is now subject to the SCA which came into effect on March 30th. Removal of the Cultural Thicket and Cultural Savannah communities within the subject property will result in the removal of suitable species at risk bat maternity roost habitat. The activity of habitat removal is considered a registerable activity in accordance with section 16 of the SCA. In accordance with the SCA, the details of the mitigation and habitat enhancement measures will be outlined in the conservation plan that will be uploaded as part of the registration of the activity in the online Species Conservation Registry. See **section 5.2.1.2** for further information on the contents of a conservation plan. Proposed enhancement of the ecological linkage realignment will include the installation of Rocket Bat Boxes and/or Brandon Bark Structures to provide habitat for roosting bats. In addition, trees proposed for planting include those that will support roosting habitat, including maples, and Shagbark Hickory. Habitat continues to be available in the large tracts of woody habitat which continue to the south of the subject property and to the east (beyond the recreation complex / Larry Pearson Park). It is recommended that the City make it condition of approval that proof of registration of activity be provided prior to removal of vegetation and site alteration on the subject property. Eastern Meadowlark is no longer protected under provincial legislation, namely the SCA. Eastern Meadowlark and its habitat continue to be protected under SARA. With the recent transition of responsibility for protection of Eastern Meadowlark from the ESA to the SARA, NSE has commenced consultation with ECCC to determine if a permit is required for activities that impact the habitat for Eastern Meadowlark on the subject property. It is recommended that the City make it a condition of approval that correspondence with ECCC be provided to demonstrate that the proposed development is being completed in accordance with the SARA. See section 5.2 of the EIS for details on SCA and SARA and Table 3 for policy conformity.

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
12	Section 11 of the EIS includes several general recommendations, but must provide a clear list of specific recommendations and mitigation measures to be implemented. Details of proposed recommendations and mitigation measures need to be determined through an Environmental Implementation Report (EIR). Some items that would need to be included are: a. Planting and restoration within the proposed Ecological Linkage; b. Inventory and transplanting/replacement of trees planted on City of Guelph property (266 Clair Rd); c. Noise and light mitigation; d. Fencing details; e. SWM facility planting and restoration; and f. Any proposed monitoring.	List of recommendations included in Section 11 of the revised EIS.
	Tree Inventory and Protection Plan	
13	The Tree Inventory and Protection Plan mainly cover the portions of the site outside the proposed Ecological Linkage alignment. It's unclear whether additional trees within the proposed Ecological Linkage will need to be removed as part of any proposed grading and construction of the stormwater management infiltration basins. Additionally, the Tree Inventory and Protection Plan does not consider the impacts or required removal of trees from within the infiltration basins due to the proposed inundation.	See response to 4b
14	The Tree Inventory and Protection Plan largely does not include trees from within the proposed linkage alignment; therefore, it is not possible to evaluate the relative difference, if any, in tree quality between the existing Ecological Linkage alignment and the proposed alignment. Several large native tree species occur in the current Ecological Linkage and are proposed for removal if the linkage is realigned. The provided inventory and analysis aren't sufficient to support the proposed relocation of the Ecological Linkage.	See response to 4b
15	The Tree Inventory and Protection Plan indicates that a $500 per tree removed compensation could be paid for the required] compensation. However, space for on-site compensation exists, and the City will require compensation plantings over cash-in-lieu where the opportunity exists. A commitment to plant compensation trees consistent with the requirements of the Tree Technical Manual is required.	It is anticipated that the entire extent of the linkage will be suitable for naturalization. As described in the EIS (Section 7): Native herbaceous plants, shrubs and tree species will be chosen. Compensation planting within the proposed realignment will be prioritized over cash-in-lieu.
	Notes	
16	Note: The proposed Ecological Linkage alignment includes an approximately 6.4 m wide City of Guelph-owned parcel to the west of the subject property. The City-owned parcel is currently zoned as Industrial. It is unclear whether the proposed Zoning Bylaw amendment and Official Plan Amendment include that parcel, but that portion of City-owned property will also need to be rezoned and incorporated into the Ecological Linkage.	Please see correspondence from March 18, 2026 from James Goodram, City of Guelph to Hugh Handy, GSP Group, which confirms the following: "*You do not require our authorization for the application. Any approvals would require subsequent agreements with the City should the application have merit and meet technical requirements etc.*" See Appendix 2 *JamesGoodramGuelph_CorrespndenceGSP_reCityLands_18Mar26*
17	Note: The Tree Inventory and Protection Plan proposes the removal of, or impacts to, shared and neighbouring trees. Please note that it is the applicant's responsibility to gain permission from the shared owners of the trees before any removal or injury to the trees occurs.	Understood

#	Environmental Planning Comments (R. Hamelin, November 28, 2025)	NSE Response
18	Note: The Site Grading Plan doesn't show proposed grading at the location of Tree #62. This is a large Black Cherry tree with a 62 cm DBH, proposed for removal in the Tree Inventory and Protection Plan. Opportunities to retain this tree should be explored.	Opportunities to retain this tree will be considered through detailed design.
19	Note: The City's Natural Areas Stewardship group has conducted tree planting in the current Ecological Linkage alignment, at the City-owned 266 Clair Road parcel, between 2020 and 2024. A total of 1090 native trees and shrubs were planted on this parcel. The planted material is undersized and not subject to compensation under the Tree Bylaw. However, full compensation for these plantings is recommended by Environmental Planning as part of any land swap agreement in addition to the standard tree compensation requirements.	Client confirmed their commitment to fully compensating for the removal of the “undersized” plantings.
20	Note: The EIS indicates no trails are proposed within the linkage. It should be noted that revisions to add trails at a later planning stage may not be supported without an increase in linkage width.	Understood
21	Note: Section 3.1 of the Planning Justification Report states, "Minor landscape enhancements are proposed to the linkage, including transplanting some trees from the eastern parts of the Subject Lands." Please note that a detailed and robust enhancement plan for the Ecological Linkage will be required to mitigate the impacts of the proposed change in width and the intensity of the adjacent land uses (i.e., industrial and high-density residential), and to compensate for on-site tree removals.	Noted – Enhancement Plan will be recommended through the Site Plan and associated Environmental Implementation Report (EIR).

Ministry of the Environment, Conservation and Parks

Species at Risk Branch
40 St. Clair Avenue West, Floor 14
Toronto, ON M4V 1M2

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des espèces en péril
40, avenue St. Clair Ouest
14e étage
Toronto ON M4V 1M2

March 30, 2026

Dear Client,

On March 30, 2026, the *Species Conservation Act, 2025* (SCA) and several implementing regulations came into force and the *Endangered Species Act, 2007* (ESA) was repealed.

We understand that you have submitted an Information Gathering Form and/or Permit Application Form to the ministry for review. Under the ESA, these forms were used to assist proponents in determining whether their project activities were likely to require an authorization or to be registered to a conditional exemption under the ESA in order to proceed. The ministry will no longer be reviewing submitted Information Gathering Forms or Permit Application Forms because the ESA has now been repealed.

Together the SCA and the new regulations modernize species protection and implement a registration-first approach while maintaining strong environmental safeguards. The registration-first approach, a process already in use for other environmental permissions, allows most projects to begin as soon as they are registered, while requiring persons undertaking those projects follow clear, enforceable rules aimed at protecting species and their habitats. It is important to note that in some limited circumstances, some activities will require a permit and cannot be registered. At the same time, the new legislation and regulations also set out many activities that are excepted and can proceed without a registration or permit as long as the conditions and requirements associated with that exception are met.

Depending on your activity and whether it may impact a species that is protected under the SCA or its habitat, you may be required to register, or obtain a permit under the SCA, or may be eligible to proceed under an applicable exception. We would encourage you to review the SCA and its regulations and obtain independent professional advice to understand how the requirements of the SCA may apply to your activity. Contact SAROntario@ontario.ca for further information on the permit process, if applicable to you.

The following regulations are in effect as of March 30th, 2026:

- Protected Species in Ontario List regulation (O. Reg. 60/26): sets out the species that receive protections under the SCA
- Registrable Activities regulation (O. Reg.75/26): sets out registration requirements and rules for conducting registrable activities
- Permit Activities regulation (O. Reg. 74/26): prescribes activities that require a permit and cannot proceed under a registration

- Excepted Activities – No Permit or Registration regulation (O. Reg. 61/26): prescribes activities impacting protected species or their habitat that can proceed without a registration or permit
- Transitional Matters regulation (O. Reg. 62/26): sets out transition rules that apply to existing authorizations (i.e., permits and agreements) or activities registered to conditional exemptions under the ESA, or certain exemptions under the ESA

To support the launch of the streamlined, registration-first approach, the ministry has launched a new Species Conservation Registry that must be used to register activities online, in accordance with the SCA. If your activity is a registrable activity, please visit Species Conservation Registry | ontario.ca to learn more or begin a registration.

Activities that are excepted under the Excepted Activities regulation do not need to be registered and do not require a permit. Some exceptions have requirements that must be fulfilled. For a small number of excepted activities, an Exception Information Form must be completed through the Species Conservation Registry.

For assistance with submitting information required under the Excepted Activities regulation. Please review the Excepted Activities regulation to determine whether your activity is subject to an exception.

We recommend that, in consultation with appropriate experts and professionals, you assess the potential impacts of your project in the context of the SCA and its regulations to determine whether your proposed activities must be registered, require obtaining a permit or are excepted under the SCA.

If you have questions regarding the new requirements, please contact your current ministry representative or SAROntario@ontario.ca. If you have any questions regarding how to use the new SCR, please contact SCRegistry@ontario.ca.

Thank you,

C. Whittaw

Manager, Permissions Section
Species at Risk Branch
Ministry of the Environment, Conservation and Parks

From: James Goodram <James.Goodram@guelph.ca>
Sent: March 18, 2026 5:37 PM
To: Hugh Handy <hhandy@gspgroup.ca>
Subject: RE: 266-280 Clair Road West discussion

Hi Hugh,

You do not require our authorization for the application. Any approvals would require subsequent agreements with the City should the application have merit and meet technical requirements etc. The issue is that Home Opportunities has not provided the City with the expert technical documentation we require to review the proposal. We don't know the feasibility of what is being proposed other than verbal assurances from Mr. Farley.

Hope you have a nice break and we'll see you upon your return,

James

James Goodram, MCIP, RPP, PLE

General Manager
Economic Development & Tourism
Infrastructure, Development & Environment
City of Guelph

Mobile 519-362-2102

My work hours may not match yours, and I do not expect you to respond outside your working hours.

APPENDIX 3 | Species Lists

Table 1. Flora List

Scientific Name	Common Name	G Rank	S Rank	SARA	SARO	COSEWIC	Native Status	Local and Regional Statuses		CC	Vegetation Communities		
								Guelph (City of Guelph 2020)	Wellington (Frank & Anderson 2009)		CUM	CUS	CUT
Acer negundo	Manitoba Maple	G5	S5				Native			0	X	X	X
Acer nigrum	Black Maple	G5	S4?				Native	X	U	7		X	X
Acer saccharum	Sugar Maple	G5	S5				Native			4		X	
Achillea millefolium	Common Yarrow	G5	SNA				Non-Native				X	X	X
Agrostis gigantea	Redtop	G4G5	SNA				Non-Native				X	X	X
Ambrosia artemisiifolia	Common Ragweed	G5	S5				Native			0	X	X	X
Amelanchier sp.	a serviceberry species											X	
Anemone virginiana	Tall Anemone	G5	S5				Native			4		X	X
Antennaria neglecta	Field Pussytoes	G5	S5				Native			3			X
Arctium minus	Common Burdock	GNR	SNA				Non-Native				X		X
Asclepias syriaca	Common Milkweed	G5	S5				Native			0	X	X	X
Bromus inermis	Smooth Brome	G5T5	SNA				Non-Native				X	X	X
Centaurea stoebe	Spotted Knapweed	GNR	SNA				Non-Native					X	
Cirsium arvense	Canada Thistle	G5	SNA				Non-Native				X		X
Cirsium vulgare	Bull Thistle	GNR	SNA				Non-Native				X		
Clinopodium vulgare	Wild Basil	G5	S5				Native			4			X
Cornus obliqua	Silky Dogwood	G5	S5				Native		U	2			X
Cornus sericea	Red-osier Dogwood	G5	S5				Native			2		X	X
Crataegus monogyna	English Hawthorn	G5	SNA				Non-Native					X	X
Crataegus sp.	a hawthorn species											X	
Dactylis glomerata	Orchard Grass	GNR	SNA				Non-Native				X	X	X
Daucus carota	Wild Carrot	GNR	SNA				Non-Native				X	X	X
Dipsacus fullonum	Common Teasel	GNR	SNA				Non-Native				X		
Echinocystis lobata	Wild Cucumber	G5	S5				Native			3		X	
Echium vulgare	Common Viper's Bugloss	GNR	SNA				Non-Native				X	X	X
Elaeagnus angustifolia	Russian Olive	GNR	SNA				Non-Native				X	X	X
Elaeagnus umbellata	Autumn Olive	GNR	SNA				Non-Native					X	X
Elymus repens	Quackgrass	GNR	SNA				Non-Native				X		
Erigeron canadensis	Canada Horseweed	G5	S5				Native			0	X	X	X
Erigeron strigosus	Rough Fleabane	G5	S5				Native			4	X	X	X
Erythronium americanum	Yellow Trout-lily	G5	S5				Native			5		X	
Euthamia graminifolia	Grass-leaved Goldenrod	G5	S5				Native			2		X	X
Fagus grandifolia	American Beech	G5	S4				Native			6		X	
Fragaria virginiana	Wild Strawberry	G5	S5				Native			2	X	X	X
Fraxinus americana	White Ash	G4	S4				Native			4	X	X	
Galium mollugo	Smooth Bedstraw	GNR	SNA				Non-Native					X	
Galium sp.	a bedstraw species											X	X
Geum aleppicum	Yellow Avens	G5	S5				Native			2		X	X

Hypericum perforatum	Common St. John's-wort	GNR	SNA				Non-Native				X	X	X
Juniperus virginiana	Eastern Red Cedar	G5	S5				Native		U	4		X	
Leonurus cardiaca	Common Motherwort	GNR	SNA				Non-Native				X		
Leucanthemum vulgare	Oxeye Daisy	GNR	SNA				Non-Native				X	X	X
Linaria vulgaris	Butter-and-eggs	GNR	SNA				Non-Native				X	X	X
Lolium perenne	Perennial Ryegrass	GNR	SNA				Non-Native					X	X
Lonicera morrowii	Morrow's Honeysuckle	GNR	SNA				Non-Native					X	X
Lonicera tatarica	Tatarian Honeysuckle	GNR	SNA				Non-Native				X	X	X
Lotus corniculatus	Garden Bird's-foot Trefoil	GNR	SNA				Non-Native				X	X	X
Malus pumila	Common Apple	G5	SNA				Non-Native					X	
Medicago lupulina	Black Medick	GNR	SNA				Non-Native					X	X
Melilotus albus	White Sweet-clover	G5	SNA				Non-Native				X	X	X
Monarda fistulosa	Wild Bergamot	G5	S5				Native		U	6	X		
Morus alba	White Mulberry	GNR	SNA				Non-Native					X	X
Nepeta cataria	Catnip	GNR	SNA				Non-Native				X	X	X
Panicum capillare	Common Panicgrass	G5	S5				Native			0	X		X
Parthenocissus quinquefolia	Virginia Creeper	G5	S4?				Native			6	X	X	X
Phalaris arundinacea	Reed Canarygrass	G5	S5				Native			0	X		
Phleum pratense	Common Timothy	GNR	SNA				Non-Native				X	X	X
Picea glauca	White Spruce	G5	S5				Native			6	X	X	
Pilosella aurantiaca	Orange Hawkweed	GNR	SNA				Non-Native					X	X
Pinus strobus	Eastern White Pine	G5	S5				Native			4	X	X	
Pinus sylvestris	Scots Pine	GNR	SNA				Non-Native					X	
Plantago lanceolata	English Plantain	G5	SNA				Non-Native				X	X	X
Plantago major	Common Plantain	G5	SNA				Non-Native					X	
Poa pratensis ssp. pratensis	Kentucky Bluegrass	G5T5	SNA				Non-Native				X	X	X
Polygonum aviculare	Prostrate Knotweed	G5	S4?				Native			0	X		
Populus balsamifera	Balsam Poplar	G5	S5				Native			4		X	
Potentilla recta	Sulphur Cinquefoil	GNR	SNA				Non-Native				X	X	X
Prunus mahaleb	Mahaleb Cherry	G5	SNA				Non-Native					X	X
Prunus pensylvanica	Pin Cherry	G5	S5				Native			3	X	X	X
Prunus serotina	Black Cherry	G5	S5				Native			3		X	
Prunus virginiana	Chokecherry	G5	S5				Native			2		X	
Prunus virginiana var. virginiana	Chokecherry	G5T5	S5				Native			2			X
Pyrus communis	Common Pear	G5	SNA				Non-Native					X	X
Ranunculus acris	Common Buttercup	G5	SNA				Non-Native					X	X
Rhamnus cathartica	European Buckthorn	GNR	SNA				Non-Native				X	X	X
Rhus typhina	Staghorn Sumac	G5	S5				Native			1	X		
Ribes rubrum	European Red Currant	G4G5	SNA				Non-Native					X	X
Ribes sp.	#N/A	#N/A	#N/A				#N/A					X	
Rubus idaeus	Red Raspberry	G5	S5				Native			2	X	X	X
Rubus occidentalis	Black Raspberry	G5	S5				Native			2		X	
Rumex crispus	Curled Dock	GNR	SNA				Non-Native				X		X

Salix sp.	a willow species										X		
Sanguinaria canadensis	Bloodroot	G5	S5				Native			5		X	
Securigera varia	Purple Crown-vetch	GNR	SNA				Non-Native				X		
Solanum dulcamara	Bittersweet Nightshade	GNR	SNA				Non-Native				X	X	X
Solidago altissima	Tall Goldenrod	G5	S5				Native			1	X	X	X
Solidago canadensis	Canada Goldenrod	G5	S5				Native			1	X	X	X
Solidago juncea	Early Goldenrod	G5	S5				Native		R	3		X	X
Solidago nemoralis	Grey-stemmed Goldenrod	G5	S5				Native			2		X	X
Sonchus arvensis	Field Sow-thistle	GNR	SNA				Non-Native				X		X
Sorbus aucuparia	European Mountain-ash	G5	SNA				Non-Native					X	
Symphyotrichum ericoides	White Heath Aster	G5	S5				Native			4	X	X	X
Symphyotrichum laeve	Smooth Aster	G5	S5				Native			7		X	
Symphyotrichum lanceolatum	Panicled Aster	G5	S5				Native			3	X		
Symphyotrichum lateriflorum	Calico Aster	G5	S5				Native			3	X		
Symphyotrichum novae-angliae	New England Aster	G5	S5				Native			2	X	X	X
Symphyotrichum pilosum var. pilosum	Old Field Aster	G5T5	S5				Native		U	1		X	X
Symphyotrichum urophyllum	Arrow-leaved Aster	G4G5	S4				Native		U	6		X	
Tanacetum vulgare	Common Tansy	GNR	SNA				Non-Native				X		
Taraxacum officinale	Common Dandelion	G5	SNA				Non-Native				X	X	X
Tilia americana	Basswood	G5	S5				Native			4	X	X	X
Tragopogon dubius	Yellow Goatsbeard	GNR	SNA				Non-Native					X	X
Trifolium pratense	Red Clover	GNR	SNA				Non-Native				X	X	X
Trifolium repens	White Clover	GNR	SNA				Non-Native						X
Tussilago farfara	Coltsfoot	GNR	SNA				Non-Native					X	
Ulmus americana	White Elm	G4	S5				Native			3		X	X
Ulmus pumila	Siberian Elm	GNR	SNA				Non-Native					X	
Urtica dioica	Stinging Nettle	G5	SNA				Non-Native					X	
Verbascum thapsus	Common Mullein	GNR	SNA				Non-Native				X		X
Viburnum lantana	Wayfaring Viburnum	GNR	SNA				Non-Native					X	X
Viburnum lentago	Nannyberry	G5	S5				Native			4		X	
Viburnum opulus var. americanum	Highbush Cranberry	G5T5	S5				Native		U	5	X	X	
Vicia cracca	Tufted Vetch	GNR	SNA				Non-Native				X	X	X
Vitis riparia	Riverbank Grape	G5	S5				Native			0	X	X	X

G Rank: Global Rank
G4: Apparently Secure
G5: Secure
GNR: Unranked
T#: Subspecies Rank
S Rank: Sub-national Rank
S4: Apparently Secure
S5: Secure
SNA: Not Applicable
COSEWIC – Committee of the Status of Endangered Wildlife in Canada
SARA – Species at Risk Act (Federal)
SARO – Species at Risk in Ontario (Provincial)
CC (Coefficient of Conservatism) - Higher values indicate species that are more ecologically sensitive and associated with less disturbed habitats.

Guelph Local Rank
X: Locally Significant
Wellington Regional Rank
R: Rare
U: Uncommon

Table 2. Fauna species recorded within the subject property.

Taxa	Family	Common Name	Scientific Name	G Rank	S Rank	SARA	SARO	COSEWIC	Guelph (City of Guelph 2020)	Wellington (Frank & Anderson 2009)	Area Sensitive	Breeding Bird Code
Amphibians	Hylidae	Spring Peeper	*Pseudacris crucifer*	G5	S5							
Birds	Accipitridae	Cooper's Hawk	*Accipiter cooperii*	G5	S4			NAR	X	X	TRUE	OB
Birds	Icteridae	Red-winged Blackbird	*Agelaius phoeniceus*	G5	S5						FALSE	PR
Birds	Bombycillidae	Cedar Waxwing	*Bombycilla cedrorum*	G5	S5						FALSE	PO
Birds	Cardinalidae	Northern Cardinal	*Cardinalis cardinalis*	G5	S5						FALSE	PO
Birds	Charadriidae	Killdeer	*Charadrius vociferus*	G5	S4B						FALSE	PO
Birds	Picidae	Northern Flicker	*Colaptes auratus*	G5	S5				X	X	FALSE	PO
Birds	Corvidae	American Crow	*Corvus brachyrhynchos*	G5	S5						FALSE	OB
Birds	Corvidae	Blue Jay	*Cyanocitta cristata*	G5	S5						FALSE	OB
Birds	Mimidae	Gray Catbird	*Dumetella carolinensis*	G5	S5B, S3N						FALSE	PO
Birds	Tyrannidae	Willow Flycatcher	*Empidonax traillii*	G5	S4B				X	X	FALSE	PR
Birds	Hirundinidae	Barn Swallow	*Hirundo rustica*	G5	S4B	THR		SC	X		FALSE	PO
Birds	Icteridae	Baltimore Oriole	*Icterus galbula*	G5	S4B				X	X	FALSE	PO
Birds	Laridae	Ring-billed Gull	*Larus delawarensis*	G5	S5				X	X	FALSE	OB
Birds	Passerellidae	Song Sparrow	*Melospiza melodia*	G5	S5						FALSE	PR
Birds	Paridae	Black-capped Chickadee	*Poecile atricapillus*	G5	S5						FALSE	OB
Birds	Icteridae	Common Grackle	*Quiscalus quiscula*	G5	S5						FALSE	OB
Birds	Parulidae	Yellow Warbler	*Setophaga petechia*	G5	S5B						FALSE	PR
Birds	Fringillidae	American Goldfinch	*Spinus tristis*	G5	S5						FALSE	PR
Birds	Passerellidae	Chipping Sparrow	*Spizella passerina*	G5	S5B,S3N						FALSE	PO
Birds	Passerellidae	Field Sparrow	*Spizella pusilla*	G5	S4B,S3N				X	X	FALSE	PR
Birds	Hirundinidae	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	G5	S4B						FALSE	PO
Birds	Icteridae	Eastern Meadowlark	*Sturnella magna*	G5	S4B, S3N	THR		THR	X	X	TRUE	PR
Birds	Sturnidae	European Starling	*Sturnus vulgaris*	G5	SNA						FALSE	PR
Birds	Hirundinidae	Tree Swallow	*Tachycineta bicolor*	G5	S4,S5B						FALSE	PO
Birds	Turdidae	American Robin	*Turdus migratorius*	G5	S5						FALSE	PO
Birds	Tyrannidae	Eastern Kingbird	*Tyrannus tyrannus*	G5	S4B				X		FALSE	PR
Birds	Vireonidae	Warbling Vireo	*Vireo gilvus*	G5	S5B						FALSE	PO
Birds	Columbidae	Mourning Dove	*Zenaida macroura*	G5	S5						FALSE	OB
Insects	Apidae	Common Eastern Bumble Bee	*Bombus impatiens*	G5	S5							
Insects	Nymphalidae	Monarch	*Danaus plexippus*	G4	S2N,S4B	END	SC	END	X	X		
Mammals	Canidae	Coyote	*Canis latrans*	G5	S5							
Mammals	Cervidae	White-tailed Deer	*Odocoileus virginianus*	G5	S5							
Mammals	Procyonidae	Northern Raccoon	*Procyon lotor*	G5	S5							

Taxa	Family	Common Name	Scientific Name	G Rank	S Rank	SARA	SARO	COSEWIC	Guelph (City of Guelph 2020)	Wellington (Frank & Anderson 2009)	Area Sensitive	Breeding Bird Code
Mammals	Leporidae	Eastern Cottontail	*Sylvilagus floridanus*	G5	S5							
Mammals	Sciuridae	Eastern Chipmunk	*Tamias striatus*	G5	S5							

G Rank: Global Rank
G4: Apparently Secure
G5: Secure
S Rank: Sub-national Rank
S2: Imperiled
S3: Vulnerable
S4: Apparently Secure
S5: Secure
SNA: Not Applicable
B#: Breeding Rank
N#: Non-breeding Rank

COSEWIC – Committee of the Status of Endangered Wildlife in Canada
SC: Special Concern
THR: Threatened
END: Endangered
NAR: Not at Risk
SARA – Species at Risk Act (Federal)
THR: Threatened
END: Endangered
SARO – Species at Risk in Ontario (Provincial)
SC: Special Concern
THR: Threatened
NAR: Not at Risk

Guelph Local Ranks
X: Significant
Wellington Regional Ranks
X: Significant
Area Sensitive: Wildlife species that require large areas of suitable habitat (MNRF Significant Wildlife Habitat Technical Guide)
Breeding Evidence
OB: Observed
PO: Possible
PR: Probable
CO: Confirmed

APPENDIX 4 | Bat Habitat Assessment and Acoustic Analysis

Table 1. Bat habitat assessment

Species	Tree Tag Number	Tree Class	Notes	Decay Class	Cavity Height (m)	Cavity	Loose Bark	Crack	Knot Hole	Other Snag Within 10m	Potential Bat Habitat	Latitude	Longitude
Prunus serotina	246	Excellent	poor quality habitat - vine cover	Healthy_1		No	Yes	No	No	Yes	Yes	-80.1974	43.49324269
Sorbus aucuparia	275	Poor	sap sucker holes	Declining live tree_2	3	No	No	Yes	No	No	Yes	-80.1966	43.4926637
Prunus serotina	277	Poor	poor quality habitat		3	No	Yes	No	No	Yes	Yes	-80.1965	43.49266009
Prunus serotina	278	Poor		Declining live tree_2	1, 2, 3	Yes	Yes	Yes	No	Yes	Yes	-80.1965	43.49259885
Crataegus sp.	282	Good	poor quality habitat	Declining live tree_2	3	No	No	No	Yes	No	Yes	-80.1966	43.492711
Prunus serotina	25	Dead		Recently dead_4		No	Yes	No	No	No	Yes	-80.1974	43.49201724
Prunus serotina	26	Fair		Declining live tree_2	3	Yes	Yes	Yes	Yes	No	Yes	-80.1973	43.49198587
Acer negundo	OP-15	Fair									Yes	-80.1964	43.49253362
Acer negundo	OP-18	Poor		Declining live tree_2	2.5	Yes	Yes	Yes		Yes	Yes	-80.1963	43.49247255
Prunus serotina	OP-22	Dead		Very recently dead_3	2	Yes	Yes	Yes	Yes	Yes	Yes	-80.1962	43.49239739
Acer negundo	134	Fair	leaning		2.5	Yes	No	Yes	No	Yes	Yes	-80.1962	43.49236422
Acer saccharum	OP-46	Excellent									Yes	-80.1943	43.49102289
Prunus serotina	OP-35	Poor		Declining live tree_2	4	Yes	Yes	Yes	No	Yes	Yes	-80.1948	43.49137181
Prunus serotina	OP-34	Fair		Declining live tree_2	6	Yes	Yes	No	No	Yes	Yes	-80.1949	43.49144586
Prunus serotina	OP-33	Poor		Declining live tree_2	2	Yes	Yes	No	No	Yes	Yes	-80.195	43.4915006
Acer negundo	OP-27	Fair		Declining live tree_2	2	Yes	Yes	No	No	Yes	Yes	-80.1961	43.49227179
Unknown	None	Dead		Older dead tree_5	5	Yes	Yes	No	No	No	Yes	-80.1969	43.4933038
Unknown	None		off property		1, 2, 3	Yes	Yes	Yes	Yes	Yes	Yes	-80.1964	43.49251369
Unknown	None	Dead		Older dead tree_5	3	Yes	Yes	Yes	No	Yes	Yes	-80.196	43.49222741
Unknown	None	Dead		Very old dead tree_6	2	Yes	Yes	Yes	No	Yes	Yes	-80.1958	43.49208251
Unknown	None	Very Poor			1.5	Yes	Yes	Yes	Yes	Yes	Yes	-80.1953	43.49172737
Betula alleghaniensis	None	Dead	several trunks	Older dead tree_5	1.5	Yes	Yes	Yes	Yes	Yes	Yes	-80.1952	43.49161763
Prunus serotina	None	Fair		Declining live tree_2	5	Yes	Yes	No	No	Yes	Yes	-80.1952	43.49163673
Prunus serotina	None	Poor	not tagged	Declining live tree_2	4	Yes	Yes	No	No	Yes	Yes	-80.1948	43.49135798
Malus pumila	None	Poor	leaning	Declining live tree_2	1	Yes	Yes	No	No	Yes	Yes	-80.1948	43.49128032
Prunus serotina	None	Fair		Declining live tree_2	4	Yes	Yes	No	No	Yes	Yes	-80.1946	43.49120466
Acer nigrum	None	Very Poor		Declining live tree_2	3	Yes	Yes	Yes	No	Yes	Yes	-80.1946	43.4911948
Unknown	None	Dead	poor quality habitat		3	Yes	No	Yes	No	Yes	Yes	-80.1946	43.49118681
Unknown	None	Dead			0	Yes	Yes	No	No	Yes	Yes	-80.1945	43.4911684
Unknown	None	Dead	poor quality habitat	Very old dead tree_6	0	Yes	Yes	No	No	Yes	Yes	-80.1948	43.49063123
Acer sp.	None		poor quality habitat	Declining live tree_2	1	Yes	Yes	No	No	No	Yes	-80.1959	43.48977462
Unknown	None	Dead	poor quality habitat, in vines	Very old dead tree_6	3	Yes	Yes	Yes	No	No	Yes	-80.1968	43.49263827
Betula alleghaniensis	None	Dead		Very old dead tree_6	1	Yes	Yes	Yes	No	No	Yes	-80.1977	43.49138925
Pyrus communis	None	Good	poor quality habitat - only loose bark	Declining live tree_2			Yes		No	No	Yes	-80.1978	43.49110172

Table 2. Weather data during bat acoustic survey

Evening	Avg. Temp	Total Rainfall	Avg. Wind Speed	Suitable?
19-Jun-25	15.71	0	9.6	Y
20-Jun-25	17.46364	0	1.909091	Y
21-Jun-25	24.88182	0	12.90909	Y
22-Jun-25	25.44545	0	4.636364	Y
23-Jun-25	26.00909	0	4.636364	Y
24-Jun-25	23.2	0	3.909091	Y
25-Jun-25	20.01818	7.4	9.272727	N
26-Jun-25	15.96364	0	11.81818	Y
27-Jun-25	21.67273	24.9	9.454545	N
28-Jun-25	14.50909	0	3.090909	Y
29-Jun-25	18.00909	0	2.090909	Y
30-Jun-25	21.40909	0.9	5.545455	Y (only the first hour had rain, 11 hours after are suitable)
01-Jul-25	18.51818	0	6.090909	Y
02-Jul-25	22.7	0	5.5	Y

Table 3. Bat acoustic summary and statistics

Recorder Summary (# of Calls)									Maximum Likelihood Estimation p-values							
Recorder	**EPTFUS**	**LASBOR**	**LASCIN**	**LASNOC**	**MYOLEI**	**MYOLUC**	**MYOSEP**	**PERSUB**	**EPTFUS**	**LASBOR**	**LASCIN**	**LASNOC**	**MYOLEI**	**MYOLUC**	**MYOSEP**	**PERSUB**
2	85	1	208	131	0	0	0	0	0.00*	0.03*	0.00*	0.00*	1.00	1.00	1.00	1.00
4	46	1	42	48	0	3	0	0	0.00*	0.28	0.00*	0.00*	1.00	0.01*	1.00	1.00
5	490	4	472	205	0	62	0	2	0.00*	0.40	0.00*	0.01*	1.00	0.00*	1.00	0.49
	621	**6**	**722**	**384**	**0**	**65**	**0**	**2**								

Table 4. Bat acoustic summary by night

Call Summary by Night										Calls (total by night)
	NoID	**LASBOR**	**LASCIN**	**EPTFUS**	**LASNOC**	**MYOLUC**	**PERSUB**	**MYOSEP**	**MYOLEI**	
June 19, 2025	30	0	10	38	7	4	0	0	0	89
June 20, 2025	60	0	76	75	35	6	0	0	0	252
June 21, 2025	41	0	41	53	9	0	1	0	0	145
June 22, 2025	62	0	59	45	39	9	1	0	0	215
June 23, 2025	74	1	63	52	48	8	0	0	0	246

June 24, 2025	39	2	69	42	10	11	0	0	0	173
June 25, 2025	46	1	20	25	16	1	0	0	0	109
June 26, 2025	26	0	7	46	23	4	0	0	0	106
June 27, 2025	27	0	24	27	19	0	0	0	0	97
June 28, 2025	58	1	54	41	27	5	0	0	0	186
June 29, 2025	46	0	56	49	28	4	0	0	0	183
June 30, 2025	109	1	107	63	69	0	0	0	0	349
July 1, 2025	55	0	70	35	30	6	0	0	0	196
July 2, 2025	62	0	66	30	24	7	0	0	0	189
Total:	**735**	**6**	**722**	**621**	**384**	**65**	**2**	**0**	**0**	**2535**

Table 5. Bat acoustic summary by species

	Total of All Species Calls	**EPTFUS Calls**	**LASBOR Calls**	**LASCIN Calls**	**LASNOC Calls**	**MYOLUC Calls**	**NO ID Calls**
Hour of Day	**# of Calls**	**# of Calls**	**# of Calls**	**# of Calls**	**# of Calls**	**# of Calls**	**# of Calls**
20	1	0	0	0	0	0	1
21	582	246	1	121	70	2	142
22	217	60	0	39	31	6	81
23	306	81	2	59	63	14	87
0	179	34	2	43	29	8	63
1	177	34	1	32	40	8	62
2	111	25	0	27	14	10	35
3	90	18	0	20	13	7	32
4	260	54	0	97	26	10	71
5	608	69	0	283	98	0	158
6	4	0	0	1	0	0	3
Total:	2535	621	6	722	384	65	735

Legend:
EPTFUS - Big Brown Bat
LASBOR - Eastern Red Bat
LASCIN - Hoary Bat
LASNOC - Silver-haired Bat
MYOLEI - Eastern small-footed myotis
MYOLUC - Little Brown Myotis
MYOSEP - Northern Myotis
PERSUB - Tricolored Bat

Null hypothesis: species absence
A low P-value (<0.05, indicated by *) suggests that the results can not be explained by species absence (i.e., species is present).
A high P-value does not guarantee species absence, but rather there is a very high likelihood that the results could be false positives (based on the Kaleidoscope call database)

Classifier:
Bats of North America - Balanced (neutral)

APPENDIX 5 | Species at Risk Screening

List of Species at identified through background review.

Endangered and Threatened Species							
Species	**Source**	**Status**	**Habitat Description**	**Habitat Present on Site**	**Surveys Conducted**	**Probability of Occurrence and Rationale**	**Potential to be Impacted by Proposed Activities**
Plants							
Butternut *Juglans cinerea*	NHIC	COSEWIC - END SARA - END SARO - END	Deciduous forests with moist, well-drained soil. Often found along streams and on well drained gravel sites. (OMNR, 2013)	**Yes**	**Flora, Tree Inventory**	**None -** No individuals were recorded	**None**
Fauna							
Endangered, Threatened and Special Concern Species							
Species	**Source**	**Status**		**Habitat Present on Site**	**Surveys Conducted**	**Probability of Occurrence and Rationale**	**Potential to be Impacted by Proposed Activities**
Amphibians							
Western Chorus Frog - Great Lakes / St. Lawrence - Canadian Shield population *Pseudacris triseriata*	NHIC	SARO- N/A SARA- THR COSEWIC - THR	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pool (OMNR, 2000)	**No** - No suitable habitat (wet areas) are present in the study area. Adjacent lands have suitable habitat.	**None**	**None -**No suitable habitat is present.	**None**
Birds							
Bank Swallow *Riparia riparia*	eBird	SARA-THR (under consideration) COSEWIC- SC	Sand, clay or gravel riverbanks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are a limited factor for species presence (OMNR, 2000).	**No**	**Breeding Bird Surveys**	**None -**No suitable habitat is present.	**None**
Bobolink *Dolichonyx oryzivorus*	NSE (2015), NHIC	SARA- THR COSEWIC- THR	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha (OMNR, 2000).	**No** - Low quality. The habitat is has many trees and shrubs present which is not considered suitable habitat for Eastern Meadowlark.	**Breeding Bird Surveys**	**None -**No suitable habitat is present.	**None -** No Bobolink were recorded. Development will not be removing suitable habitat.
Chimney Swift *Chaetura pelagica*	eBird	SARA- THR COSEWIC- THR	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water (OMNR, 2000).	**No -** No hollow trees recorded during surveys, but buidlings with flat roofs are present on adjacent lands.	**Breeding Bird Surveys**	**Very Low** - No breeding habitat is present. Foraging habitat is present on adjacent lands.	**None -** No breeding habitat (hollow trees, buildings) is proposed to be removed. Foraging habitat remains on adjacent lands.

