GEI Consultants

**Hydrogeological Investigation**

# Proposed Residential Development – Pine Valley Estates

9332 Country Road 93, Midland, ON

**Submitted to:**
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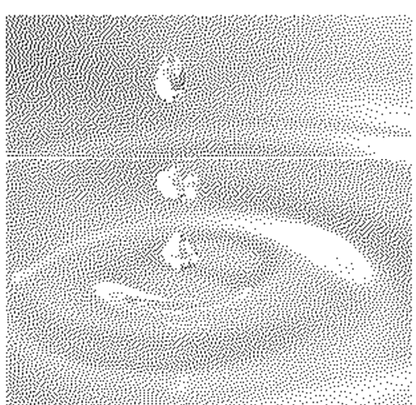

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# Record of Revisions

| Identification | Date | Description of Issued and/or Revision |
|---|---|---|
| First Submission | May 6, 2026 | Hydrogeological Investigation |
| | | |

# Acronyms and Abbreviations

| | |
|---|---|
| % | Percent (per 100 units) |
| < | Less than … |
| > | Greater than … |
| Δ | Change in … |
| µm | micrometer |
| ANSI | Area of Natural and Scientific Interest |
| APEC | Areas of Potential Environmental Concern |
| BESR | Brownfields Environmental Site Registry |
| bgs | Below Ground Surface |
| BH | Borehole |
| BH/MW | Borehole / Monitoring Well |
| cm | centimeters |
| CPT | Cone Penetration Test |
| CR | County Road |
| CTC | Credit Valley, Central Lake Ontario Conservation Authority, and Toronto and Region Conservation Authority |
| CVC | Credit Valley Conservation |
| DCPT | Dynamic Cone Penetration Test |
| EASR | Environmental Activity and Sector Registry |
| EBA | Event Based Area |
| ECA | Environmental Compliance Approval |
| Elev. | Elevation |
| EPA | Environmental Protection Act |
| ERIS | EcoLog Environmental Risk Information Services Ltd. |
| ESA | Environmental Site Assessment |
| ESGRA | Ecologically Significant Groundwater Recharge Area |
| ET | Evapotranspiration/Evaporation |
| FOS | Factor of Safety |
| FSR | Functional Servicing Report |
| GEI | GEI Consultants Canada Ltd. |
| GP | Guelph Permeameter |
| ha | hectares |
| HONI | Hydro One Networks Inc. |
| hr | hours |
| HVA | Highly Vulnerable Aquifer |
| I | Infiltration |
| ICA | Issue Contributing Area |
| ID | Identification |
| iPWQO | Interim PWQO |
| IPZ | Intake Protection Zone |

| | |
|---|---|
| K | Hydraulic Conductivity |
| kg | kilogram |
| km | Kilometres |
| kPa | Kilopascal |
| L | Litres |
| LID | Low Impact Development |
| LSRCA | Lake Simcoe and Region Conservation Authority |
| m | Metres |
| m3 | Cubic Meters |
| MECP / MOEE / MOECC / MOE | Ministry of Environment, Conservation and Parks / Ministry of Environment and Energy / Ministry of the Environment and Climate Change / Ministry of the Environment |
| min | minute |
| mm | Millimetres |
| MMAH | Ministry of Municipal Affairs and Housing |
| MNDM | Ministry of North Development |
| MNRF | Ministry of Natural Resources and Forestry |
| MW | Monitoring Well |
| N values | SPT "N Values" |
| NRC | Natural Resources Canada |
| NRCC | National Research Council of Canada |
| NVCA | Nottawasaga Valley Conservation Authority |
| O.Reg. | Ontario Regulation |
| OBC | Ontario Building Code |
| OD | Outside Diameter |
| ODWO | Ontario Drinking Water Objectives |
| ODWS/ ODWQS | Ontario Drinking Water Standards / Ontario Drinking Water Quality Standards |
| OGS | Ontario Geological Survey |
| o-Phosphate | ortho-Phosphate |
| OPSD | Ontario Provincial Standard Drawings |
| OPS | Ontario Provincial Standard |
| OPSS | Ontario Provincial Standard Specification |
| OWES | Ontario Wetland Evaluation System |
| OWRA | Ontario Water Resources Act |
| P | Precipitation |
| PHC | Petroleum Hydrocarbon |
| PTTW | Permit to Take Water |
| PWQO | Provincial Water Quality Objective |
| R | Runoff |
| RL | Reporting Limit |
| ROI/ROIs | Radius/Radii of Influence |

| | |
|---|---|
| ROW | Right-of-Way |
| RQD | Rock Quality Designation |
| RSC | Record of Site Condition |
| s | Seconds |
| S | Storage |
| SCS | Site Condition Standards |
| SGBLS | South Georgian Bay Lake Simcoe |
| SGRA | Significant Groundwater Recharge Area |
| SPT | Standard Penetration Test |
| SS | Split Spoon |
| SSEA | Severn Sound Environmental Association |
| SWM | Stormwater Management |
| SWMP | Stormwater Management Pond |
| SWRT | Single Well Response Test |
| TKN | Total Kjeldahl Nitrogen |
| TRCA | Toronto and Region Conservation Authority |
| TSS | Total Suspended Solids |
| USCS | Unified Soil Classification System |
| VOC | Volatile Organic Compound |
| WHPA | Wellhead Protection Area |
| WTRS | Water Taking and Reporting System |
| WWIS | Water Well Information System |

It is noted that all elevations in this report are metric/geodetic and expressed in m. All measurements are also in metric and expressed in mm, m, or km.

# 1. Introduction

GEI was retained by Pine Valley Estates Ltd. (the Client) to complete a hydrogeological investigation in support of the proposed residential development located at 9332 County Road 93, Midland, Ontario (the Site). The site location plan is enclosed as Figure 1.

This hydrogeological investigation was aimed to assess subsurface and groundwater conditions at the site and provide a report with recommendations on permitting requirements, preliminary infiltration capacity, construction dewatering, and precipitation runoff and infiltration.

## 1.1. Site & Project Description

The total land holding area is 27.64 ha while the developable area is located on the eastern half of the site and is approximately 16.91 ha. The developable area is approximately 440 m long (east to west) and 400 m wide (north to south). The property is bounded by vacant and forested lands to the north, south and west, while the property is bounded by commercial properties to the east. The site currently hosts vacant land, forested area and unevaluated wetlands. Based on the conceptual site plan provided by the client, the site is slated for a development of a new subdivision with three (3) apartment buildings and medium density townhouses.

GEI was provided with the following documents for review:

- “Concept Plan”, Drawing Name: PIN-19037-CP-1.dgn, by Jones Consulting Group Ltd., dated June 2025.

As part of the scope of work a geotechnical investigation was also carried out by GEI for the project which is provided under separate cover.

## 1.2. Objective

The objectives of the hydrogeological investigation for the proposed residential development at the property located at 9332 County Rd 93 includes:

a) Establish the local hydrogeological setting of the site.

b) Assess groundwater quality and compare the results to municipal sewer criteria, PWQO and PWQO metal guidelines.

c) Provide a preliminary analysis for construction dewatering rates based on the subsurface conditions and assumed site works and discuss the regulatory requirements.

d) Provide a preliminary water balance (pre-construction and post-construction) and;

e) Prepare a hydrogeological investigation report.

## 1.3. Scope of Work

The Hydrogeological Investigation included the following scope of work:

a) Conduct a background desktop review of pertinent geological and hydrogeological resources, MECP Water Well Records, surficial and bedrock geology mapping, Source Water Protection mapping, previous reports, and proposed site plan drawings.

b) Visit the site and note existing site conditions, site setting, topography, drainage, water features, and potential water wells within 500 m of the site, if any.

c) As part of the concurrent geotechnical investigation, GEI advanced ten (10) BHs to a depth of 6.0 m below grade and five (5) BHs to a depth of 12.0 m across the site and installed five (5) MWs in the 12.0 m deep BHs. MWs were developed following installation.

d) Measure groundwater levels in all MWs to assess groundwater table and groundwater flow direction.

e) Conduct SWRT's in select MWs to determine the hydraulic conductivity of overburden soils.

f) Collect and submit one (1) representative unfiltered groundwater sample for laboratory testing to compare against the PWQO standards for metals, and O. Reg. 153/04 SCS, as amended, for PHCs and VOCs, subject to sufficient available MW groundwater quantity.

g) Collect and submit one (1) representative filtered groundwater samples for laboratory testing to compare against the PWQO standards for metals, subject to sufficient available monitoring well groundwater quantity.

h) Carry out a dewatering assessment for construction and permitting requirements.

i) Complete a preliminary pre-to-post construction water balance.

j) Prepare a preliminary hydrogeological investigation to support design and permitting.

## 1.4. Applicable Regulations

### *1.4.1. Source Water Protection*

The site is within the jurisdictional boundary of the Severn Sound Source Protection Area, in the South Georgian Bay Source Protection Region. The following documents should be used in determination of the regulatory requirements when it comes to maintaining hydrogeological function at this site:

"Approved South Georgian Bay Lake Simcoe Source Protection Plan" as amended, by Lake Simcoe Region Conservation Authority, Nottawasaga Valley Conservation Authority, and Severn Sound Environmental Association, dated July 1, 2015, as amended. Based on Source Water Protection online mapping, the following is noted:

- Wellhead Protection Area (WHPA): The site is located partially within a WHPA-C1 (score of 4), partially within a WHPA-Q1 (moderate stress) and partially within a WHPA-Q2 (moderate stress) of the Midland Well Supply (Figure 3).

  - According to the Approved South Georgian Bay Lake Simcoe Source Protection Plan, Table 62. Land Use Planning Policies that Address Water Quality Threats, Policy Number LUP-12, "*Planning Approval Authorities shall only permit new major development (excluding single detached residential, barns and non-commercial structures that are accessory to an agricultural operation) in a WHPA-Q2 where the activity would be a significant drinking water threat, where it can be demonstrated through the submission of a hydrogeological study that the existing water balance can be maintained through the use of best management practices such as low impact development. Where necessary, implementation and maximization of off-site recharge enhancement within the same WHPA-Q2 to compensate for any predicted loss of recharge from the development*" as per the Policy Monitoring Requirement MON-1 for the applicable local areas (including York, Midland, Penetanguishene, Whip-Poor-Will, and Orangeville).
  - As the proposed commercial development at the site includes the construction of a building or buildings on a lot with a cumulative ground floor area equal to or greater than 500 m², and any other impervious surfaces, it is considered a *major development* according to the Approved South Georgian Bay Lake Simcoe Source Protection Plan.
- Intake Protection Zone (IPZ): The site is not located within an IPZ (Figure 4).
- Highly Vulnerable Aquifer (HVA): The site is not located within an HVA (Figure 5).
- Significant Groundwater Recharge Area (SGRA): The site is located within a SGRA with a score of 6 (Figure 6).

These designations under the Source Water Protection Plans will be used to assess the proposed development for significant threats to drinking water and to determine, if required, suitable monitoring and/or mitigation activities for the protection of drinking water resources.

### *1.4.2. Other Regulations*

- The site <u>is not located</u> within the Oak Ridges Moraine nor Niagara Escarpment planning areas.
- The site <u>is not located</u> in nor within 500 m of an ANSI.
- The site is located within the Midland Area Subwatershed of the South Georgian Bay Shoreline watershed.

### *1.4.3. Water Taking / Discharge - Temporary*

The volume of water entering the excavation during construction will be based on both groundwater infiltration and precipitation events. Based on O. Reg. 63/16, the following dewatering limits and requirements are as follows:

- Construction dewatering less than 50,000 L/day: The takings of both groundwater and stormwater do not require a hydrogeological report, does not require registration on the EASR from the MECP.
- Construction dewatering greater than 50,000 L/day: The taking of groundwater and/or stormwater requires a hydrogeological report and registration on the EASR from the MECP.

- Due to guidance provided by the MECP (ERO number 019-6853, last updated May 27, 2025), water taking for construction purposes only are eligible to be registered on the EASR, even if water taking rates are expected to exceed 400,000 L/day (per previous MECP guidance). If water taking for any purpose other than or in addition to construction dewatering occurs, a PTTW from the MECP may be necessary.

# 2. Background Review and Site Setting

## 2.1. Plans, Investigations, and Modelling by Others

### *2.1.1. Oak Ridges Moraine Groundwater Program Website (2018)*

The groundwater level measured on April 17$^{th}$, 2026, presented dry conditions. Without groundwater levels and potential variation in groundwater elevations on a yearly basis, a reference has been made to the Oak Ridges Moraine Groundwater Program (ORMGP) website to obtain local groundwater information.

While the site itself does not lie within the Oak Ridges Moraine (as discussed in Section 1.3.1.), it is within the ORMGP boundary. The ORMGP is a multi-agency, collaborative initiative in south-central Ontario, focused on understanding and managing regional water resources, especially groundwater. Spanning from the Halton and Nottawasaga Watersheds in the west to the Trent River in the east, the program covers a vast area extending north from Lake Ontario to beyond Lake Simcoe and the Kawartha Lakes.

The ORMGP mapping portal models a general water table called WT0,

> *"by contouring the static water levels from all wells where the well screen is less than 20 m deep. It should be noted that the measured static water levels reflect measurements from wells that were drilled in all seasons as well as in wetter and dryer years. So, the water table presented here is an average water table. Given the dynamic nature of the groundwater system, it should be noted that the actual water table at any given time of year may be on the order of up to 2 or 3 metres higher or lower than reflected in the map."*

Additionally, the ORMGP mapping portal can generate a further refined water table model called WT1 that

> *"displays the interpreted Water Table surface, constructed using water levels from shallow wells, larger streams and in some areas, intermediate depth wells."*

Reviewing the model results of WT0 and WT1 are useful for approximating the average water table elevation, depth to groundwater, and direction of groundwater flow for sites within the ORMGP boundary. According to the ORMGP models for groundwater levels, the average water table on-site is expected to be generally near Elev. 204 to 208 (26 to 22 m bgs).

Further, the ORMGP mapping portal models a deep potentiometric surface called PSO which

> *"shows the interpreted deep potentiometric surface using water levels from wells where the bottom of the screen is greater than 40 m below ground level."*

Reviewing the model results of PSO is useful for approximating the potentiometric surface of deeper wells including an indication of the general vertical direction of groundwater flow for sites within the ORMGP boundary. The deeper potentiometric surface on-site is expected to be generally near Elev. 233, suggesting a downward vertical gradient on-site. Considering that the current investigation wells are screened approximately 9.0 mbgs, the bottom of the monitoring wells installed on site is above the deeper potentiometric surface on-site.

### *2.1.2. Site Plan (2025) Jones Consulting Group Ltd.*

Based on the drawings provided, three 6-storey apartment buildings will be located in southeast corner of the property with high density parking lots surrounding them. Stacked townhomes and internal roadways will occupy the rest of the site linking to a main road/roundabout which will connect to existing roadways towards County Road 93. A 1.8 ha stormwater management facility is proposed in the northeast corner of the site. Parkland of varying sizes will be located throughout the site. It is understood that the development would be connected to municipal servicing. The concept plan for the development is provided in Figure 2B.

## 2.2. Topography and Drainage

The site is located within the Midland Area Subwatershed of the South Georgian Bay Shoreline watershed. The site is relatively gently sloping towards northeast from an elevation of 248.6 masl near BH10 towards 243.8 masl near BH3. Regionally, the topography slopes north or northeast towards Georgian Bay.

## 2.3. Site Physiography and Geological Setting

This site is located with the physiographic region denoted as the Simcoe Uplands physiographic region characterized by a series of broad, rolling till plains (Chapman, L.J. and Putnam, D.F., 2007). The predominant surficial geology of the site is described as glaciofluvial deposits along with coarse textured glaciolacustrine deposits of sand, gravel, minor silt and clay (OGS, 2010).

The bedrock underlying the general area predominantly corresponds to the Gull River Formation consisting of limestone. A small portion towards the southwest boundary is underlain by Bobcaygeon Formation, consisting of limestone with minor shales (OGS, 2010). Bedrock was encountered in the MECP Water Well Records within 500 m of site. According to the Oak Ridges Moraine Groundwater Program

## 2.4. Review of MECP Water Well Records

MECP water well records within 500 m of the site area were obtained from the MECP's online interactive well records map to assess the general nature of the groundwater resource in the near vicinity of the site, and historical/current uses of wells in the area, as shown in Figure 7 and summarized in Appendix A.

Sixty-eight (68) water well records were identified within 500 m of the site. A summary of the water well records is provided below.

**Table 2-1. Summary of MECP Water Well Records**

| Well Use | Number of Records | Year(s) Installed | Water Encountered (Type & Depth) | Well Screen / Open Hole (Media & Depth) |
|---|---|---|---|---|
| Domestic, Commercial, Public and/or Livestock | 22 | 1965 - 1999 | Fresh: 56.4 to 98.5 | Overburden: 0 m to 115.8 m |
| Monitoring, Observation, and/or Test Hole | 23 | 2009 - 2019 | Fresh: 50.9 m Untested: 5.5 to 98.1 m | Overburden: 0 m to 58.5 |
| Other, Not Used, and/or Not Listed | 23 | 1966 - 2023 | Untested: 50.9 m | Overburden: 0 m to 57.3 m |

The stratigraphic descriptions within the MECP monitoring well records are often inaccurate due to the methodology in which they are determined (observations of cuttings without depositional context and possibly some mixture between layers, plus no consistency between descriptions of soils between drillers). While this may be the case, an overall sense of the regional stratigraphy can be determined by looking at the commonalities between most stratigraphic descriptions and where the wells were terminated in an aquifer. Bedrock was not encountered in the well records within 500 m of site.

It is expected that all existing private water supply wells (used for domestic, livestock, industrial, or commercial purposes) on and/or within 500 m may not be in use as the surrounding area is serviced by the Town of Midland.

## 2.5. Review of MECP Permits to Take Water

Records of PTTW were obtained within 500 m of the site area from the Access Environment and MECP's online interactive permits to take water map to assess the general nature of the groundwater resources in the vicinity of the site, and the scale of historical/current groundwater takings required in the area. It should be noted that while these records indicate approved daily water taking volumes, it does not provide details on target depths for the water takings nor does it provide the actual volumes extracted, which could be less.

No active water taking records were found on-site, two permits to take water were found within 500 m surrounding the site within the search radius, the details are included below (Figure 8).