Eastern Meadowlark *Sturnella magna*	NSE (2015), NHIC	SARA- THR COSEWIC- THR	Generally prefers large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha. In migration and winter uses freshwater marshes and grasslands (OMNR 2000).	**No** - Low quality. The habitat has many trees and shrubs present which is not considered suitable breeding habitat for Eastern Meadowlark.	**Breeding Bird Surveys**	**Confirmed -** At least one individual was recorded singing during both breeding bird surveys.	**Low -** Eastern Meadowlarks were recorded within the study area. They were observed during both BBS and therefore have a breeding code of "probable". The development will involve removing habitat that is not considered suitable for breeding but may be used as foraging habitat.
Mammals (bats)							
Eastern Small-footed Myotis *Myotis leibii*	Assumed	SARO - END SARA - N/A COSEWIC- N/A	Winter habitat is in caves and abandoned mines. Summer habitat for roosting and maternity sites is poorly understood. In Ontario this species has been observed roosting in buildings, on rock outcrops, and in rock piles (MECP, 2022)	**Yes -** Mature trees (>DBH of 10cm) with suitable characteristics are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Low**- potentially suitable habitat present; however, no calls were identified during the acoustic surveys.	**Low** - no individuals identified within the study area. If mitigation measures such as tree removal outside of the active period are implemented, no negative impacts are anticipated.
Little Brown Myotis Myotis lucifugus	Assumed	SARO- END SARA- END COSEWIC- END	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy (OMNR, 2000)	**Yes -** Mature trees (>DBH of 10cm) with suitable characteristics are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Confirmed** through acoustic surveys, likely roosting within the study area.	**Moderate**- removal of suitable deciduous trees is proposed and the species is likely roosting within the study area. Negative impacts may be mitigated by removing vegetation outside of the active period, installing habitat replacement structures (such as rocket boxes), and planting native trees and shrubs within the linkage realignment.
Northern Myotis Myotis septentrionalis	Assumed	SARO- END SARA- END COSEWIC- END	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy (OMNR, 2000)	**Yes -** Mature trees (>DBH of 10cm) with suitable characteristics are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Low**- potentially suitable habitat present; however, no calls were identified during the acoustic surveys.	**Low** - no individuals identified within the study area. If mitigation measures such as tree removal outside of the active period are implemented, no negative impacts are anticipated.

Eastern Red Bat *Lasiurus borealis*	Assumed	SARO- END SARA- Under consideration COSEWIC- END	Habitat generalists that often roost solitarily or with pups in the crown foliage of large, live deciduous trees with heavy canopy cover. Maternity roosts are found in areas that have overhead canopy cover and an open flight path below, deciduous trees species are preferred. Foraging occurs in forested and non-forested habitats, open and cluttered habitats, and around canopy often along edge habitat. In winter, Eastern Red Bats hibernate in leaf litter during cold periods. (Morningstar *et al.* 2025)	**Yes -** Trees and shrubs are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Confirmed** through acoustic surveys, likely foraging but not roosting within the study area.	**Low** - foraging individuals identified within the study area; however, roosting is unlikely. If mitigation measures such as tree removal outside of the active period are implemented, no negative impacts are anticipated.
Hoary Bat *Lasiurus cinereus*	Assumed	SARO- END SARA- Under consideration COSEWIC- END	Roosts solitarily in the foliage of trees and shrubs, using primarily coniferous species. Will occasionally roost in manmade structures including bridges and buildings. Maternity roosts are found in forests with low density and canopy cover and will travel 1-4km to foraging areas. Uses several different open foraging habitats in the summer, including wetlands, grasslands, and open fields. (Morningstar *et al.* 2025)	**Yes -** Trees and shrubs are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Confirmed** through acoustic surveys, likely roosting within the study area.	**Moderate**- removal of suitable deciduous trees is proposed and the species is likely roosting within the study area. Negative impacts may be mitigated by removing vegetation outside of the active period, installing habitat replacement structures (such as rocket boxes), and planting native trees and shrubs within the linkage realignment.
Silver-haired Bat *Lasionycteris noctivagans*	Assumed	SARO- END SARA- Under consideration COSEWIC- END	Primarily roosts in large-diameter live trees with cavities and loose bark in forests, relying heavily on mature or old-growth trees. Foraging activity occurs in forested areas with open canopies, edge habitats, and riparian zones. Winter habitat may include mines, caves, anthropogenic structures, rock crevices, under loose bark, in hollow trees and on the ground. (Morningstar *et al.* 2025)	**Yes -** Mature trees (>DBH of 10cm) with suitable characteristics are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Confirmed** through acoustic surveys, likely roosting within the study area.	**Moderate**- removal of suitable deciduous trees is proposed and the species is likely roosting within the study area. Negative impacts may be mitigated by removing vegetation outside of the active period, installing habitat replacement structures (such as rocket boxes), and planting native trees and shrubs within the linkage realignment.

Tri-coloured Bat *Pipistrellus subflavus*	Assumed	SARO- END SARA- END COSEWIC- END	Found in a variety of forested habitats. Forms day roosts and maternity colonies in older forest and occasionally in barns or other structures. They forage over water and along streams in the forest. At the end of the summer they travel to a location where they swarm; it is generally near the cave or underground location where they will overwinter (OMNR, 2000)	**Yes -** Mature trees (>DBH of 10cm) with suitable characteristics are present within the Cultural Savannah and Cultural Thicket.	Bat Maternity Habitat Assessment and Acoustic Monitoring	**Low-** potentially suitable habitat present; however, no calls were identified during the acoustic surveys.	**Low** - no individuals identified within the study area. If mitigation measures such as tree removal outside of the active period are implemented, no negative impacts are anticipated.
Species	**Source**	**Status**		**Habitat Present on Site**	**Surveys Conducted**	**Probability of Occurrence and Rationale**	**Potential to be Impacted by Proposed Activities**
Reptiles							
Eastern Ribbonsnake *Thamnophis sauritus*	NHIC	SARA- SC SARO-SC COSEWIC- SC	The Eastern Ribbonsnake is usually found close to water, especially in marshes, where it hunts for frogs and small fish. A good swimmer, it will dive in shallow water, especially if it is fleeing from a potential predator. At the onset of cold weather, these snakes congregate in underground burrows or rock crevices to hibernate together (MECP, 2014)	**No** - Suitable habitat is likely present on adjacent lands	Incidental	**None** - No suitable habitat present	**None**
Midland Painted Turtle *Chrysemys picta marginat*	NHIC	SARA- SC SARO- N/A COSEWIC- SC	Quiet, warm, shallow water with abundant aquatic vegetation such as ponds, large pools, streams, ditches, swamps, marshy meadows; eggs are laid in sandy places, usually in a bank or hillside, or in fields; basks in groups; not territorial (OMNR 2000).	**No** - Suitable habitat is likely present on adjacent lands	Incidental	**None** - No suitable habitat present	**None**
Northern Map Turtle *Graptemys geographica*	NHIC	SARA- SC SARO- SC COSEWIC- SC	Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water; home range size is larger for females (about 70 ha) than males (about 30 ha) and includes hibernation, basking, nesting and feeding areas; aquatic corridors (e.g. stream) are required for movement; not readily observed (OMNR 2000).	**No** - Suitable habitat is likely present on adjacent lands	Incidental	**None** - No suitable habitat present	**None**
Birds							

Eastern Wood-Pewee *Contopus virens*	NHIC	SARO- SC SARA- SC COSEWIC- SC	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks (OMNR, 2000)	**No**	**Breeding Bird Surveys**	**None** - No suitable habitat present	**None**
Grasshopper Sparrow *Ammodramus savannarum pratensis*	NHIC	SARO - SC SARA - N/A COSEWIC- SC	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland > 10 ha (OMNR, 2000)	**No**	**Breeding Bird Surveys**	**None** - No suitable habitat present	**None**
Wood Thrush *Hylocichla mustelina*	NHIC	SARO-SC SARA- THR COSEWIC- THR	Undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges (OMNR, 2000).	**No**	**Breeding Bird Surveys**	**None** - No suitable habitat present	**None**
Insects							
Monarch *Danaus plexippus*	City of Guelph	SARO – SC SARA – END COSEWIC- END	Breeding habitat is confined to where milkweed grows, since the leaves of these plants are the sole food of the caterpillars. Different species of milkweed grow in a variety of environments, including meadows, along roadsides and in ditches, open wetlands, dry sandy areas, short and tall grass prairies, river banks, irrigation ditches, arid valleys and south facing hillsides. Nectaring habitat ranges from native grasslands to home gardens with adult butterflies nectaring on a wide variety of flowers including Goldenrods, Asters and Milkweeds. (Environment Canada 2014)	**Yes**	**Incidental**	**Confirmed**	**Moderate -** Vegetation communities that have milkweed species will be removed due to the development. Compensation work will include planting of milkweed.
Yellow-banded Bumblebee *Bombus terricola*	City of Guelph	SARO- SC SARO- SC COSEWIC- SC	Forage and habitat generalist, able to use a variety of nectaring plants and environmental conditions. It can be found in mixed woodlands, particularly for nesting and overwintering, as well as a variety of open habitat such as native grasslands, farmlands and urban areas. Nest sites are often underground in abandoned rodent burrows or decomposing logs (MECP, 2021)	**Yes**	**Incidental**	**Moderate**	**Moderate -** Vegetation communities that have milkweed species will be removed due to the development. Compensation work will include planting of appropriate pollinator species.

APPENDIX 6 | Significant Wildlife Habitat Assessment

Seasonal Concentration Areas of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Waterfowl Stopover and Staging Areas (Terrestrial) **Rationale:** Habitat important to migrating waterfowl.	American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 -Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	Fields with sheet water during Spring (mid-March to May). •Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. •Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available [cxlviii]. <u>Information Sources</u> •Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. •Reports and other information available from Conservation Authorities •Sites documented through water fowl planning processes (eg. EHJV implementation plan) •Field Naturalist Clubs •Ducks Unlimited Canada •Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •Any mixed species aggregations of 100 or more individuals required. •The flooded field ecosite habitat plus a 100-300m radius area, dependant on local site conditions and adjacent land use is the significant wildlife habitat. •Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). •SWHMiST Index #7 provides development effects and mitigation measures.	**ABSENT** – Ecosite CUM present; however, the slope of the site is not conducive to shallow water accumulation.
Waterfowl Stopover and Staging Areas (Aquatic) **Rationale:** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long -tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	•Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. •These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water) <u>Information Sources</u> •Environment Canada. •Naturalist clubs often are aware of staging/stopover areas. •OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. •Sites documented through waterfowl planning processes (eg. EHJV implementation plan) •Ducks Unlimited projects •Element occurrence specification by Nature Serve: http://www.natureserve.org •Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of: •Aggregations of 100 or more of listed species for 7 days, results in > 700 waterfowl use days. •Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH •The combined area of the ELC ecosites and a 100m radius area is the SWH •Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are significant wildlife habitat. •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). •SWHMiST Index #7 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Shorebird Migratory Stopover Area **Rationale:** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red -necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	•Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. •Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. •Sewage treatment ponds and storm water ponds do not qualify as a SWH. Information Sources •Western hemisphere shorebird reserve network. •Canadian Wildlife Service (CWS) Ontario Shorebird Survey. •Bird Studies Canada •Ontario Nature •Local birders and naturalist clubs •Natural Heritage Information Center (NHIC) Shorebird Migratory Concentration Area	Studies confirming: •Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) •Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. •The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #8 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Raptor Wintering Area **Rationale:** Sites used by multiple species, ahigh number of individuals and used annually are most significant	Rough-legged Hawk Red -tailed Hawk Northern Harrier American Kestrel Snowy Owl **Special Concern:** Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM; CUT; CUS; CUW. Bald Eagle: Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area)	•The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. •Raptor wintering sites (hawk/owl) need to be > 20 ha cxlvi ii, cxlix with a combination of forest and upland. xvi , xvii , xviii , xix, xx, xxi. •Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands cxlix •Field area of the habitat is to be wind swept with limited snow depth or accumulation. •Eagle sites have open water, large trees and snags available for roosting cxlix Information Sources: •OMNRF Ecologist or Biologist •Field Naturalist Clubs •Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area •Data from Bird Studies Canada •Results of Christmas Bird Counts •Reports and other information available from Conservation Authorities.	Studies confirm the use of these habitats by: •One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species. •To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. •The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #10 and #11 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Seasonal Concentration Areas of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Bat Hibernacula **Rationale**: Bat hibernacula are rare habitats in all Ontario landscapes.	Big Brown Bat Tri -coloured Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	•Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. •Active mine sites should not be considered as SWH •The locations of bat hibernacula are relatively poorly known. <u>Information Sources:</u> •OMNRF for possible locations and contact for local experts •Natural Heritage Information Center (NHIC) Bat Hibernaculum •Ministry of Northern Development and Mines for location of mine shafts. •Clubs that explore caves (eg. Sierra Club) •University Biology Departments with bat experts.	•All sites with confirmed hibernating bats are SWH. •The habitat area includes a 200m radius around the entrance of the hibernaculum for most development types and 1000m for wind farms. •Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects". •SWHMiST Index #1 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Bat Maternity Colonies **Rationale:** Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.	Big Brown Bat Silver-haired Bat	Maternity colonies considered SWH are found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	•Maternity colonies can be found in tree cavities, vegetation and often in buildings (buildings are not considered to be SWH). •Maternity roosts are not found in caves and mines in Ontario. •Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25cm dbh) wildlife trees •Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2. •Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred <u>Information Sources</u> •OMNRF for possible locations and contact for local experts •University Biology Departments with bat experts.	Maternity Colonies with confirmed use by; •>10 Big Brown Bats •>5 Adult Female Silver-haired Bats •The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies. •Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects". •SWHMiST Index #12 provides development effects and mitigation measures.	**ABSENT-** four bat species identified and may be roosting within the study area; however, ecosite criteria is not met.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Turtle Wintering Areas **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles; ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO Northern Map Turtle; Open Water areas such as deeper rivers or streams and lakes with current can also be used as over- wintering habitat.	•For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. •Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen •Man -made ponds such as sewage lagoons or storm water ponds should not be considered SWH. <u>Information Sources</u> •EIS studies carried out by Conservation Authorities. •Local field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. •OMNRF Ecologist or Biologist •Field Naturalist clubs •Natural Heritage Information Center (NHIC)	•Presence of 5 over-wintering Midland Painted Turtles is significant. •One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. •The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep -water pool where the turtles are over wintering is the SWH. •Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May). •Congregation of turtles is more common where wintering areas are limited and therefore significant. •SWHMiST Index #28 provides development effects and mitigation measures for turtle wintering habitat.	**ABSENT-** No suitable habitat present.
Reptile Hibernaculum **Rationale:** Generally sites are the only known sites in the area. Sites with the highest number of individuals are	<u>Snakes:</u> Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **Special Concern:** Milksnake Eastern Ribbonsnake <u>Lizard:</u> **Special Concern (Southern Shield population):** Five-lined Skink	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator. For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3	•For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. •Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. •Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. •Five-lined Skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures. <u>Information Sources</u> •In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g.old dug wells). •Reports and other information available from Conservation Authorities. •Field Naturalists clubs •University herpetologists •Natural Heritage Information Center (NHIC) •OMNRF ecologist or biologist may be aware of locations of wintering skinks	Studies confirming: •Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. •Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct) •Note: If there are Special Concern Species present, then site is SWH •Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e. strong hibernation site fidelity). Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH •SWHMiST Index #13 provides development effects and mitigation measures for snake hibernacula. •Presence of any active hibernaculum for skink is significant. •SWHMiST Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat.	**ABSENT-** Anthropogenic rock piles present, no reptiles observed.

Seasonal Concentration Areas of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Colonially -Nesting Bird Breeding Habitat (Bank and Cliff) **Rationale:** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles. Cliff faces, bridge abutments, silos, barns. Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	•Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. •Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. •Does not include a licensed/permitted Mineral Aggregate Operation. <u>Information Sources</u> •Reports and other information available from Conservation Authorities. •Ontario Breeding Bird Atlas •Bird Studies Canada; NatureCountshttp://www.birdscanada.org/birdmon/ •Field Naturalist Clubs.	Studies confirming: •Presence of 1 or more nesting sites with 8 or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. •A colony identified as SWH will include a 50m radius habitat area from the peripheral nests •Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #4 provides development effects and mitigation measures	**ABSENT-** No suitable habitat present.
Colonially -Nesting Bird Breeding Habitat (Tree/Shrubs) **Rationale:** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	•Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. •Most nests in trees are 11 to 15 m from ground, near the top of the tree. <u>Information Sources</u> •Ontario Breeding Bird Atlas colonial nest records. •Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNRF). •Natural Heritage Information Center (NHIC) Mixed Wader Nesting Colony •Aerial photographs can help identify large heronries. •Reports and other information available from CAs. •MNRF District Offices. •Local naturalist clubs	Studies confirming: •Presence of 5 or more active nests of Great Blue Heron or other listed species. •The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH •Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells •SWHMiST Index #5 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Colonially -Nesting Bird Breeding Habitat (Ground) **Rationale:** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6 MAS1 – 3 CUM CUT CUS	•Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. •Brewers Blackbird colonies are found loosely on the ground in low bushes in close proximity to streams and irrigation ditches within farmlands. <u>Information Sources</u> •Ontario Breeding Bird Atlas, rare/colonial species records. •Canadian Wildlife Service •Reports and other information available from CAs. •Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area •MNRF District Offices. •Field Naturalist clubs.	Studies confirming: •Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern. •Presence of 5 or more pairs for Brewer's Blackbird. •Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. •The edge of the colony and a minimum 150m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH •Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #6 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Migratory Butterfly Stopover Areas **Rationale:** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral **Special Concern:** Monarch	Combination of ELC Community Series; need to have present one Community Series from each land class: <u>Field:</u> CUM CUT CUS <u>Forest:</u> FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario [cxlix]. •The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south [xxxii, xxxiii, xxxiv, xxxv, xxxvi]. •The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat [cxlv iii, cxlix]. •Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes [xxxvii, xxxviii, xxxix, xl, xli]. <u>Information Sources</u> •OMNRF (NHIC) •Agriculture Canada in Ottawa may have list of butterfly experts. •Field Naturalist Clubs •Toronto Entomologists Association •Conservation Authorities	Studies confirm: •The presence of Monarch Use Days (MUD) during fall migration (Aug /Oct)[xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur. •Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. •MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. •SWHMiST Index #16 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present. Does not meet minimum size criteria and is not within 5km of Lake Ontario.

Seasonal Concentration Areas of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Landbird Migratory Stopover Areas **Rationale:** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds. Canadian Wildlife Service Ontario website:http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Woodlots need to be >10 ha in size and within 5 km of Lake Ontario. •If multiple woodlands are located along the shoreline those Woodlands <2km from Lake Ontario are more significant •Sites have a variety of habitats; forest, grassland and wetland complexes. •The largest sites are more significant •Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5km of Lake Ontario are Candidate SWH. <u>Information Sources</u> •Bird Studies Canada •Ontario Nature •Local birders and naturalist club •Ontario Important Bird Areas(IBA) Program	Studies confirm: •Use of the habitat by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. •Studies should be completed during spring (Apr./May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #9 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Deer Yarding Areas **Rationale:** Winter habitat for deer is considered to be the main limiting factor for northern deer populations. In winter, deer congregate in "yards" to survive severe winter conditions. Deer yards typically have a long history of annual use by deer, yards typically represent 10-15% of an areas summer range.	White-tailed Deer	Note: OMNRF to determine this habitat. ELC Community Series providing a thermal cover component for a deer yard would include; FOM FOC SWM SWC Or these ELC Ecosites; CUP2 CUP3 FOD3 CUT	•Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20 cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30 cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter. •The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%. •OMNRF determines deer yards following methods outlined in "Selected Wildlife and Habitat Features: Inventory Manual" •Woodlots with high densities of deer due to artificial feeding are not significant.	No Studies Required: •Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH. •Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRF offices or via Land Information Ontario (LIO). •Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNRF will complete these field investigations. •If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. •SWHMiST Index #2 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present. Not mapped on LIO/GEO.

Seasonal Concentration Areas of Animals					
Wildlife Habitat	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Deer Winter Congregation Areas **Rationale:** Deer movement during winter in the southern areas of Eco region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions [cxlviii].	White-tailed Deer	All Forested Ecosites with these ELC Community Series; FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	•Woodlots will typically be >100 ha in size. Woodlots <100ha may be considered as significant based on MNRF studies or assessment. •Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands. •If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule. •Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha. •Woodlots with high densities of deer due to artificial feeding are not significant. Information Sources •MNRF District Offices. •LIO/NRVIS	Studies confirm: •Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF. •Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF •Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques, ground or road surveys. or a pellet count deer density survey. •If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. •SWHMiST Index #2 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present. Not mapped on LIO/GEO.

Specialized Habitat for Wildlife					
Habitat Type	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Waterfowl Nesting Area **Rationale:** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 **Note: includes adjacency to PSWs**	A waterfowl nesting area extends 120 m cxlix from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. •Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. •Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. <u>Information Sources</u> •Ducks Unlimited staff may know the locations of particularly productive nesting sites. •OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. •Reports and other information available from Conservation Authorities.	Studies confirmed: •Presence of 3 or more nesting pairs for listed species excluding Mallards, or; •Presence of 10 or more nesting pairs for listed species including Mallards. •Any active nesting site of an American Black Duck is considered significant. •Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m i from the wetland and will provide enough habitat for waterfowl to successfully nest. •SWHMiST Index #25 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat **Rationale**: Nest sites are fairly uncommon in Eco -region 6E and are used annually by the se species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey **Special Concern:** Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM, and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. •Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. •Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). <u>Information Sources</u> •Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. •MNRF values information (LIO/ NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. •Nature Counts, Ontario Nest Records Scheme data. •OMNRF Districts. •Check the Ontario Breeding Bird Atlas ccv or Rare Breeding Birds in Ontario for species documented •Reports and other information available from Conservation Authorities. •Field Naturalists clubs	Studies confirm the use of these nests by: •One or more active Osprey or Bald Eagle nests in an area. •Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. •For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH ci, maintaining undisturbed shorelines with large trees within this area is important. •For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat •To be significant a site must be used annually. When found inactive, the site must be known to be inactive for > 3 years or suspected of not being used for >5 years before being considered not significant. •Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid-March to mid-August. •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index # 26 provides development effects and mitigation measure	**ABSENT-** No suitable habitat present.

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Woodland Raptor Nesting Habitat Rationale: Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	Northern Goshawk Cooper's Hawk Sharp -shinned Hawk Red -shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites.May also be found in SWC, SWM, SWD and CUP3	All natural or conifer plantation woodland/forest stands >30ha with >10 ha of interior habitat. Interior habitat determined with a 200m buffer •Stick nests found in a variety of intermediate-aged to mature coniferous, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. •In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. Information Sources •OMNRF Districts. •Check the Ontario Breeding Bird Atlas or Rare Breeding Birds in Ontario for species documented. •Check data from Bird Studies Canada. •Reports and other information available from Conservation Authorities.	Studies confirm: •Presence of 1 or more active nests from species list is considered significant. •Red - shouldered Hawk and Northern Goshawk – A 400m radius around the nest or 28 ha area of habitat is the SWH ci. (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest) •Barred Owl – A 200m radius around the nest is the SWH. •Broad-winged Hawk and Coopers Hawk,– A 100m radius around the nest is the SWH. •Sharp-Shinned Hawk – A 50m radius around the nest is the SWH. •Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. •SWHMiST Index #27 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Turtle Nesting Areas **Rationale:** These habitats are rare and when identified will often be the only breeding site for local populations of turtles	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m) or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. •For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. •Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. <u>Information Sources</u> •Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). •Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. •Natural Heritage Information Center (NHIC) •Field Naturalist clubs	Studies confirm: •Presence of 5 or more nesting Midland Painted Turtles •One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. •The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH. •Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30-100m area of habitat. •Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. •SWHMiST Index #28 provides development effects and mitigation measures for turtle nesting habitat	**ABSENT-** No suitable habitat present.

Seeps and Springs **Rationale:** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system. •Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species. <u>Information Sources</u> •Topographical Map. •Thermography. •Hydrological surveys conducted by Conservation Authorities and MOE. •Field Naturalists clubs and landowners. •Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.	Field Studies confirm: •Presence of a site with 2 or more seeps/springs should be considered SWH. •The area of a ELC forest ecosite or an eco-element within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat. •SWHMiST Index #30 provides development effect and mitigation measures	**ABSENT-** No suitable habitat present (i.e., no seeps or springs).

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Amphibian Breeding Habitat (Woodland) **Rationale:** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibian	•Presence of a wetland, pond or woodland pool (including vernal pools) >500m2 (about 25m diameter) within or adjacent (within 120m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. •Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat <u>Information Sources</u> •Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records •Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. •OMNRF District. •OMNRF wetland evaluations •Field Naturalist clubs •Canadian Wildlife Service Amphibian Road Call Survey •Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm; •Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3. •A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. •The habitat is the wetland area plus a 230m radius of woodland area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. •SWHMiST Index #14 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present (i.e., no wetlands).

Amphibian Breeding Habitat (Wetlands) **Rationale:** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.	•Wetlands>500m2 (about 25m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. •Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. •Bullfrogs require permanent water bodies with abundant emergent vegetation. <u>Information Sources</u> •Ontario Herpetofaunal Summary Atlas (or other similar atlases) •Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. •OMNRF Districts and wetland evaluations •Reports and other information available from Conservation Authorities.	Studies confirm: •Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3. or; Wetland with confirmed breeding Bullfrogs are significant. •The ELC ecosite wetland area and the shoreline are the SWH. •A combination of observational study and call count surveys ii will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. •If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. •SWHMiST Index #15 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present (i.e., no wetlands).

Specialized Habitat for Wildlife

Habitat Type	Wildlife Species	Candidate SWH		Confirmed SWH	Assessment of Habitat in Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	
Woodland Area - Sensitive Bird Breeding Habitat **Rationale:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red -breasted Nuthatch Veery Blue -headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren **Special Concern:** Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	•Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. •Interior forest habitat is at least 200 m from forest edge habitat.[clxiv] <u>Information Sources</u> •Local bird clubs. •Canadian Wildlife Service (CWS) for the location of forest bird monitoring. •Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species •Reports and other information available from Conservation Authorities.	Studies confirm: •Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. •Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. •Conduct field investigations in spring and early summer when birds are singing and defending their territories. •Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” •SWHMiST Index #34 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present (i.e., no woodland, forests, or swamps present).

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)					
Habitat Type	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Marsh Breeding Bird Habitat **Rationale:** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied -billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	Nesting occurs in wetlands. •All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present. •For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. <u>Information Sources</u> •OMNRF District and wetland evaluations. •Field Naturalist clubs •Natural Heritage Information Center (NHIC) Records. •Reports and other information available from Conservation Authorities. •Ontario Breeding Bird Atlas.	Studies confirm: •Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species. •Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH. •Area of the ELC ecosite is the SWH. •Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #35 provides development effects and mitigation measures	**ABSENT-** No suitable habitat present (i.e., no wetlands).
Open Country Bird Breeding Habitat Rationale; This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper SparrowVesper SparrowNorthern Harrier Savannah Sparrow **Special Concern:** Short-eared Owl	CUM1CUM2	•Large grassland areas (includes natural and cultural fields and meadows) >30 ha •Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years). •Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. •The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. <u>Information Sources</u> •Agricultural land classification maps, Ministry of Agriculture. •Local bird clubs. •Ontario Breeding Bird Atlas •Reports and other information available from Conservation Authorities.	Field Studies confirm: •Presence of nesting or breeding of 2 or more of the listed species. •A field with 1 or more breeding Short-eared Owls is to be considered SWH. •The area of SWH is the contiguous ELC ecosite field areas. •Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #32 provides development effects and mitigation measures	**ABSENT-** Suitable ecosite present; however, it does not meet the size criteria.

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)					
Habitat Type	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Shrub/Early Successional Bird Breeding Habitat **Rationale;** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	Indicator Spp: Brown Thrasher Clay-coloured Sparrow Common Spp. Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	Large field areas succeeding to shrub and thicket habitats>10ha size. •Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years). •Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. •Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. <u>Information Sources</u> •Agricultural land classification maps, Ministry of Agriculture. •Local bird clubs. •Ontario Breeding Bird Atlas •Reports and other information available from Conservation Authorities.	Field Studies confirm: •Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. •A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. •The area of the SWH is the contiguous ELC ecosite field/thicket area. •Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories •Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" •SWHMiST Index #33 provides development effects and mitigation measures.	**ABSENT-** Suitable ecosite present; however, it does not meet the size criteria.
Terrestrial Crayfish **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	Chimney or Digger Crayfish; (*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish; (Cambarus Diogenes)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh or swamp ecosites can be used by terrestrial crayfish.	Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish. •Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. •Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. <u>Information Sources</u> •Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: •Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites •Area of ELC ecosite or an eco-element area of meadow marsh or swamp within the larger ecosite area is the SWH. •Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult •SWHMiST Index #36 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Habitat for Species of Conservation Concern (Not including Endangered or Threatened Species)					
Habitat Type	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Special Concern and Rare Wildlife Species **Rationale: These species are quite rare or have experienced significant population declines in Ontario.**	All Special Concern and Provincially Rare (S1 -S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.	All plant and animal element occurrences (EO)within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites Information Sources •Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. •NHIC Website "Get Information" : http://nhic.mnr.gov.on.ca •Ontario Breeding Bird Atlas •Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm: •Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. •The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. •SWHMiST Index #37 provides development effects and mitigation measures.	**ABSENT-** Suitable habitat for Yellow-banded Bumble Bee and Monarch present; however, it is marginal and not present in significant quantities (i.e., it does not provide critical habitat). Monarch was identified incidentally on Milkweed. Barn Swallow (Special Concern) was recorded during both breeding bird surveys and is considered to have probable breeding evidence in the study area. However, no suitable nesting structure (e.g., building, culverts, bridges) are present on the subject property.

Rare Vegetation Communities					
Rare Vegetation Community	**ELC Ecosite Codes**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		Habitat Description	**Detailed Information and Sources**	**Defining Criteria**	
Cliffs and Talus Slopes **Rationale:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO TAS TAT CLO CLS CLT	A Cliff is vertical to near vertical bedrock >3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris	Most cliff and talus slopes occur along the Niagara Escarpment. <u>Information Sources</u> •The Niagara Escarpment Commission has detailed information on location of these habitats. •OMNRF District •Natural Heritage Information Center (NHIC) has location information available on their website •Field Naturalist clubs •Conservation Authorities	•Confirm any ELC Vegetation Type for Cliffs or Talus Slopes •SWHMiST Index #21 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Sand Barren **Rationale:** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always < 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.	A sand barren area >0.5ha in size. <u>Information Sources</u> •OMNRF Districts. •Natural Heritage Information Center (NHIC) has location information available on their website. •Field Naturalist clubs •Conservation Authorities	•Confirm any ELC Vegetation Type for Sand Barrens •Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). •SWHMiST Index #20 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Alvar **Rationale:** Alvars are extremely rare habitats in Eco- region 6E. Most alvars in Ontario are in Eco regions 6E and 7E. Alvars in 6E are small and highly localized just north of the Palaeozoic-Precambrian contact.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 Five Alvar Indicator Species: 1) *Carex crawei* 2) *Panicum philadelphicum* 3) *Eleocharis compressa* 4) *Scutellaria parvula* 5) *Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 6E[cxlix]	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover [lxxviii].	An Alvar site > 0.5 ha in size. <u>Information Sources</u> •Alvars of Ontario (2000), Federation of Ontario Naturalists [lxxvi]. •Ontario Nature – Conserving Great Lakes Alvars [ccviii]. •Natural Heritage Information Center (NHIC) has location information available on their website •OMNRF Districts •Field Naturalist clubs. •Conservation Authorities.	•Field studies that identify four of the five Alvar Indicator Species at a Candidate Alvar site is Significant. •Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). •The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses •SWHMiST Index #17 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Rare Vegetation Communities					
Rare Vegetation Community	**ELC Ecosite Codes**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		Habitat Description	**Detailed Information and Sources**	**Defining Criteria**	
Old Growth Forest **Rationale:** Due to historic logging practices, extensive old growth forest is rare in the Ecoregion. Interior habitat provided by old growth forests is required by many wildlife species.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi- layered canopy and an abundance of snags and downed woody debris.	Woodland areas 30 ha or greater in size or with at least 10 ha interior habitat assuming 100 m buffer at edge of forest. Information Sources •OMNRF Forest Resource Inventory mapping •OMNRF Districts. •Field Naturalist clubs •Conservation Authorities •Sustainable Forestry Licence (SFL) companies will possibly know locations through field operations. •Municipal forestry departments	Field Studies will determine: •If dominant trees species of the are >140 years old, then the area containing these trees is Significant Wildlife Habitat •The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present) •The area of forest ecosites combined or an eco-element within an ecosite that contains the old growth characteristics is the SWH. •Determine ELC vegetation types for the forest forest area containing the old growth characteristics [lxxviii] •SWHMiST Index #23 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Savannah **Rationale:** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.	No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. <u>Information Sources</u> •Natural Heritage Information Center (NHIC) has location information available on their website •OMNRF Districts •Feld Naturalist clubs. •Conservation Authorities.	Field studies confirm one or more of the Savannah indicator species listed in Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used. •Area of the ELC Ecosite is the SWH. •Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). •SWHMiST Index #18 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Rare Vegetation Communities					
Rare Vegetation Community	**ELC Ecosite Codes**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		Habitat Description	**Detailed Information and Sources**	**Defining Criteria**	
Tallgrass Prairie **Rationale:** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.	No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. <u>Information Sources</u> •Natural Heritage Information Center (NHIC) has location information available on their website •OMNRF Districts •Feld Naturalist clubs. •Conservation Authorities.	Field studies confirm one or more of the Prairie indicator species listed in Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 6E should be used •Area of the ELC Ecosite is the SWH. •Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). •SWHMiS Index #19 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
Other Rare Vegetation Communities **Rationale:** Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG . Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M The OMNRF/NHIC will have up to date listing for rare vegetation communities. <u>Information Sources</u> •Natural Heritage Information Center (NHIC) has location information available on their website •OMNRF Districts •Feld Naturalist clubs. •Conservation Authorities	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG. •Area of the ELC Vegetation Type polygon is the SWH. •SWHMiST Index #37 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.

Animal Movement Corridors					
Habitat Type	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
Amphibian Movement Corridors **Rationale;** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue -spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	•Corridors may be found in all ecosites associated with water. •Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1	Movement corridors between breeding habitat and summer habitat. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat –Wetland) of this Schedule. <u>Information Sources</u> •MNRF District Office. •Natural Heritage Information Center (NHIC). •Reports and other information available from Conservation Authorities. •Field Naturalist Clubs.	•Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. •Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant •Corridors should have at least 15m of vegetation on both sides of waterway or be up to 200m wide of woodland habitat and with gaps <20m. •Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat. •SWHMiST Index #40 provides development effects and mitigation measures	**ABSENT-** No suitable habitat present.
Deer Movement Corridors **Rationale:** Corridors important for all species to be able to access seasonally important life - cycle habitats or to access new habitat for dispersing individuals by minimizing their vulne- rability while travelling.	White-tailed Deer	Corridors may be found in all forested ecosites. A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridor	Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH from Table 1.1 of this schedule. •A deer wintering habitat identified by the OMNRF as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion. •Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges). <u>Information Sources</u> •MNRF District Office. •Natural Heritage Information Center (NHIC). •Reports and other information available from Conservation Authorities. •Field Naturalist Clubs.	Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas. •Corridors that lead to a deer wintering habitat should be unbroken by roads and residential areas. •Corridors should be at least 200m wide with gaps <20m and if following riparian area with at least 15m of vegetation on both sides of waterway Shorter corridors are more significant than longer corridors. •SWHMiST Index #39 provides development effects and mitigation measur es	**ABSENT-** No suitable habitat present.

Significant Wildlife Habitat Exceptions for Ecodistricts within EcoRegion 6E					
EcoDistrict, Habitat Type and Rationale	**Wildlife Species**	**Candidate SWH**		**Confirmed SWH**	**Assessment of Habitat in Study Area**
		ELC Ecosite Codes	**Habitat Criteria and Information Sources**	**Defining Criteria**	
6E-14 **Mast Producing Areas** **Rationale:** The Bruce Peninsula has an isolated and distinct populations of Black Bears. Maintenance of large woodland tracs with mast-producing tree species is important for bears.	Black Bear	All forested habitat represented by ELC community series: FOM FOD	**Habitat Description** •Black bears require forested habitat that provides cover, winter hibernation sites, and mast-producing tree species. •Forested habitats need to be large enough to provide cover and protection for black bears **Habitat Criteria and Information** Woodland ecosites >30ha with mast -producing tree species, either soft (cherry) or hard (oak and beech) Information Sources Important forest habitat for black bears may be identified by OMNRF.	•All woodlands > 30ha with a 50% composition of these ELC Vegetation Types are considered significant: FOM1-1 FOM2-1 FOM3-1 FOD1-1 FOD1-2 FOD2-1 FOD2-2 FOD2-3 FOD2-4 FOD4-1 FOD5-2 FOD5-3 FOD5-7 FOD6-5 SWHMiST Index #3 provides development effects and mitigation measures.	**ABSENT-** No suitable habitat present.
6E-17 **Lek Rationale**: Sharp-tailed Grouse only occur on Manitoulin Island in Ecoregion 6E, Leks are an important habitat to maintain their population.	Sharp-tailed Grouse	CUM CUS CUT	**Habitat Description** •The lek or dancing ground consists of bare, grassy or sparse shrubland. There is often a hill or rise in topography. •Leks are typically a grassy field/meadow >15ha with adjacent shrublands and >30ha with adjacent deciduous woodland. Conifer trees within 500m are not tolerated. **Habitat Criteria and Information** •Grasslands (field/meadow) are to be >15ha when adjacent to shrubland and >30ha when adjacent to deciduous woodland. •Grasslands are to be undisturbed with low intensities of agriculture (light grazing or late haying) •Leks will be used annually if not destroyed by cultivation or invasion by woody plants or tree plantingInformation Sources •OMNRF district office •Bird watching clubs •Local landowners •Ontario Breeding Bird Atlas	Studies confirming lek habitat are to be completed from late March to June. •Any site confirmed with sharp-tailed grouse courtship activities is considered significant •The field/meadow ELC ecosites plus a 200 m radius area with shrub or deciduous woodland is the lek habitat •SWHMiST Index #32 provides development effects and mitigation measures	**ABSENT-** No suitable habitat present.

APPENDIX 7 | Hydrogeological Investigation Report and Counterpoint Memorandum

Hydrogeological Investigation Report

Proposed Residential Development
280 Clair Road West
Guelph, Ontario

Client:
John Farley and Home Opportunities

Attention:
John Farley

Type of Document:
Draft Report

Project Number:
G4836-24-3

Project Name:
Proposed Residential Development

JLP Services Inc.
Geotechnical and Environmental Consultants
405 York Road,
Guelph, ON
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Date Submitted:
September 4, 2024

Version Control

	First Issue	Final Issue
Project Number	G4836-24-3	
Report Title	Hydrogeological Investigation Report Proposed Residential Development, 280 Clair Road West, Guelph, Ontario	
Version Number	1	
Remarks	Draft Report	
Prepared By	Cindy Luu, B.Sc. / Jay Samarakkody, M. Phil., P.Geo.	
Initials	Draft Report	
Reviewed By	Ajay Jayalath, MBA, P.Geo., QP	
Initials	Draft Report	
Date	September 4 , 2024	

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1. Introduction

1.1 Project Description

JLP Services Inc. (JLP) was retained by John Farley and Home Opportunities ("Client") to conduct a Hydrogeological Investigation for the proposed residential development located at 280 Clair Road West, Guelph, Ontario, herein referred to as the "Site" and "Subject Property".

The Site is currently vacant. The Site is an irregular-shaped parcel of land and is surrounded by parkland, an urban reserve, a high school, and industrial properties. Residential and industrial properties were noted within the near surrounding areas.

The Site location is shown in Figure 1.

As per the information presented in the drawings from Architecture Unfolded, JLP understands that the development includes approximately 1,000 residential units spread over thirty-three (33) cluster townhouse buildings with 323 units, two (2) apartment buildings with 6-storey and 18-storey towers and one five-storey parking structure. JLP understands that all residential buildings will be completed with one level full basements and the 5-storey parking structure with a partial basement. An on-grade parking lot is located on the northwestern portion of the site and associated driveway and greenspace areas are proposed throughout the site.

However, the site configuration is subject to change. Final details of the proposed development were not available for review during the preparation of this report.

JLP conducted a Geotechnical Investigation in conjunction with this study. Pertinent information gathered from the geotechnical investigation was utilized for the completion of this report.

Limitations and Use of Report (Report Terms and Conditions) are provided in Appendix A.

1.2 Project Objectives and Scope of Work

The main objectives of the proposed hydrogeological investigation are provided below:

- Characterize regional and site-specific hydrogeological conditions;
- Estimate construction and post-construction dewatering rates and evaluate potential dewatering related impacts;
- Evaluate permitting requirements for construction and post-construction dewatering (if applicable) activities;
- Preparation of a Hydrogeological Investigation report.

This hydrogeological investigation report was prepared to satisfy the Ministry of the Environment, Conservation and Parks (MECP), Grand River Conservation Authority (GRCA), and the City of Guelph.

To achieve the investigation objectives, JLP has completed the following scope of work:

Information Review

- Reviewed available geological and hydrogeological information for the Site including established maps and public reports;
- Reviewed the MECP and GRCA mapping on Wellhead Protection Areas (WHPA), Highly Vulnerable Aquifers (HVA), Significant Groundwater Recharge Areas (SGRA) and other hydrogeologically sensitive areas (e.g., karstic areas); and,
- Searched MECP water well records database for existing water wells within 500 m of the property boundary.

Field Program

- Drilled and installed seven (7) monitoring wells at selected locations on-site to a maximum depth of approximately 9 metres below ground surface (mbgs) with 3.1 m long and 50 mm diameter screens, as part of the combined drilling program;
- Developed and conducted Single Well Response Tests (SWRT) on five (5) monitoring wells installed on-site to evaluate hydraulic properties of the saturated stratigraphic units at the Site;

  Note: two (2) monitoring wells were dry at the time of SWRT testing
- Completed four (4) rounds of groundwater level measurements at all monitoring wells after well development;
- Completed elevation survey at all monitoring wells for geodetic elevations;
- Completed six (6) in-situ infiltration rate tests at three (3) selected locations using Guelph Permeameter at 0.5 m and 1.5 m below ground surface to provide infiltration rates across the Site;
- Collected one (1) groundwater sample from a selected monitoring well for laboratory analysis (currently in progress) and screening against the City of Guelph Sanitary and Storm Sewer By-Law criteria; and,
- Conduct one-year seasonal groundwater level monitoring program including continual water level monitoring using data loggers at five (5) selected monitoring wells.

  Note: The seasonal groundwater level monitoring program is in progress

Data Evaluation

- Evaluated the information collected during the field investigation program including, but not limited to; borehole geological information, SWRT results, groundwater level measurements, and groundwater water quality;
- Prepared site-specific surface and bedrock geological maps, Site plans, groundwater contours, and cross sections;
- Estimated construction dewatering flow rates (short-term), assessed potential impacts, and recommended mitigation measures;
- Evaluated requirement of MECP water taking permits (permit to take water / Environmental Activity and Sector Registry [EASR]) and discharge agreements with the relevant municipality/Region.

Reporting

- Prepared Hydrogeological Investigation Report which summarizes the work completed on the site to satisfy regulatory authorities having jurisdiction.
    - This report provides information on site setting, desktop review of geological and hydrogeological information, groundwater quality, results of field investigation program, and construction dewatering requirements and potential impacts on the surrounding environment.
- Preparation of three (3) quarterly reports and one (1) year-end report on seasonal groundwater level monitoring results (manual and continual)- currently ongoing.

1.3 Review of Previous Reports

The following report was reviewed as part of this hydrogeological investigation:

- JLP Services Inc. (July 15, 2024). Geotechnical Investigation Report, Proposed Residential Development, 280 Clair Road West, Guelph, Ontario, prepared for John Farley and Home Opportunities.

2. Regional and Local Hydrogeology

2.1 Regional Setting

2.1.1 Regional Physiology

The Site is located within a physiographic region named the Horseshoe Moraines, and a physiographic landform named as the Till Moraines.

The Horseshoe Moraines occupies an area of approximately 5,590 km^2 lying to the west of the highest part of the Niagara Escarpment. The "toe" of the horseshoe-shaped region lies on the highest part of the upland south of Georgian Bay at about 518 m above sea level (masl), while the two "heels" are about 274 m lower (Chapman & Putman, 2007).

Associated meltwater stream deposits give the region two main landform types; (a) irregular, stony knobs and ridges, and (b) pitted sand and gravel terraces and swampy valley floors.

2.1.2 Regional Geology and Hydrogeology

The surficial geology of the subject property and surrounding area is mapped as glaciofluvial deposits (gravelly river deposits and delta topset facies) in the west to northwest, stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain in the south to southeast and ice-contact stratified deposits (sand and gravel, minor silt, clay and till) in the northeast (Ontario Geological Survey, 2010). Based on the surficial geology/mapping, the Site is an intersection of glaciofluvial, ice contact and stone poor deposits.

The dominant bedrock geology of the area is mapped as Lower Silurian sandstone, shale, dolostone, and siltstone belonging to the Guelph Formation. The bedrock in the area shows potential karstic conditions.

The surficial and bedrock geology of the Site and surrounding areas are shown in Figures 2 and 3, respectively.

The Site area is located within the Ellis Creek-Speed River watershed and Hanlon Creek sub-watershed which eventually joins the Speed River. Regional groundwater flow in the area is in a northwest direction, towards the Speed River. It is expected that groundwater flow directions may vary locally from the regional flow directions due to various natural factors including local topographic and stratigraphic variations, submerged riverbeds, and engineering structures such as buildings and infrastructure.

2.2 Vulnerable Areas Assessment

The site is located within the Grand River Source Protection Area. Published maps and websites for GRCA and the MECP were reviewed to identify if the Site footprint is included in any regulated areas.

It should be noted that the area of the proposed development does not fall within a GRCA regulated area.

The following regulated areas were considered during the above information search:

- Wellhead Protection Areas (WHPA) – The Site area is located within Wellhead Protection Area C (WHPA-C) with a low vulnerability score of 4. The Site is located outside WHPA under the direct influence of surface water (WHPA-E).

- WHPA – Q (Water Quantity) – The Site area is located outside of mapped WHPA Q1/Q2 (Water Quantity).
- Significant Groundwater Recharge Areas (SGRA) – The Site area is located within mapped SGRA, with an unspecified vulnerability score.
- Highly Vulnerable Aquifer Areas - The Site is located outside the mapped highly vulnerable aquifer areas.
- Intake Protection Zones (IPZ) - Intake Protection Zones are the area of water and land surrounding a municipal surface water intake. The closest Intake Protection Zone (IPZ3) is located approximately 200 m southeast of the Site.
- Paris-Galt Moraine – The southern part of the Site is located within the Paris-Galt Moraine area.
- Karst Areas – The Site is located within an area categorized as a potential karstic area.

The location of the Site in relation to vulnerable areas is shown in Figures 4-1 to 4-8.

2.3 Existing Water Wells

Water Well Records (WWRs) from the database maintained by the MECP were reviewed to determine the number of water wells within a 500 m buffer from the Site centroid. The locations of the MECP WWR are shown in Figure 5. A summary of the WWR is included in Appendix B.

The MECP WWR database indicates a total of 43 wells within 500 m distance from the site boundaries, including one domestic water supply well, one livestock water supply well and three observation wells located on-Site. The off-site wells are recorded as; domestic water supply wells (1), abandoned wells (6), observation/monitoring/testing wells (24), dewatering and test wells (1), municipal test wells (1) and unidentified wells (5).

The recorded water found depths ranged from approximately 3.6 to 4.9 mbgs.

The closest water supply well (for domestic use) outside the Site is located approximately 100 m away from the Site boundary. Existing water supply wells within 500 m of the Site boundary were installed from 1963 to 1977.

The Site and surrounding areas are serviced by municipal water supply.

2.4 Site Setting

2.4.1 Site Topography and Surface Water Features

As per elevation survey results at borehole/monitoring well locations, the surface elevation of the Site area varies from approximately 333.21 to 342.15 masl, which indicates an approximate difference of about 8.94 m between the highest and lowest elevations at borehole/monitoring well locations. The topography of the site area can be considered sloped towards the northwest across the property.

The Site is zoned as parkland (P.1) and urban reserve (UR) under the City of Guelph Zoning By-law (2023)-20790.

The Site area is located within the Ellis Creek-Speed River watershed and Hanlon Creek sub-watershed. The nearest surface water feature is a tributary of Hanlon Creek, which runs approximately 700 m northwest of the Site boundary. Available area maps show that no streams or surface waterbodies exist on-Site.

2.4.2 Local Geology and Hydrogeology

A summary of subsurface soil stratigraphy at the Site is provided in the following paragraphs.

Appendix C provides geological logs for boreholes with detailed soil profiles. The borehole location plan and interpreted geological cross sections are presented in Figures 6, 7 and 8.

It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the hydrogeological investigation and shall not be interpreted as exact planes of geological change.

Refer to the geotechnical investigation report (JLP, July 2024) for a detailed description of the subsurface soil stratigraphy at the Site.

A layer of **topsoil**, about 175 to 400mm thick, was encountered at the surface of all boreholes. The topsoil consisted of dark brown to brown silty sand, some gravel with scattered organic inclusions. The topsoil was generally dark brown in colour.

Based on visual and tactile examination of the soil samples, the topsoil was in moist condition.

It should be noted that the thickness of topsoil may vary significantly between boreholes locations and should not be used to estimate the quantity of topsoil removal.

Below the topsoil in BH/MW1, BH4, BH/MW5, BH/MW8, BH/MW9, BH/MW10, BH/MW11, BH12, BH13, BH14 and BH/MW15, a discontinuous deposit of fill was encountered to depths of about 0.8 to 1.3 mbgs. In BH/MW1, BH/MW8, BH/MW9, BH/MW10, BH13 and BH14, the fill consisted of dark brown to brown silty sand, some gravel, and occasional organic inclusions. In BH4, BH/MW5, BH/MW11, BH12 and BH/MW15, the fill consisted of brown sand and gravel, some silt. Standard Penetration tests in the fill gave N-values ranging from 5 to 35 blows/300mm. The natural moisture content was found to range from 7 to 35%. The relatively high moisture content in a portion of the fill material was due to the presence of organics.

Based on visual and tactile examination of the soil samples and the test results, the silty sand fill and sand and gravel fill are considered to be in a loose to dense state of compactness and in moist condition.

The silty sand and sand and gravel fill at BH/MW1, BH4, BH/MW5, BH/MW8, BH/MW9, BH/MW10, BH/MW11, BH12, BH13, BH14 and BH/MW15 and topsoil at BH2, BH3, BH6 and BH7 were underlain by a deposit of sand and gravel to the depth of 6.1 mbgs in BH14 and to the full depth of investigation in all other boreholes at about 2.3 to 9.0 mbgs. The sand and gravel was brown in colour and contained trace to some silt inclusions and scattered sandy silt seams. Standard Penetration tests in this material gave N-values ranging from 5 to greater than 100 blows/300mm, with typical values between 27 and 65 blows/300mm. The natural moisture content was found to range between 1 and 18%, with typical values between 3 and 13.

Based on visual and tactile examination of the soil samples and the test results, the sand and gravel was typically in a compact to very dense state of compactness and in moist to wet condition.

A discontinuous layer of silt till was found at BH12 between the sand and gravel ranging from 2.4 to 3.8 mbgs and to the full depth of investigation i.e. 7.6 mbgs in BH14. The silt till was brown or grey in colour and contained trace to some sand inclusions. Standard Penetration tests in this material gave N-values ranging from 5 to 69 blows/300mm. The natural moisture content was found to range between 7 and 10%.

Based on visual and tactile examination of the soil samples and the test results, the silt till is typically in a loose to very dense state of compactness and in moist condition.

It is noted that auger refusal on probable boulder was encountered at BH/MW1, BH2, BH3, BH6, BH7, BH/MW8 and BH/MW10 at depths of about 2.3 to 7.6 mbgs.

Two (2) cross sections (Cross Section A-A' and Cross Section B-B') were prepared to show the soil stratigraphy to a depth of approximately 9.0 mbgs within the Site boundaries. Cross Section A-A' and Cross Section B-B' are provided as Figures 7 and 8, respectively.

3. Field Investigation Results

3.1 Monitoring Well Network Details

As part of the combined drilling program for geotechnical and hydrogeological investigations, fifteen (15) boreholes (BH/MW1, BH2, BH3, BH4, BH/MW5, BH6, BH7, BH/MW8, BH/MW9, BH/MW10, BH/MW11, BH12, BH13, BH14 and BH/MW15) were advanced at the Site, of which seven (7) were completed as monitoring wells (BH/MW1, BH/MW5, BH/MW8, BH/MW9, BH/MW10, BH/MW11 and BH/MW15) by JLP, (Figure 6 and Appendix C).

All monitoring wells were equipped with a 50 mm diameter PVC pipe and 3.1 metre long well screens and completed with monument style well protectors.

Table 3.1 provides a summary of monitoring well construction details.

Table 3.1: Summary of Monitoring Well Installation Details

Monitoring Well ID	Northing (m±)	Easting (m±)	Ground Elevation (masl)	Well Depth (mbgs)	Screen Interval (masl)	Soil Formation Screened
BH/MW1	4815636.4	565116.9	341.39	7.54	336.9 to 333.85	Sand and Gravel
BH/MW5	4815554.4	564941.3	335.45	6.1	332.4 to 329.35	Sand and Gravel
BH/MW8	4815723.7	565062.3	341.21	4.28	339.98 to 336.93	Sand and Gravel
BH/MW9	4815661.0	564934.1	335.80	8.73	330.12 to 327.07	Sand and Gravel
BH/MW10	4815656.7	564860.1	335.44	6.03	332.46 to 329.41	Sand and Gravel
BH/MW11	4815746.8	564855.3	336.41	7.46	332.0 to 328.95	Sand and Gravel
BH/MW15	4815931.0	564864.3	333.21	5.37	330.89 to 327.84	Sand and Gravel

Ontario Regulation 903 of the Ontario Water Resources Act requires that all monitoring wells and dewatering wells (if available) be decommissioned when no longer required. Well decommissioning should be completed by a licenced well contractor.

3.2 Groundwater Level Monitoring

As part of the current hydrogeological investigation, groundwater levels have been monitored using all wells located on-site within the property boundary. All water levels in the monitoring wells have been measured with respect to masl.

Groundwater level monitoring was carried out at the Site in four (4) full monitoring rounds from April 16, 2024, to August 11, 2024. A summary of the groundwater level monitoring results is provided in Table 3.2.

Table 3.2: Summary of Groundwater Level Monitoring Results

Monitoring Well ID	Ground Surface Elevation (masl)	Monitoring Well Depth (mbgs)	Monitoring Well bottom Elevation (masl)	Units	April 16, 2024	July 9, 2024	July 22, 2024	August 13, 2024
BH/MW1	341.392	7.54	333.85	mbtoc	Dry	Dry	Dry	8.37
				mbgs	>7.54	>7.54	>7.54	7.43
				masl	<333.85	<333.85	<333.85	333.96
BH/MW5	335.445	6.1	329.35	mbtoc	Dry	6.72	6.2	6.36
				mbgs	>6.1	5.85	5.33	5.49
				masl	<329.35	329.60	330.12	329.96
BH/MW8	341.207	4.28	336.93	mbtoc	Dry	Dry	Dry	Dry
				mbgs	>4.28	>4.28	>4.28	>4.28
				masl	<336.93	<336.93	<336.93	<336.93
BH/MW9	335.795	8.73	327.07	mbtoc	7.17	7.03	6.51	6.68
				mbgs	6.35	6.21	5.69	5.86
				masl	329.45	329.59	330.11	329.94
BH/MW10	335.437	6.03	329.41	mbtoc	Dry	6.55	6.02	6.19
				mbgs	>6.03	5.83	5.30	5.47
				masl	<329.41	329.61	330.14	329.97
BH/MW11	336.406	7.46	328.95	mbtoc	7.46	7.37	6.82	7.03
				mbgs	6.90	6.81	6.26	6.47
				masl	329.51	329.60	330.15	329.94
BH/MW15	333.209	5.37	327.84	mbtoc	4.23	4.31	3.6	3.97
				mbgs	3.57	3.65	2.94	3.31
				masl	329.64	329.56	330.27	329.90

mbtoc means “meters below top of casing”

The highest groundwater elevations recorded at monitoring wells from April 16, 2023, to August 13, 2024, are provided in Table 3.3.

Table 3.3: Highest Recorded Groundwater Elevations

Monitoring Well ID	Date Measured	Highest Groundwater Elevation (masl)	Groundwater Level (mbgs)
BH/MW1	August 13, 2024	333.96	7.43

According to the results of the groundwater level (Static Water Level) monitoring, the shallow groundwater flow direction across the Site is interpreted to be varied from northwest to southwest, towards Hanlon Creek. The groundwater flow maps may need to be updated as groundwater monitoring progresses.

One (1) groundwater contour map for the water-bearing zone up to approximately 9 mbgs is shown in Figure 9.

It should be noted that groundwater levels are expected to show seasonal fluctuations and the groundwater flow directions across the Site may change. Thus, seasonal groundwater level monitoring will be pertinent to understand seasonal groundwater level and/or flow fluctuations.

A seasonal groundwater monitoring program at the Site is currently in progress.

3.3 Hydraulic Conductivity Testing

3.3.1 Single Well Response Testing

Single Well Response Tests (SWRT) were completed at all five (5) monitoring wells (BH/MW1, BH/MW5, BH/MW10, BH/MW11, and BH/MW15) on June 8th and 9th of 2024, in order to estimate the saturated hydraulic conductivity (K) of the soil/bedrock surrounding the monitoring well screen.

All monitoring wells were developed prior to conducting SWRT testing and left for full recovery. Prior to starting SWRT testing, static groundwater level in each well was measured and the test was conducted by rapidly inserting a solid/water slug into the well. A digital data logger pre-programmed to record data at each 1 second interval was inserted in the well prior to inserting solid/water slug.

SWRT field data interpretation was completed using the Hvorslev solution provided in the AQTESOLV Pro. V.4.5 software package.

3.3.2 Summary of Hydraulic Conductivity Test Results

Table 3.4 provides a summary of SWRT results completed on monitoring wells BH/MW5, BH/MW9, BH/MW10, BH/MW11 and BH/MW15.

Appendix D provides SRWT test analytical results.

Table 3.4: Summary of Hydraulic Conductivity Test Results

Monitoring Well ID	Well Depth (mbgs)	Screen Interval (mbgs)		Screened Lithologic Unit	Test Type	Estimated Hydraulic Conductivity (m/s)
		From	To			
BH/MW5	6.10	3.05	6.10	Sand and Gravel	SWRT – Falling Head	4.65E-06
BH/MW9	8.73	5.68	8.73	Sand and Gravel	SWRT – Falling Head	1.08E-05
BH/MW10	6.03	2.98	6.03	Sand and Gravel	SWRT – Falling Head	5.86E-05
BH/MW11	7.46	4.41	7.46	Sand and Gravel	SWRT – Falling Head	7.92E-05
BH/MW15	5.37	2.32	5.37	Sand and Gravel	SWRT – Falling Head	5.91E-05
					Highest Estimated K Value	7.92E-05
					Geometric Mean of K Values	2.68E-05

The highest K value of the saturated overburden to a depth of approximately 9 mbgs is 7.92E-05 m/s and the geometric mean of the K values is 2.68E-05 m/s.

It should be noted that SWRT results provide the estimated saturated hydraulic conductivity (K) of the soil surrounding each monitoring well screen and therefore, may not represent the hydraulic conductivity of the total soil formation screened.

3.4 Infiltration Rate Testing Results

3.4.1 Infiltration Rate Testing

Using Guelph Permeameter, JLP completed six (6) infiltration rate tests at three (3) selected locations (INF5S/D, INF10S/D and INF11S/D) within the Site area close to existing boreholes / monitoring wells BH/MW5 (INF5S/D), BH/MW10 (INF10S/D) and BH/MW11 (INF11S/D), on August 8, 2024.

Infiltration rate testing was completed by constant head well permeameter method using Guelph Permeameter.

Infiltration tests were conducted at depths of 0.5 and 1.5 mbgs at each of the above noted locations and the infiltration tests were conducted in 7 cm diameter holes. The reported water levels at these monitoring wells on August 13, 2024, were approximately 5.49 mbgs (BH/MW5 – INF5S/D), 5.47 mbgs (BH/MW10 – INF10S/D) and 6.47 mbgs (BH/MW11 – INF11S/D).

The encountered soil types within the infiltration test holes are medium to coarse grained sand and gravel with some silt (Appendix C).

Table 3.4.2 below provides a summary of field saturated hydraulic conductivity (Kfs) testing and design infiltration rates, as per the LID Stormwater Management Planning and Design Guide, CVC – TRCA, 2010, Appendix G. The estimated field saturated hydraulic conductivities were correlated to infiltration rates based on the relationship provided in Appendix D of the guideline.

Infiltration rate testing locations are shown in Figure 6 and infiltration rate analysis is provided in Appendix E.

Table 3.5: Summary of Infiltration Testing Results

Infiltration Test Location/MW ID	Depth of Hole (mbgs)	Formation tested	Field Saturated Hydraulic Conductivity, Kfs (cm/s)	Infiltration Rate (mm/hr)
Shallow Soils				
INF5S – 0.5 mbgs	0.5	Sand and Gravel	8.10E-04	81
INF10S – 0.5 mbgs	0.5	Silty Sand	1.31E-03	92
INF11S – 0.5 mbgs	0.5	Sand and Gravel	1.80E-03	101
Deep Soils				
INF5D – 1.5 mbgs	1.5	Sand and Gravel	1.40E-02	173
INF10D – 1.5 mbgs	1.5	Sand and Gravel	5.70E-03	137
INF11D – 1.5 mbgs	1.5	Sand and Gravel	2.50E-02	202
Geometric Mean (Shallow Soils)			1.24E-03	91
Geometric Mean (Deep Soils)			1.25E-02	168
Design Infiltration Rate (Based on Infiltration Rate Testing) *				**36**

Notes:
*Safety Factor of 2.5 was used to calculate the design infiltration rate as per Low Impact Development Stormwater Management Planning and Design Guide, CVC – TRCA, 2010.

The estimated design infiltration rate based on infiltration rate testing for the Site is 36 mm/hr., which will be used to determine the area of Low Impact Development (LID) system to mitigate the pre- vs post-development infiltration rate deficit.

Please note that the City of Guelph requires completing a monthly water balance analysis for the Site to maintain pre-development recharge rate, volume and hydroperiods at post development conditions. LID best management practices (BMP) can be proposed to mitigate the development's impact on the water balance and mimic pre-development recharge when pre- vs post-development infiltration deficit is available from a Site water balance assessment. Based on the correspondences with the civil consultant, a water balance assessment was not undertaken at this point in time.

3.5 Groundwater Quality

To assess the suitability for discharging pumped groundwater into a municipal drain during dewatering activities, one (1) groundwater sample was collected from monitoring well BH/MW9 on September 4, 2024, using a bailer.

Laboratory results for the water sample collected at the Site were not available for review at the time of preparation of this report. This report will be updated when the Laboratory results are available for review.

4. Dewatering Rate Assessment

As per the information presented in the concept site plan from Architecture Unfolded, JLP understands that the development includes approximately 1,000 units spread over thirty-three (33) cluster townhouse buildings with 323 units, two (2) apartment buildings with 6-storey and 18-storey towers and one 5-storey parking structure. JLP understands that all residential buildings will be completed with one level full basements and the 5-storey parking structure with a partial basement. An on-grade parking lot is located on the northwestern portion of the site and associated driveway and greenspace areas are proposed throughout the site.

Based on the results of the groundwater level monitoring at the subject Site, and the assumed foundation elevation, it is expected that dewatering may be required during the construction phase of the development. Therefore, construction (short-term) and post construction (long-term) dewatering rate assessment is included in this report.

An assessment of expected short-term and long-term dewatering rates was completed as described below.

4.1 Dewatering Rate Estimates

Apartment buildings with 6-storey and 18-storey towers (Apartment Buildings A and B): Two (2) apartment buildings are proposed with one (1) level of basement with a building footprint area of approximately 1,753.4 m^2 (approximately 79.7 m x 22.0 m). As suggested in the Geotechnical Report (JLP, July 25, 2024), assuming that the lowest basement floor slab will be at about 3.5 to 4.0 m below the existing grade, the lowest elevation of the basements for Apartment Buildings A and B are 331.8 and 337.0 masl, respectively. The estimated highest groundwater elevation within the footprint areas of Apartment Buildings A and B are 330.0 and 333.0 masl.

Five (5) Story Parking Structure: One (1) parking structure is proposed with one (1) level of partial basement with a building footprint area of approximately 4,622.0 m^2 (approximately 122.6 m x 37.7 m). As suggested in the Geotechnical Report (JLP, July 25, 2024), assuming that the lowest basement floor slab will be at about 3.5 to 4.0 m below existing grade, the lowest elevation of the basement for the Parking Structure is 332.0 masl. The estimated highest groundwater elevation within the footprint areas of the Parking Structure is 330.0 masl.

Town House Buildings: The reported water level for most of the Site is between 5.3 and 7.43 mbgs, which is expected to be more than 1 m deeper than the foundation level, as per the existing ground elevation. However, assuming that the lowest basement flow slab will be at about 3.5 to 4.0 mbgs, basement levels of two (2) B28(12) buildings (B(28)-A/B), one (1) B28(10) building (B28(10)-A) , one (1) B28(6) building (B28(6)-A), and two (2) 12-plex buildings (12-Plex-A/B) are expected to be slightly lower than the seasonal high groundwater elevation at the northern corner of the Site (Figure 9). The reported highest groundwater level in this area is approximately 2.94 mbgs. As a result, construction dewatering will be required in these areas.

Site Services: The inverts of the proposed site services are not available at the time of this report. However, it is expected that the on-site sanitary sewer, storm sewer and watermain inverts will be located at depths ranging between 2 and 4 metres below the finished grades (JLP, July 25, 2024). The reported groundwater levels at the Site varied from 2.94 to 7.43 mbgs. With the exception of the reported water level at BH/MW15, reported water levels at all other monitoring wells varied from 5.30 to 7.43 mbgs. As per the available information and reported groundwater elevations, it is expected that at the area adjacent to BH/MW15, some dewatering will be required during the installation of site services.

Please note that to estimate the requirement of construction dewatering for the Site, existing ground elevation was considered. When the site regrading plan and the final elevation for the building basements (proposed construction designs) are available for review, construction and post-construction dewatering rates may need to be updated.

Dewatering rate estimates were carried out using the methodology provided in Sections 4.2 and 4.3.

Table 4.1: Summary of In-put Data – Construction Dewatering

Input Parameter	Unit	B28-12 (two Building)	B28-10 (one Building)	B28-6 (one Building)	12-Plex (two Buildings)	Site Servicing	Notes
Lowest ground surface elevation	masl	334.0	333.0	334.0	334.0	-	Approximate ground surface elevation, based on Site Plan (2024.01.31).
Highest groundwater elevation	masl	330.8	330.8	330.8	330.8	2.44	Highest groundwater level recorded at the Site plus 0.5 m for seasonal highest groundwater elevation.
Lowest basement footing elevation	masl	330.0	329.0	330.0	330.0	4.0	Building basements – Assumed to be 4.0 mbgs.
Dewatered elevation target	masl	329.0	328.0	329.0	329.0	5.0	Short-term – Assumed 1.0 metre below lowest foundation/site servicing invert elevation.
Footprint area	m^2 (m x m)	522.4 (43.9x11.9)	440.3 (37.0x11.9)	261.8 (22.0x11.9)	306.4 (32.6x9.4)	20 (2 x 10)	As per concept drawings. Area of the building simplified to a rectangle having the same footprint area.
Excavation for footings/site servicing	m^2 (m x m)	522.4 (43.9x1.9)	440.3 (37.0x11.9)	261.8 (22.0x11.9)	306.4 (32.6x9.4)	20 (2 x 10)	100% of building area (full basement) and 10 m of underground servicing
Hydraulic Conductivity (K)	m/s	2.68E-05	2.68E-05	2.68E-05	2.68E-05	2.68E-05	Geometric mean of K values estimated for overburden

4.2 Dewatering Flow Rate Assessment Methodology

a. Condominium Buildings & residential townhomes

Radial flow to a well (circular source) at a distance of R_0 to a fully penetrating well can be expressed using the equation (Dupuit-Forcheimer equation) given below. This equation was used to estimate short-term (construction) and post construction (long-term) dewatering rates for the project.

$$Q = \frac{\pi K(H^2 - hw^2)}{Ln\left[\frac{R_o}{r_e}\right]}$$

Where:

Q = Dewatering Rate (m^3/s)
K = Saturated Hydraulic conductivity (m/s)
H = Initial water column in aquifer (static groundwater elevation) (m)
h_w = Final water column in aquifer (m)
R_0 = Radius of influence (m)
r_e = Equivalent radius (m)

Equivalent radius (re) can be calculated using the following equations:

$$r_e = \frac{a+b}{\pi} \quad \text{or} \quad R_{o-mod} = R_0 + r_e \text{ if } R_0 < r_e$$

a = Length of the excavation area (m)
b = Width of the excavation area (m)

Due to the requirement of removal of groundwater storage within the depth range of dewatering in addition to groundwater seepage, it is expected that the initial dewatering rate will be higher compared to the dewatering rate during the later stages of dewatering.

The Dupuit-Forcheimer equation does not take into account the daily volume required to be removed from the groundwater storage within the area of the zone of influence, which is mainly from the excavation area.

To compensate for the unaccounted groundwater removal from storage and higher dewatering rates due to any unforeseen conditions, a factor of safety will be applied to estimate the final rate of groundwater removal.

b. Site Servicing

Linear flow to an excavation (linear source) at a distance of L_0 to a fully penetrating well can be expressed using the equation (Dupuit equation) given below. This equation was used to estimate short-term (construction) dewatering rates for the project.

$$Q_w = (x1 + x2) * K * (H^2 - h^2)/Lo$$

Where:

Qw = Rate of pumping (m^3/s)
x_1 = Length of excavation (m)
X_2 = Width of excavation (m)
K = Hydraulic conductivity (m/s)
H = Aquifer Thickness/Initial Water Column Thickness (m)
h = Final Water Column Thickness (m)
Lo = Distance of influence (m)

Rainfall Intake

The additional volume of water will need to be removed from the excavation during and after precipitation events. As a result, the daily dewatering volume should include the removal of anticipated rainwater from the excavation to determine the total dewatering rate.

To estimate the volume of rainwater collected within the footprint area of the excavation, an assumed 15 mm/day precipitation was considered. It is the responsibility of the dewatering contractor to manage the volume from direct precipitation safely without exceeding the permitted daily dewatering and discharging rates during and after rainfall events greater than 15 mm (e.g., 2-year/100-year storm event).

As provided in the Intensity Duration Frequency (IDF) Curves (Ontario Ministry of Transportation), the recorded 2-year and 100-year storm event in the Site area are 60.1 and 132.0 mm/24-hrs, respectively.

4.3 Dewatering Radius of Influence

Circular Flow

It is considered that the distance to the circular source (radial flow) of groundwater is similar to the length of the dewatering zone of influence. To estimate the dewatering radius of influence during the construction dewatering activities, the Cooper-Jacob (1946) equation was used.

The estimated radius of influence due to dewatering:

$$R_0 = \sqrt{2.25KDt/S}$$

Where:

Ro = Estimated dewatering radius of influence (m)
K = Saturated Hydraulic conductivity (m/s)
D = For unconfined aquifers, original saturated thickness (considered as similar to aquifer thickness) (m)
S = Storage coefficient
t = Duration of pumping (s)

It should be noted that the above equation was derived for confined aquifers, however, it can be used for unconfined aquifers under site specific conditions.

If the estimated R_o is less than r_e, as described above $R_{0\text{-mod}}$ is used to estimate daily dewatering rates.

Linear Flow

The radius of influence (ROI) for the construction dewatering was calculated based on Sichardt's equation. This equation is used to predict the distance at which the drawdown resulting from pumping is negligible. These empirical formulas were developed to provide flow rates assuming steady state flow, as stated below.

The estimated radius of influence (R_o) of pumping based on Sichardt's formula is described as follows:

$$R_o = C(H - h)\sqrt{(K)}$$

Where:

R_o = Estimated radius of influence (m)
H = Hydraulic head in aquifer (static water level or saturated depth (m)
h = Dynamic water level (m)
K = Hydraulic conductivity (m/sec)
C = Constant (3000) for radial flow

Based on Sichardt's formula and the highest K-value, the calculated maximum theoretical zone of influence for linear flow (L_0) is taken as $R_o/2$.

4.4 Results of Construction Dewatering Rate Estimate

For this assessment, a temporary shoring system, if required, was assumed to be included in the proposed construction plans. Should the proposed shoring system be revised, JLP should be retained to review the dewatering estimates.

Table 4.2 and Appendix F present the short term (construction) dewatering estimate. Please note that, the dewatering estimates provided in Table 4.2 will need to be revised, when the final grading plan for the proposed development and proposed basement levels for the buildings are available.

Table 4.2: Short Term (Construction) Dewatering Estimates

Description	B28(12) -A L/day	B28(12) -B L/day	B28(10) -A L/day	B28(6) L/day	12-Plex-A L/day	12-Plex-B L/day	Site Services L/day	Notes
Dewatering Flow Rate without SF	50,180	50,180	60,430	39,520	43,610	43,610	23,470	Assumed 10 m long servicing trench kept open at a time
Dewatering Flow Rate multiplied by FS of 1.5 (Qsf)	75,270	75,270	90,650	59,280	65,420	65,420	35,210	For MECP Permitting purposes
Volume from 15 mm/day rainfall event (p)	7,840	7,840	6,600	3,930	4,600	4,600	300	
Dewatering Flow Rate multiplied by FS of 1.5 + Precipitation of 15 mm/day (Qsf+p)	83,110	83,110	97,250	63,210	70,020	70,020	35,510	For Discharge Purposes / Agreement
Dewatering Zone of Influence from Excavation Boundary	63.0	63.0	63.0	63.0	63.0	63.0	10.0	

The estimated dewatering rates provided in Table 4.2 should be considered conservative, which accounts for initial high dewatering rates, seasonal high groundwater elevation and any other unforeseen conditions including variation of hydraulic properties and the effect of underground servicing.

Pits (if needed) are assumed to have equal excavation depth as the main excavation, and therefore the same dewatering target; deeper pits may require extra localized dewatering and revised dewatering estimates. High dewatering rates can be expected within local areas having highly conductive soils, deeper excavations for pits etc., and it is the dewatering contractor's responsibility to install additional dewatering systems to keep the excavation floor free from ponding water during the entire dewatering period.

As described in Section 4.1, basement elevations of Bldg. A, Bldg. B, Parking Structure, and twenty-seven (27) Town House Buildings (three B28(12), five B28(10), one B28(8), four 12-Plex, three 9-Plex and eight 8-Plex) are approximately 0.5 to 4.5 m above the estimated highest groundwater elevation at the Site. As a result, no groundwater removal is expected during the construction phase of the project. Based on the assumed precipitation of 15 mm/day, the expected rainwater collection into individual excavations varies from approximately 3,430 to 34,300 L/day.

4.5 Long-Term Dewatering Rate Assessment

As per the information provided by the Client, the proposed buildings will be constructed with one basement level. Most of the basement footing invert elevations are more than 1 m above the estimated highest groundwater elevations at the Site. Therefore, post-construction (underfloor drain system) dewatering will not be required to manage groundwater seepage for these buildings.

As per the available information and the results of groundwater level monitoring at the Site, basements for several buildings are expected to be 0.8 m to 1.8 m higher, compared to the estimated highest groundwater elevation at the footprint area of six (6) buildings (B28(12)-A/B, B28(10)-A, B28(6)A and 12-Plex-A/B). Therefore, post-construction (underfloor drain system) dewatering will be required to manage groundwater seepage for these buildings.

The basement foundations, wall and floors can be sealed tight using water proofing systems and designed to resist full hydrostatic pressures to prevent long-term dewatering using underfloor drain systems.

Table 4.3 and Appendix F present the long term (post-construction) dewatering estimates, if basements of these buildings are not constructed as watertight structures.

Table 4.3: Long Term (Post-Construction) Dewatering Estimates

Description	B28(12)-A L/day	B28(12)-B L/day	B28(10)-A L/day	B28-6 L/day	12-Plex-A L/day	12-Plex-A L/day	Total L/day	Notes
Dewatering Flow Rate without SF	34,350	34,350	46,070	26,920	29,770	29,770	201,230	
Dewatering Flow Rate multiplied by FS of 1.25 (Qsf)	42,940	42,940	57,590	33,650	37,210	37,210	251,540	For MECP Permitting purposes

The dewatering estimates provided in Table 4.3 are average discharge volumes, which may require further revision when the final grading plan for the proposed development and proposed basement levels for the buildings are available. These estimates can be affected by variations in hydrogeological, fluctuations in groundwater levels, changes to existing infrastructure and future infrastructure in the adjacent areas.

The estimated long-term discharge rates should be confirmed by additional in-situ testing once the sub-drain system is in place. Water sampling of the sub-drain water will be required to ensure its compliance with the applicable By-Law.

As per the Development Engineering Manual (City of Guelph, October 2023), “where basement floor elevations are above and within 0.5 m of the seasonal high groundwater elevation, on a case-by-case basis the developer may be permitted to provide a foundation enhanced damp-proofing system to the satisfaction of the City, subject to eligibility based on:

a. A minimum of 3 years of continuous groundwater monitoring showing declined and/or stabilized seasonal high groundwater level, and

b. Review of suitable hydraulic conductivity, of the soils (documented recommendation of civil/geotechnical/hydrogeological professionals, under stamp, that enhanced damp-proofing is appropriate given the soil conditions)"

Conducting a seasonal water level monitoring program is recommended to verify the seasonal high groundwater elevation across the Site.