**Table 2-2. MECP Permit to Take Water**

| Permit Number | Permit Holder Name | Purpose | Specific Purpose | Max (L/day) | Source Type |
|---|---|---|---|---|---|
| 2406-AKPQ83 | The Corporation of the Town of Midland | Water Supply | Municipal | 1,963,800 | Ground Water |
| 4740-AXZGGA | Midland Golf & Country Club Limited | Commercial | Golf Course Irrigation | 1,090,195 | Ground Water |

# 3. Procedures and Methodology

## 3.1. Borehole Drilling & Monitoring Well Installation

The fieldwork for the drilling program was carried out between March 23 and March 30, 2026. Boreholes 1, 3, 9, 14 and 15 were drilled 12.6 to 24.8 m below existing grade (Elev. 218.9 to 233.9) in an attempt to capture the deep groundwater table that the area is known for. Boreholes 2, 4 to 8, and 11 to 13 were drilled 6.6 m below existing grade (Elev. 257.1 to 259.7).

The BH locations were laid out in the field by GEI staff prior to commencement of drilling operations. The locations of U/G utilities were coordinated with locating companies. Ground surface elevations of the BHs and coordinates (referencing NAD 83 geodetic datum) were surveyed by GEI with a Topcon FC – 5000 GPS Survey unit. The elevations are provided on the BH logs in Appendix B. BH and MW locations are shown in Figures 2A/B.

Drilling and sampling of the BHs was completed using track mounted drilling equipment operated by a specialty drilling subcontractor retained and supervised by GEI. The BHs were advanced to predetermined depths using solid stem augers and sampling was conducted using a 51 mm O.D. SS sampler. SPT N values were recorded for the sampled intervals as the number of blows required to drive an SS sampler 305 mm into the soil using a 63.5 kg drop hammer falling 750 mm, in accordance with ASTM D1586. Soil sampling was conducted at 0.75 m intervals for the upper 3.0 m and at 1.5 m intervals thereafter.

The MWs consisted of 50 mm diameter PVC pipes and protective casing. The MWs were installed with 1.5 m or 3.0 m long screens where sufficient overburden was available. BHs without MWs were backfilled in accordance using industry best practices. MWs construction is shown on the BH logs in Appendix B1/B2 and summarized below in Table 3-1.

**Table 3-1. Summary of Monitoring Well Installation Details**

| Monitoring Well ID | Ground Surface Elevation (masl) | Screen Intervals (mbgs) | |
|---|---|---|---|
| | | Top | Bottom |
| MW1 | 244.8 | 1.70 | 3.20 |
| MW3 | 243.8 | 2.10 | 3.60 |
| MW9 | 245.9 | 0.80 | 2.30 |
| MW14 | 246.5 | 1.20 | 2.30 |
| MW15 | 245.5 | 0.70 | 2.20 |

The GEI field staff examined and classified characteristics of the soils encountered in the BHs, including the presence of fill materials, groundwater observations during and upon completion of the drilling, recorded observations of BH advancement, and processed the recovered samples. All recovered soil samples were logged in the field, carefully packaged, and transported to the laboratory for more detailed examination and classification.

In GEI's laboratory, the soil samples were classified as to their visual and textural characteristics. All samples were submitted for moisture content determination in accordance with ASTM D2216. Ten (10) samples of the subgrade soils were selected and submitted to our laboratory for grain size analysis. Grain size results are provided in Appendix C.

## 3.2. Groundwater Level Measurements

Groundwater levels are to be measured monthly at all monitoring wells using a manual water level reader/meter. The monitoring is proposed to take place for a period of one (1) year to capture seasonal groundwater level fluctuations.

## 3.3. Hydraulic Conductivity Testing

Single well response tests (SWRTs) were proposed to be conducted to estimate the horizontal hydraulic conductivity (K) of the soils at the depths of the well screens. These tests were proposed to be carried out in monitoring wells at the site with adequate water volume available (>0.5 m column of water) after drilling, development and stabilization of groundwater levels.

Sufficient water was not present in the wells at the time of this report therefore no SWRTs were carried out.

## 3.4. Groundwater Sampling

To establish baseline conditions and assess the most suitable discharge options for pumped groundwater during potential dewatering activities, the following groundwater samples are proposed to be collected from monitoring wells on site:

- One (1) unfiltered groundwater sample was collected and analyzed against O.Reg.153/04 PHCs and VOCs, and PWQO for metals and TSS;
- One (1) filtered groundwater samples were collected and analyzed against PWQO for metals and TSS only.

It is noted that sufficient groundwater was not present in the wells at the time of report writing and therefore water quality samples were not collected.

## 3.5. Preliminary Infiltration Testing

GEI conducted infiltration testing using a Guelph Permeameter (GP) apparatus (Model 2800K1). As per industry best practices in Southern Ontario, the infiltration testing conducted by GEI generally conformed to the methodology laid out in the NVCA Stormwater Technical Guide, dated December 2013. In this regard:

- Hand augers were used to drill the holes (pits) with a radius of 3 cm.
- The test type was combined (inner and outer reservoir) infiltration test.
- The testing did not occur during a precipitation event nor within 24 hours of a significant rainfall event, and the temperature was above freezing.

# 4. Subsurface Conditions

The detailed soil profiles encountered in the boreholes are indicated in the attached borehole logs in Appendix B. The geotechnical laboratory results are included in Appendix C. The borehole locations are shown on Figure 2A and 2B.

It should be noted that the conditions indicated on the borehole logs are for specific locations only and can vary between and beyond the locations. It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. The boundaries are intended to reflect approximate transition zones and should not be interpreted as exact planes of geological change.

In addition, the descriptions provided in the borehole logs are inferred from a variety of factors, including visual observations of the soil samples retrieved, measurements prior to and after drilling, and the drilling process itself (speed of drilling, shaking/grinding of the augers, etc.) and laboratory testing. The passage of time may also result in changes in conditions to exist at locations where sampling was conducted.

## 4.1. Stratigraphy

### *4.1.1. Topsoil*

A topsoil layer was at the ground surface in all boreholes. Topsoil thickness measurements are provided below.

| Borehole No. | Topsoil Thickness (mm) |
|---|---|
| 1 | 50 |
| 2 | 75 |
| 3 | 75 |
| 4 | 75 |
| 5 | 75 |
| 6 | 50 |
| 7 | 75 |
| 8 | 75 |
| 9 | 75 |
| 10 | 50 |
| 11 | 50 |
| 12 | 50 |
| 13 | 150 |
| 14 | 50 |
| 15 | 150 |

Topsoil thickness may vary between boreholes and in other areas of the site.

### *4.1.2. Silty Fine Sand*

Underlying the topsoil in all boreholes except Borehole 3, a surficial layer of silty fine sand was encountered and was penetrated at 0.8 to 3.0 m depth (Elev. 242.3 to 246.0). Trace organics were noted in some samples. The layer was moist to wet with moisture contents ranging from 5 to 31%. N values in the soil ranged from 4 to 10 blows, indicating very loose to loose conditions.

### *4.1.3. Silt and Sand / Sand and Silt*

Underlying the surficial silty fine sand in boreholes 2, 4, 7, 8, 10, 11, 12, 13, 14, and 15, an upper silt and sand (locally sand and silt) layer was encountered and extended to 4.6 to 10.7 m depth (Elev. 234.9 to 241.4). Three (3) samples of the material were submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to locally wet with moisture contents of 3 to 20 %. The N values ranged from 5 to 62 blows, indicating loose to very dense, but typically compact, conditions.

Intermittent sand and silt to silt and sand layers were encountered in Borehole 1 from 4.6 m to 6.1 m depth (Elev. 238.7 to 240.2) and from 9.1 to 15.2 m depth (Elev. 229.6 to 235.7). The soil was moist with moisture contents of 2 to 8 %. The N values ranged from 22 to 49 blows, indicating compact to very dense, but typically dense, conditions.

An intermittent sand and silt layer was encountered in Borehole 3 from 6.1 to 9.1 m depth (Elev. 234.6 to 237.7). The soil was moist to locally wet with moisture contents of 10 to 22 %. The N values ranged from 16 to 46 blows, indicating compact to dense conditions.

An underlying silt and sand layer was encountered in Borehole 6 from 4.6 to 6.6 m depth of exploration (Elev. 239.8 to 241.8). The soil was moist with moisture contents of 4 and 5%. The N values ranged from 25 to 27 blows, indicating compact conditions.

An underlying sand and silt layer was encountered in Borehole 9 from 4.6 to the 12.6 m depth of exploration (Elev. 233.2 to 241.3). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to locally wet seams with moisture contents of 2 to 18%. The N values ranged from 32 to 43 blows, indicating dense conditions.

### *4.1.4. Silt*

Underlying the surficial silty fine sand in boreholes 5 and 6, an upper silt, some sand, trace clay, was encountered and extended to 4.6 to 6.6 m depth (Elev. 238.0 to 241.8). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to locally wet with moisture contents of 5 to 27 %. The N values ranged from 4 to 38 blows, indicating very loose to dense, but typically dense, conditions.

Underlying the silt and sand/sand and silt layer in boreholes 12 and 13, a silt, trace sand, trace clay, was encountered and extended to the 6.6 m depth of exploration (Elev. 238.3 to 239.5). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist with moisture contents of 7 to 20 %. The N values ranged from 29 to 50 blows, indicating dense to very dense conditions.

An underlying silt layer was encountered in Borehole 15 from 15.2 to the 17.2 m depth of exploration (Elev. 228.3 to 230.3). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to wet with moisture contents of 15 to 21 %. The N value was 57 blows, indicating very dense conditions.

### *4.1.5. Sand*

Underlying the surficial silty fine sand in boreholes 1 and 9, and underlying the topsoil in Borehole 3, an upper sand with trace to some silt was encountered and extended to 4.6 to 6.1 m depth (Elev. 237.7 to 241.3). Trace organics were noted in the upper sand layer in Borehole 3. The soil was moist with moisture contents of 5 to 9 %. The N values ranged from 6 to 21 blows, indicating loose to compact conditions.

An Intermittent sand layer was encountered in Borehole 1 from 6.1 to 9.1 m depth (Elev. 235.7 to 238.7). The soil was moist with moisture contents of 2 %. The N values ranged from 50 to 52 blows, indicating very dense conditions.

An underlying sand deposit was encountered in Borehole 1 from 15.2 to the 21.8 m depth of exploration (Elev. 223.0 to 229.6). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist with moisture contents of 1 to 3 %. The N values ranged from 37 to greater than 100 blows, indicating dense to very dense conditions.

An underlying sand deposit was encountered in Borehole 3 from 9.1 to the 24.8 m depth of exploration (Elev. 218.9 to 234.6). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to wet with moisture contents of 2 to 14 %. The N values ranged from 44 to 79 blows, indicating dense to very dense conditions.

Underlying the silt and sand layer in Borehole 14, an underlying sand unit was encountered and extended to the 12.6 m depth of exploration (Elev. 233.9). One (1) sample of the material was submitted for grain size analysis, and the results are provided in Appendix C. The soil was moist to very moist with moisture contents of 2 to 9 %. The N values ranged from 38 to 68 blows, indicating dense to very dense conditions.

Underlying the sand and silt layer in Borehole, a sand unit was encountered and extended to 15.2 m depth (Elev. 230.3). The soil was moist with moisture contents of 3 %. The N values ranged from 44 to 70 blows, indicating dense to very dense conditions.

## 4.2. Groundwater Conditions

Unstabilized groundwater level measurements and cave measurements were taken upon the completion of drilling of each borehole as shown on the borehole logs in Appendix B. These measurements were taken to provide a rough estimate of the possible excavation and temporary groundwater control constructability considerations that may arise. Monitoring well configuration and groundwater observations are noted on the borehole logs in Appendix B, it should be noted that water was not encountered in any of the wells during the monitoring event on April 17th, 2026.

Groundwater levels are expected to show seasonal fluctuations and vary in response to prevailing climate conditions. Groundwater level monitoring will continue on a monthly basis to confirm if water is encountered on site.

## 4.3. Surficial Infiltration Conditions

The field-saturated hydraulic conductivity of the soil was calculated using the one-head method which is calculated as follows:

$$K_{fs} = \frac{C_1 Q_1}{2H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{a^*}}$$

Where:

| | |
|---|---|
| $K_{fs}$ | field-saturated hydraulic conductivity (cm/s) |
| $C_1$ = | shape factor |
| $Q_1$ = | flow rate ($cm^3$/s) |
| $H_1$ = | water column height (cm) |
| a = | well radius (cm) |
| α* = | alpha factor (0.01 to 0.36 $cm^{-1}$) |

The infiltration rates (I, in mm/hour) were estimated using the TRCA Stormwater Management Criteria (2012) recommended approach, equation below.

$$K_{fs} = 6 * 10^{-1} \ (I)^{3.7363}$$

The graphical representation of testing results and detail of calculation is provided in Appendix D. A summary of estimated field-saturated hydraulic conductivity and infiltration rates is provided in Table 4-2. The location of the infiltration tests is shown on Figure 2A.

**Table 4-1.Guelph Permeameter Testing Results**

| Test Location | Depth (m) | Soil at Test Elevation | Field-Saturated Hydraulic Conductivity (cm/s) | Infiltration Rate (mm/hr) | Factor of Safety | Factored Infiltration Rate for Design (mm/hr) |
|---|---|---|---|---|---|---|
| GP1 – Test Pit 15 | 0.9 | Silty Fine Sand | $2.6 \times 10^{-2}$ | 204.1 | 2 | 102 |
| GP2 – Test Pit 14 | 0.6 | Silty Fine Sand | $3.8 \times 10^{-3}$ | 122.9 | 2 | 61 |
| GP3 – Test Pit 9 | 0.5 | Silty Fine Sand | $8.3 \times 10^{-3}$ | 151.1 | 2 | 76 |
| GP4 – Test Pit 1 | 0.7 | Silty Fine Sand | $9.6 \times 10^{-3}$ | 157.0 | 2 | 79 |
| GP5 – Test Pit 3 | 0.6 | Sand | $6.4 \times 10^{-3}$ | 140.9 | 2 | 70 |

The recommended factor of safety for the fine sand is 2 based on the *CVC Low Impact Development Stormwater Management Planning and Design Guide*. It is noted that infiltration cannot occur below the groundwater table. It is recommended that infiltration elevations to be kept at least 1 m above the seasonally high groundwater level.

The factored infiltration rate of the silty fine sand for design is 27.3 to 45.4 mm/hr. The factored infiltration rate of the sand for design is 31.3 mm/hr.

GEI understands that LID infiltration measures will be designed and constructed on site, however the location and design details are not currently finalized. GEI can further refine the infiltration rates by excavating test pits and conducting additional Guelph Permeameter tests in the exact footprints and elevations of the LID measures.

It is not recommended to infiltrate into existing earth fill deposits. If significant grade raises are required and LIDs are designed to infiltrate into imported fill, uniform deposits of fill could be placed under careful observation with quality control procedures, and additional post-compaction infiltration testing would need to be completed.

# 5. Site Dewatering

## 5.1. Preliminary Construction Dewatering

This section of the report presents hydrogeological assumptions, assessments and recommendations based on the following proposed developments plan:

- "Site Plan, Pine Valley Estates, 9332 County Road 93, Midland, Ontario, Project No. 16142 ", Prepared by Orchard Design Studio Inc., dated January 16, 2026.

The recommendations are based on our understanding of the project and results of the field investigation. The interpretation and recommendations are intended for the use of the design consultant and Client and shall not be relied upon by any other parties including the construction contractor or used for any purposes other than development of the project design.

Comments on construction methodology and equipment, where presented, are provided only to highlight those aspects that could affect the design of the project. Contractors must make their own assessment of the information presented in previous sections of the report, and the implications on equipment selection, construction methodology, and scheduling.

The following calculations for the excavations are based on the assumed groundwater conditions for temporary dewatering rates anticipated to occur during construction, permanent dewatering is not expected for the proposed development. To reflect the conditions during construction, GEI should be retained to measure groundwater levels immediately before construction and incorporate the results into updated short-term construction dewatering rate calculations.

It should be noted that these calculations have been prepared using the drawings provided to GEI. Should the design change, updated drawings will need to be provided, and GEI will need to update the calculations to confirm that any recommendations presented here remain valid.

### *5.1.1. Construction Description & Dewatering Assumptions*

The dewatering assessment in the following sections assumes open-cut excavations or permeable shoring. A mitigated "worst case scenario" approach has been applied to these preliminary dewatering calculations. This approach assesses the reasonable potential impact and suggests methods to consider during construction dewatering.

Based on the drawing provided, three (3) 6-storey apartment buildings will be located at the southeast corner of the property with high density parking lots surrounding them. Some underground levels are begin considered. Stacked townhomes and internal roadways will occupy the rest of the site linking to a main road/roundabout which will connect to existing roadways towards County Road 93. A 1.8 ha stormwater management facility is proposed in the northeast corner of the site. Parklands of varying sizes will be located throughout the site. It is understood that the development would be connected to existing municipal services.

At this time, excavations for the project are anticipated to extend to about 3.0 to 5.0 m below existing grade to account for the buildings, trenches for site servicing and the SWM pond.

Ground surface elevation ranges from an Elev. 246.8 to 243.8, the excavations will extend from approximately Elev. 243.8 to 238.8 on site. Groundwater was not encountered on site from 12.2 to 24.6 mbgs (Elev. 234.3 to 219.1) and will not intersect the bottom of the excavation. Based on the assumptions provided, the dewatering rate calculations are summarized in Table 5-1 below. It should be noted that due to the expected highest groundwater elevation is lower than the depth of the expected excavation, no dewatering rate flow is expected for the construction of the proposed future building with one level of basement, site servicing excavations, or SWM pond installation.

**Table 5-1. Summary of Construction Dewatering**

| Parameters | Unit | Dewatering Zone | | | |
|---|---|---|---|---|---|
| | | Apartment Building | Largest Townhouse block | Site Servicing | SWM Pond |
| Lowest Grade Elevation | masl | 243.8 | 243.8 | 243.8 | 243.8 |
| Excavation Length | m | 85 | 45 | 20.0 | 200 |
| Excavation Width | m | 30 | 15 | 4.0 | 100 |
| Lowest Excavation Elevation | masl | 238.8 | 238.8 | 238.8 | 238.8 |
| Groundwater Drawdown Target | masl | 237.8 | 237.8 | 238.3 | 237.8 |
| Measured Highest Groundwater Elevation | masl | <219.1 | <219.1 | <219.1 | <219.1 |
| Radius of influence (from center of excavation) | m | **n/a** | **n/a** | **n/a** | **n/a** |
| Dewatering Rate | L/day | **0** | **0** | **0** | **0** |
| 25mm Storm Event | L/day | **63,750** | **16,875** | **2,000** | **500,000** |

Please note that the anticipated dewatering rate may increase if larger excavations are undertaken beyond the assumptions detailed in the preceding section. The calculated dewatering rates below are based on the current assumptions; however, larger excavations would likely elevate the overall dewatering requirements beyond these calculations. Excavations are currently understood to be above the groundwater table and dewatering, or sump pumping may be required due to a local perched water or rainfall.

### *5.1.2. Permit Recommendations*

Given that the estimated preliminary temporary water taking rates for construction dewatering on site are calculated below 50,000 L/day, a registration on the EASR system is not anticipated for construction dewatering works on site (latest MECP regulations).

Dewatering more than 50,000 L/day shall not take place until the proposed water taking is registered with the MECP.

The flow calculation is intended to provide an estimate for planning purposes. It should be noted that the dewatering estimates provided in this report are based on assumptions and details available at the time of this report. If changes to the design are implemented (e.g., increase to planned excavation depths, widening of excavations, increased length of trenching etc.), the dewatering estimates must be revised to include and reflect future changes and to ensure that any conclusions or recommendations made by GEI remain valid.

Additionally, to reflect the conditions during construction, GEI should be retained to measure groundwater levels immediately before construction and incorporate the results into updated short-term construction dewatering rate calculations.

### *5.1.3. Remedial Dewatering Activities*

The dewatering contractor will be responsible for finalizing and implementing the discharge plan, including information such as the exact discharge location, erosion control methods, method of conveyance, treatment systems, temperature of the discharged groundwater, etc. It is the contractor's responsibility to implement a treatment system to ensure that discharged groundwater meets the applicable standards. This may be done by examining the hydrogeologic conditions in a test pit (and/or a full-range pumping test by the dewatering subcontractor).

Treatment and disposal of the dewatering discharge should follow best management practices, including sediment and erosion control measures, removal of suspended solids by a decanting tank and/or filter bag, as well as water quality and quantity control monitoring programs, as mentioned earlier. The contractor should be aware that the purpose of the dewatering system is to maintain stable excavation slopes and dry working conditions during excavation.

The extent and details of the dewatering scheme (trench or well dimensions, spacing, pump levels, screen size and wick gradation, etc.) are left solely to the contractor's discretion to achieve the performance objectives for maintaining stable slopes and dry working conditions and will be based on their own interpretation and analysis of site conditions, equipment, experience, and efficiency. The contractor should also appreciate that additional dewatering means and modifications may be required as variations in site conditions are encountered.

# 6. Preliminary Water Balance

## 6.1. Water Balance Components

A water balance is an accounting of the water resources within a given area. A water balance analysis is conducted to assess the difference between pre-development and post-development conditions with respect to infiltration conditions. The water balance equates the precipitation (P) over a given area to the summation of the change in groundwater storage (S), evapotranspiration/evaporation (ET), surface water runoff (R) and infiltration (I) using the following equation from Thornthwaite and Mather (1957):

$$\mathrm{P} = S + I + ET + R$$

The components of the water balance vary in space and time and depend on climatic conditions as well as the soil and land cover conditions (i.e., rainfall intensity, land slope, soil hydraulic conductivity and vegetation). For example, runoff occurs at a higher percentage during periods of snowmelt when the ground is frozen or during intense rainfall events.

Precise measurement of the water balance components is difficult, and as such, approximations and simplifications are made to characterize the water balance of a property. Field observations of the drainage conditions, land cover and soil types, groundwater levels and local climatic records are important inputs to the water balance calculations.

- Precipitation (P): For the purposes of approximating the annual precipitation at this site, the monthly rainfall between 1981 and 2000 was used based on Environment Canada historical weather data for the “Midland Water Pollution Control Plant” weather station. This climate station is approximately 4km away from the Site area.
- Storage (S): Although there are groundwater storage gains and losses on a short-term basis, the net change in groundwater storage on a long-term basis is assumed to be zero.
- Evapotranspiration/Evaporation (PET): The evapotranspiration and evaporation components vary based on the characteristics of the land surface cover (i.e., type of vegetation, soil moisture conditions, perviousness of surfaces, etc.). Potential evapotranspiration refers to the water loss from a vegetated surface to the atmosphere under conditions of an unlimited water supply. For the purposes of this assessment, adjusted monthly PET was estimated based on the Thornthwaite and Mather (1957) formula, using information from Midland Water Pollution Control Plant climate station. The unadjusted PET was then adjusted using factor of U to account for variation in daylight hours and solar radiation based on the Site latitude.
- Water Surplus (R + I): The difference between the mean precipitation and evapotranspiration is referred to as the water surplus. The water surplus is divided into two parts: as surface or overland runoff (R) and the infiltration into the surficial soil (I). The infiltration and runoff conditions depend on a number of factors including soils type, vegetation cover and slope of the site. To estimate the infiltration, an infiltration factor was estimated based on the Ontario Stormwater Management Planning and Design Manual (March 2003). According to this Manual, a series of infiltration factors can be applied to a site, based on its slope, soil type and vegetation coverage. The cumulative

value of these factors is termed the infiltration factor, with the values ranging from 0 to 1. The difference between the value 1 and the infiltration factor is referred to as the runoff factor.

## 6.2. Water Balance Approach and Methodology

The analytical approach to calculate the water balance involves monthly soil-moisture balance calculations to determine the pre- and post- development infiltration volumes. The detailed water balance calculation is provided in Appendix J, which is summarized in this and subsequent sections of the report. The following assumptions were used as part of the soil-moisture balance calculations:

- A soil moisture balance approach assumes that soil does not release water as potential recharge while a soil moisture deficit exists.
- During wetter periods, any excess of precipitation over evapotranspiration first goes to restore soil moisture. Considering the nature of the current near surface soils and vegetation cover, a soil moisture storage capacity of 100 mm was assumed for pre- and post- development scenarios.
- Once the soil moisture deficit is overcome, any further excess water can then pass through the soil as infiltration and either become interflow (indirect runoff) or recharge (deep infiltration).

The Thornthwaite and Mather analytical approach (1957) was used to calculate the water balance and involves monthly potential evapotranspiration calculations accounting for latitude, climate and the actual evapotranspiration and water surplus. The MECP SWM Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding infiltration factor was calculated for pre- and post-development conditions. The water surplus was multiplied by the infiltration factor to determine both the pre-existing and post-condition annual volumes for run-off and infiltration for the property.

The pre-development scenario was estimated from the site inspection and aerial images. As the site is vacant and predominantly covered forested area, the condition of the site pre-development is estimated to be 100% permeable and 0% impermeable. The post-development water balance scenario was estimated based on the development preliminary site plan by Jones Consulting Ground Ltd, dated June 2, 2025. The post-construction scenario assumes 66% of the site remains permeable land. The remaining 34% of the land is assumed to be impermeable and consists of buildings and paved areas. The current site plans are preliminary and subject to change. The water balance must be updated following final site configuration to reflect the final site plan.

It is noted that the infiltration and runoff values presented in Appendix J are estimates only. Single values are used for water balance calculations, but it is important to understand that infiltration rates are dependent upon the hydraulic conductivity of the surficial soils which may vary over several orders of magnitude. As such, the margins of error for the calculated infiltration and runoff component values are potentially quite large. These margins of error are recognized, but for the purposes of this assessment, the numbers used in the water balance calculations are considered reasonable estimates based on the site-specific conditions and useful for comparison of pre- to post-development conditions.

## 6.3. Pre to Post-development Water Balance Analysis

Detailed water balance calculations are included in Appendix F. The pre- and post- development calculations summarized in this section are preliminary only and must be updated once site plans are finalized.

**Table 6-1. Summary of Pre- and Post-Development Water Balance Conditions**

| Condition | Total Area (ha) | Relative Permeable Areas | Relative Impermeable Areas | Average Annual Infiltration Volume ($m^3$/year) | Average Annual Runoff Volume ($m^3$/year) |
|---|---|---|---|---|---|
| Pre-/Existing Development Land Use | 27.6 | 100% | 0% | 77,850 | 63,696 |
| Post-/Proposed Development Land Use | | 66% | 34% | 51,212 | 129,376 |
| Pre- to Post-Development Change | | | | | |
| Relative Change (%) | | | | -34% | + 103% |
| Annual Volume Change ($m^3$/year) | | | | -26,639 | + 65,681 |

These calculations suggest that, without mitigation such as LID measures, the proposed development will decrease average infiltration by approximately 26,639 $m^3$/year (34% decrease). The proposed development will increase runoff by approximately 129,376 $m^3$/year (103% increase). This means approximately 26,639 $m^3$/year of infiltration is required to maintain the water balance. The potential impacts of these changes and recommended mitigation measures are discussed below.

## 6.4. Recommended Mitigation Measures

As indicated in the previous Section, the proposed development will cause a reduction in infiltration/recharge that needs to be mitigated. The three broad categories which typically need to be mitigated and accounted for are:

- Reducing the volume and speed in which additional surface water runoff occurs;
- Increasing the amount of infiltration to match pre-development conditions; and
- Ensuring that the quality of existing surface water features and groundwater will not be adversely impacted.

It is understood that the client will be implementing LID features on this site. Details have not been yet provided to GEI. In general, it is recommended that the base of the infiltration facilities penetrate at least into the native soils on site and may be limited by soil type. LID features are required to maintain a clearance of 1 m from the groundwater table.

### *6.4.1. Runoff Quantity*

Urban development of an area affects the natural water balance. The most significant difference is the addition of impervious surfaces as a type of surface cover (e.g., roads, parking lots, driveways, rooftops). Impervious surfaces prevent infiltration of water into the underlying soils and the removal of the vegetation reduces the evapotranspiration component of the natural water balance. The evaporation component from impervious surfaces is relatively minor (estimated to be 15% of precipitation) compared to the evapotranspiration component that occurs with vegetation in this area (up to two thirds of precipitation). So, the net effect of the urbanization of the site is that most of the precipitation that falls onto impervious surfaces increases the surplus water resulting in more direct runoff from developed areas and reduced natural infiltration.

In conjunction with increased runoff, there is a reduction in infiltration to the shallow groundwater system. A reduction in infiltration can potentially lead to a lowering of the local water table and reduce the potential for this seasonal water table intersection and discharge.

Methods which do not necessarily increase infiltration rate, but decrease the volume and concentration of surface water runoff can be considered at this site include (but are not limited to):

- Increasing the topsoil thickness by about two times the normal thickness (up to 30 cm) to retain more water in storage; and
- Implementation of rainwater harvesting which intercepts, diverts and stores roof runoff (i.e., cisterns) for future use.

### *6.4.2. Mitigation Measures for Maintaining Infiltration*

The increases in surface water runoff that will occur with urban development and mitigation of the potential impacts to the local water table due to reduction of infiltration may be minimized by using appropriate SWM and using LID measures to promote infiltration. These measures can be implemented on-site.

The basic premise for LID is to try to minimize changes to runoff and infiltration. As outlined in the MECP SWM Practice Design Manual (2003), Technical Guidelines for SWM Submissions published by the LSRCA (2022), and LID SWM Planning and Design Guide published by the CVC and TRCA (2010), and industry standard for best practices in Southern Ontario, there are a suite of techniques that may be considered to promote infiltration and reduce runoff.

Should LID measures such as the SWM pond and/or others be implemented for the site, the details and designs should demonstrate through plans and sections (including all dimensions, materials used and including the seasonal high groundwater level) how this infiltration deficit will be mitigated.

As it is typically a requirement of maintaining the same levels of infiltration post construction, no appreciable change in the groundwater table elevation should occur over the long-term condition.

If LID infiltration measures will be designed and constructed on site, it is recommended to measure the in-situ infiltration rates by excavating test pits and conducting GP tests in the exact footprints and elevations of the LID measures.

### *6.4.3. Groundwater Quality*

Depending on land use, runoff from urban developments may contain a variety of dilute contaminants such as suspended solids, chloride from road salt, oil and grease, metals, pesticide residues, phosphorous, bacteria and viruses. For groundwater, generally except for the dissolved constituents such as nitrogen and salt, most contaminants are attenuated by filtration during groundwater flow through the soils.

LID measures or end treatments such as oil/grit separators or wet ponds also help to remove suspended solids and other contaminants in runoff prior to infiltration or conveying the flows off the site, especially when a treatment train approach is taken for SWM. Any SWM facilities must be designed such that the water quality is maintained or improved prior to discharging water from the site or infiltrating water into the ground.

Runoff from rooftops and landscaped areas are typically considered “clean” and can be collected and infiltrated where possible. Infiltration-based practices for runoff from paved areas may be restricted for the proposed commercial development or may require pre-treatment prior to any infiltration.

Provided only clean or pre-treated runoff will be infiltrated, the groundwater quality will not be degraded and will not impact nearby domestic wells or other nearby environmental features.

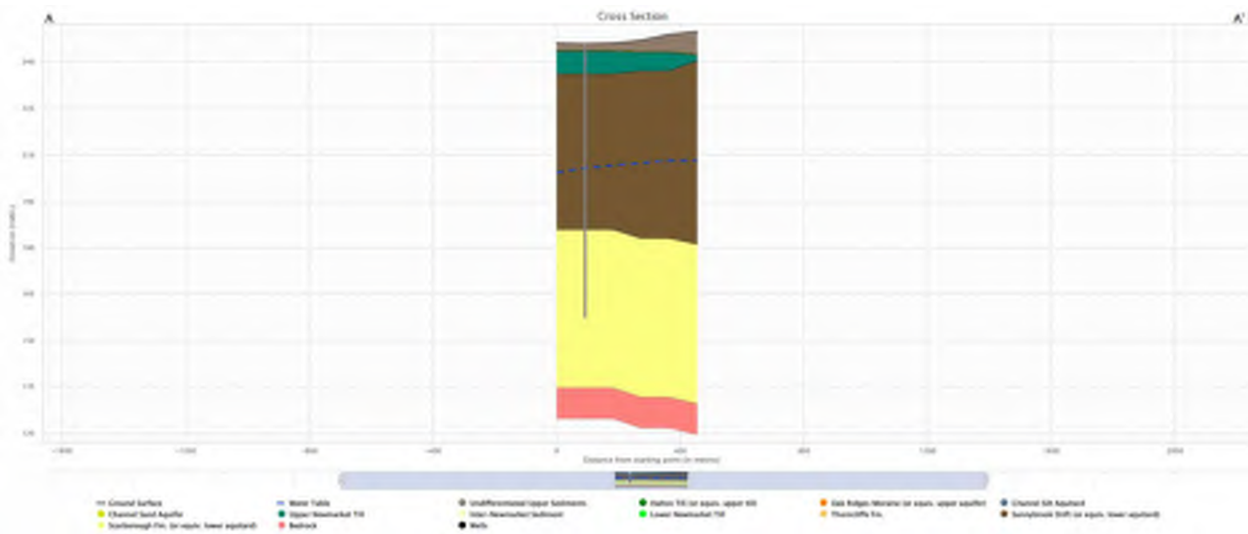
# 7. Source Water Impact Assessment and Mitigation Plan (SWIAMP)

As identified in section 1.3.1 Well Head Protection Areas A, B, C, D have four (4) different protected areas such as 100-metre radius around the well, 2-year, 5-year and 25-year time-of-travel to the well respectively. It is noted that only activities in the Wellhead Protection Areas A to C can be significant drinking water threats. The site is located within WHPA C associated with one municipal drinking water wells, and the entire area is within WHPA Q1/Q2 (Figure 3).

Based on the well record for the municipal supply wells known as Well Supply Well 9 (within the Dominion Well field) (MECP Well ID 5714014) the well is screened from 81 and 93 m bgs. The screen was installed in the overburden sand units. Bedrock was not noted in the MECP well water record. According to the report, "*Town of Midland Source Water Protection Threat Assessment*" (dated July 2010, by Associates), Section 9.3 notes that the municipal well 9 is located within a major aquifer unit known as Aquifer A3, historically referred to as Lower Aquifer and generally found at an elevation of 120 masl to 200 masl. Aquifer A3 is has a varied composition ranging from fine sand to coarse gravel. Thin confining units overlie the aquifer in the vicinity of Well 9 where one log observes a 2.5 m thin aquitard layer at an elevation of approximately 180 masl.

No anthropogenic transport pathways from the ground surface to the aquifer below are expected due to construction on site. The proposed development will be serviced with existing storm and sanitary sewers and other embedded utilities which are expected to be installed approximately 5.0 mbgs, which is considerably shallower than the municipal well screened at 81 m bgs to 93 m bgs. Although sands are present across the site, all the wells presented dry conditions, it is expected that the sand layers are only surficial and not hydraulically connected to the aquifer below. According to the ORGMP website cross-section tool (Chart 7-1 below), a layer of the Upper Newmarket Till aquitard near the vicinity of the site is between the surficial sands and the lower aquifer at an Elevation of 236 masl. Due to the depth of the installation of servicing on site, the depth to the drinking water is significant (81 m), and the presence of an aquitard, it is not expected that any appreciable new preferential pathways to the lower aquifer relative to the pre-development conditions will occur.

**Chart 7-1. ORMGP Cross Section**



### *7.1.1. Identification of Water Quality Impacts and Threats*

The Clean Water Act, 2006, prescribes several land uses that are considered to be drinking water threats. The applicable circumstances for activities and conditions to the site are listed, along with a qualitative evaluation of the threat level, in Table 7-1 below. For the proposed site, two activities from the list are considered relevant potential drinking water quality threats: application of winter de-icing salt and the above grade handling of liquid fuel and storage. These are listed as Threat Numbers in *Tables of Drinking Water Threats, Clean Water Act, 2006, Ontario Ministry of the Environment* (as amended Nov 16, 2009).

**Table 7-1. Drinking Water Quality Threats Summary**

| # | WHPA Zone on Property | Intrinsic Vulnerability Score | Identified Prescribed Drinking Water Threat | Short Form Name | Type of Threat (Chemical or Pathogen) | Applicable Circumstances | CWA Rating of the Drinking Water Threat |
|---|---|---|---|---|---|---|---|
| 1 | WHPA Zone A, B, C and D Q1/Q2 | 10 | The application of road salt | Road Salt | Chemical | The road salt is applied in an area where the percentage of total impervious surface area, as set out on a total impervious surface area map, is less than 80 percent. The application may result in the presence of chloride /sodium in groundwater or surface water. | Moderate |

| # | WHPA Zone on Property | Intrinsic Vulnerability Score | Identified Prescribed Drinking Water Threat | Short Form Name | Type of Threat (Chemical or Pathogen) | Applicable Circumstances | CWA Rating of the Drinking Water Threat |
|---|---|---|---|---|---|---|---|
| 2 | WHPA Zone A, B, C and D Q1/Q2 | 10 | Above grade handling of fuel | Fuel | Chemical | The storage of liquid fuel in a tank at or above grade at a facility defined under O.Reg. 217 excluding a bulk plant, or at a facility defined under O. Reg. 213. | Significant |

During construction of the proposed development, there may be temporary handling or storage of fuels or chemicals. This typically would represent a potential threat to groundwater quality due to the potential for a spill. It is noted however that the municipal aquifer is in a lower confined aquifer and is protected from the potential threat to water quality.