4.6 MECP Water Taking Permit Requirements

4.6.1 Construction Dewatering

The Ontario Water Resources Act states that registration in the Environmental Activity and Sector Registry (EASR) with the MECP will be required for a rate of water taking between 50,000 and 400,000 L/day, during the construction period. If the rate of water taking exceeds 400,000 L/day, a Category 3 Permit to Take Water (PTTW) will be required from the MECP.

Based on the available hydrogeological information, and assuming only one (1) building excavation is kept open at any given time, the estimated maximum construction dewatering rate using the geometric mean of K values obtained for the overburden is 90,650 L/day (including safety factor of 1.5 and without intake from rainfall). Therefore, an EASR from the MECP will be required to facilitate the construction dewatering program for the Site.

It should be noted that the estimated dewatering rate is a conservative value, which may be higher than the dewatering rate during the later stage of dewatering.

The EASR, Discharge Plan, hydrogeological investigation report, water taking plan and geotechnical assessment of settlements must also be available at the construction Site during the entire construction dewatering. JLP should be notified immediately about any changes to the construction dewatering schedule or design, since the EASR will need to be updated to reflect these changes and/or modifications.

4.6.2 Post-Construction Dewatering

The Ontario Water Resources Act states that a Category 3 Permit to Take Water (PTTW) will be required for rate of water taking between 50,000 L/day, to facilitate long-term (post-construction) dewatering activities. The estimated total dewatering rate for the buildings (B28-12A&B, B28-10, B28-6 and 12-Plex (A and B) building) is 251,540 L/day (Table 4.3). Therefore, Category 3 PTTW will be required from the MECP prior to commence long-term dewatering for the buildings.

5. Environmental Impact Assessment

5.1 Surface Water Features

The Site area is located within the Ellis Creek-Speed River watershed and Hanlon Creek sub-watershed The nearest surface water feature is a tributary of Hanlon Creek, which runs approximately 700 m northwest of the Site boundary. Available area maps show that no streams exist on Site.

The estimated maximum construction dewatering zone of influence is approximately 63 m from the Site boundary. Given that a tributary of Hanlon Creek, which is the nearest surface water feature is approximately 700 m away from the Site boundary, no impacts to surface water features are expected during construction activities.

5.2 Potential Impacts on Groundwater Users in the Area

As per the results of the MECP WWR Database, there is one (1) water supply well (for domestic use) outside the Site and within 500m of the Site boundary. The closest water supply well outside the Site is located approximately 100 m away from the Site boundary.

Based on the locations of the proposed buildings and the limited dewatering zone of influence (maximum 63 m from the excavation boundary), dewatering related impacts are not expected during dewatering activities.

5.3 Other Potential Impact Considerations

5.3.1 Geotechnical Considerations

Geotechnical assessment of the potential ground settlement due to water taking (ex. settlement, soil loss, subsidence, etc.) is required to ensure that the required water taking would not have an unacceptable effect on soils and surrounding engineering structures.

A letter report related to potential dewatering related geotechnical issues will need to be completed by a qualified geotechnical engineer.

5.3.2 Groundwater Quality

It is JLP's understanding that the dewatering effluent during the construction will be directed into a municipal drain/existing surface water body during dewatering activities. This report will be updated when laboratory results on groundwater quality at the Site are available.

6. Conclusions and Recommendations

The conclusions and recommendations provided below should be reviewed in conjunction with the entirety of the report. Any changes to the design concept may result in a modification to the recommendations provided in this report.

Based on the findings of the hydrogeological investigation, the following conclusions and recommendations are provided:

- The Site is located within a physiographic region named the Horseshoe Moraines, and physiographic landform named the Till Moraines. The Horseshoe Moraines occupies an area of approximately 5,590 km^2 lying to the west of the highest part of the Niagara Escarpment. The "toe" of the horseshoe-shaped region lies on the highest part of the upland south of Georgian Bay at about 518 m above sea level (masl), while the two "heels" are about 274 m lower.

- As required by the City of Guelph it is recommended to complete a monthly water balance analysis for the Site to maintain predevelopment recharge rate, volume and hydroperiods at post development conditions. Low Impact Development (LID) best management practices (BMP) can be proposed to mitigate the development's impact on the water balance and mimic pre-development recharge.

- The highest static groundwater level recorded at the Site is 333.96 masl (7.43 mbgs), which was measured on August 13, 2024. It is recommended to carry out a seasonal groundwater level monitoring program to determine the seasonal highest water level at the Site.

- The highest K value of the saturated overburden to a depth of approximately 8.7 mbgs is 7.92×10^{-5} m/s and geometric mean of the K values is 2.68×10^{-5} m/s.

- Laboratory Results for the water sample collected at the Site are not available for review at the time of preparation of this report. This report will be updated when the Laboratory results are available for review.

- Based on the assumptions outlined in this report, the estimated maximum dewatering rate for the proposed construction activities will be 97,250 L/day (with SF of 1.5 and stormwater intake). This daily rate should be used for the discharge purposes and permitting, if required.

- Based on the available hydrogeological information, and assuming only one (1) building excavation is kept open at any given time, the estimated maximum construction dewatering rate using the geometric mean of K values obtained for the overburden is 90,650 L/day (including safety factor of 1.5 and without intake from rainfall). Therefore, an EASR from the MECP will be required to facilitate the construction dewatering program for the Site. Please note that the dewatering estimates provided above will need to be revised, when the final grading plan for the proposed development is available.

- The estimated total dewatering rate for the buildings (B28-12A&B, B28-10, B28-6 and 12-Plex (A and B) building) is 251,540 L/day (Table 4.3). Therefore, Category 3 PTTW will be required from the MECP prior to commence long-term dewatering for the buildings.

- The EASR/PTTW, Discharge Plan, hydrogeological investigation report, water taking plan and geotechnical assessment of settlements must also be available at the construction Site during the entire construction dewatering. JLP should be notified immediately about any changes to the construction

dewatering schedule or design, since the EASR will need to be updated to reflect these changes and/or modifications.

- Discharge from dewatering (short-term) can be directed to the municipal sewer system. The City of Guelph should be contacted prior to releasing dewatering effluent (short-term) for required approvals, if any.

- The geometric mean of the estimated design infiltration rates based on the results of infiltration rate testing using Guelph Permeameter for the Site is 36 mm/hr. This rate can be used to determine the area of LID system to mitigate pre- vs post-development infiltration rate deficit when results from Site water balance assessment are available.

- Regulation 903 of the Ontario Water Resources Act requires that all monitoring wells and dewatering wells (if available) be decommissioned when no longer required. Well decommissioning should be completed by a licensed well contractor.

7. Closure

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Sincerely,

JLP Services Inc.

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Environmental Scientist

DRAFT

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Senior Hydrogeologist

DRAFT

Ajay Jayalath, MBA, P.Geo., QP.
Vice President, Environmental Services

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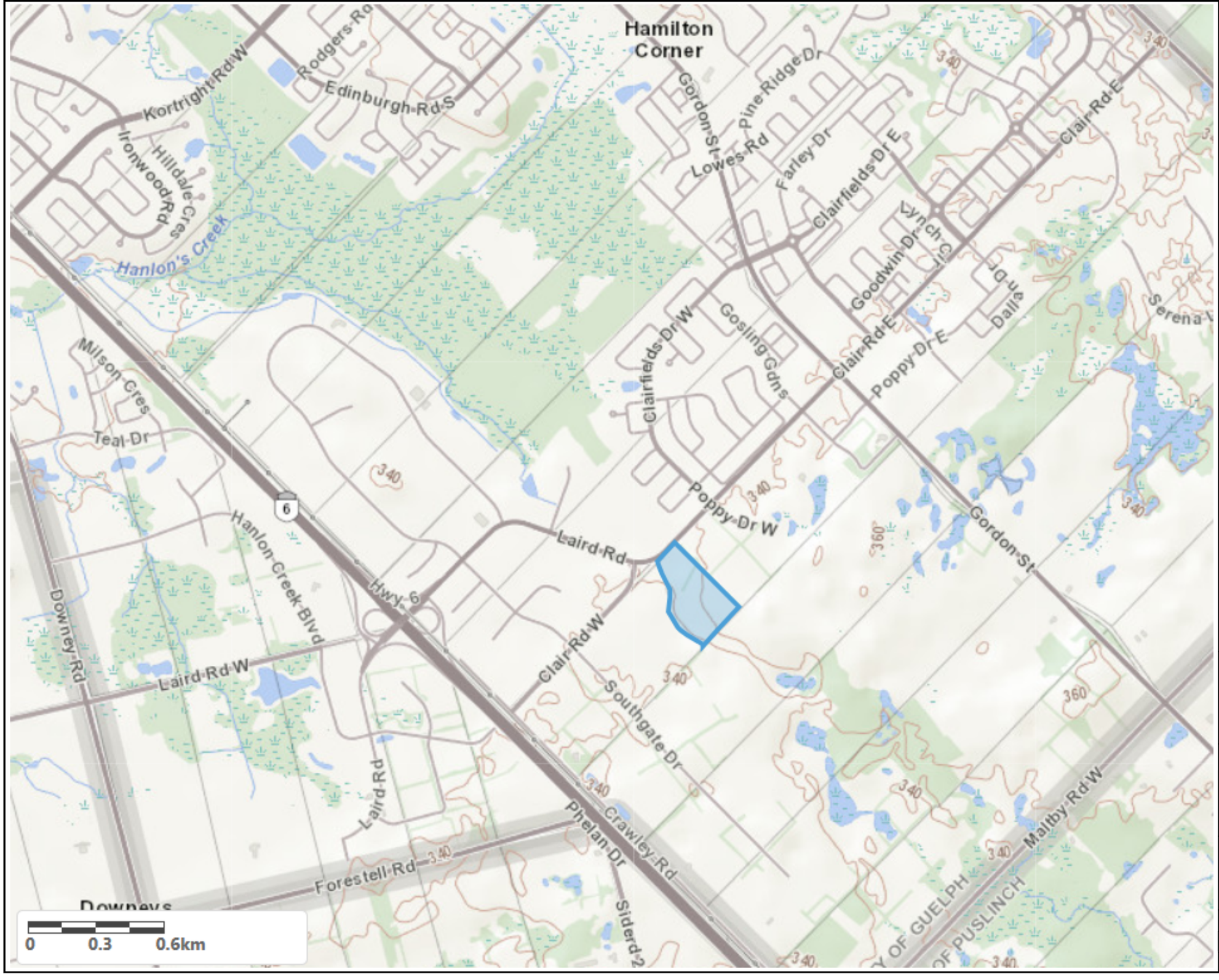
Figures



Legend:

Site Location

N

True North

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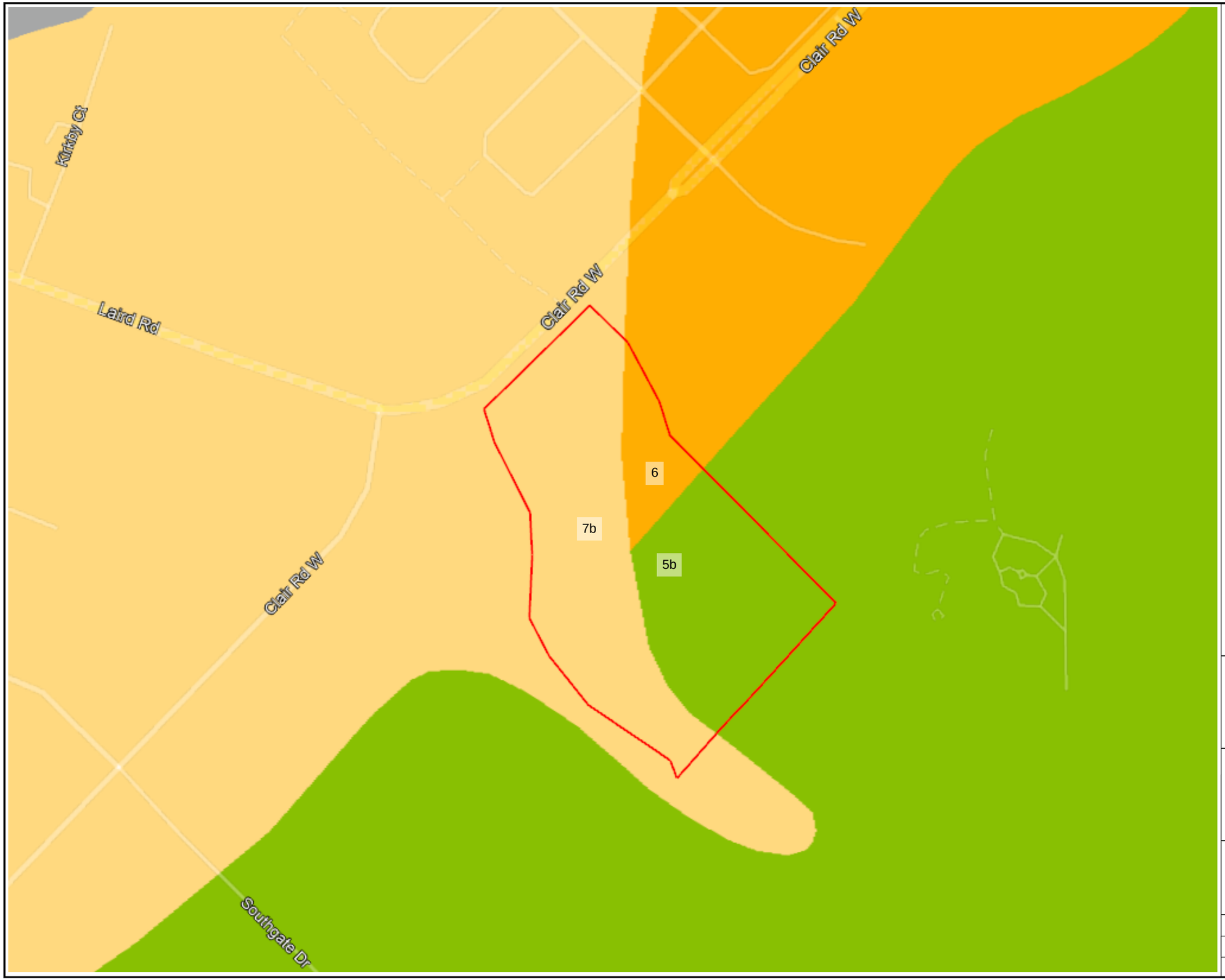
Locality Plan
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 20, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 1
Source: King's Printer for Ontario, 2023		



Legend:

Project Area

PLEISTOCENE

- **7** — **Glaciofluvial deposits:** river deposits and delta topset facies
  - 7a Sandy deposits
  - 7b Gravelly deposits
- **6** — **Ice-contact stratified deposits:** sand and gravel, minor silt, clay and till
  - 6a In moraines, eskers, kames and crevasse fills
  - 6b In subaquatic fans
- **5a** — **Till:** Silty sand to sand-textured till on Precambrian terrain
  - 5a Silty sand to sand-textured till on Precambrian terrain
- **5b** — 5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain

N
True North

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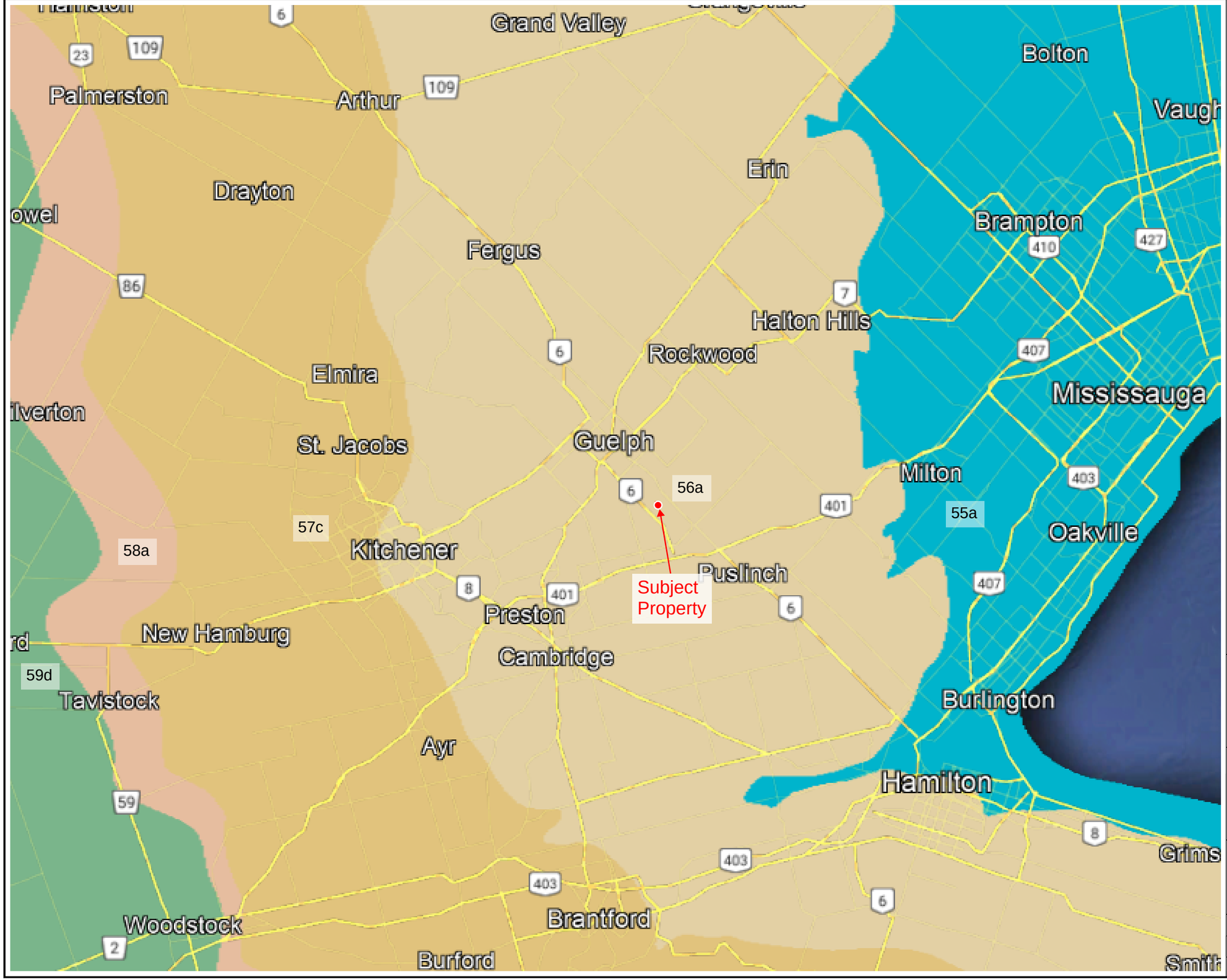
Surficial Geology
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 20, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 2
Source: Ontario Geological Survey, 2010	Scale: 10 20 40 80 metres	



Legend:

PHANEROZOIC[b] (Present to 542.0 Ma)

PALEOZOIC (251.0 Ma to 542.0 Ma)

DEVONIAN (359.2 Ma to 416.0 Ma)

MIDDLE DEVONIAN

59 **Limestone, dolostone, shale**

- 59a Hamilton Gp.
- 59b Marcellus Fm.
- 59c Dundee Fm.
- 59d Detroit River Gp.; Onondaga Fm.
- 59e Williams Island Fm.
- 59f Murray Island Fm.
- 59g Moose River Fm.
- 59h Kwataboahegan Fm.

LOWER DEVONIAN

58 **Sandstone, dolostone, limestone**

- 58a Bois Blanc Fm.; Oriskany Fm.
- 58b Stooping River Fm.
- 58c Sextant Fm.

SILURIAN (416.0 Ma to 443.7 Ma)

UPPER SILURIAN

57 **Limestone, dolostone, shale, sandstone, gypsum, salt**

- 57a Bass Islands Fm.
- 57b Bertie Fm.
- 57c Salina Fm.
- 57d Kenogami River Fm. (Upper Silurian to Lower Devonian)

LOWER SILURIAN

56 **Sandstone, shale, dolostone, siltstone**

- 56a Guelph Fm. (also present in the Upper Silurian)
- 56b Lockport Fm.
- 56c Amabel Fm.
- 56d Clinton Gp.; Cataract Gp.
- 56e Thornloe Fm.; Earlton Fm.
- 56f Wabi Gp.
- 56g Attawapiskat Fm. (also present in the Upper Silurian)
- 56h Ekwan River Fm.
- 56i Severn River Fm.

ORDOVICIAN (443.7 Ma to 488.3 Ma)

UPPER ORDOVICIAN

55 **Shale, limestone, dolostone, siltstone**

- 55a Queenston Fm.
- 55b Georgian Bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb.
- 55c Liskeard Gp.
- 55d Red Head Rapids Fm.
- 55e Churchill River Gp.
- 55f Bad Cache Rapids Gp.

N
True North

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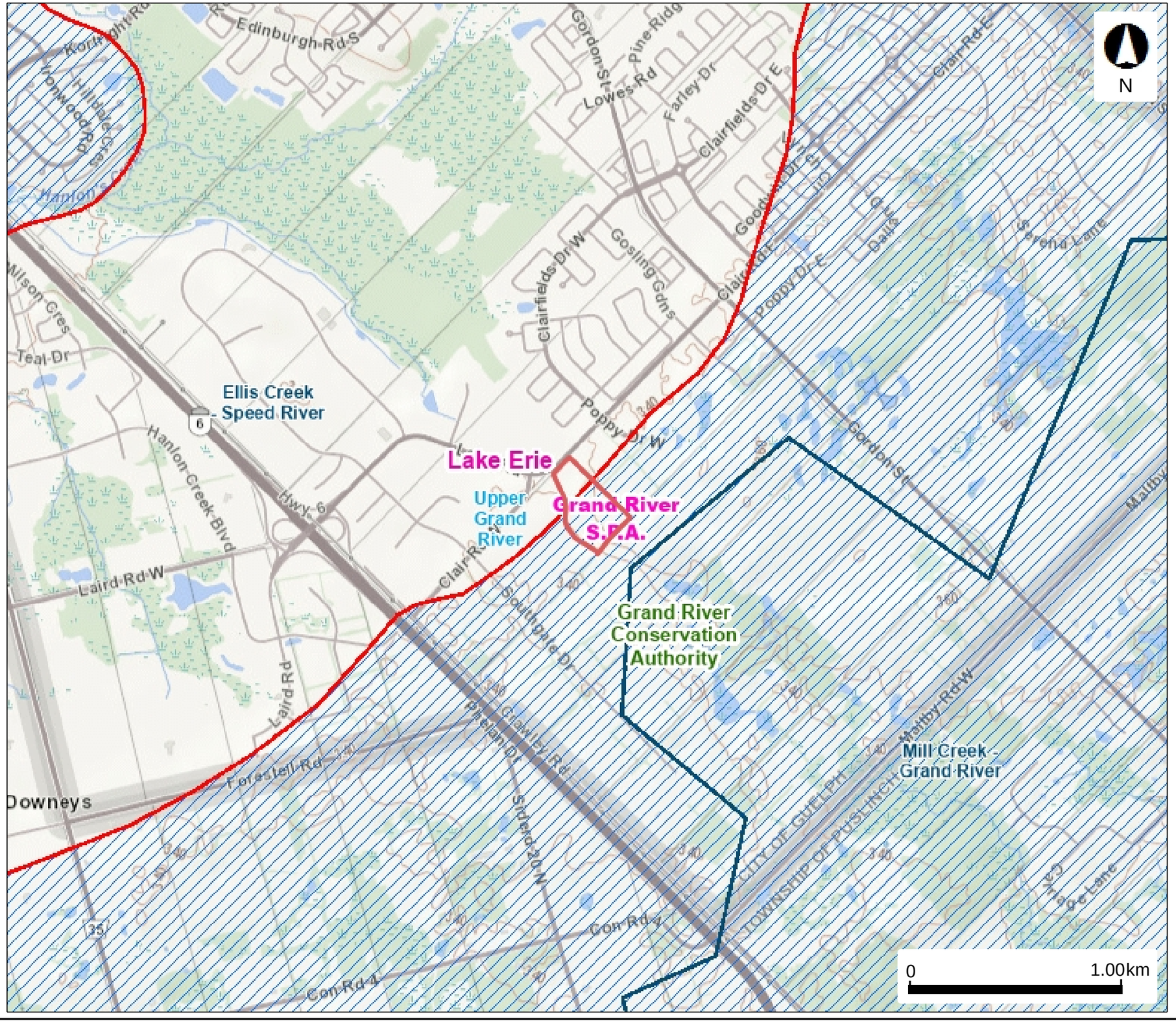
Bedrock Geology
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 20, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 3
Source: Ontario Geological Survey, 2011	Scale: 1.3 2.5 5.0 7.5 kilometres	



Legend:

- Project Area
- Niagara Escarpment Plan (NEP)
- Greenbelt
- Oak Ridges Moraine
- Source Protection Areas
- Source Protection Regions
- Conservation Authority
- Tertiary
- Quaternary
- Paris Galt Moraine

N
True North

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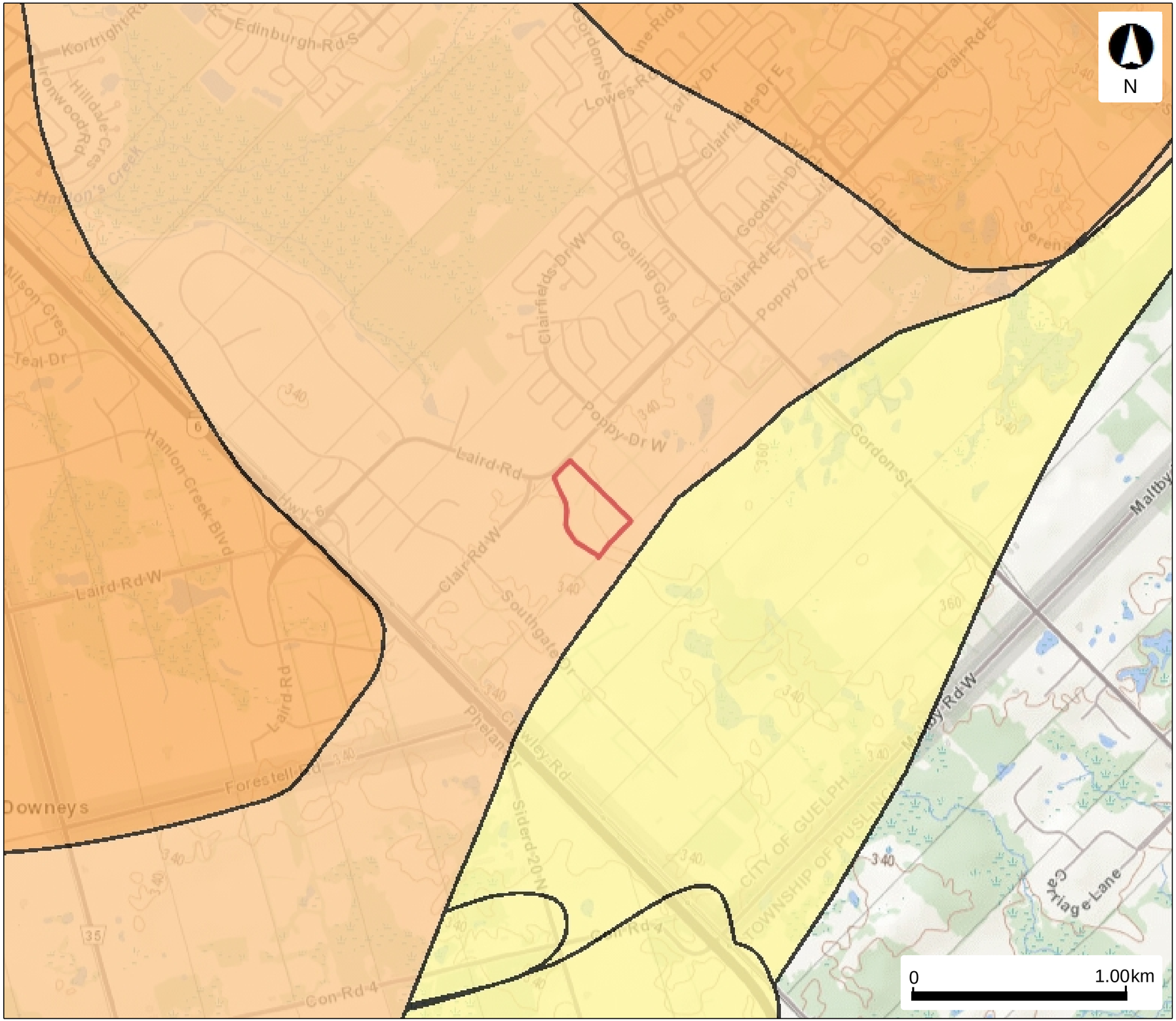
Vulnerability Mapping 1
Paris Galt Moraine Area
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-1
Source: King's Printer for Ontario, 2024		



Legend:

- Project Location
- Issue Contributing Areas
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F

N
True North

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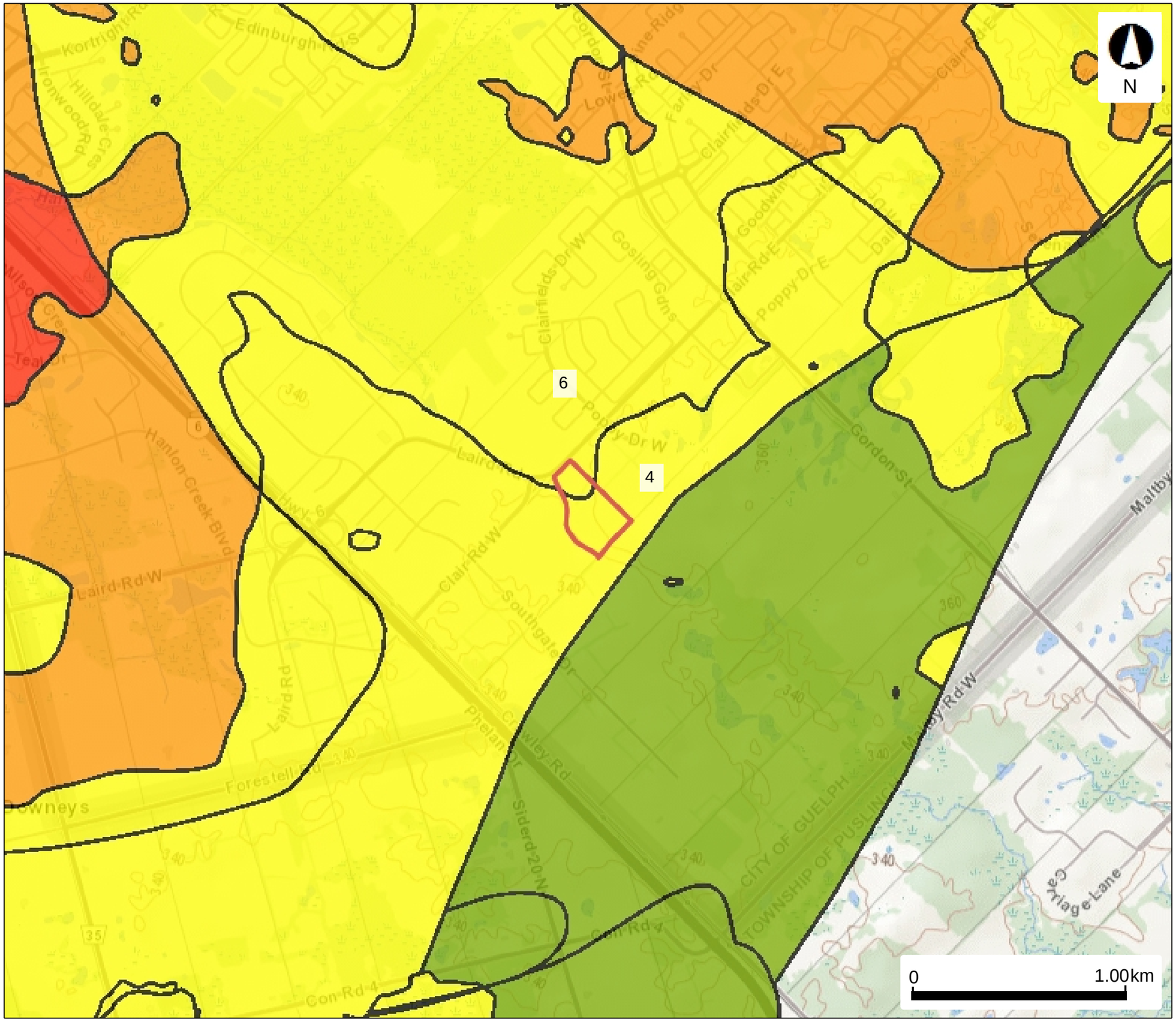
Vulnerability Mapping 2
WHPAs
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-2
Source: King's Printer for Ontario, 2024		



Legend:

Project Area

Vulnerable Scoring Area - Groundwater

- 2
- 4
- 6
- 8
- 10

N

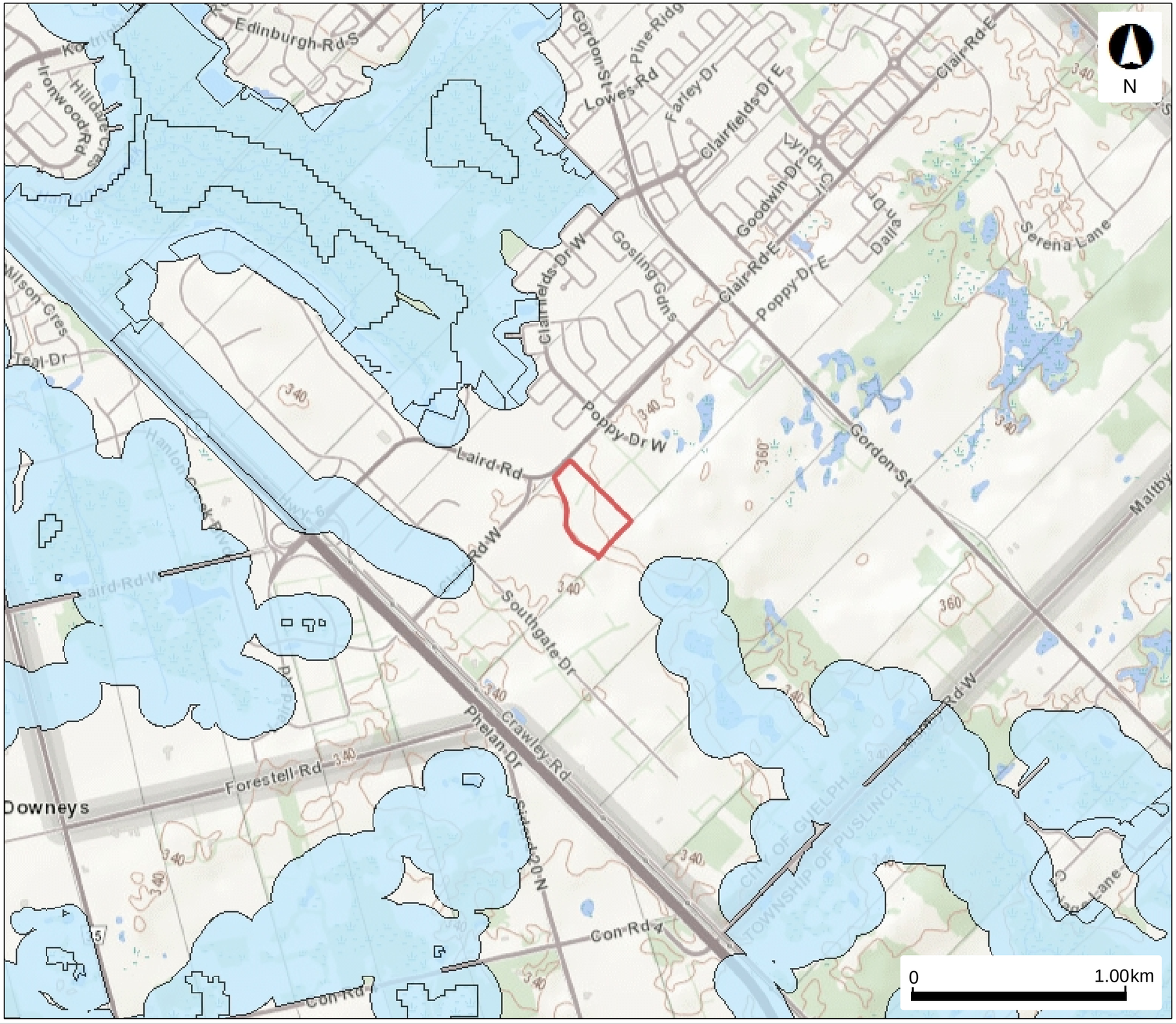
True North

JLP

Geotechnical & Environmental Consultants

Vulnerability Mapping 3
Wellhead Protection Areas
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-3
Source: King's Printer for Ontario, 2024		



Legend:

- Project Area
- Intake Protection Zone 1
- Intake Protection Zone 2
- Intake Protection Zone 3