### *7.1.2. Identification of Drinking Water Quantity Impacts and Threats*

The site's current use is vacant and slated to be a residential property, and the site currently provides groundwater recharge into a shallow groundwater system. Based on Section 4.1, the general stratigraphy of at the site it topsoil and fill underlain by zones of sandy silt, sandy silt, silt and sand. As mentioned above, the upper conductive layers are underlain by a layer of the Newmarket Till Aquitard.

As the Newmarket till Aquitard is expected to be between the surface and the lower source water obtained from the lower Aquifer, minimal to negligible impacts are expected to groundwater levels, flow directions or to deeper aquifers from constructions dewatering that could impact water quantity. There is no construction dewatering expected for the construction of the proposed development. Due to reasons outlined above, as well as municipal wells screened within sand deposits deep below grade (81 mbgs), that are underlying a clay aquitard (as shown on the MECP well records), there will be no water quality threats to the underlying aquifer in which the water supply wells are installed within.

It is noted that in the long-term condition, since there will be maintenance of the pre to post development infiltration characteristics using LIDs, no impact to water quantity in the long-term is expected either.

# 8. Limitations

The recommendations and comments provided are necessarily on-going as new information of subsurface conditions becomes available. More specific information with respect to the conditions between samples, or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the BH information must, therefore, be validated during excavation operations. Consequently, conditions not observed during this investigation may become apparent. Should this occur, GEI should be contacted to assess the situation and additional testing and reporting may be required.

GEI should be retained for a general review of the final design drawings and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, GEI will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of the design engineers. The number of BHs required to determine the localized subsurface conditions between BHs affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual BH results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report was authorized by and prepared by GEI for Pine Valley Estates (as provided in the signed Standard Professional Services Agreement). Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GEI accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

# 9. Closure

We trust that this information is satisfactory for your purposes. Should you have any questions or comments, please do not hesitate to contact our office.

Yours truly,

**GEI Consultants Canada Ltd.**

**Prepared By:**

______________________
Tanvi Patel, G.I.T.
Hydrogeologist-In-Training

**Reviewed By:**

Professional Engineers
Ontario

Licensed Engineering Technologist

Name: K. L. PICKETT
Number: 100501338
Limitations: Environmental investigations of soil, groundwater, air and sediment products including Record of Site Conditions, soil management plans and completion of Phase I and Phase II Environmental Site Assessments, excluding design, construction and verification of site remediation.
Association of Professional Engineers of Ontario

______________________
Kim Pickett M. Ed, C.E.T, LET, $QP_{ESA}$
Branch Manager, Project Manager

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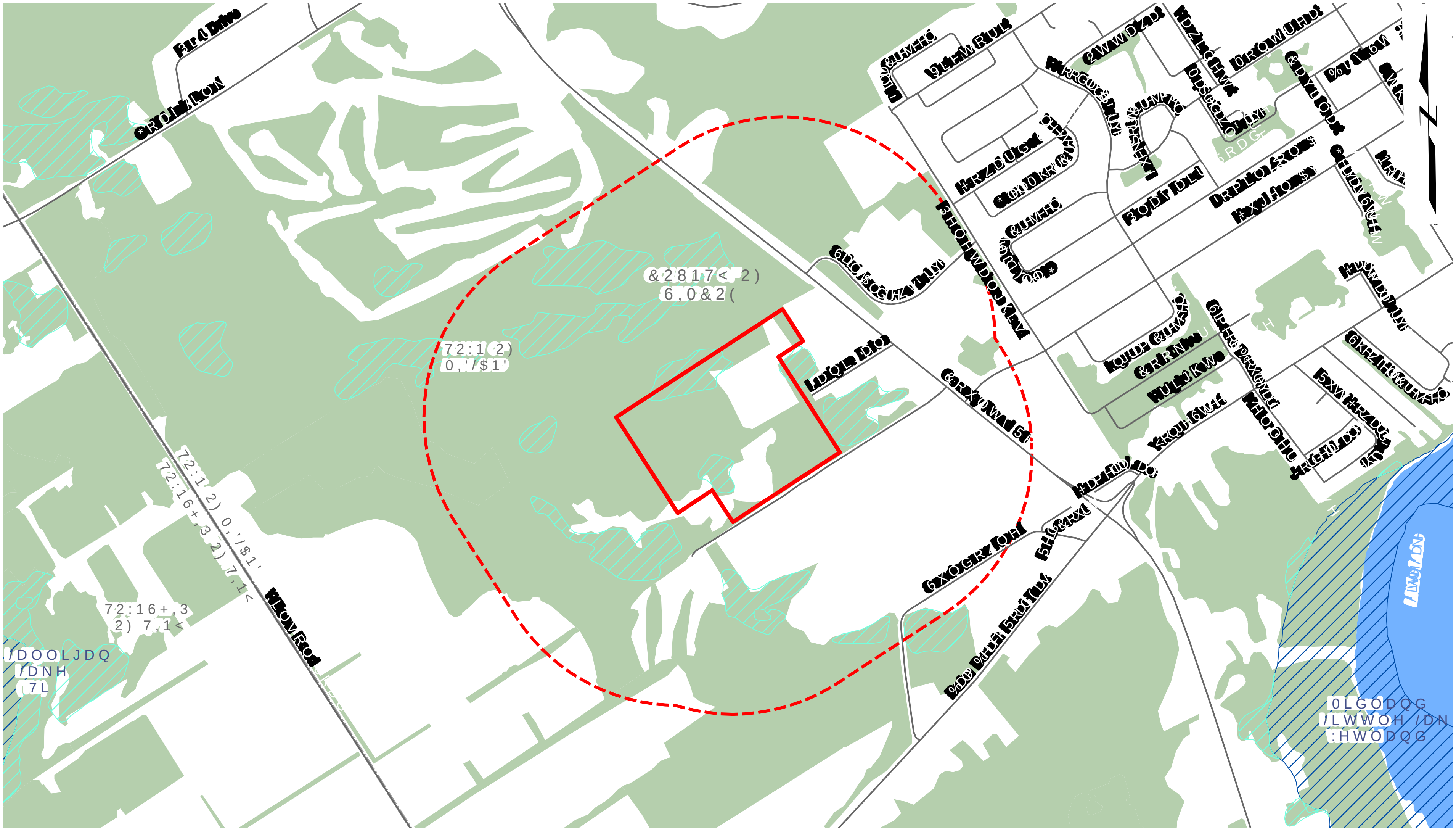
# Figures

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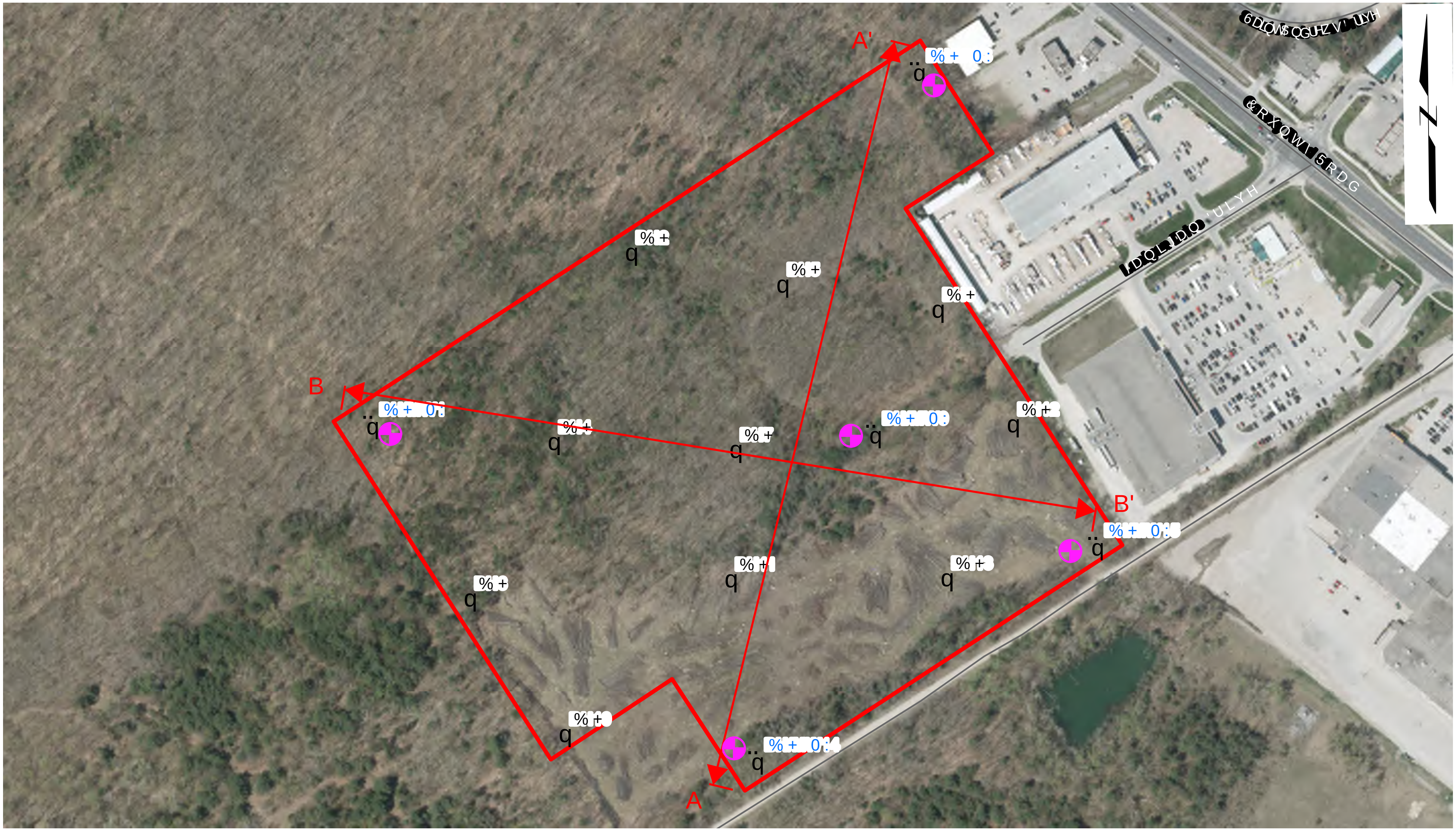


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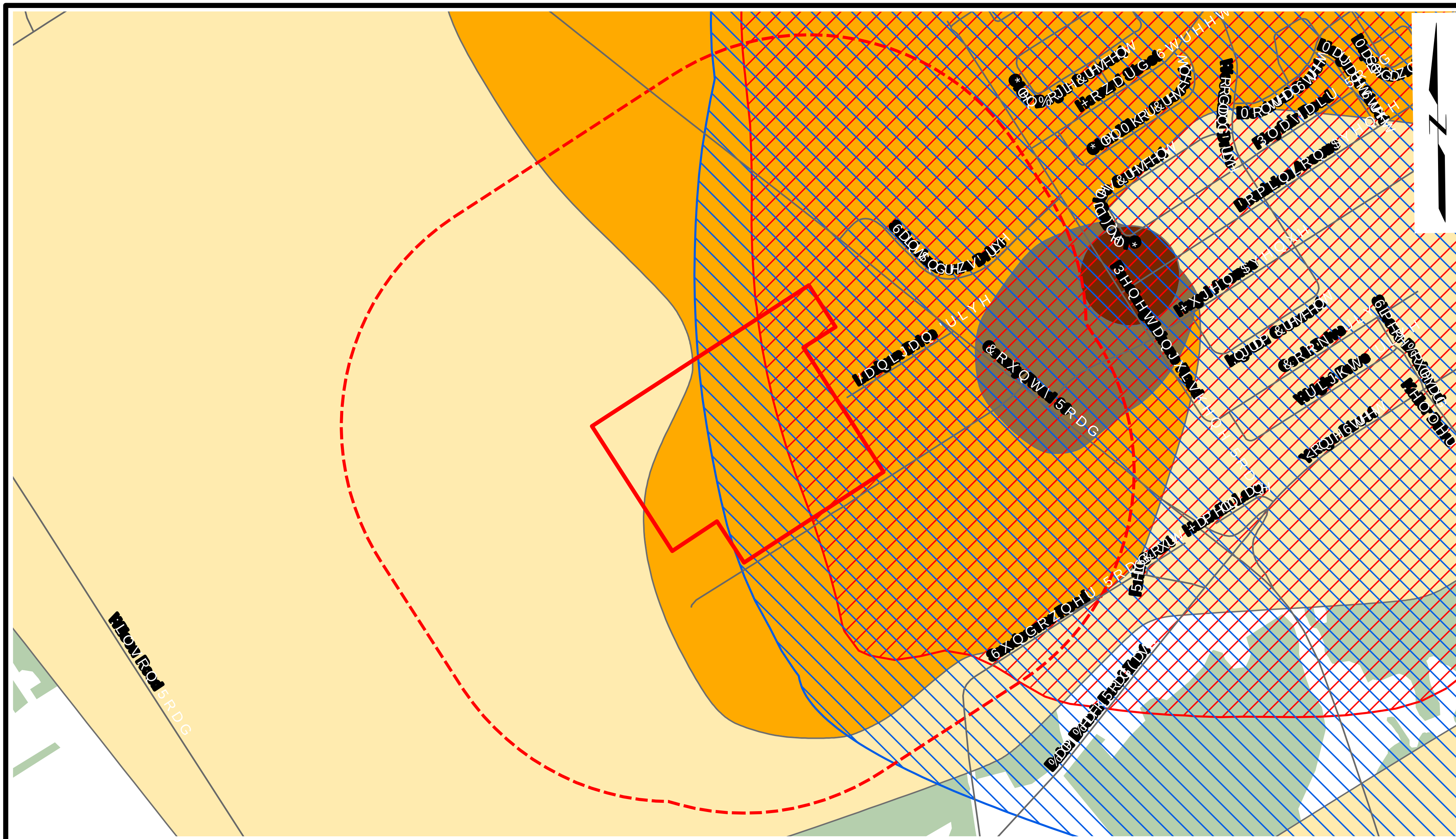

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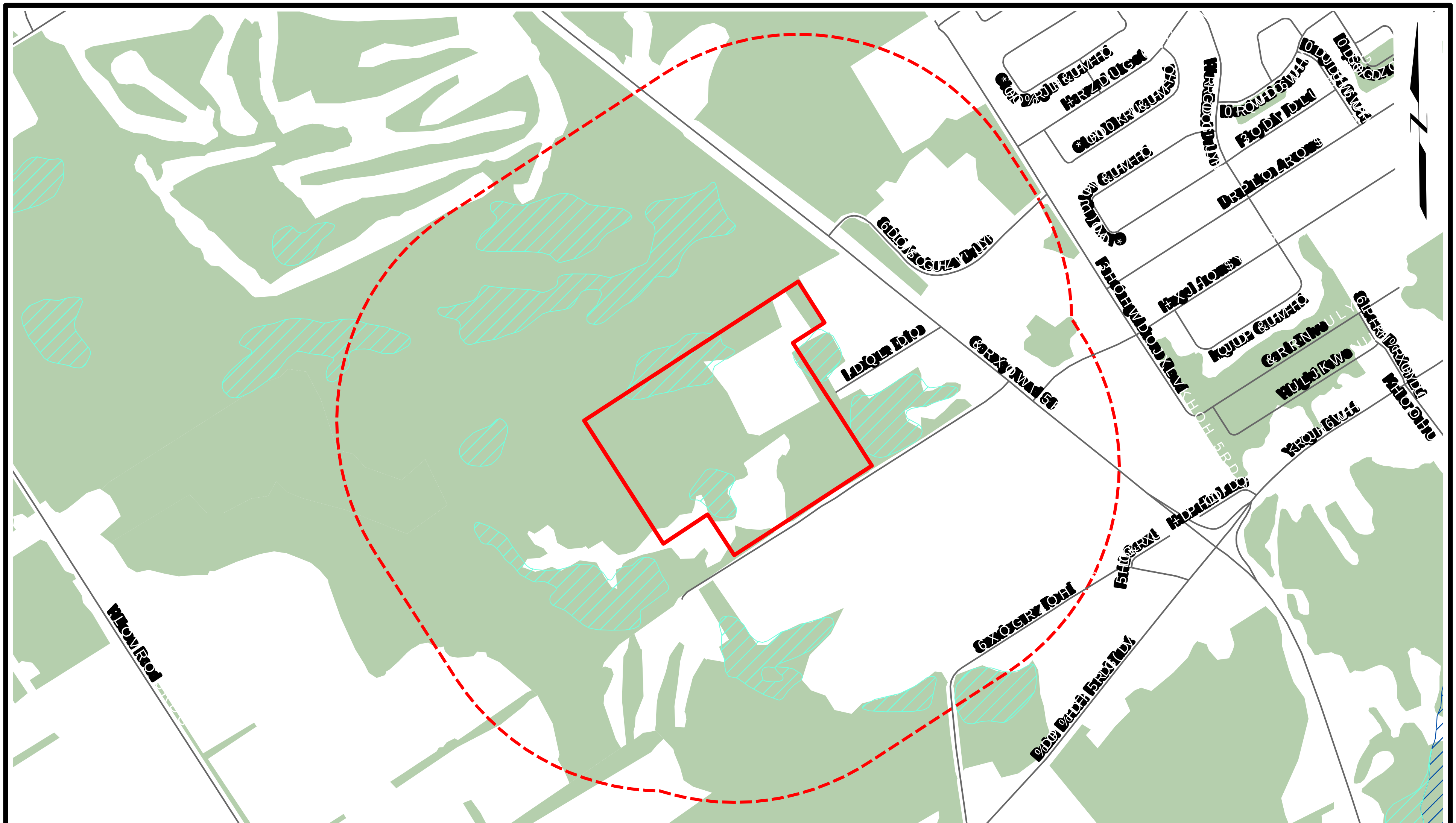