N
True North

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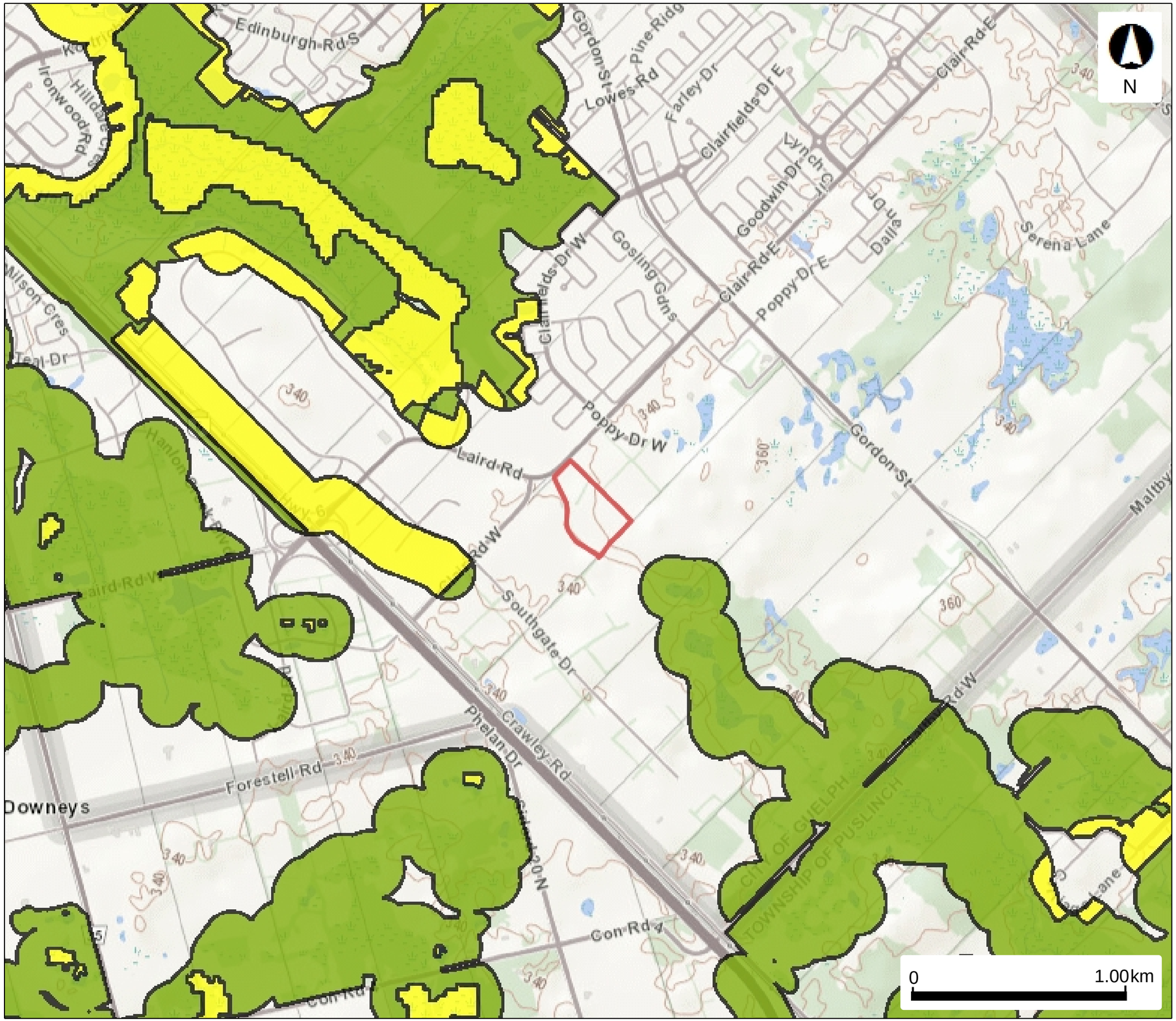
Vulnerability Mapping 4
Intake Protection Zone
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-4
Source: King's Printer for Ontario, 2024		



Legend:

- Project Area

Vulnerable Scoring Area - Surface Water

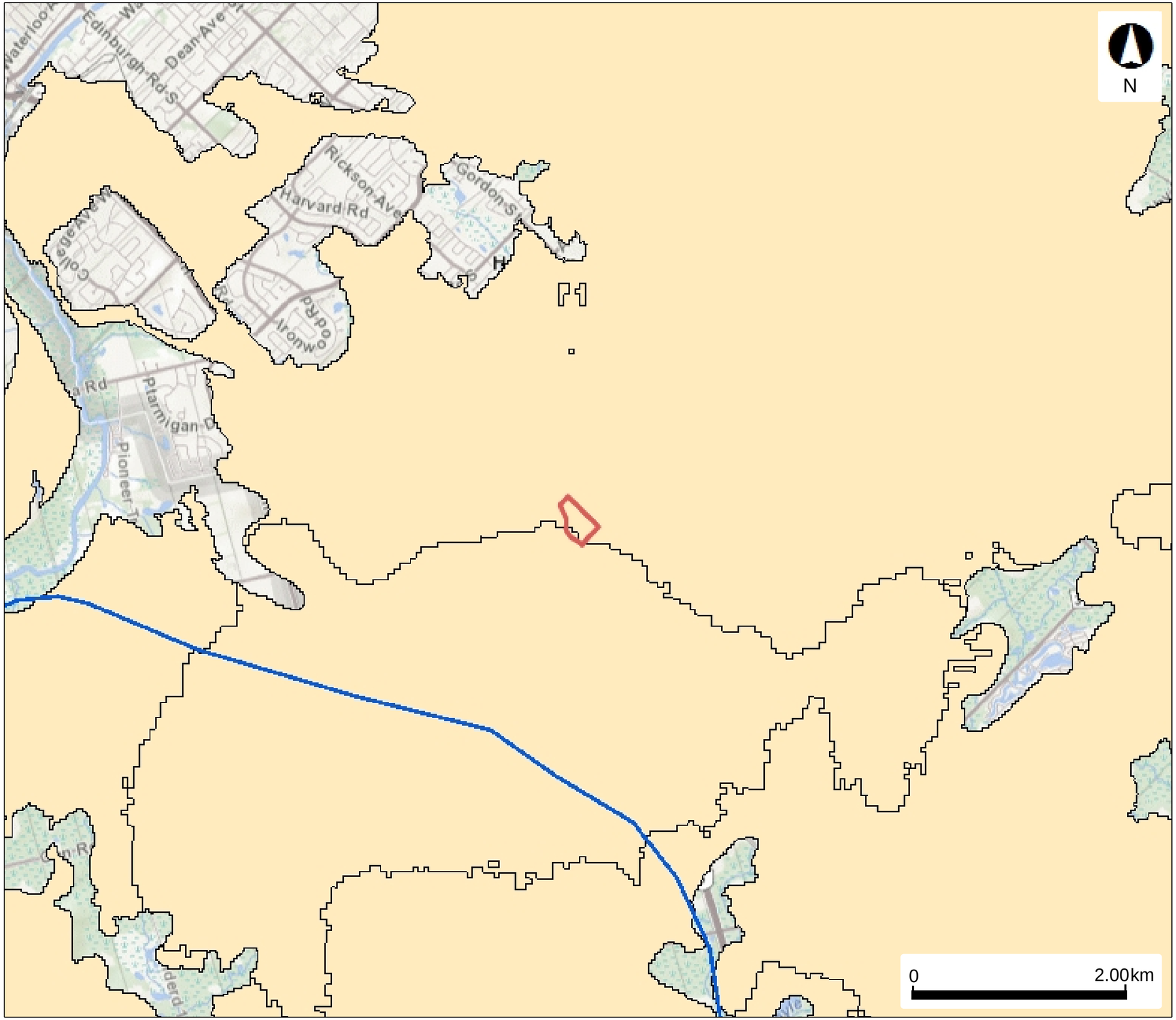
- 0 - 3.9
- 4 - 7.9
- 8 - 8.9
- 9 - 10

N
True North

JLP
Geotechnical & Environmental Consultants

Vulnerability Mapping 5
Intake Protection Zones
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-5
Source: King's Printer for Ontario, 2024		



Legend:

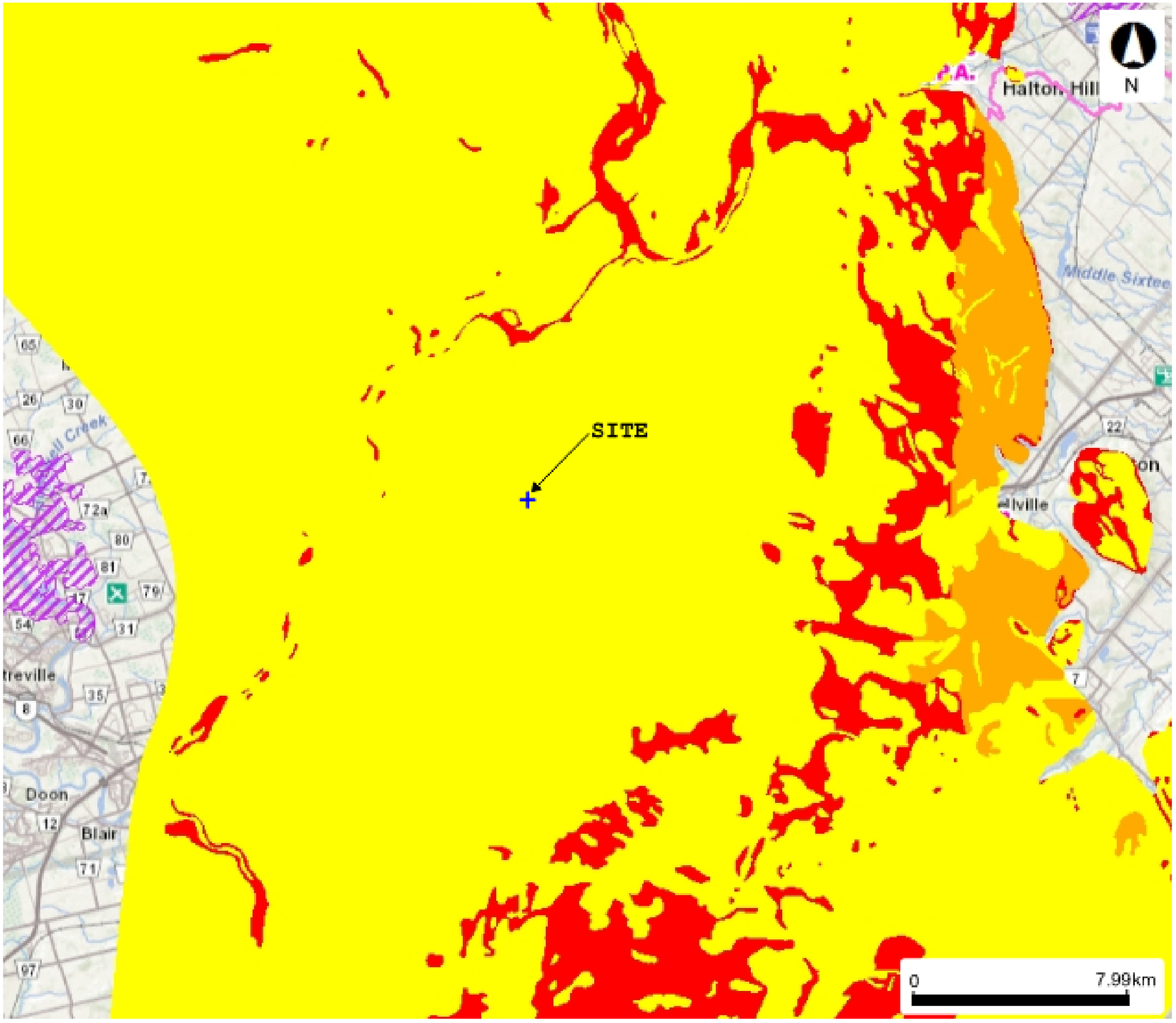
- Project Area
- Intake Protection Zone Q
- Wellhead Protection Area Q2
- Significant Groundwater Recharge Area
  - N/A
  - 0
  - 2
  - 4
  - 6

N
True North

JLP
Geotechnical & Environmental Consultants

Vulnerability Mapping 6
Significant Groundwater Recharge Areas
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 4-6
Source: King's Printer for Ontario, 2024		



Legend:

- Project Area

Karst

- Known
- Inferred
- Potential

N

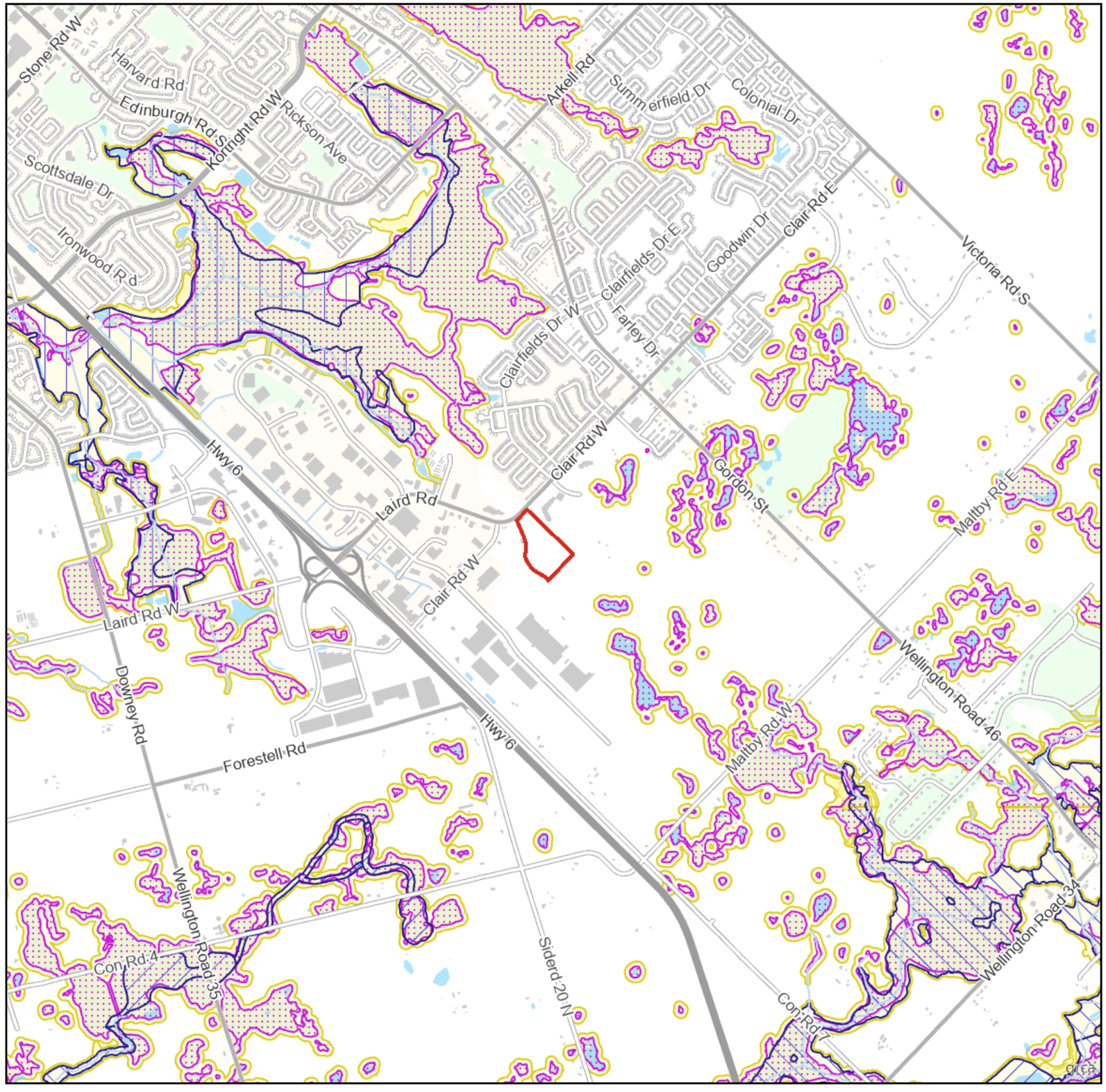
True North

JLP

Geotechnical & Environmental Consultants

Vulnerability Mapping 7
Karst Area
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3		
Prepared By: CL	Checked By: JS	FIG. No.	4-7
Source: King's Printer for Ontario, 2024			



Legend:

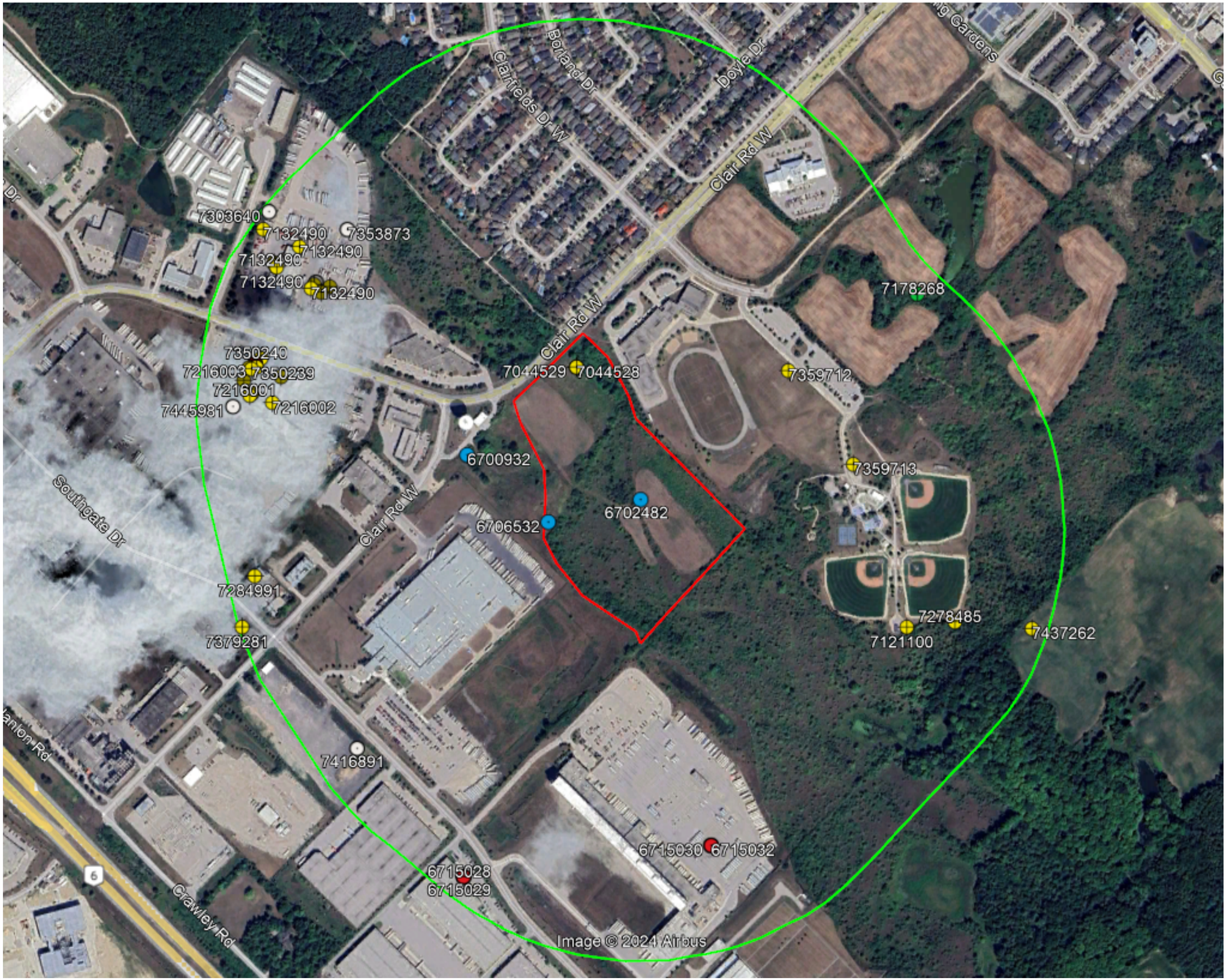
- Project Area
- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)

N
True North

JLP
Geotechnical & Environmental Consultants

Vulnerability Mapping 8
GRCA Regulated Areas
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 22, 2024	Ref. No. G4836-24-3		
Prepared By: CL	Checked By: JS	FIG. No.	4-8
Source: GRCA, 2024	Scale:		



Legend:

- Project Area
- 500m Radius from Site-Boundary
- Monitoring / Observation Well / Test Hole
- Unclassified / Unfinished Well
- Water Supply Well
- Dewatering Well
- Abandoned Well

N
True North

JLP
Geotechnical & Environmental Consultants

MECP Water Well Record Map
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 20, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: JS	FIG. No. 5
Source: MECP Well Records, 2024	Scale: 15 30 60 120 metres	

Legend

- Project Area
- Borehole (JLP, 2024)
- Borehole with Monitor (JLP, 2024)
- Infiltration Test Location

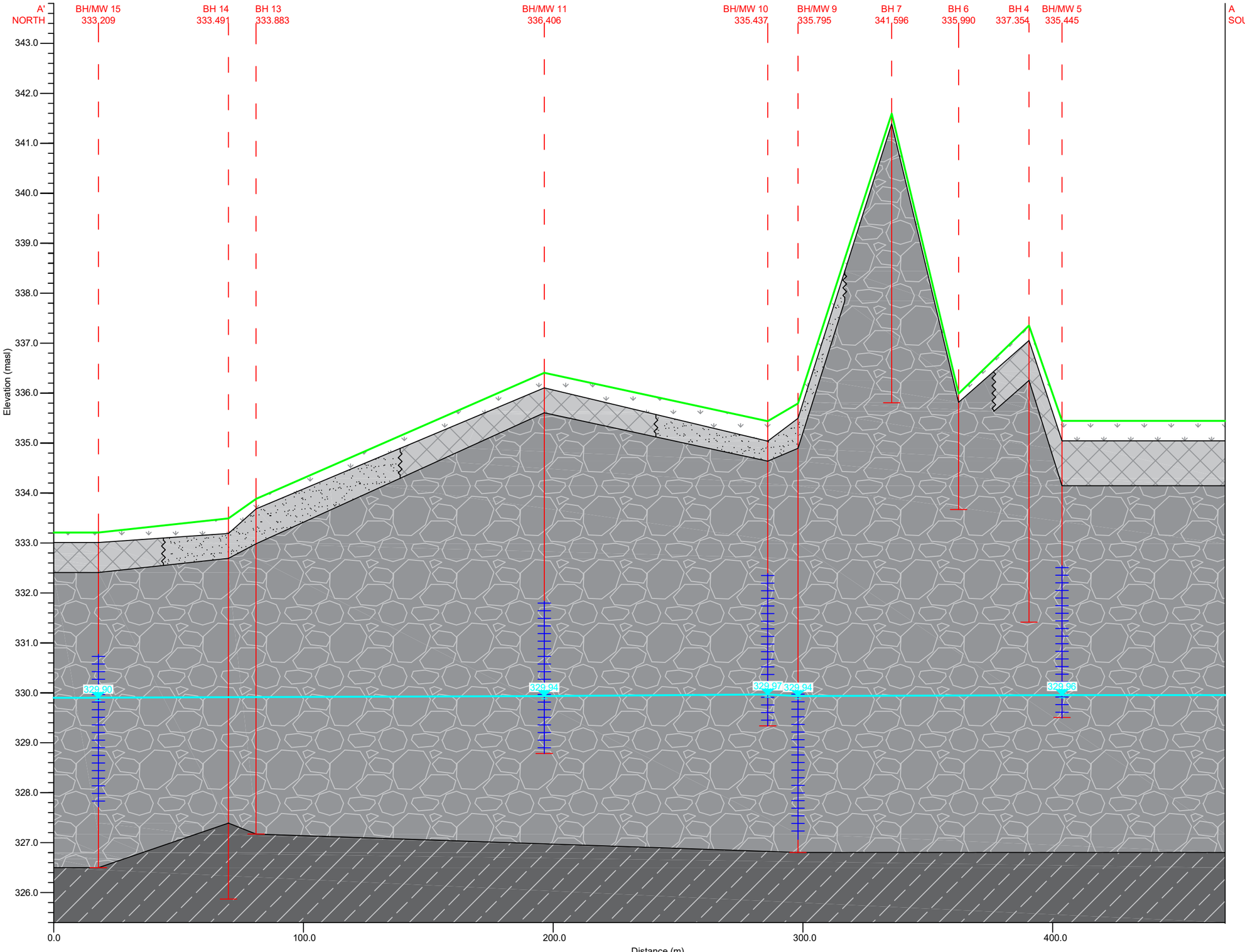
N
True North

- This drawing shall be read in conjunction with the associated technical report.
- El = Elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.
- The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
- The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.

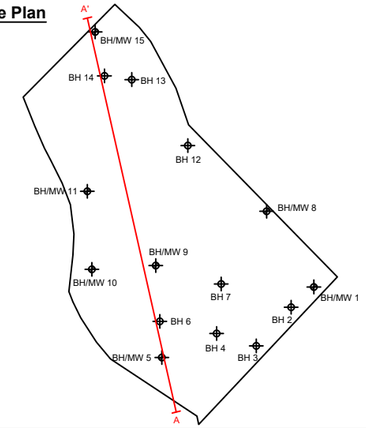
JLP
Geotechnical & Environmental Consultants

Borehole Location Plan
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: July 5, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: AL	Encl. No. 6
Source: ERIS Canada	Scale: 7.5 15 30 45 metres	



Site Plan



Legend

BH8 229.0 — *Borehole Number and Elevation*

Existing Ground Topography

223.0 — *Groundwater Elevation (August 13, 2024)*

Well Screen Location

Borehole with Monitoring Well (JLP, 2024)

Borehole (JLP, 2024)

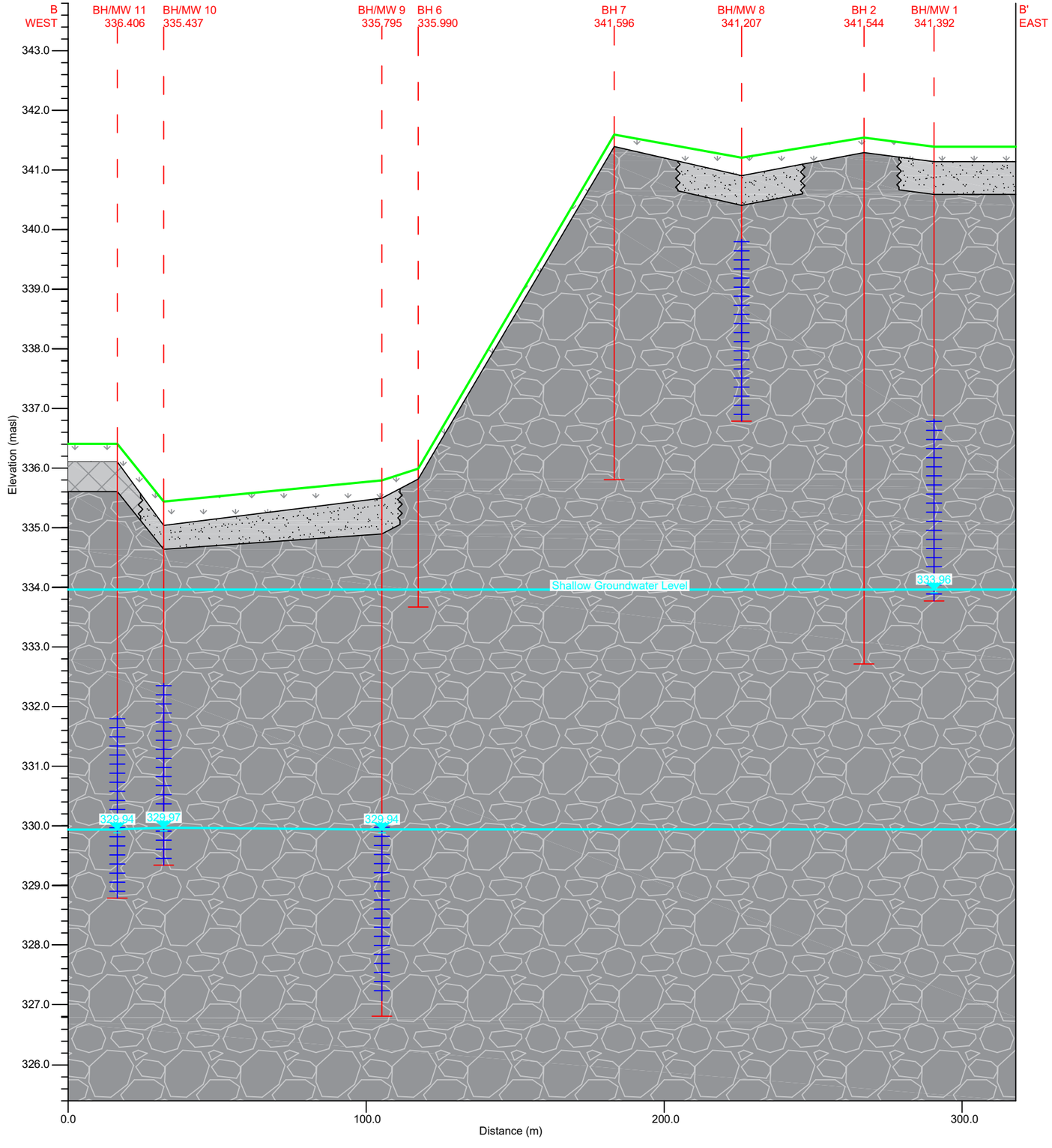
	TOPSOIL
	Sand and Gravel FILL
	Silty Sand FILL
	SAND AND GRAVEL
	SILT TILL

JLP

Geotechnical & Environmental Consultants

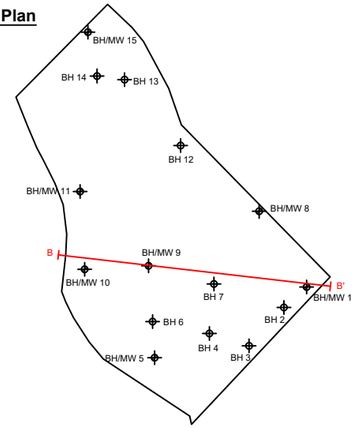
Cross Section A-A'
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: August 15, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: AJ	FIG. No. 7
Horizontal Scale: 1:1500	Vertical Scale: 1:75	



Vertical Exaggeration - 20x

Site Plan



Legend

BH8 229.0 — *Borehole Number and Elevation*

Existing Ground Topography

223.0 — *Groundwater Elevation (August 13, 2024)*

Well Screen Location

Borehole with Monitoring Well (JLP, 2024)

Borehole (JLP, 2024)

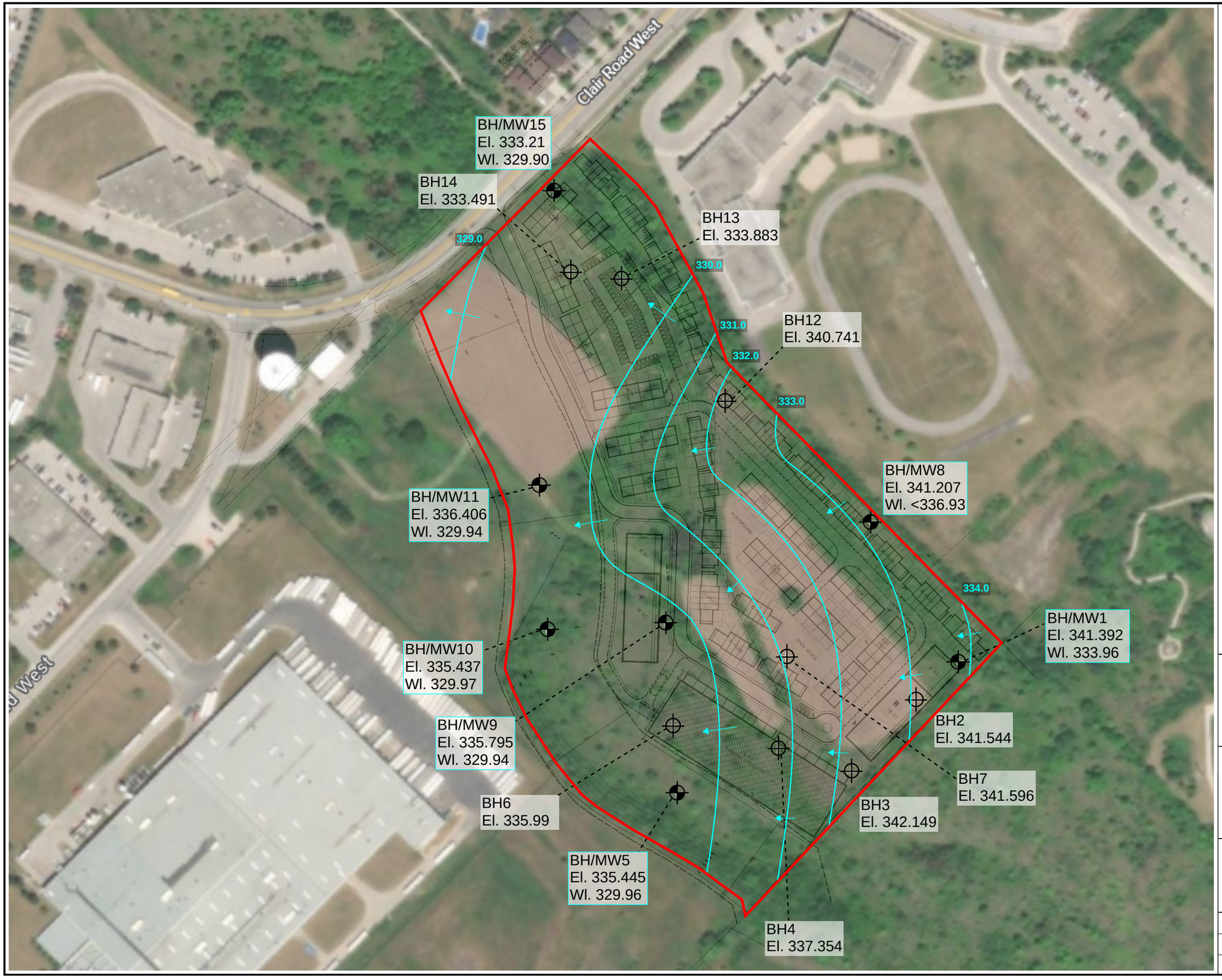
	TOPSOIL
	Sand and Gravel FILL
	Silty Sand FILL
	SAND AND GRAVEL
	SILT TILL

JLP

Geotechnical & Environmental Consultants

Cross Section B-B'
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: August 15, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: AJ	FIG. No. 8
Horizontal Scale: 1:1500	Vertical Scale: 1:75	



Legend

- Project Area
- Borehole (JLP, 2024)
- Borehole with Monitor (JLP, 2024)
- Groundwater Contour (water levels taken August 13, 2024)

N
True North

- This drawing shall be read in conjunction with the associated technical report.
- El = Elevation
- Wl = Water level elevation
- The ground surface elevations were obtained using a Sokkia GcX3 global position system referenced to the coordinate system known as NAD83 no trans, which is the North American Datum of 1983 of the Canadian Spatial Reference System, and the Universal Transverse Mercator (UTM) Zone 17.
- The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
- The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.

JLP
Geotechnical & Environmental Consultants

Groundwater Contour Plan
Proposed Residential Development
280 Clair Road West,
Guelph, Ontario

Date: Aug. 15, 2024	Ref. No. G4836-24-3	
Prepared By: CL	Checked By: AL	Encl. No. 9
Source: ERIS Canada	Scale: 7.5 15 30 45 metres	

Appendix A – Limitations and Use of Report

REPORT TERMS AND CONDITIONS

NOTICE: THE FOLLOWING PROVISIONS SET FORTH IMPORTANT QUALIFICATIONS AND LIMITATIONS ON THE FINDINGS AND RECOMMENDATIONS IN THE REPORT AS WELL AS THE USE OF, AND RELIANCE ON, THE REPORT.

1. **DEFINITIONS**. The following capitalized terms have the following meanings:

   (a) "**Additional Investigations**" means investigations that JLP has indicated to the Client should be undertaken to take into account any Out-of-Scope Requirements, but that are not otherwise specifically within the scope of investigations conducted for the purpose of the Report.

   (b) "**Applicable Laws**" means and includes without limitation all applicable provincial laws, regulations, guidelines, policies, standards, protocols, and objectives administered by the Ministry of the Environment and Climate Change or any other duly-constituted governmental authority, all as in force as of the date of the Report.

   (c) "**Client**" means the Client as referred to in the Report.

   (d) "**Client Information**" means the information, representations, and instructions provided by the Client, the Client's representatives, and/or others and upon which the Report is based, in whole or in part.

   (e) "**Findings**" means the evaluations and conclusions set forth in the Report.

   (f) "**JLP**" means JLP Services Inc.

   (g) "**Out-of-Scope Requirements**" means special concerns or requirements of the Client in respect of the subject matter of the Report.

   (h) "**Recommendations**" mean the findings and recommendations referred to in the Report, taking into account any Out-of-Scope Requirements that were disclosed to JLP prior to the date of the Report.

   (i) "**Report**" means the report to which these Terms and Conditions are attached and form part.

   (j) "**Report Documents**" means the underlying documents, records, data, and files, in any medium whatsoever, generated in connection with the preparation of the Report, including without limitation, the instructions and objectives communicated to JLP by the Client, communications between JLP and the Client, and other reports, proposals, or documents prepared by JLP for the Client in connection with the Site.

   (k) "**Site**" means the site in respect of which the Report was prepared.

   (l) "**Site Conditions**" means Site conditions known as a result of, or reasonably imputed by, the investigations that were undertaken as of the date of the Report.

2. **BASIS OF REPORT**. The Report is based on the Site Conditions. Any changes to the Site Conditions after the date of the Report that could or will affect the Site Conditions may or will have a corresponding effect on the Recommendations. The Report does not take into account any (a) Additional Investigations that were not undertaken, or (b) Out-of-Scope Requirements that were not communicated prior to completion of the investigations that were been undertaken as of the date of the Report. Where recommended field services are referred to, they are the minimum services necessary to determine compliance of construction with Applicable Laws, generally accepted industry-standard practices, and the Recommendations.

3. **RELIANCE & USE**. The Report has been prepared only for the Site and the related design, development, building, or building assessment objectives identified by the Client. The Findings and Recommendations are based on the Site Conditions and the Client Information. In preparing the Report, JLP has relied upon the Client Information and disclaims any responsibility for any inaccuracy, misstatement, omission, unintentional misrepresentation, or other deficiency contained in the Report as a result of such reliance. Unless specifically stated otherwise, the applicability and reliability of the Findings and the Recommendations expressed in the Report are only valid to the extent that (a) there has been no material change to or variation from any of the Client Information, (b) the Client Information contains no untrue statement of a material fact, or (c) the Client Information omits no statement of a material fact necessary in order to make the Client Information not misleading.

   The Report and the Findings and Recommendations are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the prior written consent of JLP, which may be arbitrarily withheld or conditioned.

   RELIANCE UPON THE REPORT OR ANY OF THE DETERMINATIONS MADE HEREIN BY A THIRD PARTY WITHOUT JLP'S CONSENT IS PROHIBITED AND JLP MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY IN FAVOUR OF ANY

THIRD PARTY WITH RESPECT TO THE REPORT WHATSOEVER. JLP FULLY DISCLAIMS, AND WILL HAVE NO LIABILITY FOR, ANY LOSS, DAMAGES, OR EXPENSES WHICH ANY THIRD-PARTY MAY INCUR OR SUFFER AS A RESULT OF THE USE OF OR RELIANCE ON THIE REPORT WHERE JLP HAS NOT EXPRESSLY AUTHORIZED SAME. ANY THIRD PARTY WHO RELIES ON THE REPORT TO ANY EXTENT DOES SO AT SUCH PARTY'S OWN RISK AND COMPLETELY WAIVES ANY AND ALL CLAIMS AGAINST JLP IN CONNECTION WITH THE REPORT, REGARDLESS OF THE THEORY OF LAW (WHETHER IN CONTRACT, TORT, OR ANY THEORY OF LAW COMING INTO EXISTENCE HEREAFTER).

4. **STANDARD OF CARE**. The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances. No other warranty, expressed or implied, is made or intended in the Report. It is intended that the Findings and Recommendations are meant to assist in reducing the Client's risk associated with environmental impairment at the Site. The Report should not be considered risk mitigation.

5. **ENTIRE REPORT**. The Report also includes the Report Documents. In order to properly understand the Findings and Recommendations, reference must be made to the Report in its entirety. JLP is not responsible for use by any party of a part of the Report only.