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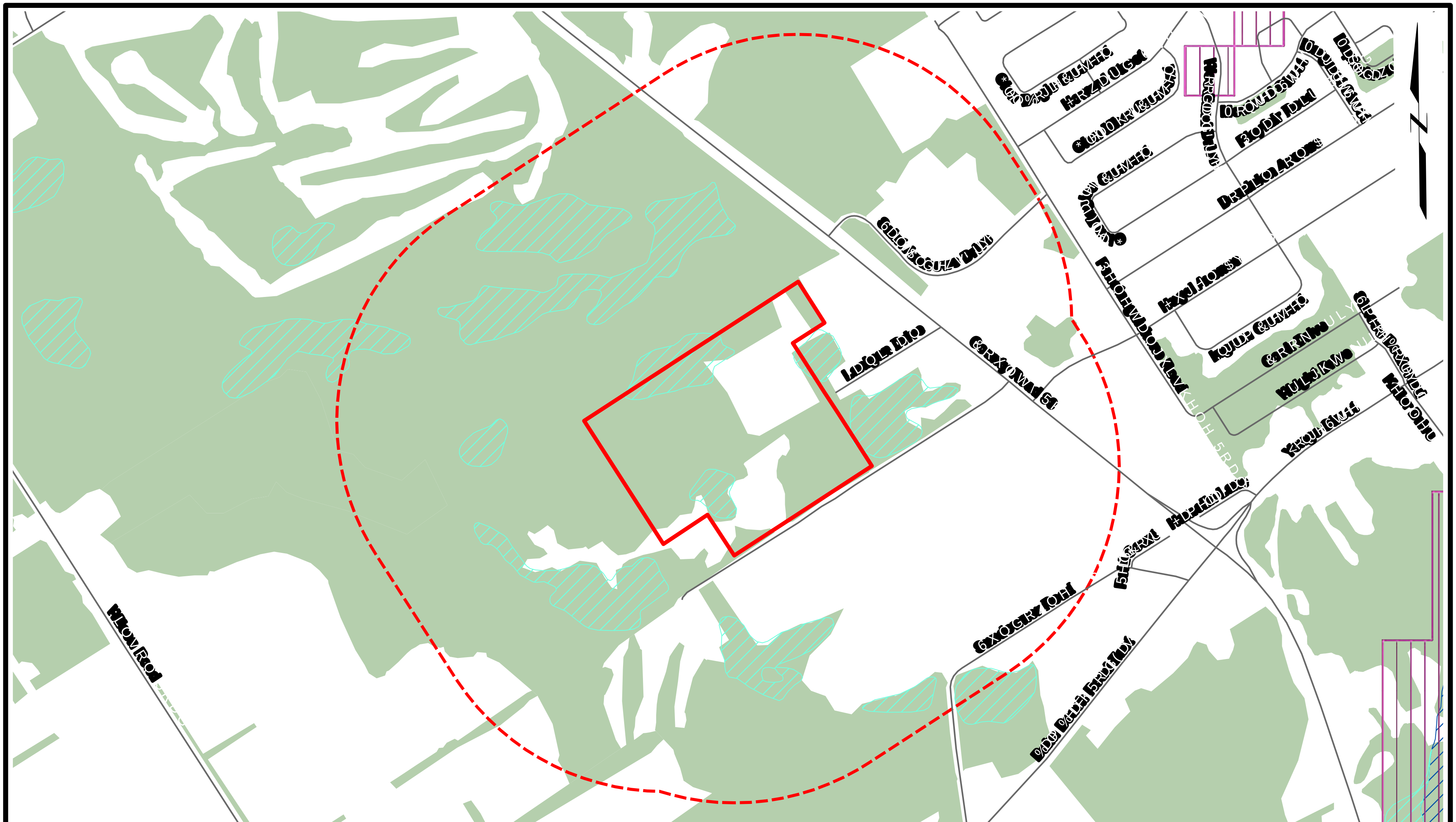

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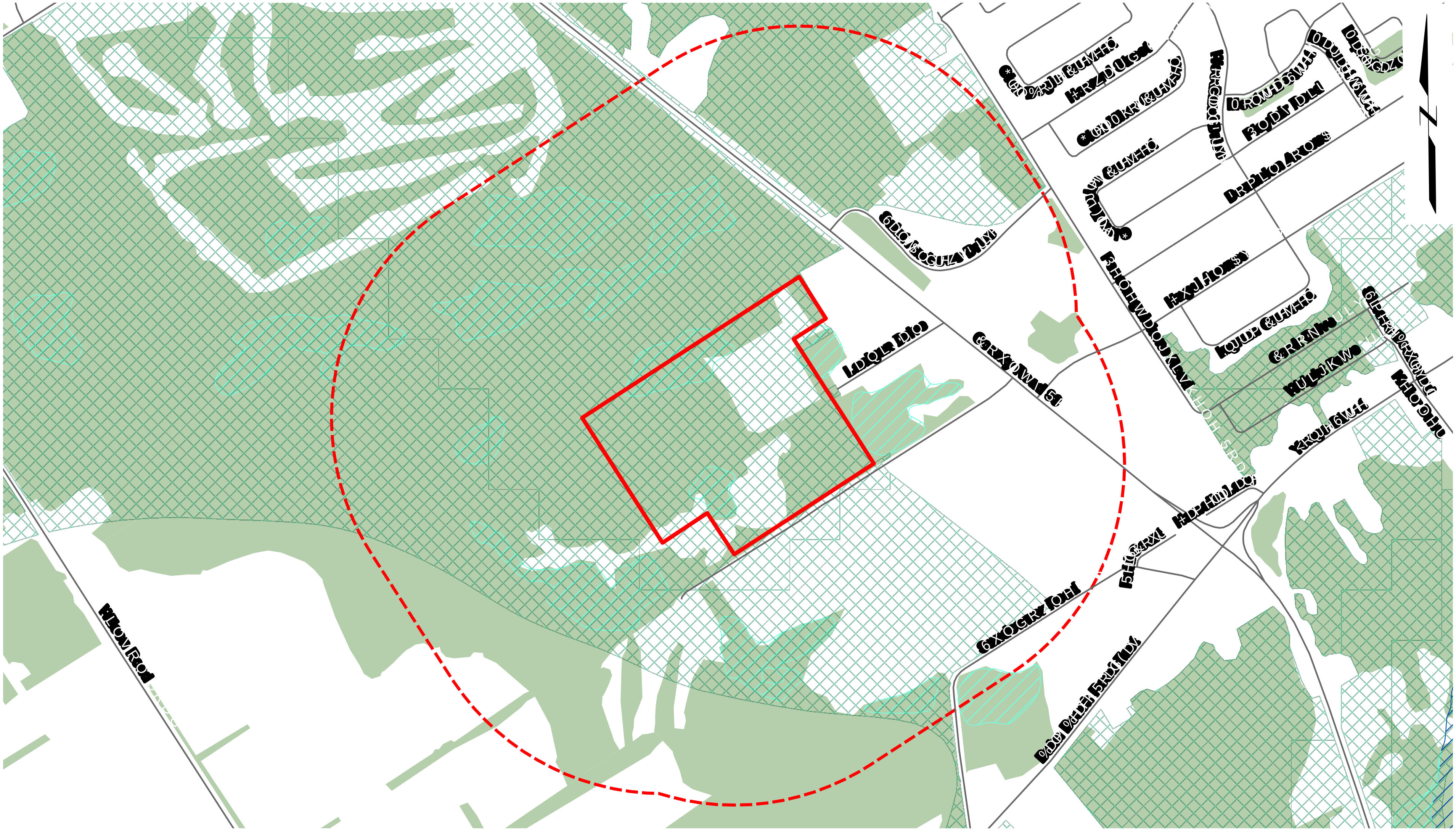

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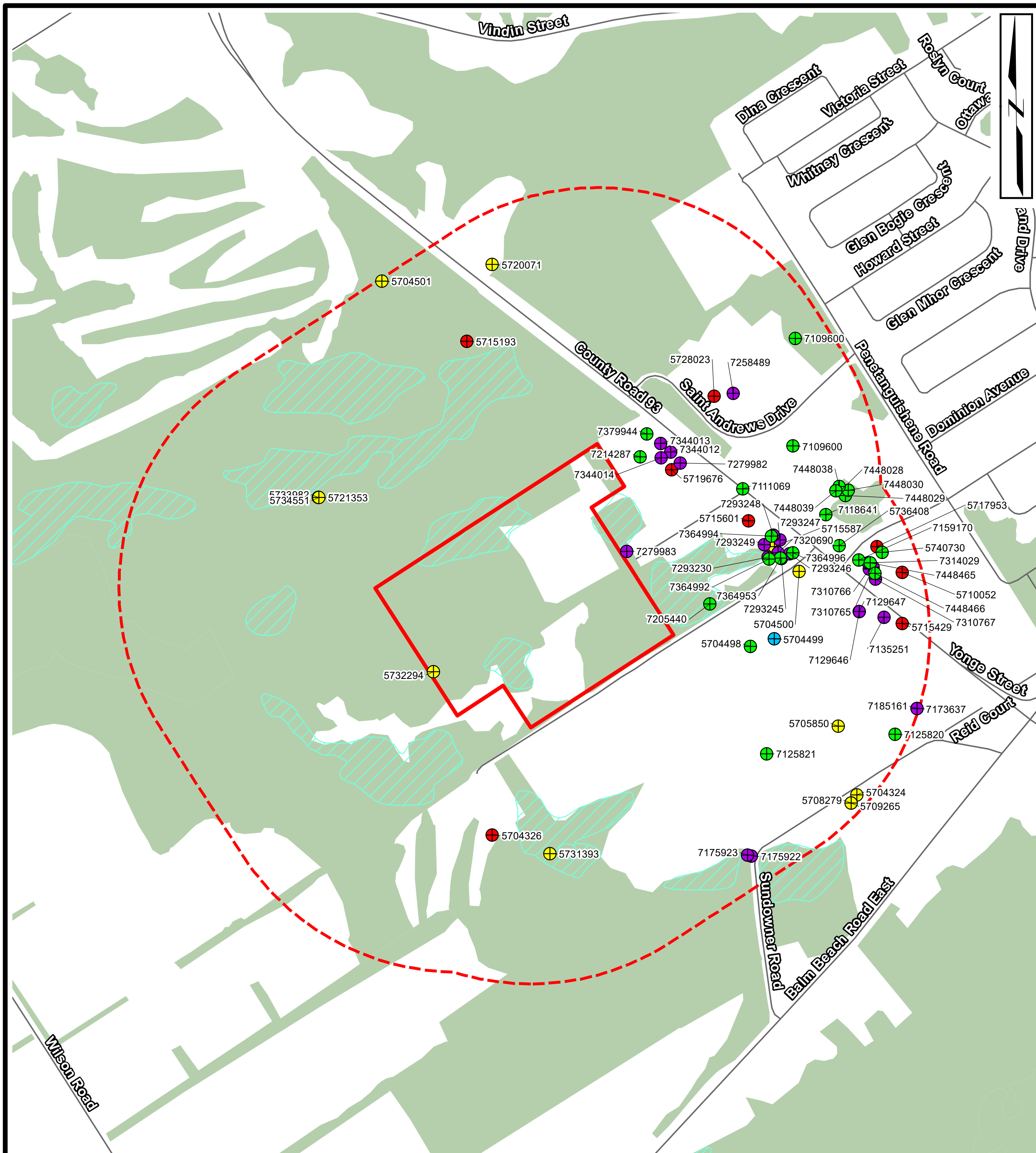


- Site
- Study Area
- Wooded Area
- Wetland - Not evaluated per OWES

**Well Record Location and Use**

- Not Used/No Use Listed/Other
- Commerical/Industrial
- Domestic/Irrigation
- Monitoring/Test Hole
- Public

**Reference(s):**
1. Coordinate System: NAD 1983 CSRS UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2026, © Toronto and Region Conservation Authority, 2026.

0 75 150
Metres

| Hydrogeological Investigation<br>9332 County Road 93<br>Midland, Ontario | GEI Consultants Canada | **MECP WATER WELL RECORDS** |
|---|---|---|
| Pine Valley Estates Ltd. | Project 2506478 | May 2026 Fig. 7 |

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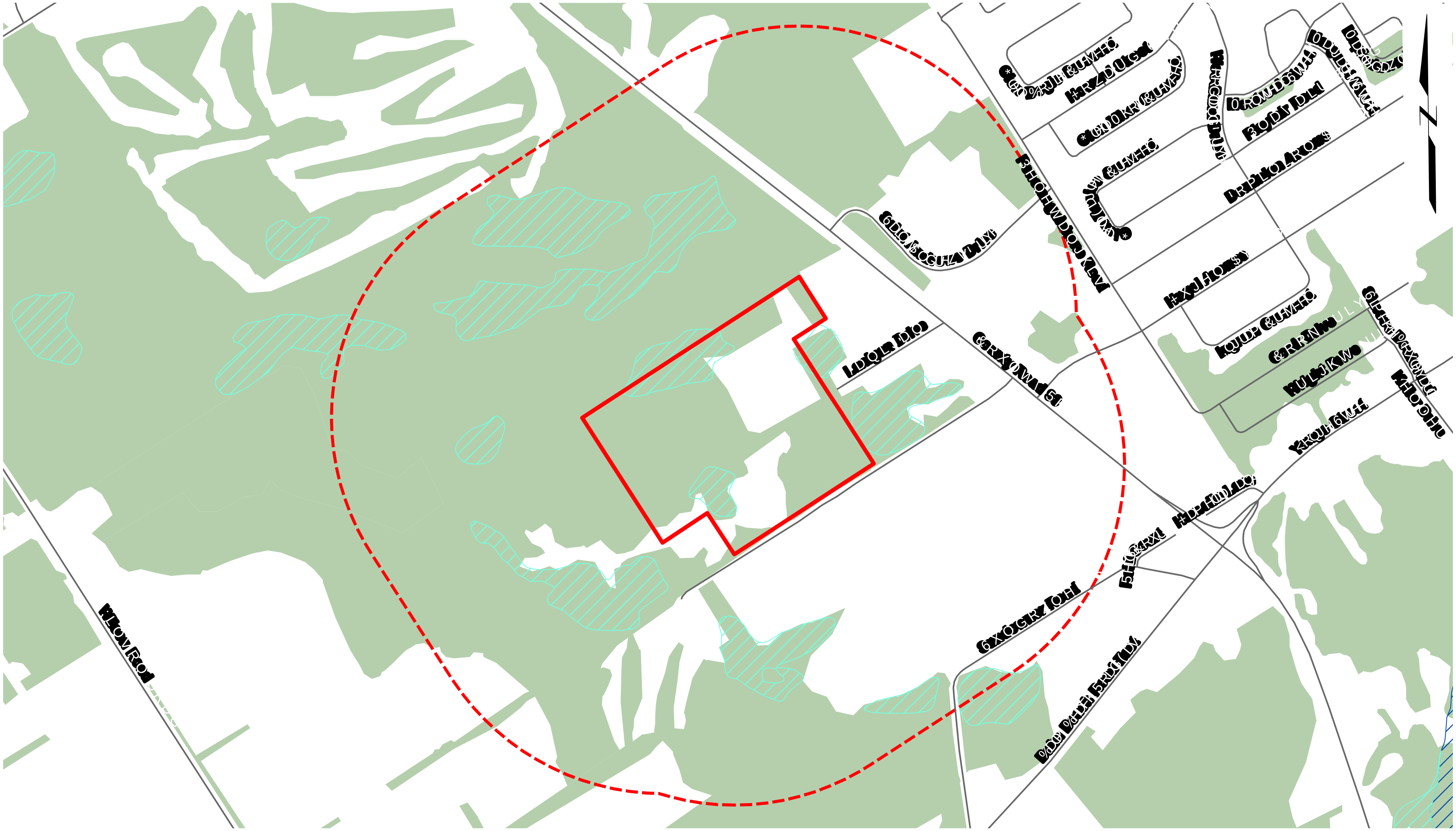

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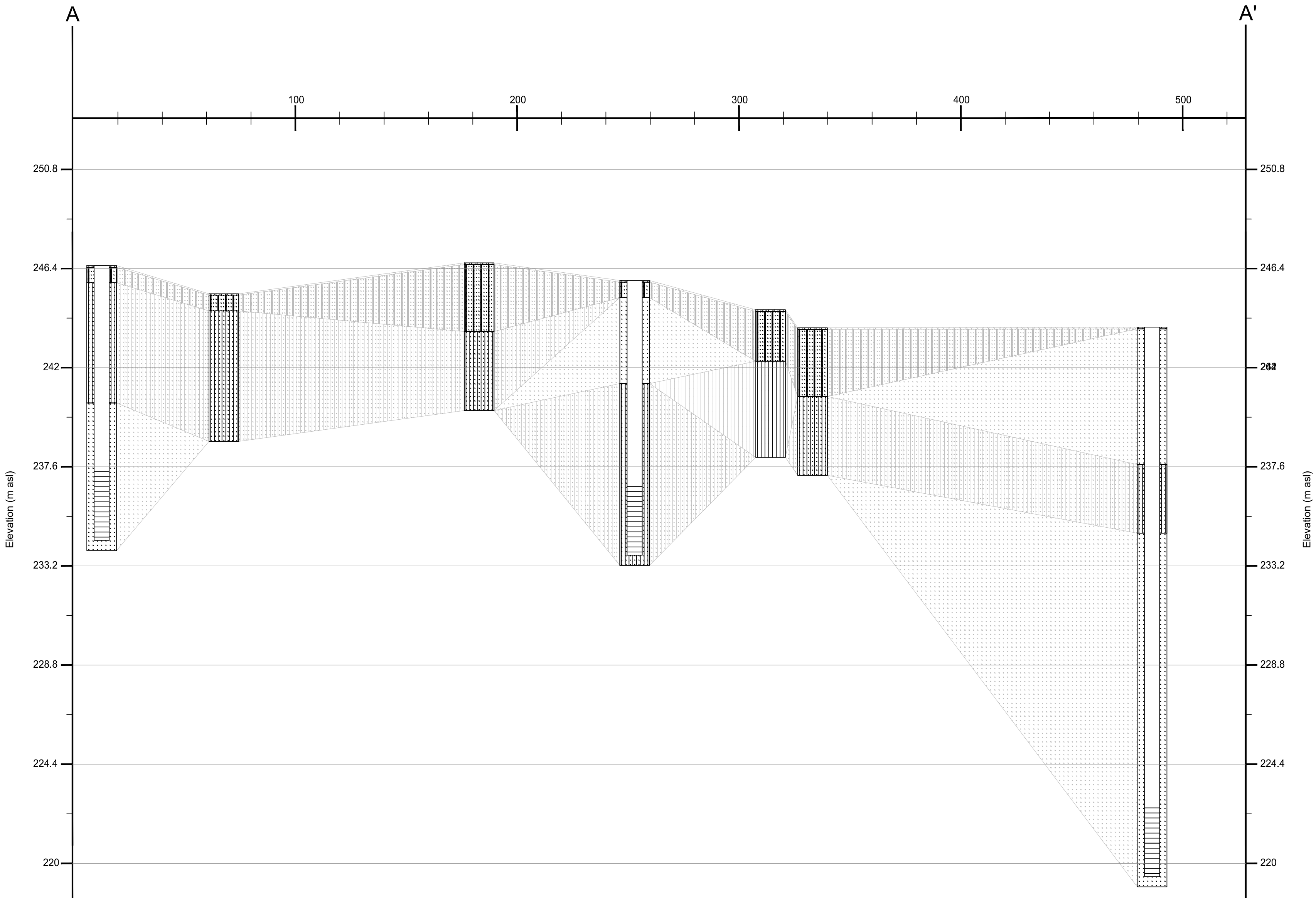


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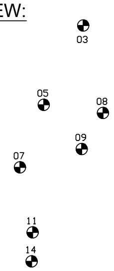



LEGEND:

- Topsoil
- Sand
- Silty Fine Sand
- Silt
- Silty Sand Glacial Till

***NOTES:***

HORIZONTAL SCALE: 0 20 40 60 80 100 METERS

VERTICAL SCALE: 0 2.2 4.4 METERS

**Hydrogeological Investigation and Report**
**Proposed Residential Development - Pine Valley Estates**
**Midland, Ontario**

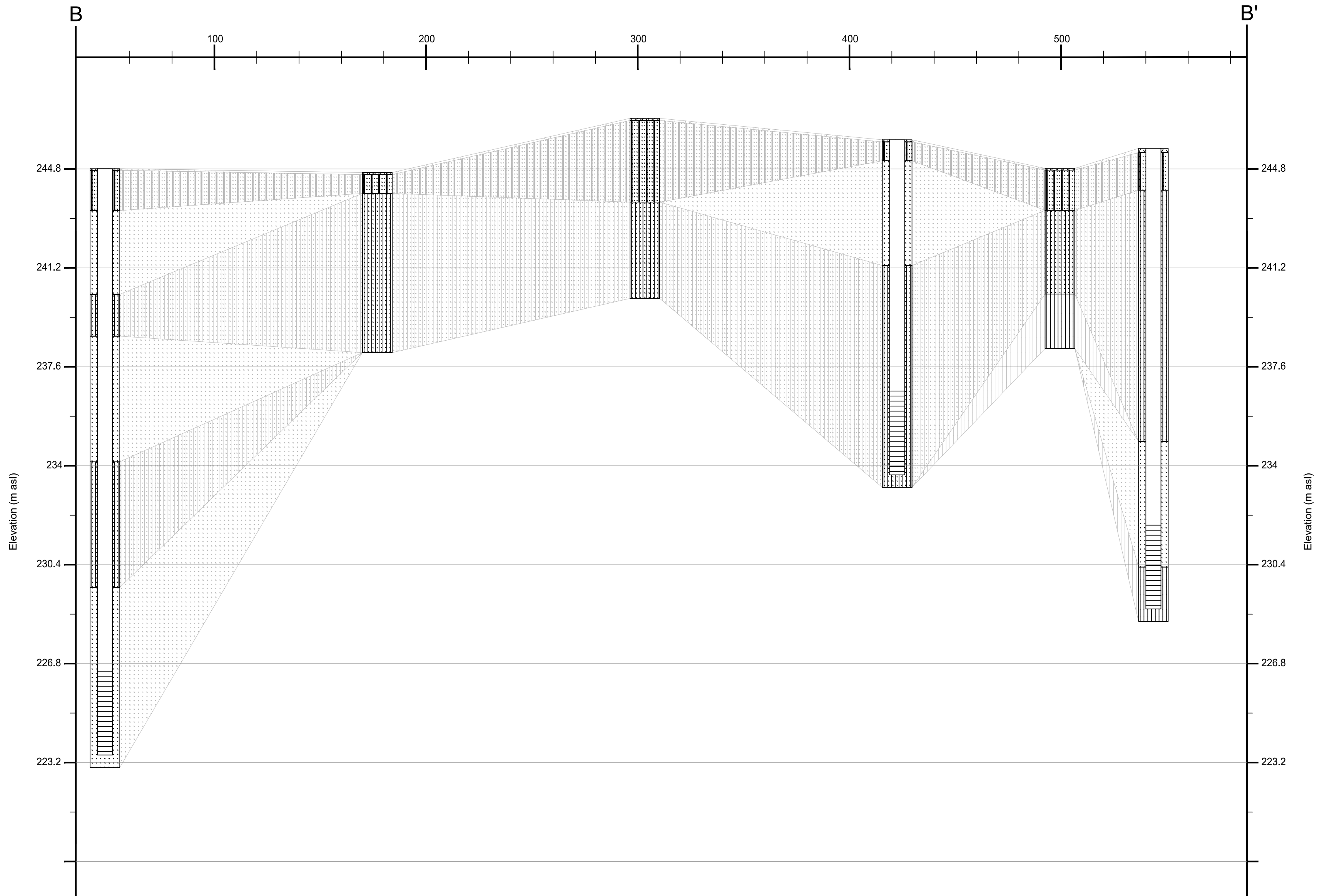
**Pine Valley Estates**

GEI Consultants

**2506478**

**GEOLOGICAL CROSS SECTION A-A'**

**May 2026** **Fig. 9**

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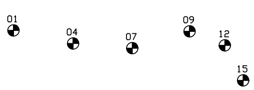


LEGEND:

- Topsoil
- Silty Fine Sand
- Sand
- Silt and Sand
- Silt

***NOTES:***

HORIZONTAL SCALE: 0 20 40 60 80 100 METERS

VERTICAL SCALE: 0 1.8 3.6 METERS

**Hydrogeological Investigation and Report**
**Proposed Residential Development - Pine Valley Estates**
**Midland, Ontario**

**Pine Valley Estates**

GEI Consultants

**2506478**

**GEOLOGICAL CROSS SECTION B-B'**

**May 2026**

**Fig. 10**

# Appendix A MECP Water Well Records

GEI Consultants

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | Well ID Only | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|---|
| TINY TOWNSHIP PR W 01 105 | 17 586225 4954040 W | 1967/10 4816 | 6 | FR 0245 | 174/221/10/24:0 | DO | 0246 4 | 5704324 | 5704324 () | FSND 0114 MSND 0156 CSND 0172 MSND 0214 FSND 0242 CSND 0250 |
| TINY TOWNSHIP PR W 01 106 | 17 585514 4953961 W | 1967/10 4816 | 6 | FR 0255 | 176/188/10/24:0 | CO | 0257 3 0: | 5704326 | 5704326 () | FSND 0127 MSND 0166 CSND 0188 FSND 0254 MSND 0264 |
| TINY TOWNSHIP PR W 01 106 | 17 586018 4954329 W | 1966/08 4816 | 5 | | | | | 5704498 | 5704498 () | LOAM STNS CLAY 0012 FSND CLAY 0128 CSND 0146 MSND 0160 FSND CLAY 0170 MSND 0200 FSND MSND 0210 MSND 0235 MSND STNS 0306 GREY CLAY 0320 |
| TINY TOWNSHIP PR W 01 106 | 17 586064 4954344 W | 1967/04 4816 | 10 | FR 0210 | 169/197/166/24:0 | PS CO | 0210 30 | 5704499 | 5704499 () | LOAM SNDY 0009 FSND CLAY LYRD 0126 CSND 0147 MSND 0162 MSND CLAY LYRD 0204 FSND 0234 FSND VERY 0237 GRVL 0241 SAND CMTD GRVL 0250 |
| TINY TOWNSHIP PR W 01 107 | 17 586113 4954475 W | 1965/02 2113 | 6 | FR 0226 | 140/184/10/2:0 | DO | 0221 4 | 5704500 | 5704500 () | LOAM 0001 BRWN FSND 0226 FSND GRVL 0230 |
| TINY TOWNSHIP PR W 01 109 | 17 585299 4955042 W | 1966/09 2104 | 6 5 | FR 0200 | 150/200/100/3:0 | IR | 0324 16 | 5704501 | 5704501 () | FILL 0001 MSND STNS 0050 CSND 0200 FSND 0300 CSND STNS 0325 CSND 0340 CLAY 0380 |
| TINY TOWNSHIP PR W 01 106 | 17 586189 4954174 W | 1968/05 4816 | 6 | FR 0215 | 171/174/25/4:0 | DO | 0211 10 | 5705850 | 5705850 () | FSND CLAY 0155 MSND 0221 |
| TINY TOWNSHIP PR W 01 106 | 17 586214 4954024 W | 1971/08 2514 | 6 | FR 0213 | 174/183/13/1:0 | DO | | 5708279 | 5708279 () | BRWN SAND BLDR FILL 0003 BRWN SAND CLAY BLDR 0018 BRWN SAND 0152 BRWN CLAY SAND 0194 BRWN SAND 0212 BRWN GRVL 0213 |
| TINY TOWNSHIP PR W 01 106 | 17 586214 4954024 W | 1972/10 4816 | 6 | FR 0245 | 172//4/4:0 | DO | 0246 3 | 5709265 | 5709265 () | SAND CLAY CMTD 0198 FSND 0230 SAND CMTD 0244 CSND 0250 |
| TINY TOWNSHIP PR W 01 106 | 17 586314 4954474 W | 1973/07 4816 | 6 | FR 0260 | 175/250/40/2:0 | CO | 0255 10 | 5710052 | 5710052 () | SAND GRVL CMTD 0164 MSND 0170 CSND 0189 SAND STNS CMTD 0225 FSND 0229 SAND CMTD 0243 SAND CLAY 0260 FSND MSND 0271 SAND CMTD 0290 |
| TINY TOWNSHIP PR W 01 108 | 17 585464 4954924 W | 1978/05 4816 | 6 | FR 0263 | 162/190/20/2:0 | CO | 0266 4 | 5715193 | 5715193 () | SAND 0055 FSND CMTD 0230 MSND 0236 MSND FSND CMTD 0265 CSND GRVL 0305 |
| TINY TOWNSHIP PR W 01 106 | 17 586314 4954374 W | 1978/06 4816 | 6 | FR 0213 | 169//15/2:0 | CO | 0210 10 | 5715429 | 5715429 () | FSND CLAY BLDR 0030 FSND 0170 CSND 0215 UNKN 0223 |
| TINY TOWNSHIP PR W 01 107 | 17 586064 4954524 W | 1978/08 4816 | 6 | FR 0198 | 164//15/2:0 | DO | 0217 6 | 5715587 | 5715587 () | SAND BLDR 0018 SAND BLDR LYRD 0040 SAND GRVL CLAY 0051 FSND CLAY 0123 FSND CMTD 0183 MSND CMTD 0198 MSND 0228 MSND FSND 0243 |
| TINY TOWNSHIP PR W 01 107 | 17 586014 4954574 W | 1978/09 4816 | 6 | FR 0248 | 167//25/3:0 | CO | 0242 3 | 5715601 | 5715601 () | MSND 0046 FSND CMTD 0216 MSND FSND 0238 CSND 0243 SAND GRVL 0260 |
| TINY TOWNSHIP PR W 01 107 | 17 586264 4954524 W | 1981/10 4816 | 6 | FR 0244 | 167//12/2:0 | CO | 0245 5 | 5717953 | 5717953 () | SAND SILT GRVL 0059 CLAY 0090 CLAY SAND 0110 FSND SILT GRVL 0225 FGVL SAND 0244 CSND 0255 FGVL SAND 0270 |
| TINY TOWNSHIP PR W 01 107 | 17 585864 4954674 W | 1984/10 1583 | | | 170///: | CO | 0242 10 | 5719676 | 5719676 () | SAND GRVL 0008 BRWN SAND 0119 FSND SILT 0161 FSND 0200 MSND 0212 FSND 0222 FSND GRVL 0240 MSND 0255 FSND 0260 FSND SILT 0290 |
| TINY TOWNSHIP PR W 01 109 | 17 585514 4955074 W | 1985/07 3602 | 6 | FR 0185 | 153/160/15/1:0 | DO | 0193 4 | 5720071 | 5720071 () | BRWN LOAM 0001 BRWN CLAY SAND STNS 0042 BRWN SAND DRY 0180 BRWN CLAY HARD 0185 BRWN SAND CLN WBRG 0196 |
| TINY TOWNSHIP PR W 01 108 | 17 585175 4954620 L | 1986/05 1583 | 6 | FR 0251 | 170//40/2:15 | CO | 0241 10 | 5721353 | 5721353 (NA) | SAND GRVL 0008 BRWN SAND STNS 0119 FSND SILT 0161 FSND 0202 MSND 0215 FSND FGVL 0240 MSND 0252 FSND 0260 |
| TINY TOWNSHIP PR W 01 107 | 17 585947 4954817 W | 1991/03 2652 | 8 | FR 0185 FR | 157/212/50/24:0 | IN | 0242 14 | 5728023 | 5728023 (65573) | BRWN SAND MSND 0031 GREY SAND FSND 0042 BRWN SAND FSND 0146 BRWN SAND GRVL MSND 0256 |
| TINY TOWNSHIP PR W 01 106 | 17 585627 4953925 L | 1994/12 2514 | 6 5 | FR 0214 | 176/245/3/8:0 | DO | 0249 3 | 5731393 | 5731393 (133619) | BRWN LOAM 0001 BRWN SAND GRVL STNS 0060 BRWN SAND CLAY HARD 0241 YLLW SAND GRVL 0252 |
| TINY TOWNSHIP CON 01 107 | 17 585399 4954280 L | 1995/10 2431 | 6 5 | FR 0323 | 323//18/2:0 | DO | 0342 4 | 5732294 | 5732294 (160539) | BRWN FSND BLDR 0007 BRWN FSND 0066 GREY CLAY TILL 0083 GREY CLAY GVLY TILL 0120 GREY GRVL SLTY STNS 0190 GREY CLAY TILL 0202 BRWN FSND SLTY LYRD 0264 BRWN FSND MSND 0275 BRWN FSND 0309 BRWN FSND MSND GRVL 0337 BRWN MSND GRVL 0352 |
| TINY TOWNSHIP PR W 01 108 | 17 585175 4954620 L | 1998/10 5528 | 5 6 | UK 0342 | 302/328/8/2:0 | DO | 0342 4 | 5733982 | 5733982 (190248) | BRWN SAND GRVL 0085 BRWN CLAY SAND 0092 BRWN SAND SILT FSND 0308 BRWN SAND MGVL 0350 |
| TINY TOWNSHIP PR W 01 108 | 17 585176 4954620 L | 1999/10 5528 | 6 5 | FR 0251 | 202/245/8/2:0 | DO | 0251 4 | 5734551 | 5734551 (199578) | BRWN SAND STNS 0008 BRWN CLAY 0016 GREY CLAY 0038 BRWN SAND 0196 GREY SAND GRVL 0215 GREY CLAY 0245 BRWN SAND 0255 |
| TINY TOWNSHIP PR W 01 106 | 17 586191 4954526 W | 2001/08 1851 | | | | | | 5736408 | 5736408 (231883) A | |
| TINY TOWNSHIP PR W 01 106 | 17 586275 4954513 W | 2006/05 5528 | 6.09 | | | NU | 0254 15 | 5740730 | 5740730 (Z24537) A | 269 |
| TINY TOWNSHIP | 17 586003 4954637 W | 2008/08 6607 | | | | | | 7111069 | 7111069 (Z60540) A | |
| MIDLAND TOWN | 17 586165 4954586 W | 2008/06 2514 | 6.25 | | | | | 7118641 | 7118641 (Z54588) A048116 A | 245 |
| TINY TOWNSHIP PR W 01 106 | 17 586300 4954158 W | 2009/01 5528 | 6.09 | | 171///: | NU | | 7125820 | 7125820 (Z79228) A | |
| TINY TOWNSHIP PR W 01 106 | 17 586050 4954120 W | 2009/03 5528 | 100 | | 168///: | NU | | 7125821 | 7125821 (Z79227) A | |
| MIDLAND TOWN | 17 586230 4954397 W | 2009/08 7403 | 1.92 | UK 0167 | | NU | 0160 21 | 7129646 | 7129646 (Z096384) A083766 A | BRWN GRVL SAND FILL 0001 BRWN SAND SILT DNSE 0167 GREY SAND SILT WBRG 0180 |
| MIDLAND TOWN | 17 586230 4954397 W | 2009/07 7403 | 1.92 | UT 0167 | | MO | 0160 21 | 7129647 | 7129647 (Z096383) A083766 | BRWN GRVL SAND FILL 0001 BRWN SAND SILT DNSE 0167 GREY SAND SILT WBRG 0180 |
| MIDLAND TOWN | 17 586279 4954386 W | 2009/10 7403 | 1.92 | FR 0167 | | MO | 0160 21 | 7135251 | 7135251 (Z096385) A | BRWN GRVL SAND FILL 0001 BRWN SAND SILT DNSE 0167 GREY SAND SILT 0180 |
| TINY TOWNSHIP PR W 01 107 | 17 586230 4954498 W | 2010/12 1413 | 4 | | | | | 7159170 | 7159170 (Z122484) A | |
| TINY TOWNSHIP | 17 586343 4954208 W | 2011/10 6032 | | | | MO | 0012 5 | 7173637 | 7173637 (Z121355) A116375 | BRWN FILL SILT LOOS 0012 BRWN FILL SAND LOOS 0012 |
| TINY TOWNSHIP PR W 01 106 | 17 586020 4953920 W | 2011/11 5528 | 1.97 | UT 0246 | | MO | 0246 10 | 7175922 | 7175922 (Z126566) A111780 | BRWN SAND STNS 0035 BRWN CLAY 0079 BRWN SAND MSND 0218 GREY CLAY SILT SAND 0226 BRWN SAND FGVL 0259 |
| TINY TOWNSHIP PR W 01 106 | 17 586012 4953922 W | 2011/11 5528 | 1.97 | UT 0322 | | MO | 0320 10 | 7175923 | 7175923 (Z126565) A111779 | BRWN SAND FSND 0035 BRWN CLAY STNS 0079 BRWN SAND MSND 0218 GREY CLAY STNS SILT 0225 BRWN SAND GRVL 0330 GREY SAND SILT 0365 BRWN SAND CMTD 0380 GREY CLAY SAND LYRD 0400 |
| TINY TOWNSHIP | 17 586343 4954208 W | 2011/11 6032 | | | | MO | | 7185161 | 7185161 (Z131696) A116375 A | |
| TINY TOWNSHIP | 17 585939 4954412 W | 2013/04 7215 | | | | | | 7205440 | 7205440 (Z163857) A | |
| TINY TOWNSHIP | 17 585803 4954699 W | 2013/07 2576 | | | | NU | | 7214287 | 7214287 (Z169569) A | |
| TINY TOWNSHIP | 17 585984 4954823 W | 2016/01 7190 | 0.75 | | | MO | 0050 10 | 7258489 | 7258489 (Z213651) A156766 | BRWN SAND LOOS 0050 |
| TINY TOWNSHIP PR W 01 107 | 17 585881 4954687 W | 2016/10 7360 | 2 | 170 | | MO | 0165 20 | 7279982 | 7279982 (Z251760) A210289 | SAND 0189 |
| TINY TOWNSHIP PR W 01 107 | 17 585777 4954515 W | 2016/11 7360 | 2 | 164 | | MO | 0150 30 | 7279983 | 7279983 (Z251761) A210291 | BRWN SAND 0180 |
| TINY TOWNSHIP | 17 586052 4954503 W | 2017/06 7241 | 2 | | | TH MO | 0015 10 | 7293230 | 7293230 (Z263204) A195119 | BLCK HARD 0000 BRWN SAND GRVL DNSE 0003 BRWN SAND DNSE 0017 GREY SILT SAND DNSE 0025 |
| TINY TOWNSHIP | 17 586078 4954501 W | 2017/06 7241 | 2 | | | TH MO | 0015 10 | 7293245 | 7293245 (Z263209) A195325 | BRWN LOAM SOFT 0001 BRWN SAND DNSE 0025 |
| MIDLAND TOWN | 17 586094 4954510 W | 2017/06 7241 | 2 | | | TH MO | 0012 10 | 7293246 | 7293246 (Z263207) A195123 | BRWN LOAM SOFT 0001 BRWN SAND DNSE 0022 |
| TINY TOWNSHIP | 17 586076 4954537 W | 2017/06 7281 | 2 | | | TH MO | 0012 10 | 7293247 | 7293247 (Z263208) A195122 | BRWN LOAM SOFT 0001 BRWN SAND DNSE 0022 |