6. **GOVERNING FORMAT**. Notwithstanding that JLP may have submitted an electronic version of the Report or any document forming part of the Report, only the signed and sealed physical copy of the Report shall be deemed to be the original and in the event of any dispute or discrepancy, the physical copy shall govern. JLP makes no representation about the compatibility of its electronic or digital file format with the Client's current or future software and/or hardware systems. The documents described herein are JLP's instruments of professional service and shall not be altered without the written consent of JLP.

7. **GENERAL LIMITATIONS**.

   (a) Unless specifically stated otherwise, the Report does not contain environmental consulting advice.

   (b) The Report contains no opinion or determination as to any matters governed by laws other than the laws of the Province of Ontario and the federal laws of Canada applicable therein as of the date hereof.

   (c) During any future development of the Site, conditions not observed during JLP's investigations may become apparent. If this occurs, JLP should be contacted to assess the situation and whether there is a need for additional testing.

   (d) JLP's investigations were carried out to address the intent of Applicable Laws, which are subject to change, and such changes, when coming into legal force and effect, could alter the Findings and Recommendations in a material way.

   (e) Achieving the objectives stated in the Report has required JLP to arrive at conclusions based upon the best information presently known to JLP. Current investigative methodologies do not completely eliminate the possibility of imprecise or incomplete information. Rather, they merely reduce such possibility to acceptable levels. Professional judgment was exercised in gathering and analyzing information obtained and in the formulation of the Findings. JLP does not act as an absolute insurer of the Findings and will only be responsible for gross negligence with respect thereto.

   (f) The Report may not be reproduced in whole or in part by any party other than the Client without JLP's prior written consent. All intellectual property rights in the Report are reserved to JLP.

Appendix B – MECP WWR Summary Table

Appendix B: MECP Water Well Record Summary Table
(Water Wells located within 500 m of Site Boundary)

JLP Services Inc.
G4836-24-3
280 Clair Road West, Guelph, ON

# Well	Well ID	Distance From Site Centroid (m)	Zone	East 83	North 83	Location Accuracy	Date Received	Street	City	Final Status	1st Use	2nd Use	Depth Water Found (m)	Geology			
														Depth (m)	Material 1	Material 2	Material 3
1 (on-Site)	6702482	59	17	564980.3	4815700	margin of error : 100 m - 300 m	3/20/1963			Water Supply	Livestock	Domestic	42.06	6.1 10.7 13.7 21.3 25.0 27.4 37.5 38.7 42.1	BOULDERS BOULDERS STONES HARDPAN MEDIUM SAND HARDPAN LIMESTONE LIMESTONE LIMESTONE	CLAY HARDPAN GRAVEL	
2 (on-Site)	6706532	104	17	564834.3	4815663	margin of error : 30 m - 100 m	10/14/1977			Water Supply	Domestic		54.86	9.1 12.8 39.0 48.8 60.4 71.6 91.4 93.0	CLAY CLAY CLAY ROCK ROCK ROCK ROCK ROCK	STONES GRAVEL STONES LIGHT-COLOURED DARK-COLOURED COARSE-GRAINED	
3 (on-Site)	7044527	199	17	564876	4815909	margin of error : 10 - 30 m	6/7/2007	CLAIR RD W.	PUSLINCH	Observation Wells				17.5 42.0 45.0 82.3	SAND	SILTY	
4 (on-Site)	7044528	199	17	564876	4815909	margin of error : 10 - 30 m	6/7/2007	CLAIR RD W.	PUSLINCH	Observation Wells				17.5 42.0 45.0 64.1	SAND	SILTY	
5 (on-Site)	7044529	199	17	564876	4815909	margin of error : 10 - 30 m	6/7/2007	CLAIR RD WEST	PUSLINCH	Observation Wells				17.5 33.9	SAND	SILTY	
6	6700932	226	17	564704.3	4815768	margin of error : 100 m - 300 m	9/25/1967			Water Supply	Domestic		19.81	0.3 9.1 17.4 32.6 32.9 43.3 82.3	TOPSOIL GRAVEL CLAY ROCK SAND ROCK ROCK	 STONES GRAVEL	
7	6715028	653	17	564705	4815101	margin of error : 10 - 30 m	9/10/2004	CRAWLEY RD AND CLAIR RD WEST	GUELPH	Abandoned-Other	Not Used						
8	6715029	653	17	564705	4815101	margin of error : 10 - 30 m	9/10/2004	CRAWLEY RD AND CLAIR RD WEST	GUELPH	Abandoned-Other	Not Used						
9	6715030	587	17	565097	4815155	margin of error : 10 - 30 m	9/10/2004	CRAWLEY RD AND CLAIR RD WEST	GUELPH	Abandoned-Other	Not Used						
10	6715032	587	17	565097	4815155	margin of error : 10 - 30 m	9/10/2004	CRAWLEY	GUELPH	Abandoned-Other	Not Used						
11	7121100	524	17	565403	4815503	margin of error : 10 - 30 m	3/30/2009	1 GUELPH SOUTH BALL PARK	Guelph	Test Hole	Municipal		41.15	2.4 27.4 36.6 37.8 48.8 59.4 80.8 96.0 102.1	CLAY CLAY CLAY GRAVEL LIMESTONE LIMESTONE LIMESTONE LIMESTONE SHALE	SAND STONES STONES ROCK	FRACTURED

Appendix B: MECP Water Well Record Summary Table
(Water Wells located within 500 m of Site Boundary)

JLP Services Inc.
G4836-24-3
280 Clair Road West, Guelph, ON

# Well	Well ID	Distance From Site Centroid (m)	Zone	East 83	North 83	Location Accuracy	Date Received	Street	City	Final Status	1st Use	2nd Use	Depth Water Found (m)	Geology			
														Depth (m)	Material 1	Material 2	Material 3
12	7132490	638	17	564393	4816070	margin of error : 30 m - 100 m	10/23/2009	405 LAIRD RD	Guelph	Test Hole	Monitoring		3.60	0.1			
13	(cluster wells)	631	17	564397	4816063	margin of error : 10 - 30 m								0.6	SAND	GRAVEL	FILL
14		634	17	564395	4816066	margin of error : 10 - 30 m								1.6	SAND	GRAVEL	SILT
15		621	17	564433	4816096	margin of error : 10 - 30 m								2.1	SILT	SAND	GRAVEL
16		567	17	564452	4816030	margin of error : 10 - 30 m								5.8	SAND	GRAVEL	
17		550	17	564468	4816024	margin of error : 10 - 30 m											
18		544	17	564482	4816033	margin of error : 10 - 30 m											
19		566	17	564457	4816036	margin of error : 10 - 30 m											
20		683	17	564375	4816123	margin of error : 10 - 30 m											
21	7136046	582	17	564361	4815863	margin of error : 30 m - 100 m	12/16/2009	412 LAIRD RD.	Guelph	Observation Wells	Monitoring			5.5	SAND	MEDIUM GRAVEL	PACKED
														7.9	GRAVEL	SAND	PACKED
22	7178268	582	17	565415	4816029	margin of error : 30 m - 100 m	3/19/2012	CLAIR ROAD	Guelph	Test Hole	Dewatering			2.4	SAND	GRAVEL	DENSE
														15.2	GRAVEL	SAND	SILT
23	7216001	585	17	564357	4815859	margin of error : 30 m - 100 m	2/10/2014	412 LAIRD DR	GUELPJ	Monitoring and Test Hole	Monitoring and Test Hole			0.3	SAND	GRAVEL	LOOSE
														5.2	SAND	LOOSE	
														7.0	GRAVEL	DENSE	
24	7216002	547	17	564393	4815848	margin of error : 30 m - 100 m	2/10/2014	412 LAIRD DR	GUELPH	Monitoring and Test Hole	Monitoring and Test Hole			0.3	SAND	GRAVEL	LOOSE
														5.2	SAND	LOOSE	
														7.0	GRAVEL	DENSE	
25	7216003	588	17	564367	4815904	margin of error : 30 m - 100 m	2/10/2014	412 LAIRD ST	GUELPH	Monitoring and Test Hole	Monitoring and Test Hole			0.3	SAND	GRAVEL	LOOSE
														5.2	SAND	LOOSE	
														7.0	GRAVEL	DENSE	
26	7216004	546	17	564406	4815889	margin of error : 30 m - 100 m	2/10/2014	412 LAIRD DR	GUELPH	Monitoring and Test Hole	Monitoring and Test Hole			0.3	SAND	GRAVEL	LOOSE
														5.2	SAND	LOOSE	
														7.0	GRAVEL	DENSE	
27	7239559	566	17	564460	4816040	margin of error : 30 m - 100 m	4/8/2015										
28	7278485	591	17	565479	4815512	margin of error : 30 m - 100 m	1/6/2017	25 POPPY DR	GUELPH	Observation Wells	Monitoring		20.42	0.6	TOPSOIL		
														3.0	SAND	SILT	
														22.9	SAND	GRAVEL	
														24.4	SAND		FINE-GRAINED
														29.0	SAND		FINE-GRAINED
														33.5	SAND	CLAY	
														35.4	SAND	GRAVEL	COARSE-GRAINED
29	7284991	574	17	564368	4815573	margin of error : 30 m - 100 m	4/10/2017	836 SOUTHGATE DR	Guelph	Monitoring and Test Hole	Test Hole	Monitoring		0.9	FILL		
														10.7	SAND	GRAVEL	
30	7303640	693	17	564384	4816151	margin of error : 30 m - 100 m	1/19/2018										
31	7333798	601	17	564347	4815883	margin of error : 30 m - 100 m	4/15/2019	430 Laird	Guelph	Monitoring and Test Hole	Monitoring and Test Hole			1.2	OTHER		
														9.1	SAND	GRAVEL	
32	7333799	599	17	564355	4815903	margin of error : 30 m - 100 m	4/15/2019	430 Laird Guelph		Monitoring and Test Hole	Monitoring and Test Hole			0.1	OTHER		
														0.9	SAND	GRAVEL	
33	7350239	595	17	564359	4815901	margin of error : 30 m - 100 m	12/24/2019	LAIRD ROAD	Guelph	Observation Wells							
34	7350240	586	17	564374	4815918	margin of error : 30 m - 100 m	12/24/2019	LAIRD ROAD	Guelph	Observation Wells							
35	7353873	582	17	564509	4816124	margin of error : 30 m - 100 m	2/21/2020										
36	7359712	345	17	565212	4815906	margin of error : 30 m - 100 m	5/28/2020	25 Poppy St W	Guelph	Observation Wells	Monitoring		13.72	0.3	TOPSOIL		
														15.2	SILT	SAND	GRAVEL
37	7359713	394	17	565316	4815759	margin of error : 30 m - 100 m	5/28/2020	25 Poppy Dr W	Guelph	Observation Wells	Monitoring		15.24	0.3	TOPSOIL		
															SILT	SAND	GRAVEL
38	7370925	590	17	564365	4815905	margin of error : 30 m - 100 m	10/19/2020	412 Laird Road	Guelph	Abandoned-Other							
39	7370926	592	17	564365	4815910	margin of error : 30 m - 100 m	10/19/2020	412 Laird Road	Guelph	Abandoned-Other							
40	7379281	617	17	564349	4815492	margin of error : 30 m - 100 m	1/27/2021	489 Clair Rd West	Guelph	Observation Wells	Monitoring and Test Hole			0.3	TOPSOIL		LOOSE
														9.1	STONES	SAND	HARD
41	7416891	569	17	564534	4815302	margin of error : 30 m - 100 m	5/10/2022										
42	7437262	709	17	565600	4815503	margin of error : 30 m - 100 m	12/23/2022	2090 Gordon St.	Guelph	Observation Wells	Monitoring		21.70	22.8	SAND	GRAVEL	HARD
43	7445981	606	17	564331	4815841	margin of error : 30 m - 100 m	3/15/2023										

Appendix C – Borehole Logs

BORING NUMBER BH 1 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/3/24 **COMPLETED** 4/3/24
GROUND ELEVATION 341.392 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE (20 40 60 80) / PL MC LL	WELL CONSTRUCTION
341	0		**TOPSOIL** 250mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	1-2-3-3 (5)	41	ND			
	1		**FILL** silty sand, trace gravel, trace organic inclusions; brown, moist, no odour, no staining	0.8	SS 2	2-5-7-9 (12)	36	ND			
340	2		**SAND AND GRAVEL** medium to coarse grained; brown, moist, compact to very dense, no odour, no staining		SS 3	9-8-19-31 (27)	30	ND			
339	3				SS 4	18-39-31-34 (70)	3	ND			
338	4				SS 5	19-23-20-27 (43)	43	ND			
					SS 6	50/0.08 50/75mm	0	ND		>>	
337	5				SS 7	10-7-9-6 (16)	25	ND			
336	6										
335	7										
334				7.6							

End of Borehole at 7.62 mbgs Due to Auger Refusal

BORING NUMBER BH 2

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/3/24 **COMPLETED** 4/3/24
GROUND ELEVATION 341.544 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL 20 40 60 80	WELL CONSTRUCTION
341	1		**TOPSOIL** 250mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	4-5-9-13 (14)	41	ND			
			SAND AND GRAVEL medium to coarse grained; brown, moist, compact to very dense, no odour, no staining		SS 2	26-17-15-20 (32)	25	ND			
340	2				SS 3	14-15-14-20 (29)	36	ND			
339	3				SS 4	28-29-17-14 (46)	41	ND			
					SS 5	25-50/0.08 50/75mm	0	ND		>>	
338	4				SS 6	27-46-23-19 (69)	30	ND			
337	5				SS 7	25-50/0.13 50/125mm	33	ND		>>	
336	6										
					SS 8	50/0.10 50/100mm	15	ND		>>	
335	7										
334	8										
333				8.8							

End of Borehole at 8.83 mbgs Due to Auger Refusal

BORING NUMBER BH 3

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/3/24 **COMPLETED** 4/3/24
GROUND ELEVATION 342.149 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL / 20 40 60 80	WELL CONSTRUCTION
342			**TOPSOIL** 300mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	2-9-10-22 (19)	36	ND			
	1										
341			**SAND AND GRAVEL** brown, moist, dense to very dense, no odour, no staining		SS 2	15-24-25-36 (49)	30	ND			
	2				SS 3	27-40-24-21 (64)	30	ND			
340				2.4	SS 4	50/0.08 50/75mm	0	ND		>>	

End of Borehole at 2.37 mbgs Due to Auger Refusal

BORING NUMBER BH 4

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/4/24 **COMPLETED** 4/4/24
GROUND ELEVATION 337.354 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80	WELL CONSTRUCTION
337			**TOPSOIL** 300mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	2-2-3-3 (5)	41	ND			
	1		**FILL** sand and gravel, some silt; brown, moist, no odour, no staining	1.1	SS 2	4-6-13-20 (19)	28	ND			
336			**SAND AND GRAVEL** medium to coarse grained; brown, moist, compact to very dense, no odour, no staining		SS 3	18-27-50-47 (77)	41	ND			
	2										
335					SS 4	14-28-25-23 (53)	38	ND			
	3										
334					SS 5	23-23-31-43 (54)	41	ND			
	4				SS 6	21-41-43-32 (84)	53	ND			
333											
	5				SS 7	15-13-10-25 (23)	38	ND			
332											
				5.9	SS 8	22-17-28-50 (45)	38	ND			

End of Borehole at 5.94 mbgs

BORING NUMBER BH 5 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 335.445 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 5.33 m / Elev 330.12 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE / PL MC LL	WELL CONSTRUCTION
335	0		**TOPSOIL** 400mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.4	SS 1	2-3-7-6 (10)	15	ND			
	1		**FILL** sand and gravel, some silt; brown, moist, no odour, no staining	1.3	SS 2	3-4-5-9 (9)	51	ND			
334	2		**SAND AND GRAVEL** trace silt; brown, moist, very dense, no odour, no staining		SS 3	50 50/100mm	0	ND			
333	3				SS 4	35-44-50 (94) 50/75mm	25	ND			
332	4				SS 5	40-33-50 (83) 50/50mm	28	ND			
					SS 6	50 50/50mm	0	ND			
331	5				SS 7	24-33-36-50 (69) 50/125mm	38	ND			
330			wet at 5.6 mbgs	5.9	SS 8	19-30-25-26 (55)	41	ND			

End of Borehole at 5.94 mbgs

BORING NUMBER BH 6

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/4/24 **COMPLETED** 4/4/24
GROUND ELEVATION 335.99 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL / 20 40 60 80	WELL CONSTRUCTION
			TOPSOIL 175mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.2	SS 1	1-2-3-3 (5)	18	ND			
335	1		**SAND AND GRAVEL** trace silt; brown, moist, very dense, no odour, no staining		SS 2	17-29-30-44 (59)	38	ND			
334	2				SS 3	23-29-37-41 (66)	43	ND			
				2.3	AU 4	50/0.03 50/25mm					
			End of Borehole at 2.32 mbgs Due to Auger Refusal								

BORING NUMBER BH 7

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/4/24 **COMPLETED** 4/4/24
GROUND ELEVATION 341.596 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL 20 40 60 80	WELL CONSTRUCTION
			TOPSOIL 200mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.2	SS 1	5-15-24-26 (39)	33	ND			
341	1		**SAND AND GRAVEL** trace silt, brown; moist, compact to very dense, no odour, no staining		SS 2	19-18-50/0.13 50/125mm	30	ND		>>	
340	2				SS 3	50/0.08 50/75mm	3	ND		>>	
339	3				SS 4	30-18-18-15 (36)	33	ND			
338	4				SS 5	10-21-23-26 (44)	33	ND			
337	5				SS 6	21-29-21-23 (50)	28	ND			
336					SS 7	14-13-11-22 (24)	38	ND			
				5.8	SS 8	40-39-50 (89) 50/150mm	43	ND			

End of Borehole at 5.79 mbgs Due to Auger Refusal

BORING NUMBER BH 8 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 341.207 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE (20 40 60 80) / PL MC LL	WELL CONSTRUCTION
341			**TOPSOIL** 300mm of silty sand, some gravel; scattered organic inclusions, dark brown, moist, no odour, no staining	0.3	SS 1	1-2-4-17 (6)	36	ND			
	1		**FILL** silty sand, trace gravel, trace organic inclusions; brown, moist, no odour, no staining	0.8	SS 2	16-15-21-17 (36)	25	ND			
340					SS 3	18-30-32-43 (62)	33	ND			
	2		**SAND AND GRAVEL** medium to coarse grained; brown, moist, compact to very dense, no odour, no staining		SS 4	10-23-39-32 (62)	23	ND			
339											
	3				SS 5	15-33-44-50 (77)	36	ND			
338											
	4				SS 6	50/0.01 50/10mm				>>	
337				4.4							

End of Borehole at 4.42 mbgs Due to Auger Refusal

BORING NUMBER BH 9 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/4/24 **COMPLETED** 4/4/24
GROUND ELEVATION 335.795 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR Arrow
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY MC **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 5.69 m / Elev 330.11 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE / PL MC LL	WELL CONSTRUCTION
335	1		**TOPSOIL** 300mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	1-1-2-3 (3)	25	ND			
			FILL silty sand, trace gravel; brown, moist, no odour, no staining	0.9	SS 2	13-30-37-38 (67)	41	ND			
334	2		**SAND AND GRAVEL** medium to coarse grained; brown, moist to wet, very dense, no odour, no staining		SS 3	20-34-48-50/0.08 50/125mm	36	ND		>>	
					SS 4	34-50/0.08 50/75mm	25	ND		>>	
333	3				SS 5	26-29-31-37 (60)	38	ND			
332	4				SS 6	15-36-37-46 (73)	38	ND			
331	5				SS 7	32-50-50/0.13 50/125mm	30	ND		>>	
330	6				SS 8	20-27-32-37 (59)	38	ND			
329	7				SS 9	13-12-23-16 (35)	50	ND			
328	8										
327				9.0	SS 10	5-13-16-10 (29)	35	ND			

End of Borehole at 8.99 mbgs

BORING NUMBER BH10 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 335.437 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 5.30 m / Elev 330.14 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL 20 40 60 80	WELL CONSTRUCTION
335	1		**TOPSOIL** 400mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.4	SS 1	1-2-2-3 (4)	51	ND			
			FILL silty sand, trace gravel; brown, moist, no odour, no staining	0.8	SS 2	29-12-18-22 (30)	51	ND			
334	2		**SAND AND GRAVEL** medium to coarse grained, some silt; brown, moist to wet, very dense, no odour, no staining		SS 3	15-26-25-50 (51)	41	ND			
333	3				SS 4	17-30-47-43 (77)	41	ND			
332	4				SS 5	27-49-50 (99)	25	ND			
					SS 6	49-50	25	ND			
331	5				SS 7	50	20	ND			
330	6			6.1							

End of Borehole at 6.10 mbgs Due to Auger Refusal

BORING NUMBER BH11 (MW)

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 336.406 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 6.26 m / Elev 330.15 m

ELEV. (m)	DEPTH (m)	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL 20 40 60 80	WELL CONSTRUCTION
336		**TOPSOIL** 300mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	6-12-23-27 (35)	41	ND			
	1	**FILL** sand and gravel, trace silt; brown, moist, no odour, no staining	0.8	SS 2	45-33-23-43 (56)	36	ND			
335										
	2	**SAND AND GRAVEL** medium to coarse grained, some silt; brown, moist to wet, very dense, no odour, no staining		SS 3	34-32-32-22 (64)	53	ND			
334										
	3			SS 4	14-30-23-19 (53)	36	ND			
333										
	4			SS 5	16-42-19-33 (61)	48	ND			
332										
	5			SS 6	18-22-41-49 (63)	46	ND			
331										
	6			SS 7	11-33-27-28 (60)	43	ND			
330										
	7			SS 8	20-17-18-14 (35)	43	ND			
329		sand seams at 7.2mbgs wet	7.6							
		End of Borehole at 7.62 mbgs								

BORING NUMBER BH12

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 340.741 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80	WELL CONSTRUCTION
			TOPSOIL 225mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.2	SS 1	1-4-7-7 (11)	43	ND			
340	1		**FILL** sand and gravel, trace silt; brown, moist, no odour, no staining	0.8	SS 2	10-26-12-14 (38)	33	ND			
339	2		**SAND AND GRAVEL** some silt; brown, moist to wet, dense, no odour, no staining		SS 3	17-22-20-17 (42)	28	ND			
				2.4	SS 4	16-23-17-36 (40)	25	ND			
338	3		**SILT TILL** silt, trace gravel; brown, wet, no odour, no staining		SS 5	25-29-31-45 (60)	33	ND			
337	4		**SAND AND GRAVEL** medium to coarse grained, some silt; brown, wet, dense, no odour, no staining	3.8	SS 6	11-25-46-20 (71)	43	ND			
336	5				SS 7	17-31-34-46/-0.17	33	ND		>>	
			End of Borehole at 5.33 mbgs	5.3	SS 8	50/0.00				>>	

PL MC LL 20 40 60 80

BORING NUMBER BH13

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 333.883 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80	WELL CONSTRUCTION
333	1		**TOPSOIL** 200mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.2	SS 1	1-8-7-3 (15)	25	ND			
			FILL silty sand, trace gravel, scattered organics; brown, moist, no odour, no staining	0.9	SS 2	8-15-19-23 (34)	25	ND			
332	2				SS 3	16-31-27-30 (58)	33	ND			
			SAND AND GRAVEL medium to coarse grained, some silt; brown, moist, dense to very dense, no odour, no staining		SS 4	31-49-50 (99) 50/150mm	15	ND			
331	3				SS 5	38-35-50 (85) 50/150mm	28	ND			
330	4		cobbles and boulders at about 4.0mbgs								
329	5				SS 6	16-17-16-16 (33)	43	ND			
328	6		wet at 4.6mbgs	6.7	SS 7	4-4-4-11 (8)	43	ND			

End of Borehole at 6.71 mbgs

BORING NUMBER BH14

JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 333.491 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE 20 40 60 80 / PL MC LL 20 40 60 80	WELL CONSTRUCTION
333	0		**TOPSOIL** 300mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	1-1-2-5 (3)	15	ND			
				0.8							
	1		**FILL** silty sand, trace gravel; brown, moist, no odour, no staining		SS 2	14-26-41-49 (67)	43	ND			
332					SS 3	50		ND			
	2		**SAND AND GRAVEL** medium to coarse grained, some silt, scattered cobbles; brown, moist, compact to very dense, no odour, no staining								
331					SS 4	29-22-33-34 (55)	41	ND			
	3		cobbles and boulder at about 3.2mbgs		SS 5	18-50	13	ND			
330											
	4				SS 6	15-19-16-12 (35)	41	ND			
329											
	5				SS 7	2-4-14-15 (18)	41	ND			
328											
	6			6.1							
327			**SILT TILL** some sand, trace gravel; grey, wet, loose to very dense, no odour, no staining		SS 8	1-2-3-3 (5)	25	ND			
	7										
326				7.6	SS 9	16-33-36-39 (69)	61	ND			

End of Borehole at 7.62 mbgs

BORING NUMBER BH15 (MW)

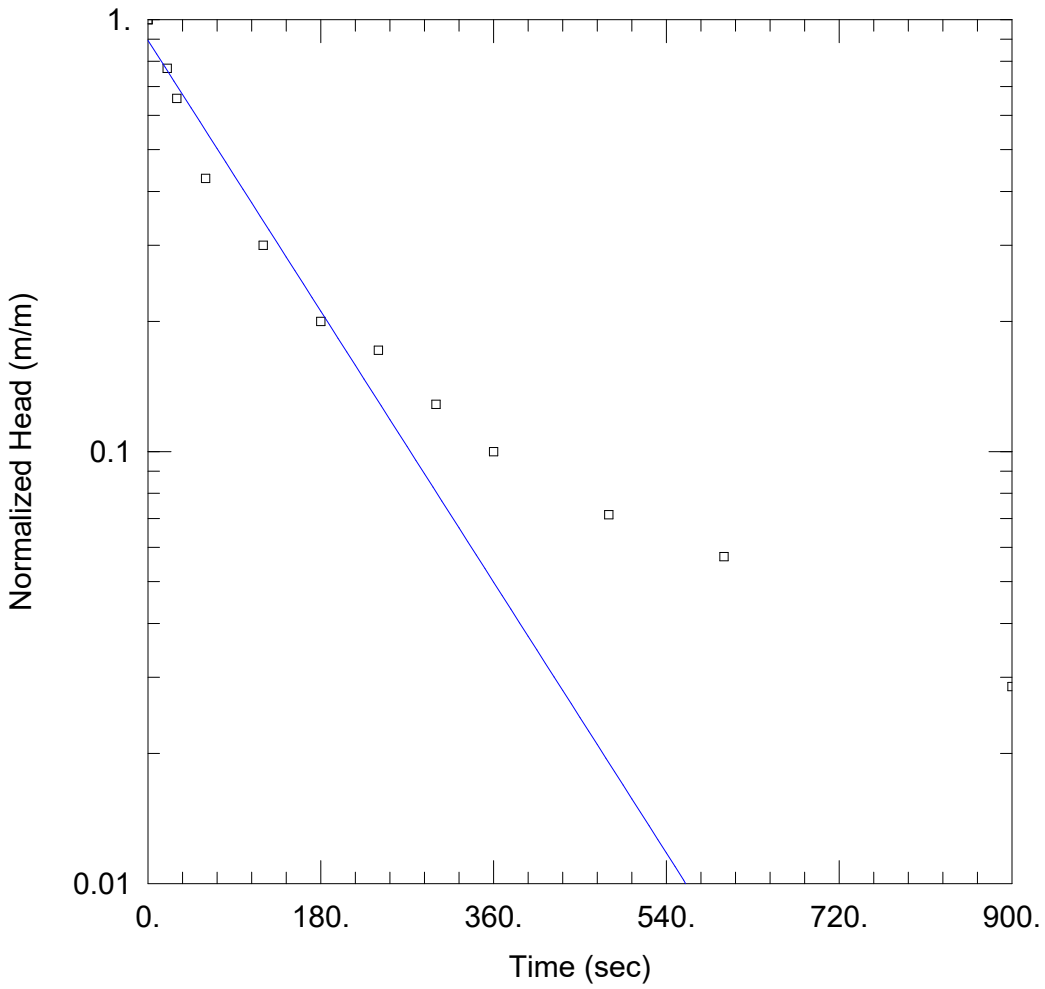
JLP
Geotechnical & Environmental Consultants

CLIENT John Farley and Home Opportunities
PROJECT NAME Proposed Residential Development
PROJECT NUMBER G4836-24-3
PROJECT LOCATION 280 Clair Road West, Guelph, ON
DATE STARTED 4/5/24 **COMPLETED** 4/5/24
GROUND ELEVATION 333.209 m Geodetic **HOLE SIZE** 150mm
DRILLING CONTRACTOR 3D Drilling
GROUND WATER LEVELS:
DRILLING METHOD CME-45 Truck
AT TIME OF DRILLING ---
LOGGED BY SJ **CHECKED BY** AL
AT END OF DRILLING ---
NOTES
AFTER DRILLING 2.94 m / Elev 330.27 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY (cm)	HEADSPACE VAPOUR (ppm)	ANALYSIS	SPT N VALUE / PL MC LL	WELL CONSTRUCTION
333			**TOPSOIL** 200mm of silty sand, some gravel, scattered organic inclusions; dark brown, moist, no odour, no staining	0.3	SS 1	1-4-6-12 (10)	15	ND			
	1			0.8	SS 2	20-14-28-27 (42)	18	ND			
332			**FILL** sand and gravel, trace silt; brown, moist, no odour, no staining		SS 3	44-50	15	ND			
	2		**SAND AND GRAVEL** medium to coarse grained, some silt; brown, moist, dense to very dense, no odour, no staining		SS 4	25-31-25-27 (56)	48	ND			
331											
	3				SS 5	36-37-39-27 (76)	48	ND			
330											
	4		wet at 3.8 mbgs		SS 6	7-15-11-13 (26)	30	ND			
329											
	5				SS 7	14-14-21-26 (35)	20	ND			
328											
	6										
327			sand seams at 6.10mbgs		SS 8	1-1-1-2 (2)		ND			
				6.7							

End of Borehole at 6.71 mbgs

Appendix D – Single Well Response Test (SWRT)



SWRT BH/MW 5

Data Set: C:\...\BHMW 5.aqt
Date: 07/30/24 Time: 12:34:47

PROJECT INFORMATION

Company: JLP Services Inc.
Client: John Farley & Home Opport.
Project: G4836-24-3
Location: 280 Clair Rd W, Guelph
Test Well: BH/MW 5
Test Date: July 8, 2024

AQUIFER DATA

Saturated Thickness: 2.95 m Anisotropy Ratio (Kz/Kr): 1.

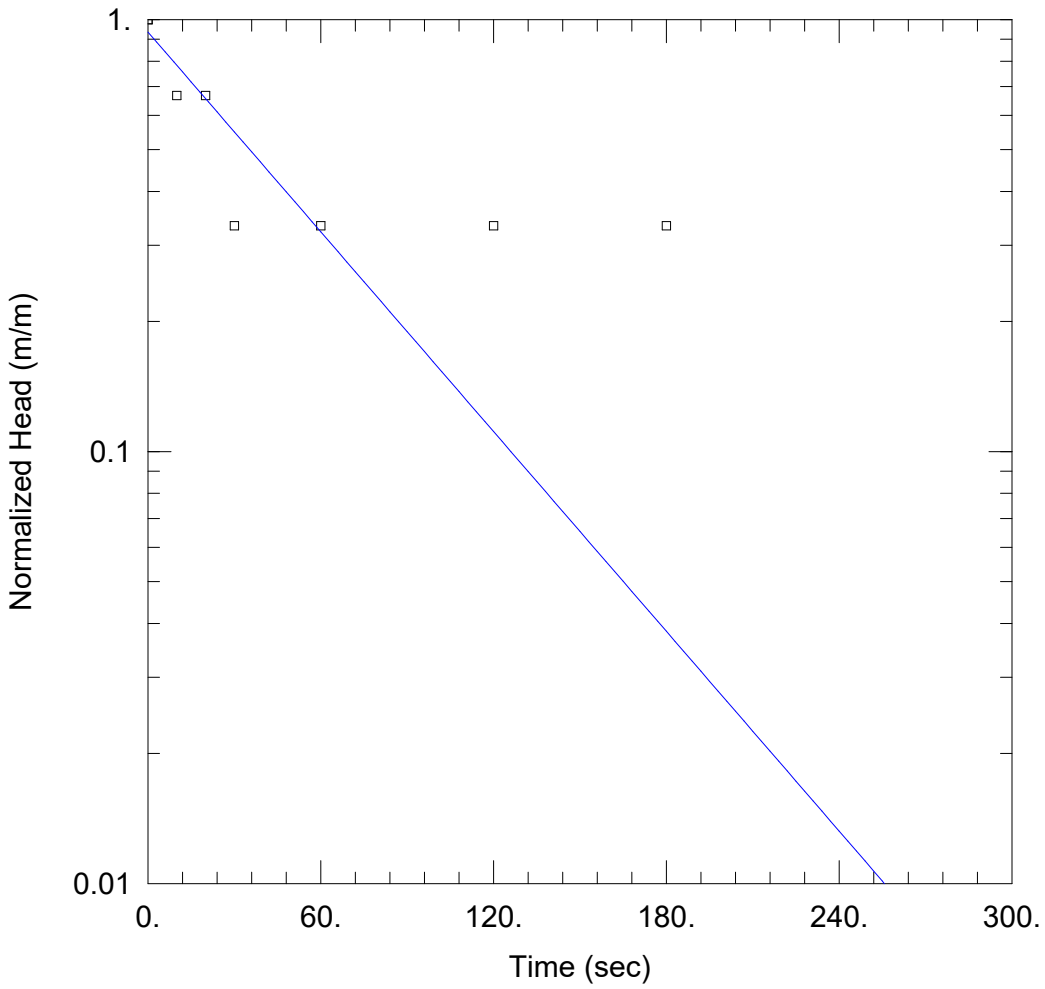
WELL DATA (BH/MW 5)

Initial Displacement: 0.7 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.95 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 4.647E-6 m/sec y0 = 0.6265 m



SWRT BH/MW 9

Data Set: C:\...\BHMW 9.aqt
Date: 07/30/24 Time: 12:28:16

PROJECT INFORMATION

Company: JLP Services Inc.
Client: John Farley & Home Opport.
Project: G4836-24-3
Location: 280 Clair Rd W, Guelph
Test Well: BH/MW 9
Test Date: July 8, 2024

AQUIFER DATA

Saturated Thickness: 2.82 m Anisotropy Ratio (Kz/Kr): 1.

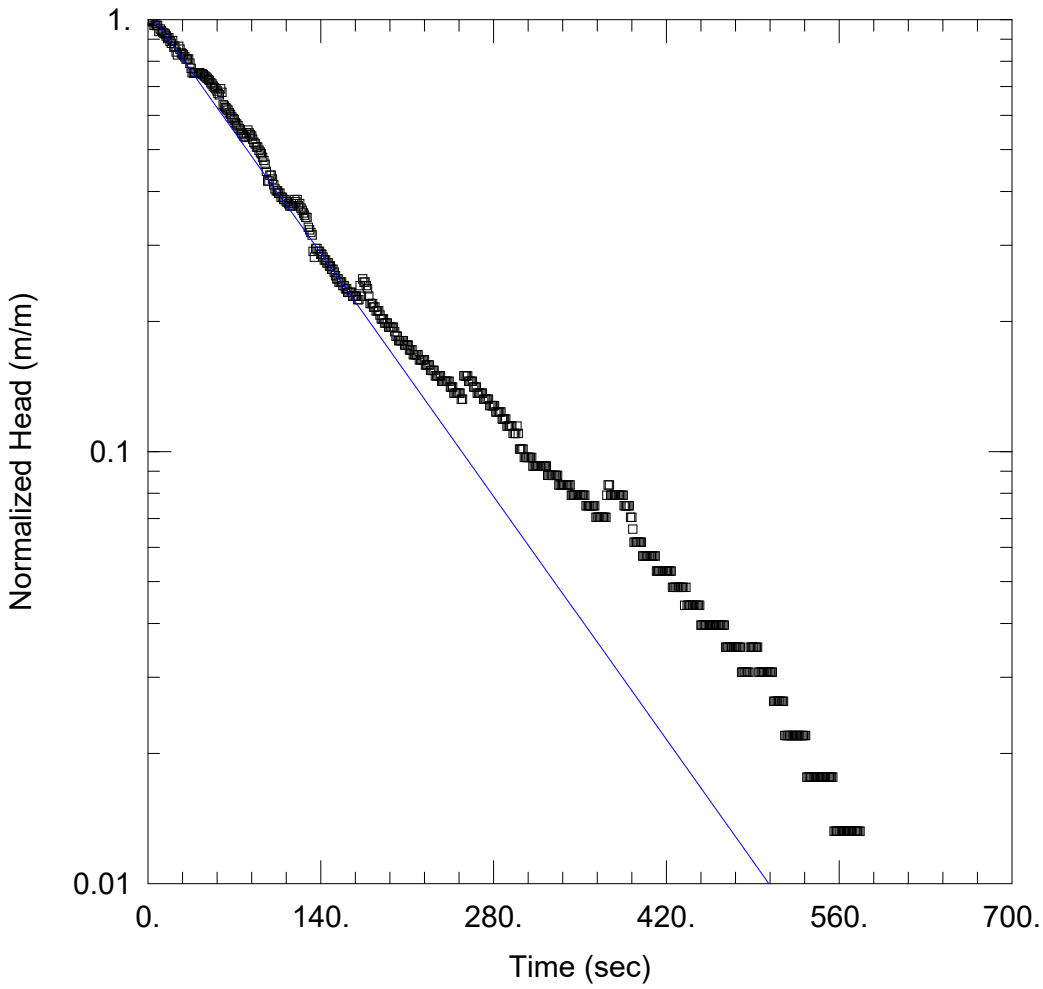
WELL DATA (BH/MW 9)

Initial Displacement: 0.03 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.82 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 1.076E-5 m/sec y0 = 0.02807 m



SWRT BH/MW 10

Data Set: C:\...\BHMW 10.aqt
Date: 07/30/24 Time: 12:20:30

PROJECT INFORMATION

Company: JLP Services Inc.
Client: John Farley & Home Opport.
Project: G4836-24-3
Location: 280 Clair Rd W, Guelph
Test Well: BH/MW 10
Test Date: July 8, 2024

AQUIFER DATA

Saturated Thickness: 0.27 m Anisotropy Ratio (Kz/Kr): 1.

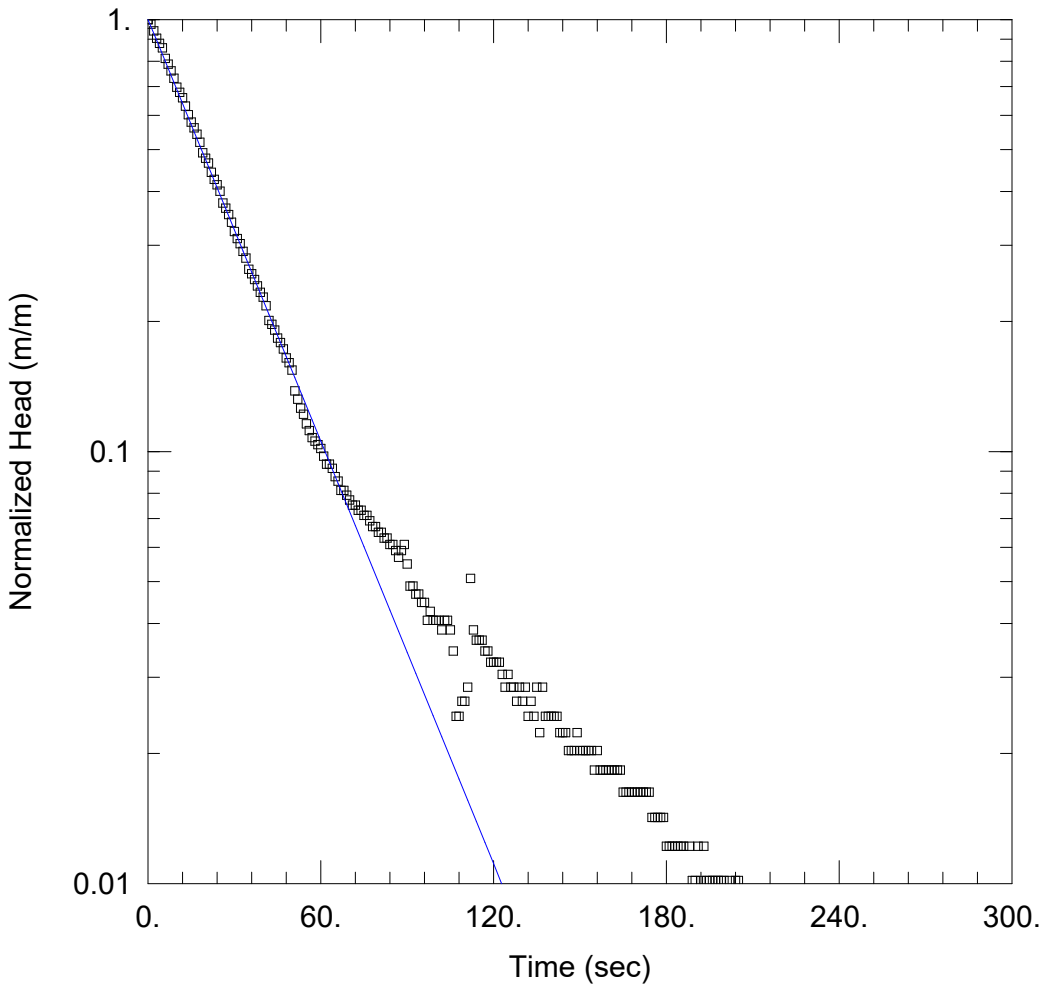
WELL DATA (BH/MW 10)

Initial Displacement: 0.681 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 0.27 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.856E-5 m/sec y0 = 0.7149 m



SWRT BH/MW 11

Data Set: C:\...\BHMW 11.aqt
Date: 07/30/24 Time: 12:14:35

PROJECT INFORMATION

Company: JLP Services Inc.
Client: John Farley & Home Opport.
Project: G4836-24-3
Location: 280 Clair Rd W, Guelph
Test Well: BH/MW 11
Test Date: July 8, 2024

AQUIFER DATA

Saturated Thickness: 0.81 m Anisotropy Ratio (Kz/Kr): 1.

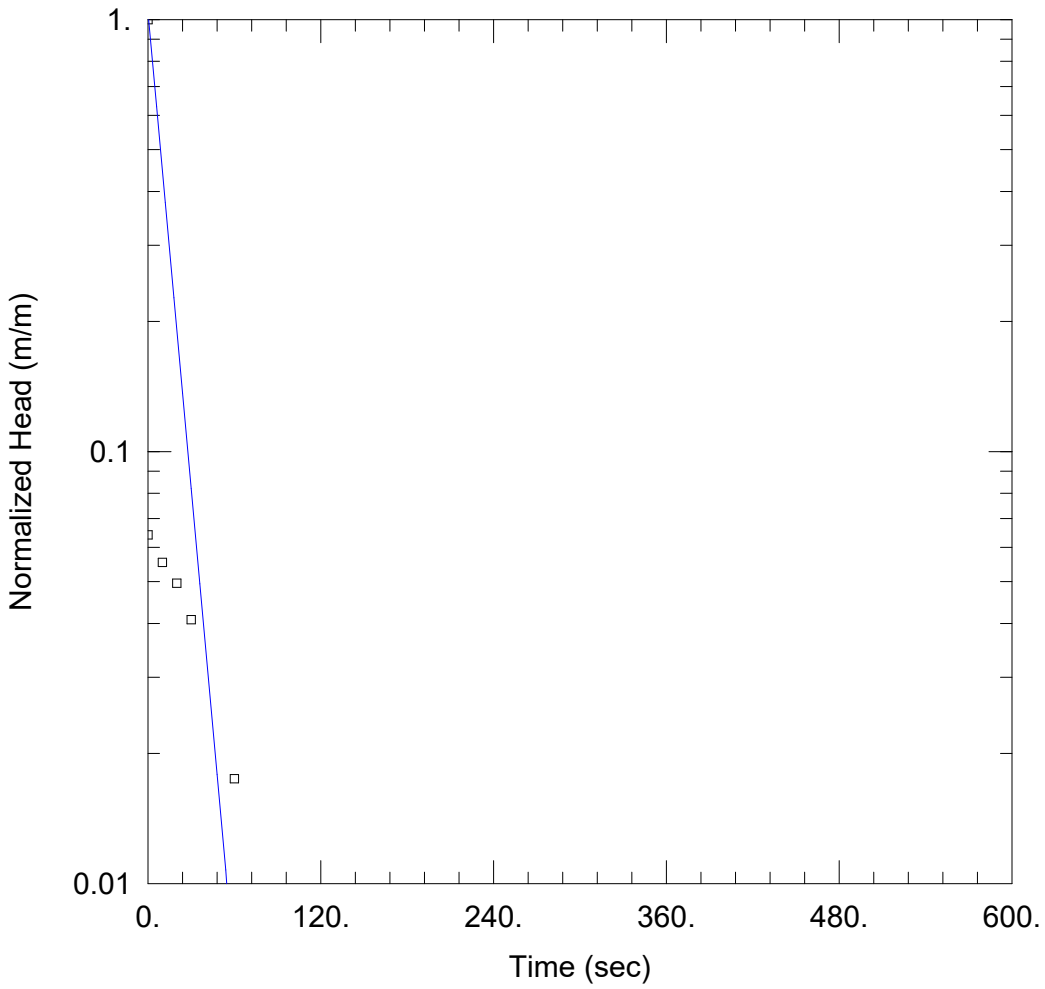
WELL DATA (BH/MW 11)

Initial Displacement: 1.476 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 0.81 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 7.915E-5 m/sec y0 = 1.481 m



SWRT BH/MW 15

Data Set: C:\...\BHMW 15.aqt
Date: 07/30/24 Time: 12:42:28

PROJECT INFORMATION

Company: JLP Services Inc.
Client: John Farley & Home Opport.
Project: G4836-24-3
Location: 280 Clair Rd W, Guelph
Test Well: BH/MW 15
Test Date: July 8, 2024

AQUIFER DATA

Saturated Thickness: 2.45 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH/MW 15)

Initial Displacement: 3.43 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 2.45 m
Screen Length: 3. m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 5.911E-5 m/sec y0 = 3.58 m

Appendix E – Infiltration Rates

Appendix E
Infiltration Test Data Analysis

Location: 280 Clair Road West, Guelph, Ontario
Project Number: G4836-24-3
Test Date: 8-Aug-24

Test Location	Co-efficient of Permeability (K_{fs}) (cm/s)	Infiltration Rate (IR) (mm/hr)	Discrete Design Infiltration Rate (mm/hr)	Percolation Time (T-Time) (min/cm)	Design Percolation (T) Time (min/cm)
Shallow Soils					
INF5S - 0.5 mbgs	8.1E-04	81	32.4	7.4	19
INF10S - 0.5 mbgs	1.31E-03	92	36.8	6.5	16
INF11S - 0.5 mbgs	1.8E-03	101	40.2	6.0	15
Deep Soils					
INF5D - 1.5 mbgs	1.4E-02	173	69.2		
INF10D - 1.5 mbgs	5.7E-03	137	54.6		
INF11D - 1.5 mbgs	2.5E-02	202	80.8		

Soil Unit	Geometric Mean of K (cm/s)	Geo-Mean Infiltration Rate (IR) (mm/hr)	Ratio - Geo-mean of Infiltration Rates	Safety Correction Factor (SCF)
Shallow Soils (0.5 mbgs)	1.24E-03	91	0.5	2.5
Deep Soils (1.5 mbgs)	1.25E-02	168		

Geo-Mean of Design Infiltration Rates (mm/hr)	Geo-mean of Design Percolation (T) Times (min/cm)
36	**17**

Note:

* Assumed approximately 1.5 m below the test elevation

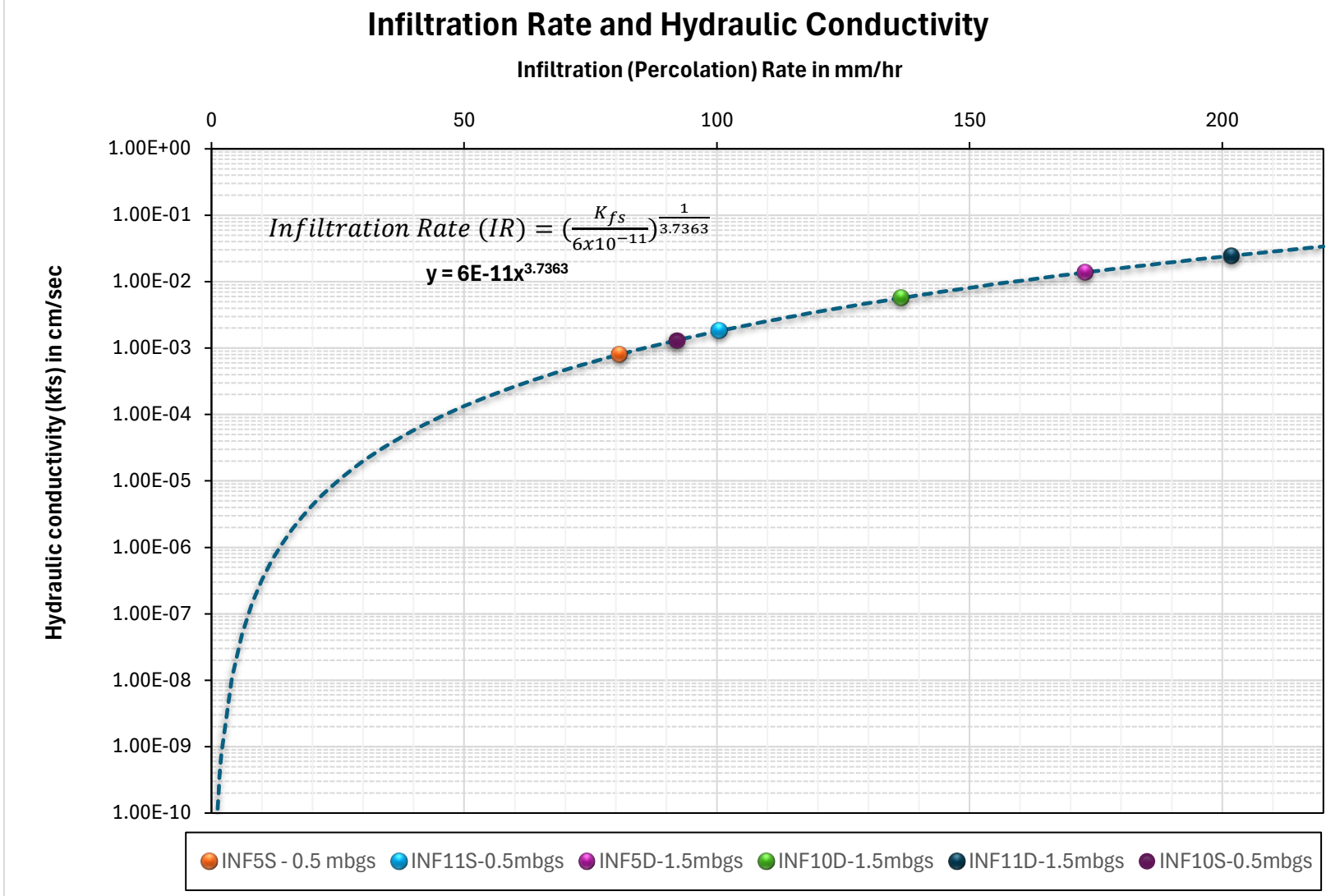
$$Infiltration\ Rate\ (IR) = (\frac{K_{\square}}{6x10^{-11}})^{\frac{1}{3.7363}}$$

$$Design\ Infiltration\ Rate\ (DIR) = \frac{IR}{SCF}$$

Safety Correction Factors (SCF) for Design Infiltration Rate**	
Ratio of Mean Measured Infiltration	Safety Correction Factor
</=1	2.5
1.1 to 4.0	3.5
4.1 to 8.0	4.5
8.1 to 16	6.5
16.1 or greater	8.5

Kfs: field saturated hydraulic conductivity (cm/sec)
IR: infiltration rate (mm/hr)
DIR: design infiltration rate (mm/hr)

****SCF**: Safety Correction Factor (based on the chart recommended by CVC and TRCA, 2010)



Source: Ontario Ministry of Municipal Affairs and Housing. 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.8000

Res Type 35.22
H 5
a 3.5
H/a 1.429
a* 0.12
C0.01 0.736
C0.04 0.763
C0.12 0.72
C0.36 0.72
C 0.72
R 0.800
Q 0.47
pi 3.142

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 0.720428
$Q =$ 0.4696

$K_{fs} =$ 7.58E-04 cm/sec
4.55E-02 cm/min
7.58E-06 m/sec
1.79E-02 inch/min
2.98E-04 inch/sec

$\Phi_m =$ 6.31E-03 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.5000

Res Type 35.22
H 10
a 3.5
H/a 2.85714
a* 0.12
C0.01 1.11597
C0.04 1.17651
C0.12 1.16258
C0.36 1.16258
C 1.16258
R 1.500
Q 0.8805
pi 3.1415

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.162583
$Q =$ 0.8805

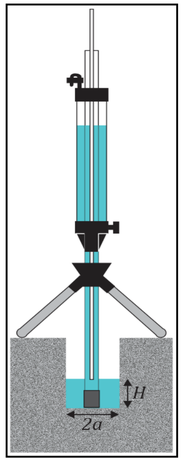
$K_{fs} =$ 8.55E-04 cm/sec
5.13E-02 cm/min
8.55E-06 m/ses
2.02E-02 inch/min
3.37E-04 inch/sec

$\Phi_m =$ 7.13E-03 (cm^2/min)

Average

$K_{fs} =$ 8.06E-04 cm/sec
4.84E-02 cm/min
8.06E-06 m/s
1.91E-02 inch/min
3.18E-04 inch/sec

$\Phi_m =$ 6.72E-03 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1

Enter the first water Head Height ("H1" in cm): 5
Enter the second water Head Height ("H2" in cm): 10

Enter the Borehole Radius ("a" in cm): 3.8

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0.36 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0
$Q_2 =$ 0
$C_1 =$ 0.679549
$C_2 =$ 1.100129
$G_1 =$ 0.004135
$G_2 =$ 0.003347
$G_3 =$ 0.048513
$G_4 =$ 0.02176

Res Type: 2.16
H1/a: 1.315789
H2/a: 2.631579
C1-0.01: 0.699357
C2-0.01: 1.06403
C1-0.04: 0.723895
C2-0.04: 1.119231
C1-0.12: 0.679549
C2-0.12: 1.100129
C1-0.36: 0.679549
C2-0.36: 1.100129

$K_{fs} =$ 0.00E+00 cm/sec
0.00E+00 cm/min
0.00E+00 m/sec
0.00E+00 inch/min
0.00E+00 inch/sec

$\Phi_m =$ 0.00E+00 (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.8000

Res Type	35.22
H	5
a	3.5
H/a	1.429
a*	0.36
C0.01	0.736
C0.04	0.763
C0.12	0.72
C0.36	0.72
C	0.72
R	0.800
Q	0.47
pi	3.142

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.72043
$Q =$ 0.4696

$K_{fs} =$ 1.24E-03 cm/sec
7.46E-02 cm/min
1.24E-05 m/sec
2.94E-02 inch/min
4.90E-04 inch/sec

$\Phi_m =$ 3.45E-03 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.7000

Res Type	35.22
H	10
a	3.5
H/a	2.85714
a*	0.36
C0.01	1.11597
C0.04	1.17651
C0.12	1.16258
C0.36	1.16258
C	1.16258
R	1.700
Q	0.9979
pi	3.1415

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.16258
$Q =$ 0.9979

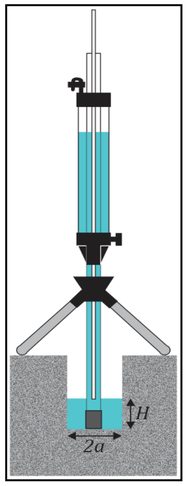
$K_{fs} =$ 1.37E-03 cm/sec
8.21E-02 cm/min
1.37E-05 m/ses
3.23E-02 inch/min
5.39E-04 inch/sec

$\Phi_m =$ 3.80E-03 (cm^2/min)

Average

$K_{fs} =$ 1.31E-03 cm/sec
7.84E-02 cm/min
1.31E-05 m/s
3.09E-02 inch/min
5.14E-04 inch/sec

$\Phi_m =$ 3.63E-03 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):

Enter the first water Head Height ("H1" in cm):
Enter the second water Head Height ("H2" in cm):

Enter the Borehole Radius ("a" in cm):

Enter the soil texture-structure category (enter one of the below numbers):

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0

$Q_2 =$ 0

$C_1 =$ 0

$C_2 =$ 0

Res Type:	2.16
H1/a:	#DIV/0!
H2/a:	#DIV/0!
C1-0.01:	#DIV/0!
C2-0.01:	#DIV/0!
C1-0.04:	#DIV/0!
C2-0.04:	#DIV/0!
C1-0.12:	#DIV/0!
C2-0.12:	#DIV/0!
C1-0.36:	#DIV/0!
C2-0.36:	#DIV/0!

$G_1 =$ #DIV/0!

$G_2 =$ #DIV/0!

$G_3 =$ #DIV/0!

$G_4 =$ #DIV/0!

$K_{fs} =$ #DIV/0! cm/sec
#DIV/0! cm/min
#DIV/0! m/sec
#DIV/0! inch/min
#DIV/0! inch/sec

$\Phi_m =$ #DIV/0! (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	5
Enter the Borehole Radius ("a" in cm):	3.5
Enter the soil texture-structure category (enter one of the below numbers):	4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.3000

Res Type	35.22
H	5
a	3.5
H/a	1.429
a*	0.36
C0.01	0.736
C0.04	0.763
C0.12	0.72
C0.36	0.72
C	0.72
R	1.300
Q	0.763
pi	3.142

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.72043

$Q =$ 0.7631

$K_{fs} =$ 2.02E-03 *cm/sec*
1.21E-01 *cm/min*
2.02E-05 *m/sec*
4.77E-02 *inch/min*
7.96E-04 *inch/sec*

$\Phi_m =$ 5.61E-03 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3.5
Enter the soil texture-structure category (enter one of the below numbers):	4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 2.0000

Res Type	35.22
H	10
a	3.5
H/a	2.85714
a*	0.36
C0.01	1.11597
C0.04	1.17651
C0.12	1.16258
C0.36	1.16258
C	1.16258
R	2.000
Q	1.174
pi	3.1415

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.16258

$Q =$ 1.174

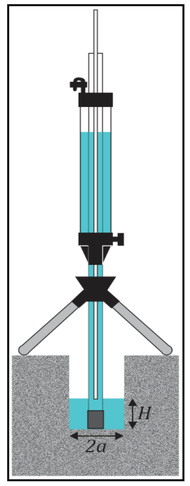
$K_{fs} =$ 1.61E-03 *cm/sec*
9.66E-02 *cm/min*
1.61E-05 *m/ses*
3.80E-02 *inch/min*
6.34E-04 *inch/sec*

$\Phi_m =$ 4.47E-03 (cm^2/min)

Average

$K_{fs} =$ 1.82E-03 *cm/sec*
1.09E-01 *cm/min*
1.82E-05 *m/s*
4.29E-02 *inch/min*
7.15E-04 *inch/sec*

$\Phi_m =$ 5.04E-03 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	0
Enter the first water Head Height ("H1" in cm):	0
Enter the second water Head Height ("H2" in cm):	0
Enter the Borehole Radius ("a" in cm):	0
Enter the soil texture-structure category (enter one of the below numbers):	0

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0

$Q_2 =$ 0

$C_1 =$ 0

$C_2 =$ 0

Res Type:	2.16
H1/a:	#DIV/0!
H2/a:	#DIV/0!
C1-0.01:	#DIV/0!
C2-0.01:	#DIV/0!
C1-0.04:	#DIV/0!
C2-0.04:	#DIV/0!
C1-0.12:	#DIV/0!
C2-0.12:	#DIV/0!
C1-0.36:	#DIV/0!
C2-0.36:	#DIV/0!

$G_1 =$ #DIV/0!

$G_2 =$ #DIV/0!

$G_3 =$ #DIV/0!

$G_4 =$ #DIV/0!

$K_{fs} =$ #DIV/0! *cm/sec*
#DIV/0! *cm/min*
#DIV/0! *m/sec*
#DIV/0! *inch/min*
#DIV/0! *inch/sec*

$\Phi_m =$ #DIV/0! (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 11.0000

Res Type	35.22
H	5
a	3.5
H/a	1.429
a*	0.36
C0.01	0.736
C0.04	0.763
C0.12	0.72
C0.36	0.72
C	0.72
R	#####
Q	6.457
pi	3.142

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.72043
$Q =$ 6.457

$K_{fs} =$ 1.71E-02 *cm/sec*
1.03E+00 *cm/min*
1.71E-04 *m/sec*
4.04E-01 *inch/min*
6.73E-03 *inch/sec*

$\Phi_m =$ 4.75E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 13.0000

Res Type	35.22
H	10
a	3.5
H/a	2.85714
a*	0.36
C0.01	1.11597
C0.04	1.17651
C0.12	1.16258
C0.36	1.16258
C	1.16258
R	13.000
Q	7.631
pi	3.1415

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.16258
$Q =$ 7.631

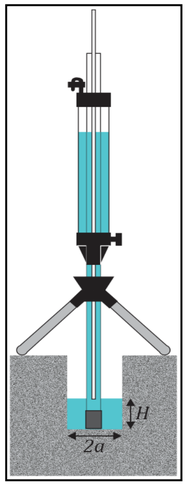
$K_{fs} =$ 1.05E-02 *cm/sec*
6.28E-01 *cm/min*
1.05E-04 *m/ses*
2.47E-01 *inch/min*
4.12E-03 *inch/sec*

$\Phi_m =$ 2.91E-02 (cm^2/min)

Average

$K_{fs} =$ 1.38E-02 *cm/sec*
8.27E-01 *cm/min*
1.38E-04 *m/s*
3.26E-01 *inch/min*
5.43E-03 *inch/sec*

$\Phi_m =$ 3.83E-02 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 0

Enter the first water Head Height ("H1" in cm): 0
Enter the second water Head Height ("H2" in cm): 0

Enter the Borehole Radius ("a" in cm): 0

Enter the soil texture-structure category (enter one of the below numbers): 0

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0

$Q_2 =$ 0

$C_1 =$ 0

$C_2 =$ 0

Res Type:	2.16
H1/a:	#DIV/0!
H2/a:	#DIV/0!
C1-0.01:	#DIV/0!
C2-0.01:	#DIV/0!
C1-0.04:	#DIV/0!
C2-0.04:	#DIV/0!
C1-0.12:	#DIV/0!
C2-0.12:	#DIV/0!
C1-0.36:	#DIV/0!
C2-0.36:	#DIV/0!

$G_1 =$ #DIV/0!

$G_2 =$ #DIV/0!

$G_3 =$ #DIV/0!

$G_4 =$ #DIV/0!

$K_{fs} =$ #DIV/0! *cm/sec*
#DIV/0! *cm/min*
#DIV/0! *m/sec*
#DIV/0! *inch/min*
#DIV/0! *inch/sec*

$\Phi_m =$ #DIV/0! (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	5
Enter the Borehole Radius ("a" in cm):	3.5
Enter the soil texture-structure category (enter one of the below numbers):	4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 4.5000

Res Type	35.22
H	5
a	3.5
H/a	1.429
a*	0.36
C0.01	0.736
C0.04	0.763
C0.12	0.72
C0.36	0.72
C	0.72
R	4.500
Q	2.642
pi	3.142

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.72043

$Q =$ 2.6415

$K_{fs} =$ 6.99E-03 *cm/sec*
4.20E-01 *cm/min*
6.99E-05 *m/sec*
1.65E-01 *inch/min*
2.75E-03 *inch/sec*

$\Phi_m =$ 1.94E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3.5
Enter the soil texture-structure category (enter one of the below numbers):	4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 5.5000

Res Type	35.22
H	10
a	3.5
H/a	2.85714
a*	0.36
C0.01	1.11597
C0.04	1.17651
C0.12	1.16258
C0.36	1.16258
C	1.16258
R	5.500
Q	3.2285
pi	3.1415

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.16258

$Q =$ 3.2285

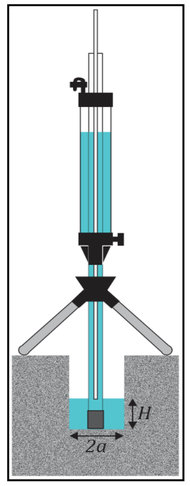
$K_{fs} =$ 4.43E-03 *cm/sec*
2.66E-01 *cm/min*
4.43E-05 *m/ses*
1.05E-01 *inch/min*
1.74E-03 *inch/sec*

$\Phi_m =$ 1.23E-02 (cm^2/min)

Average

$K_{fs} =$ 5.71E-03 *cm/sec*
3.43E-01 *cm/min*
5.71E-05 *m/s*
1.35E-01 *inch/min*
2.25E-03 *inch/sec*

$\Phi_m =$ 1.59E-02 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	
Enter the first water Head Height ("H1" in cm):	
Enter the second water Head Height ("H2" in cm):	
Enter the Borehole Radius ("a" in cm):	
Enter the soil texture-structure category (enter one of the below numbers):	

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0

$Q_2 =$ 0

$C_1 =$ 0

$C_2 =$ 0

Res Type:	2.16
H1/a:	#DIV/0!
H2/a:	#DIV/0!
C1-0.01:	#DIV/0!
C2-0.01:	#DIV/0!
C1-0.04:	#DIV/0!
C2-0.04:	#DIV/0!
C1-0.12:	#DIV/0!
C2-0.12:	#DIV/0!
C1-0.36:	#DIV/0!
C2-0.36:	#DIV/0!

$G_1 =$ #DIV/0!

$G_2 =$ #DIV/0!

$G_3 =$ #DIV/0!

$G_4 =$ #DIV/0!

$K_{fs} =$ #DIV/0! *cm/sec*
#DIV/0! *cm/min*
#DIV/0! *m/sec*
#DIV/0! *inch/min*
#DIV/0! *inch/sec*

$\Phi_m =$ #DIV/0! (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 14.0000

Res Type	35.22
H	5
a	3.5
H/a	1.429
a*	0.36
C0.01	0.736
C0.04	0.763
C0.12	0.72
C0.36	0.72
C	0.72
R	#####
Q	8.218
pi	3.142

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.72043
$Q =$ 8.218

$K_{fs} =$ 2.18E-02 *cm/sec*
1.31E+00 *cm/min*
2.18E-04 *m/sec*
5.14E-01 *inch/min*
8.57E-03 *inch/sec*

$\Phi_m =$ 6.04E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3.5

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 34.0000

Res Type	35.22
H	10
a	3.5
H/a	2.85714
a*	0.36
C0.01	1.11597
C0.04	1.17651
C0.12	1.16258
C0.36	1.16258
C	1.16258
R	34.000
Q	19.958
pi	3.1415

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.16258
$Q =$ 19.958

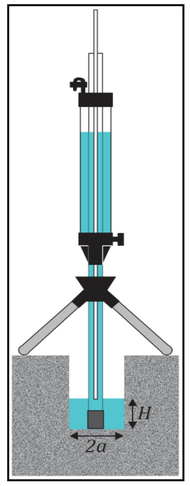
$K_{fs} =$ 2.74E-02 *cm/sec*
1.64E+00 *cm/min*
2.74E-04 *m/ses*
6.47E-01 *inch/min*
1.08E-02 *inch/sec*

$\Phi_m =$ 7.60E-02 (cm^2/min)

Average

$K_{fs} =$ 2.46E-02 *cm/sec*
1.47E+00 *cm/min*
2.46E-04 *m/s*
5.80E-01 *inch/min*
9.67E-03 *inch/sec*

$\Phi_m =$ 6.82E-02 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 0

Enter the first water Head Height ("H1" in cm): 0
Enter the second water Head Height ("H2" in cm): 0

Enter the Borehole Radius ("a" in cm): 0

Enter the soil texture-structure category (enter one of the below numbers): 0

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min):

Steady State Rate of Water Level Change ("R2" in cm/min):

$Q_1 =$ 0

$Q_2 =$ 0

$C_1 =$ 0

$C_2 =$ 0

Res Type:	2.16
H1/a:	#DIV/0!
H2/a:	#DIV/0!
C1-0.01:	#DIV/0!
C2-0.01:	#DIV/0!
C1-0.04:	#DIV/0!
C2-0.04:	#DIV/0!
C1-0.12:	#DIV/0!
C2-0.12:	#DIV/0!
C1-0.36:	#DIV/0!
C2-0.36:	#DIV/0!

$G_1 =$ #DIV/0!

$G_2 =$ #DIV/0!

$G_3 =$ #DIV/0!

$G_4 =$ #DIV/0!

$K_{fs} =$ #DIV/0! *cm/sec*
#DIV/0! *cm/min*
#DIV/0! *m/sec*
#DIV/0! *inch/min*
#DIV/0! *inch/sec*

$\Phi_m =$ #DIV/0! (cm^2/min)

Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118(H_1/a)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118(H_2/a)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Appendix F – Construction Dewatering Rates

Appendix F

Dewatering Flow Rate Estimates - Short-Term

280 Clair Road W, Guelph, Ontario

Table F-1: Short-Term Dewatering Rates for Buildings

Parameters	Unit	Short-Term					
		B28(12)-A	B28(12)-B	B28(10)	B28(6)	12-Plex-A	12-Plex-B
Ground Elevation	masl	334.0	334.0	330.0	334.0	334.0	334.0
Highest Groundwater Elevation	masl	330.8	330.8	330.8	330.8	330.8	330.8
Lowest basement Footing Invert Elevation	masl	330.00	330.00	329.00	330.00	330.00	330.00
Dewatering Target Elevation	masl	329.00	329.00	328.00	329.00	329.00	329.00
Base of Aquifer / Water Bearing Zone	masl	327.0	327.0	327.0	327.0	327.0	327.0
Height of Static Water Table Above the Base of the Water-Bearing Zone (H)	m	3.80	3.80	3.80	3.80	3.80	3.80
Height of Target Water Level Above the Base of Water-Bearing Zone (hw)	m	2.00	2.00	1.00	2.00	2.00	2.00
Length of Excavation	m	43.9	43.9	37.0	22.0	32.6	32.6
Width of Excavation	m	11.9	11.9	11.9	11.9	9.4	9.4
Hydraulic Conductivity (K)	m/s	2.68E-05	2.68E-05	2.68E-05	2.68E-05	2.68E-05	2.68E-05
Specific Yield (Sy)		0.15	0.15	0.15	0.15	0.15	0.15
Time (days)		30	30	30	30	30	30
Time (t)	s	2,592,000	2,592,000	2,592,000	2,592,000	2,592,000	2,592,000
Radius of Influence Estimates							
Equivalent Radius (re)	m	17.76	17.76	15.57	10.79	13.37	13.37
Radius of Influence (from excavation boundary) (R0)	m	62.92	62.92	62.92	62.92	62.92	62.92
Dewatering Rate Estimates							
Dewatering Flow Rate (Q) per building	L/day	**50,180**	**50,180**	**60,430**	**39,520**	**43,610**	**43,610**
Factor of Safety (Fs)	-	1.50	1.50	1.50	1.50	1.50	1.50
Dewatering Flow Rate Multiplied by Factor of Safety (QxFs)	L/day	**75,270**	**75,270**	**90,650**	**59,280**	**65,420**	**65,420**
Assumed Precipitation Event	mm/day	15	15	15	15	15	15
Volume from Precipitation	L/day	7,840	7,840	6,600	3,930	4,600	4,600
Total Volume - GW Discharge Discharge withh SF + Precipitation	L/day	**83,110**	**83,110**	**97,250**	**63,210**	**70,020**	**70,020**

Note: Dewatering rates are provided only for one each building type

$$R_0 = \sqrt{2.25KDt/S}$$

(Cooper - Jacob)

$$r_e = \frac{a+b}{\pi}$$

$$R_{o-mod} = R_0 + r_e$$

if R0 <r e

$$Q_w = \frac{\pi K(H^2 - h^2)}{Ln\left[\frac{R_o}{r_e}\right]}$$

(Dupuit-Forcheimer)

Where:

Q_w = Dewatering flow rate (L/s)

K = Hydraulic conductivity (m/s)

H = Height of static water table above base of aquifer (m)

h_w = Height of target water level above the base of aquifer (m)

R0-mod= Modified Radius of Influence (m)

R_o=Radius of influence (m)

re=Equivalent perimeter (m)

Appendix F
Dewatering Flow Rate Estimates - Short-Term
280 Clair Road W, Guelph, Ontario

Table F-2: Short-Term Dewatering Rates for Servicing

Parameters	Unit	Value
Ground Elevation / Lowest Finished Flow Elevation	masl	
Highest Groundwater Elevation (1.0 m above highest recorded)	mbgs	2.44
Lowest Invert Elevation	mbgs	4.00
Dewatered Elevation Target	mbgs	5.00
Top of the Water-Bearing Zone	mbgs	2.44
Base of the Water-Bearing Zone (assumed 3 m lowest invert)	mbgs	7.00
Height of Water Table Above the Base of Water-Bearing Zone (H)	m	4.56
Height of Dewatering Target Above the Base of Water-Bearing Zone (h)	m	2.00
Hydraulic Conductivity (K)	m/s	2.68E-05
Length of Excavation (x_1)	m	10.00
Width of Excavation (x_2)	m	2.00

Radius of Influence	Unit	Value
Method to Calculate Radius of Influence	-	**Sichardt**
Radius of Influence from Sides of Excavation	m	39.76
Distance to Linear Source from Sides of excavation (L_0)	m	19.88

Dewatering Rates	Unit	Value
Dewatering Flow Rate (unconfined linear) (Q)	L/day	**23,470**
Factor of Safety (F_s)	-	1.50
Dewatering Flow Rate (multiplied by factor of safety) Q_{FS}	L/day	**35,210**
Assumed Precipitation Event	L/day	15
Volume from Precipitation	L/day	300
Total Volume (GW Discharge Discharge withh SF + Precipitation)	L/day	**35,510**

Lamina Flow from an Unconfined Aquifer to a Fully-Penetrating Excavation

$$Q_w = xK(H^2 - h^2)/Lo$$ (Based on the Dupuit Equation)

$$R_s = C(H - h)\sqrt{(K)}$$

Where:

Qw = Rate of Pumping (m^3/s)

x_1 = Length of Excavation (m)

x_2 = Width of Excavation (m)

K = Hydraulic Conductivity (m/s)

L_0 = Distance to Line Source, assumed $R_0/2$ (m)

R = Radius of Influence (R_0)

H = Aquifer Thickness / Initial Water Column Thickness (m)

h = Final Water Column Thickness (m)

C = Constant (3000)

Appendix F
Dewatering Flow Rate Estimates - Long-Term
280 Clair Road W, Guelph, Ontario

Table F-3: Long-Term Dewatering Rates for Buildings

Parameters	Unit	Long-Term					
		B28-12(A)	B28-12(B)	B28(10)	B28(6)	12-Plex(A)	12-Plex(B)
Ground Elevation	masl	334.0	334.0	330.0	334.0	334.0	334.0
Highest Groundwater Elevation	masl	330.8	330.8	330.8	330.8	330.8	330.8
Lowest basement Footing Invert Elevation	masl	330.00	330.00	329.00	330.00	330.00	330.00
Dewatering Target Elevation	masl	329.50	329.50	328.50	329.50	329.50	329.50
Base of Aquifer / Water Bearing Zone	masl	327.5	327.5	327.5	327.5	327.5	327.5
Height of Static Water Table Above the Base of the Water-Bearing Zone (H)	m	3.30	3.30	3.30	3.30	3.30	3.30
Height of Target Water Level Above the Base of Water-Bearing Zone (hw)	m	2.00	2.00	1.00	2.00	2.00	2.00
Length of Excavation	m	43.9	43.9	37.0	22.0	32.6	32.6
Width of Excavation	m	11.9	11.9	11.9	11.9	9.4	9.4
Hydraulic Conductivity (K)	m/s	2.68E-05	2.68E-05	2.68E-05	2.68E-05	2.68E-05	2.68E-05
Specific Yield (Sy)		0.15	0.15	0.15	0.15	0.15	0.15
Time (days)		30	30	30	30	30	30
Time (t)	s	2,592,000	2,592,000	2,592,000	2,592,000	2,592,000	2,592,000
Radius of Influence Estimates							
Equivalent Radius (re)	m	17.8	17.8	15.6	10.8	13.4	13.4
Radius of Influence (from excavation boundary) (R0)	m	58.6	58.6	58.6	58.6	58.6	58.6
Dewatering Rate Estimates							
Dewatering Flow Rate (Q)	L/day	34,350	34,350	46,070	26,920	29,770	29,770
Factor of Safety (Fs)	-	1.25	1.25	1.25	1.25	1.25	1.25
Dewatering Flow Rate Multiplied by Factor of Safety (QxFs)	L/day	**42,940**	**42,940**	**57,590**	**33,650**	**37,210**	**37,210**

Note: Dewatering rates are provided only for one each building type

$$R_0 = \sqrt{2.25KDt/S}$$

(Cooper - Jacob)

$$r_e = \frac{a+b}{\pi}$$

$$R_{o-mod} = R_0 + r_e$$

if R0 <r e

$$Q_w = \frac{\pi K(H^2 - h^2)}{Ln\,[\frac{R_o}{r_e}]}$$

(Dupuit-Forcheimer)

Where:

Q_w = Dewatering flow rate (L/s)

K = Hydraulic conductivity (m/s)

H = Height of static water table above base of aquifer (m)

h_w = Height of target water level above the base of aquifer (m)

R0-mod= Modified Radius of Influence (m)

R_o=Radius of influence (m)

re=Equivalent perimeter (m)

Appendix G – Qualifications of Assessors

Cindy Luu, B.Sc.