| TOWNSHIP CON LOT | UTM | DATE CNTR | CASING DIA | WATER | PUMP TEST | WELL USE | SCREEN | Well ID Only | WELL | FORMATION |
|---|---|---|---|---|---|---|---|---|---|---|
| TINY TOWNSHIP | 17 586063 4954546 W | 2017/06 7241 | 2 | | | TH MO | 0015 10 | 7293248 | 7293248 (Z263206) A195121 | BRWN LOAM SOFT 0001 BRWN SAND DNSE 0025 |
| TINY TOWNSHIP | 17 586045 4954528 W | 2017/06 7241 | 2 | | | TH MO | 0015 10 | 7293249 | 7293249 (Z263205) A195120 | BLCK HARD 0000 BRWN SAND GRVL DNSE 0003 BRWN SAND DNSE 0016 GREY CSND DNSE 0025 |
| TINY TOWNSHIP | 17 586257 4954484 W | 2018/04 7644 | 2 | | | TH MO | 0044 10 | 7310765 | 7310765 (Z283197) A245100 | SAND SILT 0054 |
| TINY TOWNSHIP | 17 586250 4954480 W | 2018/04 7644 | 2 | | | TH MO | 0045 10 | 7310766 | 7310766 (Z283196) A245101 | SAND SILT 0054 |
| MIDLAND TOWN | 17 586262 4954461 W | 2018/04 7644 | 2 | | | TH MO | 0045 9 | 7310767 | 7310767 (Z283195) A245102 | SAND SILT 0054 |
| MIDLAND TOWN | 17 586248 4954492 W | 2018/06 7644 | 2 | | | TH MO | 0170 10 | 7314029 | 7314029 (Z283301) A239093 | BRWN SAND 0180 GREY SAND WBRG |
| TINY TOWNSHIP | 17 586072 4954512 W | 2018/07 6607 | 2 | 180 | | TH MO | 0182 10 | 7320690 | 7320690 (Z278149) A242194 | BRWN SAND 0180 BRWN SAND MSND WBRG 0192 |
| TINY TOWNSHIP PR W 01 107 | 17 585862 4954708 W | 2019/09 7147 | 1.97 | UT 0018 | | MO | 0015 10 | 7344012 | 7344012 (IO9UP9WF) A269873 | BLCK 0001 BRWN SAND 0025 |
| TINY TOWNSHIP PR W 01 107 | 17 585843 4954725 W | 2019/09 7147 | 1.97 | UT 0018 | | MO | 0015 10 | 7344013 | 7344013 (V5SOB3HT) A269874 | BLCK 0001 BRWN SAND 0025 |
| TINY TOWNSHIP PR W 01 107 | 17 585844 4954697 W | 2019/09 7147 | 1.97 | UT 0018 | | MO | 0015 10 | 7344014 | 7344014 (M2M8BI7M) A269881 | BLCK 0001 BRWN SAND 0025 |
| TINY TOWNSHIP | 17 586077 4954502 W | 2020/05 7241 | | | | | | 7364953 | 7364953 (Z338080) A | |
| TINY TOWNSHIP | 17 586054 4954500 W | 2020/05 7241 | | | | | | 7364992 | 7364992 (Z338082) A | |
| TINY TOWNSHIP | 17 586059 4954544 W | 2020/05 7241 | | | | | | 7364994 | 7364994 (Z338081) A | |
| TINY TOWNSHIP | 17 586101 4954512 W | 2020/05 7241 | | | | | | 7364996 | 7364996 (Z338097) A | |
| TINY TOWNSHIP | 17 585816 4954744 W | 2020/12 6988 | | | | | | 7379944 | 7379944 (C49247) A294304 P | |
| MIDLAND TOWN | 17 586105 4954930 W | 2025/02 6607 | 5.1 | | | TH | | 7109600 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448028 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448029 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448030 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448038 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448039 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448465 | | |
| MIDLAND TOWN | | 2023 | | | | | | 7448466 | | |

# Appendix B Borehole Logs

# RECORD OF BOREHOLE No. 01

GEI Consultants

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | **2506478** | | | | |
| Project Client: | **Pine Valley Estates** | | | | |
| Project Name: | **Residential Development 9332 Cty Road 93** | Drilling Method: | **Hollow Stem Augers** | Drilling Machine: | **Track Mount** |
| Project Location: | **9332 County Rd 93, Midland, ON** | Logged By: | **BH** | Northing: | **4954451** |
| Drilling Location: | **See Borehole Location Plan** | Reviewed By: | **MH** | Easting: | **585311** |
| Local Benchmark: | | Date Started: | **Mar 25/26** | Date Completed: | **Mar 26/26** |

## LITHOLOGY PROFILE

| Depth (m) | Elevation (m) | Description |
|---|---|---|
| 0.0 | 244.8 | TOPSOIL: 50 mm<br>SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist |
| 1.5 | 243.3 | SAND: Trace to some silt, loose, brown, moist |
| 4.6 | 240.2 | SAND AND SILT: Trace clay, compact, greyish brown, moist |
| 6.1 | 238.7 | SAND: Trace to some silt, very dense, greyish brown, moist |
| 10.7 | 234.1 | SILT AND SAND: Trace clay, dense, brown, moist |
| 15.2 | 229.6 | SAND: Trace silt, trace gravel, dense to very dense, brown, moist |

## SOIL SAMPLING / FIELD TESTING / LAB TESTING

| Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) |
|---|---|---|---|---|
| AS | 1 | | | 7 |
| SS | 2 | 100 | 7 | 5 |
| SS | 3 | 100 | 6 | 6 |
| SS | 4 | 100 | 8 | 6 |
| SS | 5 | 100 | 10 | 6 |
| SS | 6 | 100 | 22 | 6 |
| SS | 7 | 100 | 52 | 2 |
| SS | 8 | 100 | 50 | 2 |
| SS | 9 | 100 | 39 | 2 |
| SS | 10 | 100 | 43 | 5 |
| SS | 11 | 100 | 37 | 8 |
| SS | 12 | 100 | 49 | 7 |
| SS | 13 | 100 | 37 | 2 |
| SS | 14 | 100 | 55 | 3 |

Depth scale (m): 0, 2.1, 4.2, 6.3, 8.4, 10.5, 12.6, 14.7, 16.8
Elevation scale (m): 243.6, 241.5, 239.4, 237.3, 235.2, 233.1, 231, 228.9

FIELD TESTING — Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; 10, 20, 30, 40

LAB TESTING — △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); 100, 200, 300, 400. Atterberg Limits: PL — LL; ○ Water Content (%); 10, 20, 30, 40

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR | SA | SI | CL

Groundwater depth encountered on completion of drilling: Dry
Cave depth after auger removal: Open
Groundwater depth observed on: Apr 17/26 at depth of: Dry
Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 01

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | **2506478** | | | | |
| Project Client: | **Pine Valley Estates** | | | | |
| Project Name: | **Residential Development 9332 Cty Road 93** | Drilling Method: | **Hollow Stem Augers** | Drilling Machine: | **Track Mount** |
| Project Location: | **9332 County Rd 93, Midland, ON** | Logged By: **BH** | Northing: **4954451** | Date Started: | **Mar 25/26** |
| Drilling Location: | **See Borehole Location Plan** | Reviewed By: **MH** | Easting: **585311** | Date Completed: | **Mar 26/26** |
| Local Benchmark: | | | | | |

Field testing legend: Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); scale 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; scale 10, 20, 30, 40.

Lab testing legend: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); scale 100, 200, 300, 400. Atterberg Limits: PL ├──┤ LL; ○ Water Content (%); scale 10, 20, 30, 40.

| Lithology Plot | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Depth (m) | Elevation (m) | Field Testing | Lab Testing | Instrumentation Installation | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 226.8 | | | | | | | |
| | | SS | 15 | 100 | 90 | | | ○90 → | 1 ○ | | | | | |
| | | | | | | 18.9 | | | | | | | | |
| | | SS | 16 | 65 | 100+ | | 224.7 | ○100+ → | 1 ○ | | 4 | 92 | 4 | 0 |
| | | | | | | 21 | | | | | | | | |
| | 21.8 / 223.0 | SS | 17 | 20 | 100+ | | | ○100+ → | 3 ○ | | | | | |

Borehole Terminated at 21.8 m

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Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Apr 17/26 at depth of: Dry

Groundwater Elevation:

**Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretive assistance from a qualified professional. Borehole information must be read in conjunction with the accompanying report and any explanation of terms provided.**

Scale: **1 :105**

# RECORD OF BOREHOLE No. 02

GEI Consultants

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | |
| Project Client: | Pine Valley Estates | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: 4954551 | Date Started: Mar 30/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: 585509 | Date Completed: Mar 30/26 |
| Local Benchmark: | | | | | |

Field Testing legend: Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); scale 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; scale 10, 20, 30, 40.

Lab Testing legend: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); scale 100, 200, 300, 400. Atterberg Limits: PL — LL. ○ Water Content (%); scale 10, 20, 30, 40.

| Depth / Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | SPT (field) | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 / 244.4 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Trace organics rootlets, loose, brown, moist | AS | 1 | | | | 9 | | | | |
| 0.8 / 243.6 | SAND AND SILT: Trace clay, loose to dense, brown, moist | SS | 2 | 100 | 5 | 5 | 15 | 0 | 49 | 48 | 3 |
| | | SS | 3 | 100 | 7 | 7 | 4 | | | | |
| | | SS | 4 | 100 | 9 | 9 | 8 | | | | |
| | | SS | 5 | 100 | 9 | 9 | 4 | | | | |
| | | SS | 6 | 100 | 7 | 7 | 4 | | | | |
| 6.6 / 237.8 | | SS | 7 | 100 | 35 | 35 | 4 | | | | |

Borehole Terminated at 6.6 m

Depth scale (m): 0, 2.1, 4.2, 6.3. Elevation scale (m): 243.6, 241.5, 239.4.

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 03

GEI Consultants

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | | | |
| Project Client: | Pine Valley Estates | | | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | | | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954692 | Date Started: | Mar 26/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585689 | Date Completed: | Mar 30/26 |
| Local Benchmark: | | | | | | | |

| Depth (m) / Elev. (m) | Lithology Profile – Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) |
|---|---|---|---|---|---|---|
| 0.0 / 243.8 | TOPSOIL: 75 mm<br>SAND: Some silt, trace organics upper 200 mm, compact, brown, moist | AS | 1 | | | 12 |
| | | SS | 2 | 100 | 13 | 6 |
| | | SS | 3 | 100 | 13 | 7 |
| | | SS | 4 | 100 | 11 | 7 |
| | | SS | 5 | 100 | 12 | 9 |
| | | SS | 6 | 100 | 15 | 8 |
| 6.1 / 237.7 | SAND AND SILT: Trace clay, compact to dense, brown, moist to wet | SS | 7 | 100 | 16 | 10 |
| | | SS | 8 | 100 | 46 | 22 |
| 9.1 / 234.6 | SAND: Trace to some silt, dense to very dense, brown, moist | SS | 9 | 100 | 54 | 2 |
| | | SS | 10 | 100 | 72 | 3 |
| | | SS | 11 | 100 | 44 | 2 |
| | | SS | 12 | 100 | 44 | 6 |
| | | SS | 13 | 100 | 50 | 4 |

Depth (m) / Elevation (m) scale: 0 – 243.6; 2.1 – 241.5; 4.2 – 239.4; 6.3 – 237.3; 8.4 – 235.2; 10.5 – 233.1; 12.6 – 231; 14.7 – 228.9; 16.8 – 226.8

FIELD TESTING – Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded) (50, 100, 150, 200). Penetration Testing: ○ SPT; ● DCPT (10, 20, 30, 40)

LAB TESTING: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm) (100, 200, 300, 400). Atterberg Limits: PL – LL; ○ Water Content (%) (10, 20, 30, 40)

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR | SA | SI | CL

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Apr 17/26 at depth of: Dry

Groundwater Elevation:

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**Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretive assistance from a qualified professional. Borehole information must be read in conjunction with the accompanying report and any explanation of terms provided.**

Scale **1 :105**

# RECORD OF BOREHOLE No. 03

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | |
| Project Client: | Pine Valley Estates | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: 4954692 | Date Started: Mar 26/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: 585689 | Date Completed: Mar 30/26 |
| Local Benchmark: | | | | | |

| Lithology Profile: Description | Depth/Elev (m) | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Depth (m) | Elevation (m) | Field Testing (SPT) | Lab Testing (Water Content %) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SS | 14 | 100 | 51 | | | 51 | 2 | | | | |
| | | | | | | 18.9 | 224.7 | | | | | | |
| | | | | | | 21 | 222.6 | | | | | | |
| | | SS | 15 | 100 | 79 | | | 79 | 2 | | | | |
| | | | | | | 23.1 | 220.5 | | | | | | |
| - - - Wet - - - | 24.8 / 218.9 | SS | 16 | 100 | 75 | | | 75 | 14 | 1 | 85 | 14 | 0 |
| Borehole Terminated at 24.8 m | | | | | | | | | | | | | |

Field Testing legend: Shear Strength Testing (kPa) 50, 100, 150, 200 — Other Test, Pocket Penetrometer, Field Vane (Intact), Field Vane (Remolded); Penetration Testing 10, 20, 30, 40 — SPT, DCPT.

Lab Testing legend: Combustible Organic Vapour (ppm), Combustible Organic Vapour (%LEL), Total Organic Vapour (ppm) 100, 200, 300, 400; Atterberg Limits PL–LL; Water Content (%) 10, 20, 30, 40.

Instrumentation Installation

Comments & Grain Size Distribution (%)

# RECORD OF BOREHOLE No. 04

GEI Consultants

| | |
|---|---|
| Project Number: | 2506478 |
| Project Client: | Pine Valley Estates |
| Project Name: | Residential Development 9332 Cty Road 93 |
| Project Location: | 9332 County Rd 93, Midland, ON |
| Drilling Location: | See Borehole Location Plan |
| Local Benchmark: | |
| Drilling Method: | Solid Stem Augers |
| Drilling Machine: | Track Mount |
| Logged By: | BH |
| Reviewed By: | MH |
| Northing: | 4954423 |
| Easting: | 585438 |
| Date Started: | Mar 25/26 |
| Date Completed: | Mar 25/26 |

Field Testing legend: Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded) (scale 50, 100, 150, 200). Penetration Testing: ○ SPT; ● DCPT (scale 10, 20, 30, 40).

Lab Testing legend: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm) (scale 100, 200, 300, 400). Atterberg Limits: PL – LL; ○ Water Content (%) (scale 10, 20, 30, 40).

| Depth (m) / Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Depth (m) | Elevation (m) | SPT N (plot) | Water Content (%) | Instrumentation Installation | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 / 244.7 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Loose, brown, moist | AS | 1 | | | 0 | | | 8 | | | | | |
| 0.8 / 243.9 | SILT AND SAND: Trace clay, loose to compact, brown, moist | SS | 2 | 100 | 5 | | 243.6 | 5 | 7 | | | | | |
| | | SS | 3 | 100 | 9 | | | 9 | 8 | | | | | |
| | | SS | 4 | 100 | 8 | 2.1 | | 8 | 3 | | | | | |
| | | SS | 5 | 100 | 14 | | 241.5 | 14 | 4 | | | | | |
| | | SS | 6 | 100 | 27 | 4.2 | 239.4 | 27 | 3 | | | | | |
| 6.6 / 238.1 | | SS | 7 | 100 | 30 | 6.3 | | 30 | 3 | | | | | |

Borehole Terminated at 6.6 m

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:

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# RECORD OF BOREHOLE No. 05

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Number: | **2506478** | | | | | | |
| Project Client: | **Pine Valley Estates** | | | | | | |
| Project Name: | **Residential Development 9332 Cty Road 93** | Drilling Method: | **Solid Stem Augers** | | | Drilling Machine: | **Track Mount** |
| Project Location: | **9332 County Rd 93, Midland, ON** | Logged By: | **BH** | Northing: | **4954536** | Date Started: | **Mar 23/26** |
| Drilling Location: | **See Borehole Location Plan** | Reviewed By: | **MH** | Easting: | **585611** | Date Completed: | **Mar 23/26** |
| Local Benchmark: | | | | | | | |

## LITHOLOGY PROFILE

| Depth (m) | Elevation (m) | Description |
|---|---|---|
| 0.0 | 244.6 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Trace organics upper 300 mm, loose, brown, moist to wet |
| 2.3 | 242.3 | SILT: Some sand, trace clay, compact to dense, brown, wet to moist |
| 6.6 | 238.0 | Borehole Terminated at 6.6 m |

## SOIL SAMPLING, FIELD TESTING AND LAB TESTING

| Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | Comments & Grain Size Distribution (%) |
|---|---|---|---|---|---|
| AS | 1 | | | 13 | |
| SS | 2 | 100 | 6 | 15 | |
| SS | 3 | 100 | 5 | 29 | |
| SS | 4 | 100 | 11 | 24 | GR 0, SA 14, SI 80, CL 5 |
| SS | 5 | 100 | 38 | 5 | |
| SS | 6 | 100 | 33 | 13 | |
| SS | 7 | 100 | 35 | 20 | |

Depth (m) scale: 0, 2.1, 4.2, 6.3. Elevation (m) scale: 243.6, 241.5, 239.4.