Cindy has a Bachelor of Science in Biomedical Sciences from the University of Waterloo. She then completed a graduate certificate program in Environmental Engineering Applications from Conestoga College.

Cindy is responsible for environmental reporting, including Phase I and II Environmental Site Assessments, due diligence reports, excess soil management, environmental monitoring and investigations, regulatory compliance and regulations.

Ajay Jayalath, MBA, P.Geo., QP

Mr. Jayalath graduated from University of Toronto with a Bachelor of Science in Environmental Geoscience, specializing in Urban Geoscience and Hydrogeology. He then obtained a Master's of Science degree from the University of Toronto in Environmental Science and a MBA from the DeGroote School of Business, McMaster University.

Mr. Jayalath has over fifteen years of environmental investigations experience in the geo-environmental field. Mr. Jayalath has worked on numerous remediation projects including the design and application of in-situ and ex-situ remediation projects. In addition, he has been involved in over fifty Phase l and ll Environmental Site Assessments, from conducting field work to the reporting and project management phases.

His current responsibilities include the management of the environmental groups, including the site assessment, hydrogeological, air quality, hazardous materials, and risk assessment teams. As part of his responsibilities, Mr. Jayalath's role is to ensure the environmental operations are completed in a timely manner to client satisfaction. Mr. Jayalath oversees various contracts for nationwide clients and routinely coordinates with the regional offices to ensure project and contract performance.

Jay Samarakkody, B.Sc., M.Phil., P. Geo.

Mr. Samarakkody is a Senior Hydrogeologist graduated from the University of Peradeniya, Sri Lanka with a Bachelor of Science in Geology, and a Master of Philosophy in Hydrogeology. He completed a Post Graduate diploma in Environmental Engineering Applications at Conestoga College in Kitchener, Ontario.

Mr. Samarakkody has over forty years of overall experience including over twenty years in Canada, completing numerous hydrogeology related projects for public and private sector clients, mainly in the province of Ontario.

His core expertise includes overall management of variety of hydrogeology related projects, well developed hydrogeological technical expertise, water balance studies, numerical groundwater modelling, client engagement and management, project team management, staff development in technical fields, report writing and peer reviewing. He has a thorough knowledge of applicable federal, provincial and municipal Acts and Regulations.

COUNTERPOINT LAND DEVELOPMENT BY | DILLON CONSULTING

March 6, 2026
File No. 24010

North-South Environmental Inc.
101 King St W Unit B
Cambridge, Ontario
N3H 1B5

Attn: Sal Spitale, Principal, Senior Ecologist

Re: Memorandum in Support of Environmental Planning Comment Responses
Zoning By-Law Amendment
280 Clair Road West
Guelph, Ontario

Counterpoint Land Development by Dillon Consulting Inc. ('Dillon') has been retained by Home Opportunities to support a Zoning By-Law Amendment for the property located at 280 Clair Road West, in Guelph, Ontario. In general terms, our role as the civil engineer on record from a rezoning perspective is to verify that the existing municipal infrastructure (sanitary and water) can accommodate the proposed development concept put forth by Home Opportunities. The existing Clair Road West frontage is a rural street with no curbing and ditches dedicated for stormwater.

Further to the above, the existing drainage characteristics of the land comprise of unique hummocky topography (irregular mounded landscaping with high potential as groundwater recharge sources). Given the natural advantages of the land, the stormwater management and low impact development ('LID') measures proposed will maximize the topographic benefits while respecting and maintaining existing drainage characteristics.

Following the rationale above, this memo has been prepared to provide technical insight on the two (2) infiltration basins necessary to accommodate the subjected development. Both are located within the proposed 60m ecological linkage to maximize the natural topographic benefits. Additionally, this memo will aid in informing North-South Environmental Inc,'s environmental opinion on the linkage. The below addresses comments from Environmental Planning dated February 21, 2025.

We have been working with City of Guelph staff for the past 2 years to ensure the proposed development meets all regulations enforced by the authorities having jurisdiction. Dillon has made one (1) pre-application to the City at the end of 2024 that consisted of a combined Functional Servicing and Stormwater Management Report and a civil drawing package. The findings of which conclude that the current concept presented by Home Opportunities can be accommodated by the existing municipal infrastructure with a minor extension of the sanitary sewer in Clair Road and the utilization of the proposed ecological linkage as a storm outlet for 100-year capture and infiltration. Note that the sanitary extension will require Environmental Compliance Approval ('ECA'). Additionally, should the proposed ecological linkage become municipal property, an ECA may be required for the natural infiltration basin.

Infiltration Basins in the Ecological Linkage:

In accordance with the requirements outlined in consultation with City of Guelph staff, the subject site is isolated from a direct stormwater outlet and will therefore rely on infiltration and evaporation for stormwater management. In furthering the review of the natural topographic characteristics of the hummocky landscaping, the Hydrogeological Investigation Report (through in-situ permeameter testing) delineated an infiltration design rate of 81 mm/hr to 101 mm/hr. This existing infiltration rate is deemed sufficient to manage all design storm events, including the 100-year storm event. As a result, on-site stormwater management (SWM) infrastructure has been designed to meet the City's criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance, in alignment with the discussions held with City staff and municipal and Ministry of the Environment, Conservation and Parks (MECP), design criteria. Detailed calculations supporting the proposed design have been included as part of the development application.

In particular, two (2) infiltration basins (north and south) have been proposed within the ecological linkage to both maintain the existing drainage patterns and utilize the existing natural stormwater features the land provides for drainage. This will help in maximizing low impact development of the proposed site by minimizing earthworks which are disruptive to the lands. These infiltration basins will respect the existing topography of the land, with only minor regrading to define a "bottom / top of basin" elevation within each. Please see the attached **Figure 1** for a visual representation of the limit of disturbance expected in the linkage. Accordingly, the 2-, 5-, and 100-year volumes and respective height of water as well as drawdown times have been determined and plotted on the appended **Figure 2** and **Figure 3** for visualization.

Table 1: Infiltration Basin Characteristics

Infiltration Basin	Storm event	Volume Required (m^3)	Max. Water Depth (m)	Max. Drawdown time (hr)
North	2	139	0.22	6.1
	5	220	0.32	8.9
	100	493	0.66	18.3
South	2	1114	1.15	31.7
	5	1620	1.29	35.8
	100	3218	1.54	42.8

Accordingly, the following can be said regarding the infiltration basins:

- The infiltration rate used to derive the drawdown time for the above table has a safety factor of 2.5 applied, resulting in a design rate of 36 mm/hr. This is significantly less then the measured rates of 81-101 mm/hr. Therefore, in reality, the drawdown times will be less by a factor of 2.5 with the lowest value at 2.4 hrs (north basin, 2-year event) and 17.1 hrs (south basin 100-year event.
- Per rainfall data gathered throughout the GTA, 95% of the average annual precipitation is accumulated by storm sizes for a 2-year storm or less. Therefore, the regularity of noticeable pooling in the basin's will be minimized with 100-year ponding only expected to happen once ever 100-years.
- The north basin has a small area subjected to infiltration (650 sq.m to 840 sq.m).
- The south basin has a larger footprint of pooling (3040sq.m to 4880 sq.m) due to the irregular existing un-disturbed hummocky topography. However, most of the water is held in the deeper

portion of the basin (at the site's outlet), which is where the maximum drawdown time is present. As the natural topography changes, the depth of water decreases drastically, with the majority of the 100-year depth being only 10-15 cm deep. This large area, high infiltration rates and shallow depth of expected pooling are ideal conditions for stormwater infiltration, and all contribute to a basin that will be dry for 99.5% of its existence when considering the 2-year event parameters.

- Please refer to the provided **Figure 1** for the area to be cleared (as required for minor earthworks). All these disturbed areas will be naturalized.
- Site outlet structures (headwalls and rip-rap for erosion control) will be outside of the ecological linkage to ensure a complete naturalization of the area.

Figure 1 has been appended in order to visualize the limits of disturbance of each infiltration basin. **Figure 2** and **Figure 3** have been provided to visualize the limits of the various storm events discussed above.

Based on the post-development analysis of the stormwater management strategy, it is concluded that the proposed development will efficiently utilize the benefits of the existing hummocky drainage characteristic of the land and integrate effectively with the ecological linkage. The results also indicate that we meet the City's criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance, in alignment with the discussions held with City staff and municipal and Ministry of the Environment, Conservation and Parks (MECP), design criteria.

Salt Management Plan:

In accordance with the City of Guelphs “Private Salt Management Plans in the City of Guelph” dated June 30, 2016, guidance on methods to store salt, use alternative de-icing agents, reduce the amount of salt applied, identify measures for removal of snow and run-off that may be laden with salt, and to monitor salt usage and effectiveness is needed for development sites. Additionally, given the natural characteristics of the ecological linkage, review and commentary with respect to on-site salt management is required.

These objectives will be met by employing best management practices regarding the handling and storage of salt and snow in the proposed development and operation of the site. This will be done by adopting best management practices relating to the design of new development and operation of winter maintenance activities as outlined in Synthesis of Best Practices, Road Salt Management (TAC, 2013) and in other relevant published sources.

Vehicular traffic will occur along the internal roads and parking lot areas. Pedestrian traffic is anticipated to be primarily limited to the walkways between parking lots and buildings. The use of road salt will be greatest in these areas. Depending on the LID measured proposed, different caution will need to be respected for potential salt infiltration. This will be confirmed at detailed SWM design.

Anticipated snow storage areas will be identified at strategic locations with lower elevations where runoff from melting snow can be directed away from paved surfaces. Directing meltwater away from paved surfaces will reduce ice formation in high traffic areas and therefore reduce the volume of salt required for winter maintenance.

Alternative de-icing products will be evaluated at detailed design if required.

Designing and maintaining effective drainage at the Site will reduce ice formation and subsequent salt application. The proposed stormwater management plan will be optimized to ensure precipitation, meltwater and runoff is collected and conveyed away from high traffic areas. This will reduce ice formation in high traffic areas and therefore reduce the volume of salt required for winter maintenance. Snow drift control measures, such as temporary snow fences, may be considered to minimize on-site drifting.

The primary operational method of snow and ice control on-site will be timely snow removal from laneways, sidewalks and parking lots onsite. Further details on operational measures will be determined at detailed design.

A log will be kept recording winter maintenance activities, and a periodic review will be completed to evaluate the effectiveness of the SMP. The review will also provide an opportunity to consider emerging alternative ice control products and procedures for use in the future.

Through conscience design of the proposed development and operation of the site, on-site salt management will be managed to minimize salt runoff into the ecological linkage thus complementing the overall site’s natural characteristics. A more detailed assessment of the Salt Management Plan will be completed as part of the future re-submission.

Low Impact Development (LID) and Long-term Maintenance:

As concluded above under “Infiltration Basins in the Ecological Linkage” the site efficiently utilizes the benefits of the existing hummocky drainage characteristic of the land and integrates effectively with the ecological linkage. Accordingly, the proposed design meets municipal SWM criteria and is far and beyond standard requirements per MECP guidelines regarding drawdown times for infiltration-based LIDs. As the subject site SWM approach meets all applicable guidelines, there is no need for additional at source LIDs to reduce or slowdown runoff to the two (2) infiltration basis. With this said, consideration can be made at detailed design for localized LIDs to reduce runoff to the ecological linkage basins. These LID measures may be in the form of permeable pavements, bioswales, pipe exfiltration systems/infiltration galleries, soak away pits/infiltration trenches, rainwater harvesting cisterns and rain gardens.

No long-term maintenance of the infiltration basin within the ecological linkage will be required. Future vegetation growth in the infiltration basins and ecological linkage is encouraged and a benefit to the integrated design. This naturalization will help promote the hydraulic cycle through evapotranspiration and increased stormwater absorption through a thicker vegetated floor. Any required maintenance with occur upstream of the linkage. This will be in the form of an Oil Grit Separator (‘OGS’) which will treat the storm water runoff for TSS removal prior to discharge into the basins. Inspections, cleaning and general maintenance of the OGS will be completed through the site’s primary vehicle access with no access to the linkage required.

The proposed linkage is an ideal, naturally occurring, stormwater management facility and is necessary for the site’s functionality under the proposed development condition. Through conscience design choices to maximize existing topographic advantages in combination with maintaining existing drainage conditions a holistic naturally active stormwater management strategy is proposed for the site.

Functional Design Updates to Infiltration Basins:

The North basin has been adjusted to be offset from Clair Road to facilitate the potential for future wildlife tunnelling / crossing.

All roads are located outside the Ecological linkage and a 2m wide, flat (2% slope) landscape strip has been provided adjacent to the main driveway for necessary maintenance.

The south parking garage has been relocated to allow for a sufficient setback from the linkage for potential future construction, landscaping, and operations / maintenance.

Therefore, the existing natural topography effectively complements the proposed development from a stormwater management perspective. Alongside the proposed stormwater strategy meeting the City’s criteria for the Hanlon Creek Sub-watershed for quantity control, water quality treatment, and water balance in alignment with the discussions held with City staff and municipal and Ministry of the Environment, Conservation and Parks (MECP), design criteria.

We trust that the information presented herein has demonstrated that the stormwater management plan for the proposed development sufficiently address environmental planning concerns and that the existing municipal infrastructure and natural topography can accommodate the proposed development. Should you require additional information or require a copy of our latest, detailed Functional Servicing Report please do not hesitate to contact the undersigned.

Sincerely,
Counterpoint Land Development

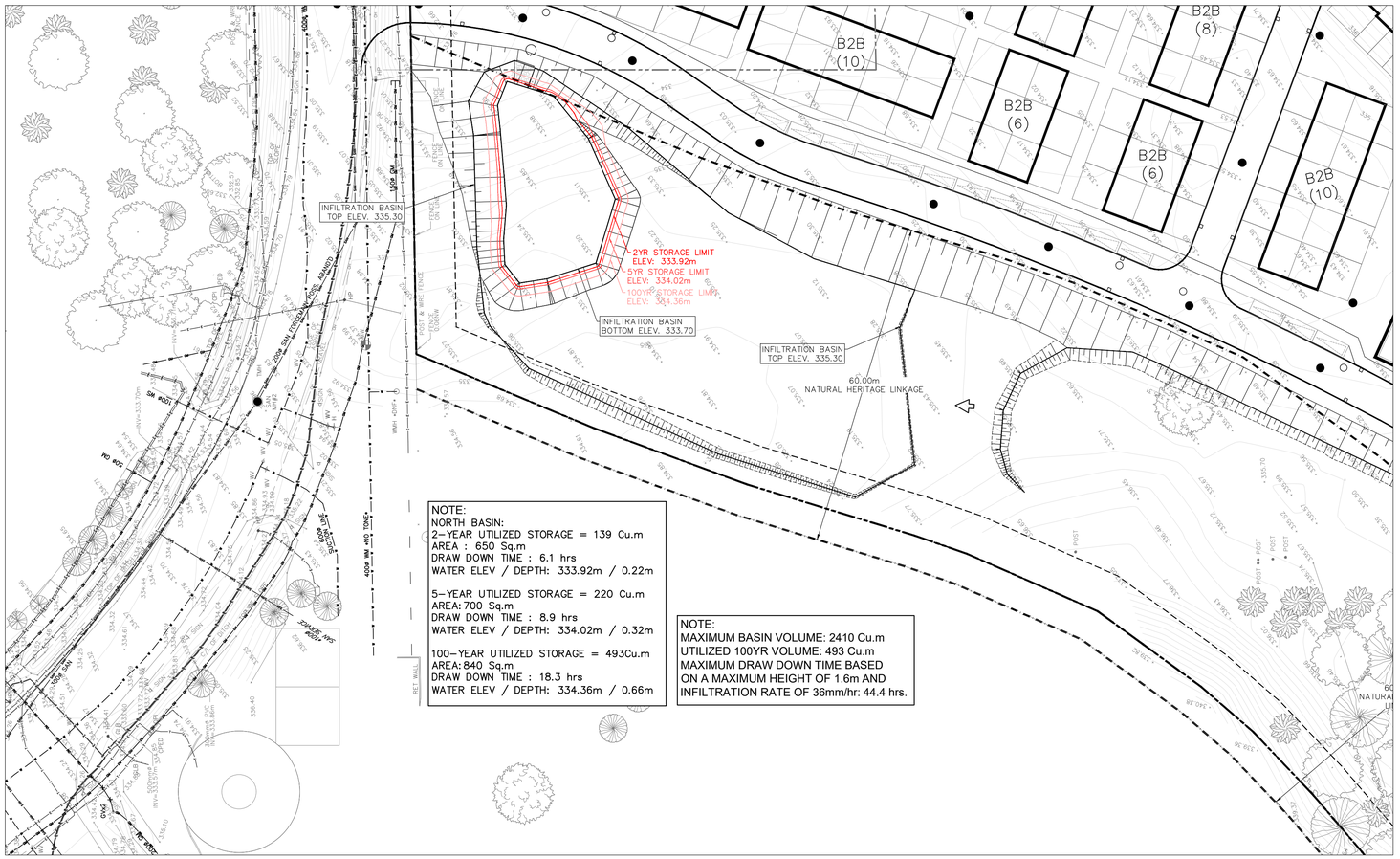
Jake Howkins, P. Eng.
416-389-9135
jhowkins@counterpointeng.com

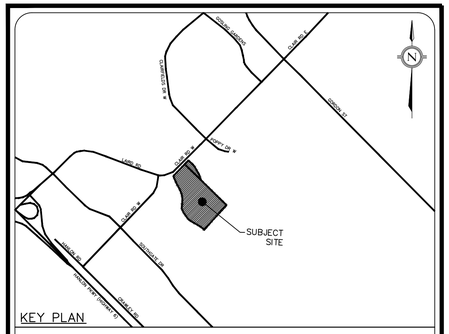
counterpoint ENGINEERING
A SUBSIDIARY OF DILLON CONSULTING LIMITED
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

RESIDENTIAL DEVELOPMENT
280 ST. CLAIR AVE
GUELPH, ONTARIO

SITE BASIN FIGURE

DESIGNED BY: BN	DATE: FEB 2026
CHECKED BY: JH	PROJECT No. 24010
DRAWING BY: BN	
CHECKED BY: JH	FIGURE No. 1
SCALE: 1:1500	





counterpoint ENGINEERING
A SUBSIDIARY OF DILLON CONSULTING LIMITED
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:
HOME OPPORTUNITIES
478 QUEEN STREET EAST, SUITE 201
TORONTO, ON M5A 1T7
PHONE: (416) 504-9855

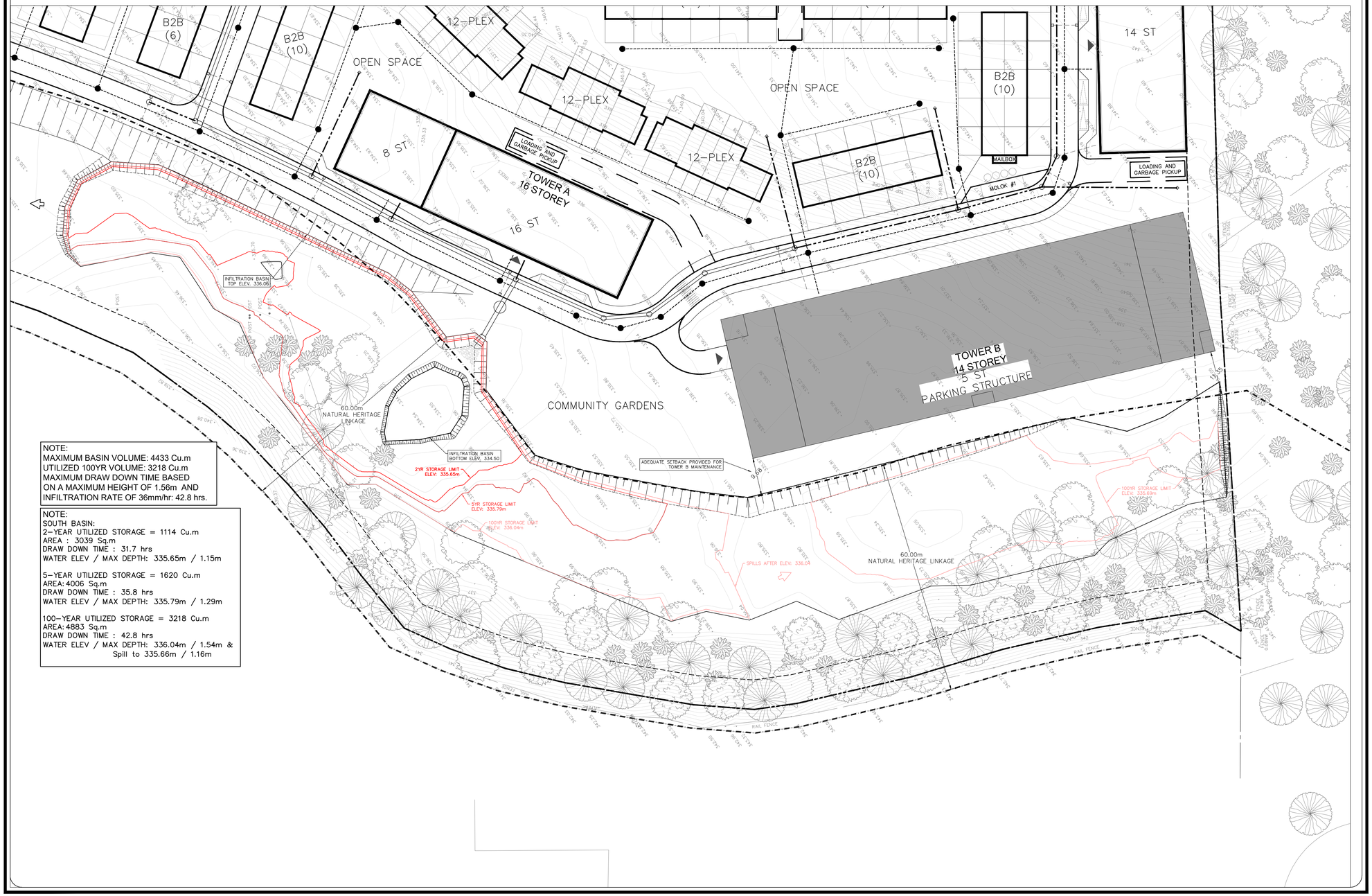
SITE LOCATION:
280 CLAIR ROAD WEST
GUELPH, ON N1L 1G1

SITE PLAN FILE No.:

NORTH BASIN FIGURE

DESIGNED BY: J.Y.	CHECKED BY: J.H.	DATE: MARCH 2026
DRAWING BY: G.D.	CHECKED BY: J.H.	PROJECT NO. 24010
SWM BY: J.H.	CHECKED BY: J.H.	
SCALE: 1:500m (0m 10m 20m 30m)		DRAWING NO. FIG 2

REGION FILE No.:

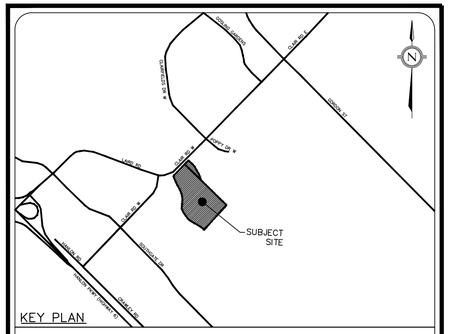


NOTE:
MAXIMUM BASIN VOLUME: 4433 Cu.m
UTILIZED 100YR VOLUME: 3218 Cu.m
MAXIMUM DRAW DOWN TIME BASED
ON A MAXIMUM HEIGHT OF 1.56m AND
INFILTRATION RATE OF 36mm/hr: 42.8 hrs.

NOTE:
SOUTH BASIN:
2–YEAR UTILIZED STORAGE = 1114 Cu.m
AREA : 3039 Sq.m
DRAW DOWN TIME : 31.7 hrs
WATER ELEV / MAX DEPTH: 335.65m / 1.15m

5–YEAR UTILIZED STORAGE = 1620 Cu.m
AREA: 4006 Sq.m
DRAW DOWN TIME : 35.8 hrs
WATER ELEV / MAX DEPTH: 335.79m / 1.29m

100–YEAR UTILIZED STORAGE = 3218 Cu.m
AREA: 4883 Sq.m
DRAW DOWN TIME : 42.8 hrs
WATER ELEV / MAX DEPTH: 336.04m / 1.54m &
Spill to 335.66m / 1.16m



counterpoint ENGINEERING
A SUBSIDIARY OF DILLON CONSULTING LIMITED
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

APPLICANT:
HOME OPPORTUNITIES
478 QUEEN STREET EAST, SUITE 201
TORONTO, ON M5A 1T7
PHONE: (416) 504-9855

SITE LOCATION:
280 CLAIR ROAD WEST
GUELPH, ON N1L 1G1

SITE PLAN FILE No.:

SOUTH BASIN FIGURE

DESIGNED BY: J.Y.	CHECKED BY: J.H.	DATE: MARCH 2026
DRAWING BY: G.D.	CHECKED BY: J.H.	PROJECT NO. 24010
SWM BY: J.H.	CHECKED BY: J.H.	
SCALE: 1: 500m (0m 10m 20m 30m)		DRAWING NO. FIG 3

REGION FILE No.:

APPENDIX 8 | Agreement with Landowner of 950 Southgate Drive for Linkage Relocation

THIS AGREEMENT OF CONSENT made as of the 5th day of January 2026.

B E T W E E N:

TDL GROUP LTD.

("TDL")

- and -

2742707 ONTARIO LIMITED

("274")

- and -

HOMES OPPORTUNITIES NON-PROFIT CORPORATION

("Home Opportunities")

W H E R E A S:

(a) 274 owns the lands municipally known as 280 Clair Road West, City of Guelph (the "**274 Lands**") and, in partnership with Home Opportunities, filed applications for an Official Plan Amendment and Zoning By-law Amendment with the City of Guelph (the "**City**") to facilitate the development of the 274 Lands with a residential affordable housing development (the "**Proposed Development**");

(b) TDL owns lands municipally known as 950 Southgate Drive, City of Guelph (the "**TDL Lands**"), which are located immediately west of the 274 Lands. TDL operates a Tim Hortons Distribution facility on the TDL Lands.

(c) The eastern portion of the 274 Lands is presently designated Ecological Linkage in the City of Guelph Official Plan (February 2024 Consolidation), as shown in **Schedule A** hereto;

(d) To facilitate the Proposed Development, 274 has been advised by the City of Guelph that the Ecological Linkage designation will have to be relocated so as to provide for a contiguously connected Ecological Linkage designation with the Natural Heritage System to the north of the 274 Lands and south of the TDL Lands;

(e) 274 is therefore proposing to relocate the Ecological Linkage designation from its current location shown in **Schedule A** to the western portion of the 274 Lands and on a portion of the TDL Lands, as conceptually shown in **Schedule B** hereto;

(f) The proposed relocation of the Ecological Linkage designation is not anticipated to have any adverse impact on the TDL Lands with respect to stormwater infiltration beyond currently existing constraints; and

(g) TDL is supportive of the Proposed Development, in particular the provision of affordable workforce housing. TDL consents to 274 seeking an amendment to the Official Plan on behalf of TDL to relocate the Ecological Linkage designation generally as depicted on **Schedule B** hereto.

IN CONSIDERATION of the mutual covenants and agreements set out below and for other good and valuable consideration, the Parties agree as follows:

1. The Parties acknowledge and agree that the above recitals hereto are true and correct in substance and in fact;

2. The Schedules hereto form an integral part of this Agreement, including:

   Schedule A – Current Ecological Linkage Designation;

   Schedule B – Proposed Realignment of Ecological Linkage Designation;

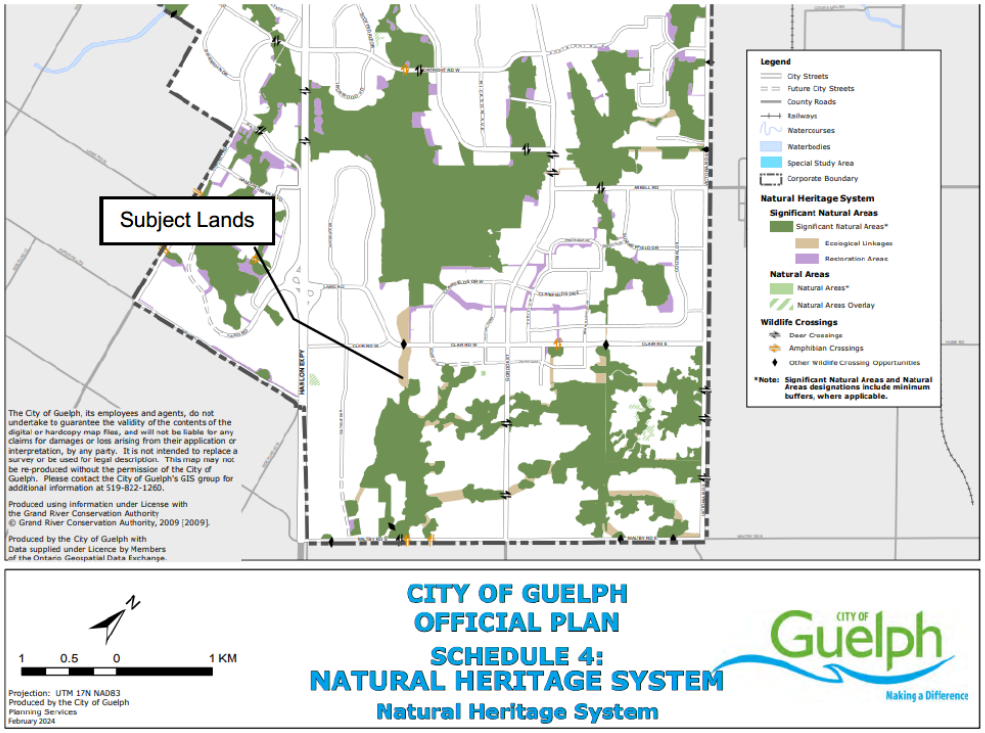
   Schedule C – Form of Authorization.

3. The Parties agree to keep the terms of this Agreement confidential except as required by law, save and except where otherwise provided in Clause 4 below, as otherwise may be required by the City of Guelph to advance the Proposed Official Plan Amendment (herein described), or disclosure to professional advisors;

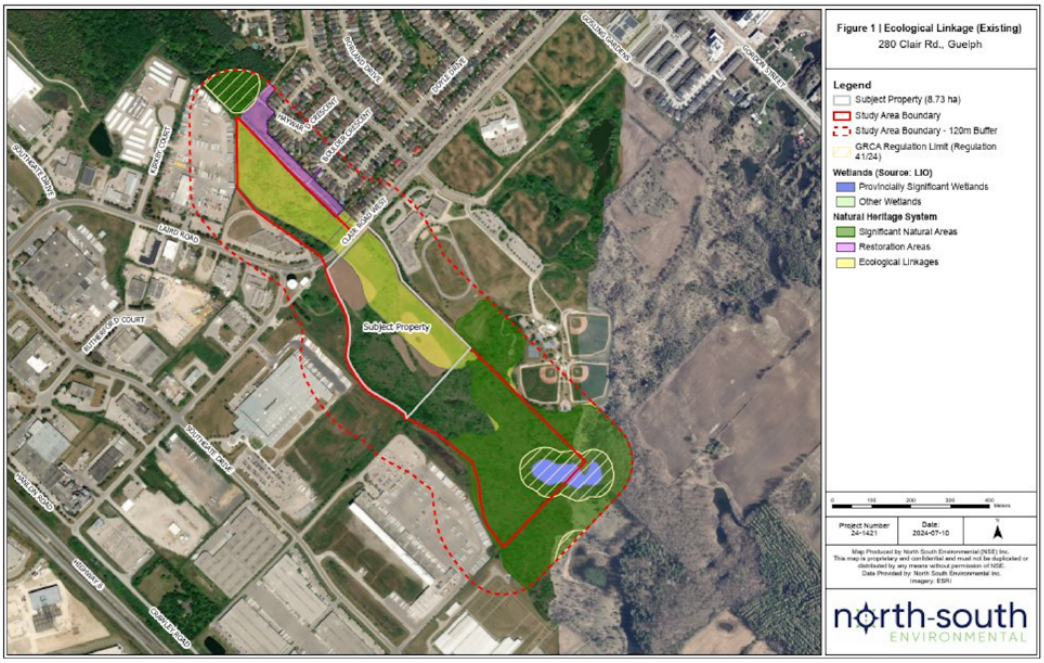
4. TDL agrees to execute the form of authorization attached as **Schedule C** hereto and authorize 274 and Home Opportunities to jointly act as agents to seek an amendment to the Official Plan to effect the relocation of the Ecological Linkage designation on a portion of the TDL Lands as generally shown in **Schedule B** (the “Proposed Official Plan Amendment”)

SCHEDULE A

Ecological Linkage as shown in
The City of Guelph Official Plan (February 2024 Consolidation)

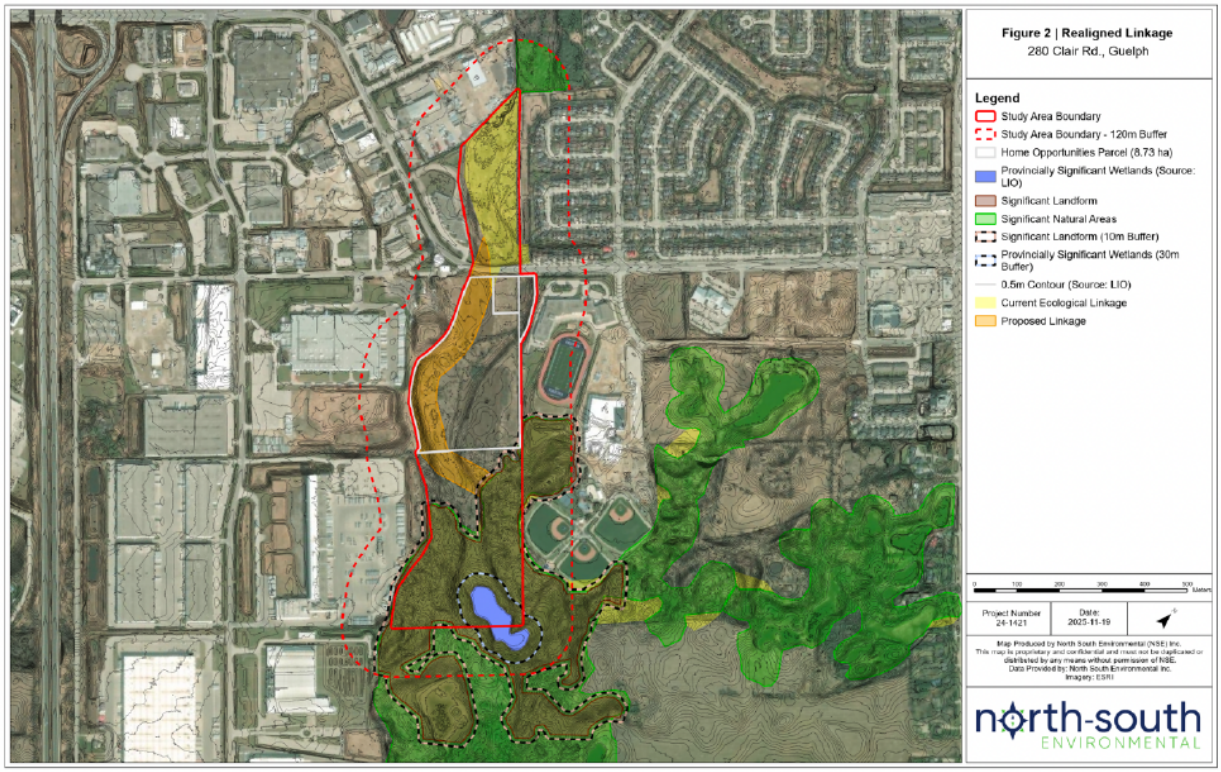


Ecological Linkage as shown in
The Constraints Memorandum - Ecological Linkage (Existing)
dated July 12, 2024
prepared by North-South Environmental



LEGAL*70432522.3

Schedule B
Proposed Realignment of Ecological Linkage Designation
dated November 14, 2025
prepared by North-South Environmental



SCHEDULE C
Authorization of Agent

7. Is the development a non-profit? (X) Yes ( ) No
8. The number of affordable units proposed, if applicable: 480
9. Is the application proposing industrial use expansion? If yes, indicate the % of proposed floor space for the expansion: No.
10. Do any of the ownership categories apply to the subject property: None

11. The number of residential units in the existing building proposed to be demolished:
N/A

Part 8 Coordination of Plans/Reports and Clearance from External Agencies

I/We, the undersigned have submitted all required materials, including all required plans/reports and they have been coordinated with the appropriate internal and external agencies:

(X) Yes ( ) No

(Initials of Applicant)

I/We, the undersigned have attained agency clearance from all required agencies/departments and clearance letters are included in this application submission:

(X) Yes ( ) No

(Initials of Applicant)

Part 9 Authorization and Declaration

9.1 Authorization of Agent

Must be completed by the owner if the Owner is not filing out the application

I / We, the undersigned,
The TDL Group Corp.

[Organization name / property owner's name(s)]

being the registered property owner(s) of
950 Southgate Drive

(Legal description and/or municipal address)

hereby authorize:

GSP Group Inc. (Hugh Handy/Michael Witmer)

(Authorized agent's name)

as my/our agent for the purpose of submitting an application(s) to the City of Guelph and acting on my/our behalf in relation to the application.

Dated this January 19 day of 20 26 .

DocuSigned by:
Jasbir Singh
D357FD33809E441...

1/19/2026

(Signature of the property owner) day month year

NOTES:

1. If the owner is a corporation, this appointment and authorization shall include the statement that the person signing this appointment and authorization has authority to bind the corporation (or alternatively, the corporate seal shall be affixed hereto).

2. If the agent or representative is a firm or corporation, specify whether all members of the firm or corporation are appointed or, if not, specify by name(s) the person(s) of the firm or corporation that are appointed.

9.2 Municipal Freedom of Information

In submitting this development application and supporting document, the owner or authorized agent, hereby acknowledge the City of Guelph will provide public access to all development applications and supporting documentation, and provide my consent, that personal information, as defined by Section 2 of the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) is collected under the authority of the Municipal Act, 2001, and in accordance with the provisions of MFIPPA. Information on this application and any supporting documentation provided by the owner/authorized agent, consultants and solicitors, will be posted online and available to the general public.

Questions regarding the collection, use, and disclosure of this information may be directed to the Information and Access Coordinator at privacy@guelph.ca or 519-822-1260 ext. 2349.

Signature of Owner or Authorized Agent Day Month Year