Field Testing – Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); scale 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; scale 10, 20, 30, 40.

Lab Testing: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); scale 100, 200, 300, 400. Atterberg Limits: PL – LL; ○ Water Content (%); scale 10, 20, 30, 40.

Instrumentation Installation

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 06

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | | | |
| Project Client: | Pine Valley Estates | | | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | | | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954299 | Date Started: | Mar 25/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585433 | Date Completed: | Mar 25/26 |
| Local Benchmark: | | | | | | | |

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| Depth (m) | Elevation (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) |
|---|---|---|---|---|---|---|---|
| 0.0 | 246.4 | TOPSOIL: 50 mm<br>SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist | AS | 1 | | | 9, 9 |
| | | | SS | 2 | 100 | 7 | |
| | | | SS | 3 | 100 | 7 | 8 |
| 2.3 | 244.1 | SILT: Some sand, trace clay, loose, brown, moist | SS | 4 | 100 | 4 | 27 |
| | | | SS | 5 | 100 | 9 | 21 |
| 4.6 | 241.8 | SILT AND SAND: Trace clay, compact, brown, moist | SS | 6 | 100 | 25 | 5 |
| 6.6 | 239.8 | | SS | 7 | 100 | 27 | 4 |

Borehole Terminated at 6.6 m

Depth scale (m): 0, 2.1, 4.2, 6.3; Elevation scale (m): 245.7, 243.6, 241.5

FIELD TESTING — Shear Strength Testing (kPa): Other Test; Pocket Penetrometer; Field Vane (Intact); Field Vane (Remolded) — 50, 100, 150, 200. Penetration Testing: SPT; DCPT — 10, 20, 30, 40

LAB TESTING — Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm) — 100, 200, 300, 400. Atterberg Limits: PL — LL. Water Content (%) — 10, 20, 30, 40

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR | SA | SI | CL

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:

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Scale 1 :105

# RECORD OF BOREHOLE No. 07

Project Number: **2506478**
Project Client: **Pine Valley Estates**
Project Name: **Residential Development 9332 Cty Road 93**
Project Location: **9332 County Rd 93, Midland, ON**
Drilling Location: **See Borehole Location Plan**
Local Benchmark:

Drilling Method: **Solid Stem Augers**
Drilling Machine: **Track Mount**
Logged By: **BH**
Reviewed By: **MH**
Northing: **4954413**
Easting: **585564**
Date Started: **Mar 25/26**
Date Completed: **Mar 25/26**

| Depth / Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 / 246.6 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Loose, brown, moist | AS | 1 | | | 9 | | | | |
| | | SS | 2 | 100 | 4 | 7 | | | | |
| | | SS | 3 | 100 | 4 | 6 | | | | |
| | | SS | 4 | 100 | 7 | 8 | | | | |
| 3.0 / 243.6 | SILT AND SAND: Trace clay, loose to dense, brown, moist | SS | 5 | 100 | 7 | 14 | | | | |
| | | SS | 6 | 100 | 24 | 18 | 0 | 35 | 57 | 8 |
| | | SS | 7 | 100 | 37 | 9 | | | | |
| 6.6 / 240.1 | Borehole Terminated at 6.6 m | | | | | | | | | |

Depth marks (m): 0, 2.1, 4.2, 6.3. Elevation marks (m): 245.7, 243.6, 241.5.

Field Testing – Shear Strength Testing (kPa): Other Test; Pocket Penetrometer; Field Vane (Intact); Field Vane (Remolded) — scale 50, 100, 150, 200. Penetration Testing: SPT, DCPT — scale 10, 20, 30, 40.

Lab Testing: Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm) — scale 100, 200, 300, 400. Atterberg Limits: PL, LL. Water Content (%) — scale 10, 20, 30, 40.

Instrumentation Installation

Groundwater depth encountered on completion of drilling: Dry
Cave depth after auger removal: Open
Groundwater depth observed on:
Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 08

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Project Number: **2506478**
Project Client: **Pine Valley Estates**
Project Name: **Residential Development 9332 Cty Road 93**
Project Location: **9332 County Rd 93, Midland, ON**
Drilling Location: **See Borehole Location Plan**
Local Benchmark:

Drilling Method: **Solid Stem Augers**
Drilling Machine: **Track Mount**
Logged By: **BH**
Reviewed By: **MH**
Northing: **4954520**
Easting: **585728**
Date Started: **Mar 23/26**
Date Completed: **Mar 23/26**

Field Testing – Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded) (50, 100, 150, 200). Penetration Testing: ○ SPT; ● DCPT (10, 20, 30, 40)

Lab Testing: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm) (100, 200, 300, 400). Atterberg Limits: PL ├──┤ LL; ○ Water Content (%) (10, 20, 30, 40)

Comments & Grain Size Distribution (%): GR | SA | SI | CL

| Depth (m) / Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) |
|---|---|---|---|---|---|---|
| 0.0 / 243.8 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist to very moist | AS | 1 | | | 16 |
| | | SS | 2 | 100 | 7 | 18 |
| | | SS | 3 | 100 | 8 | 17 |
| | | SS | 4 | 100 | 6 | 24 |
| 3.0 / 240.7 | SAND AND SILT: Trace clay, compact to very dense, brown to grey/brown, moist to wet | SS | 5 | 100 | 15 | 9 |
| | | SS | 6 | 100 | 32 | 20 |
| 6.6 / 237.2 | | SS | 7 | 100 | 62 | 13 |
| | Borehole Terminated at 6.6 m | | | | | |

Depth / Elevation scale: 0 – 243.6; 2.1 – 241.5; 4.2 – 239.4; 6.3 – 237.3

Groundwater depth encountered on completion of drilling: Dry
Cave depth after auger removal: Open
Groundwater depth observed on:
Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 09

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| | | | | | |
|---|---|---|---|---|---|
| Project Number: | **2506478** | | | | |
| Project Client: | **Pine Valley Estates** | | | | |
| Project Name: | **Residential Development 9332 Cty Road 93** | Drilling Method: | **Hollow Stem Augers** | Drilling Machine: | **Track Mount** |
| Project Location: | **9332 County Rd 93, Midland, ON** | Logged By: | **BH** | Northing: **4954449** | Date Started: **Mar 25/26** |
| Drilling Location: | **See Borehole Location Plan** | Reviewed By: | **MH** | Easting: **585686** | Date Completed: **Mar 25/26** |
| Local Benchmark: | | | | | |

**LITHOLOGY PROFILE / SOIL SAMPLING / FIELD TESTING / LAB TESTING / COMMENTS & GRAIN SIZE DISTRIBUTION (%)**

Field Testing – Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); scale 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; scale 10, 20, 30, 40.

Lab Testing: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); scale 100, 200, 300, 400. Atterberg Limits: PL ├──┤ LL; ○ Water Content (%); scale 10, 20, 30, 40.

| Depth (m) / Elevation (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 / 245.9 | TOPSOIL: 75 mm<br>SILTY FINE SAND: Trace organics, upper 200 mm, loose, brown, moist | AS | 1 | | | 6 | | | | |
| 0.8 / 245.1 | SAND: Some silt, loose to compact, brown, moist | SS | 2 | 100 | 4 | 5 | | | | |
| | | SS | 3 | 100 | 6 | 6 | | | | |
| | | SS | 4 | 100 | 6 | 6 | | | | |
| | | SS | 5 | 100 | 21 | 6 | | | | |
| 4.6 / 241.3 | SAND AND SILT: Trace clay, dense, brown, moist | SS | 6 | 100 | 39 | 10 | | | | |
| | | SS | 7 | 100 | 35 | 6 | | | | |
| | - - - Sand seams - - - | SS | 8 | 100 | 32 | 2 | | | | |
| | - - - Wet seams - - - | SS | 9 | 100 | 40 | 16 | 0 | 50 | 44 | 6 |
| | - - - Wet seams - - - | SS | 10 | 100 | 41 | 18 | | | | |
| 12.6 / 233.2 | | SS | 11 | 100 | 43 | 4 | | | | |
| | Borehole Terminated at 12.6 m | | | | | | | | | |

Depth (m) / Elevation (m) scale: 0 – 245.7; 2.1 – 243.6; 4.2 – 241.5; 6.3 – 239.4; 8.4 – 237.3; 10.5 – 235.2; 12.6

Instrumentation Installation

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Apr 17/26 at depth of: Dry

Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 10

| | |
|---|---|
| Project Number: | **2506478** |
| Project Client: | **Pine Valley Estates** |
| Project Name: | **Residential Development 9332 Cty Road 93** |
| Project Location: | **9332 County Rd 93, Midland, ON** |
| Drilling Location: | **See Borehole Location Plan** |
| Local Benchmark: | |
| Drilling Method: | **Solid Stem Augers** |
| Drilling Machine: | **Track Mount** |
| Logged By: | **BH** |
| Reviewed By: | **MH** |
| Northing: | **4954231** |
| Easting: | **585489** |
| Date Started: | **Mar 24/26** |
| Date Completed: | **Mar 24/26** |

## LITHOLOGY PROFILE

| Depth (m) | Elevation (m) | Description |
|---|---|---|
| 0.0 | 246.8 | TOPSOIL: 50 mm |
| | | SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist |
| 0.8 | 246.0 | SAND AND SILT: Trace clay, loose to compact, brown, moist |
| 6.6 | 240.2 | Borehole Terminated at 6.6 m |

## SOIL SAMPLING / FIELD TESTING / LAB TESTING

| Sample Type | Sample Number | Recovery (%) | SPT "N" Value | SPT (Penetration Testing) | Water Content (%) |
|---|---|---|---|---|---|
| AS | 1 | | | | 9 |
| SS | 2 | 100 | 7 | 7 | 14 |
| SS | 3 | 100 | 10 | 10 | 11 |
| SS | 4 | 100 | 6 | 6 | 13 |
| SS | 5 | 100 | 7 | 7 | 10 |
| SS | 6 | 100 | 19 | 19 | 8 |
| SS | 7 | 100 | 21 | 21 | 4 |

Depth scale (m): 0, 2.1, 4.2, 6.3
Elevation scale (m): 245.7, 243.6, 241.5

FIELD TESTING: Shear Strength Testing (kPa) — × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); 50 100 150 200. Penetration Testing — ○ SPT ● DCPT; 10 20 30 40

LAB TESTING: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); 100 200 300 400. Atterberg Limits PL — LL; ○ Water Content (%) 10 20 30 40

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR | SA | SI | CL

Groundwater depth encountered on completion of drilling: Dry
Cave depth after auger removal: Open
Groundwater depth observed on:
Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 11

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Project Number: **2506478**
Project Client: **Pine Valley Estates**
Project Name: **Residential Development 9332 Cty Road 93**
Project Location: **9332 County Rd 93, Midland, ON**
Drilling Location: **See Borehole Location Plan**
Local Benchmark:

Drilling Method: **Solid Stem Augers** | Drilling Machine: **Track Mount**
Logged By: **BH** | Northing: **4954285** | Date Started: **Mar 25/26**
Reviewed By: **MH** | Easting: **585589** | Date Completed: **Mar 25/26**

| Depth/Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | SPT N (plot) | Water Content (%) |
|---|---|---|---|---|---|---|---|
| 0.0 / 245.3 | TOPSOIL: 50 mm | AS | 1 | | | | 12 |
| 0.8 / 244.5 | SILTY FINE SAND: Trace organics upper 100 mm, loose, brown, moist | SS | 2 | 100 | 7 | 7 | 7 |
| | SILT AND SAND: Trace clay, loose to dense, brown, moist<br>- - - Wet seams - - - | SS | 3 | 100 | 7 | 7 | 25 |
| | | SS | 4 | 100 | 6 | 6 | 16 |
| | | SS | 5 | 100 | 6 | 6 | 8 |
| | | SS | 6 | 100 | 27 | 27 | 9 |
| 6.6 / 238.7 | | SS | 7 | 100 | 37 | 37 | 11 |
| | Borehole Terminated at 6.6 m | | | | | | |

Depth scale (m): 0, 2.1, 4.2, 6.3. Elevation scale (m): 243.6, 241.5, 239.4.

FIELD TESTING – Shear Strength Testing (kPa): Other Test; Pocket Penetrometer; Field Vane (Intact); Field Vane (Remolded) (50, 100, 150, 200). Penetration Testing: SPT; DCPT (10, 20, 30, 40).

LAB TESTING – Combustible Organic Vapour (ppm); Combustible Organic Vapour (%LEL); Total Organic Vapour (ppm) (100, 200, 300, 400). Atterberg Limits: PL – LL. Water Content (%) (10, 20, 30, 40).

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%): GR | SA | SI | CL

Groundwater depth encountered on completion of drilling: Dry
Cave depth after auger removal: Open
Groundwater depth observed on:
Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | | | |
| Project Client: | Pine Valley Estates | | | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | | | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954419 | Date Started: | Mar 23/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585761 | Date Completed: | Mar 23/26 |
| Local Benchmark: | | | | | | | |

Field Testing legend: Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); scale 50, 100, 150, 200. Penetration Testing: ○ SPT; ● DCPT; scale 10, 20, 30, 40.

Lab Testing legend: △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); scale 100, 200, 300, 400. Atterberg Limits: PL —— LL. ○ Water Content (%); scale 10, 20, 30, 40.

| Depth/Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 / 244.8 | TOPSOIL: 50 mm<br>SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist | AS | 1 | | | 16 | | | | |
| | | SS | 2 | 100 | 10 | 26 | | | | |
| 1.5 / 243.3 | SILT AND SAND: Trace clay, loose to compact, brown to greyish brown, moist | SS | 3 | 100 | 7 | 16 | | | | |
| | | SS | 4 | 100 | 8 | 20 | | | | |
| | | SS | 5 | 100 | 22 | 11 | | | | |
| 4.6 / 240.2 | SILT: Trace clay, trace sand, compact to dense, greyish brown, moist | SS | 6 | 100 | 29 | 17 | 0 | 2 | 91 | 7 |
| 6.6 / 238.3 | | SS | 7 | 100 | 50 | 19 | | | | |
| | Borehole Terminated at 6.6 m | | | | | | | | | |

Depth scale (m): 0, 2.1, 4.2, 6.3. Elevation scale (m): 243.6, 241.5, 239.4.

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:





Scale 1 :105

# RECORD OF BOREHOLE No. 13

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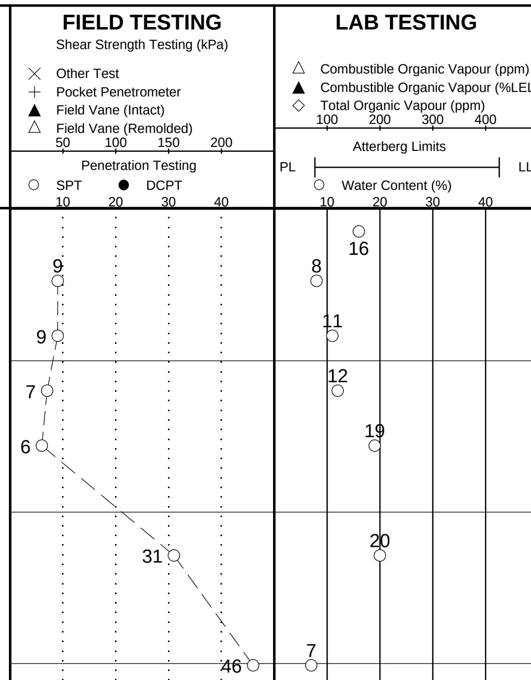
| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | |
| Project Client: | Pine Valley Estates | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Solid Stem Augers | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954314 | 
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585734 |
| Local Benchmark: | | | | | |

Date Started: Mar 24/26 · Date Completed: Mar 24/26

| Depth (m) | Elevation (m) | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0–0.2 | 246.0–245.9 | TOPSOIL: 150 mm | AS | 1 | | | 16 | | | | |
| 0.2–0.8 | 245.9–245.2 | SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist | SS | 2 | 100 | 9 | 8 | 0 | 52 | 44 | 4 |
| 0.8–4.6 | 245.2–241.4 | SAND AND SILT: Trace clay, loose, brown, moist | SS | 3 | 100 | 9 | 11 | | | | |
| | | | SS | 4 | 100 | 7 | 12 | | | | |
| | | | SS | 5 | 100 | 6 | 19 | | | | |
| 4.6–6.6 | 241.4–239.5 | SILT: Trace sand, trace clay, dense, brown, moist | SS | 6 | 100 | 31 | 20 | | | | |
| | | | SS | 7 | 100 | 46 | 7 | | | | |

Borehole Terminated at 6.6 m

Depth ticks: 0, 2.1, 4.2, 6.3 · Elevation ticks: 245.7, 243.6, 241.5




Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on:

Groundwater Elevation:

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Scale **1 :105**

# RECORD OF BOREHOLE No. 14

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| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | |
| Project Client: | Pine Valley Estates | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Hollow Stem Augers | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954228 | Date Started: | Mar 24/26 |
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585587 | Date Completed: | Mar 24/26 |
| Local Benchmark: | | | | | |

| Depth (m) | Elev. (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | GR | SA | SI | CL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 246.5 | TOPSOIL: 50 mm | AS | 1 | | | 9 | | | | |
| | | SILTY FINE SAND: Trace organics upper 200 mm, loose, brown, moist | SS | 2 | 100 | 6 | 8 | | | | |
| 0.8 | 245.7 | SILT AND SAND: Trace clay, loose to dense, brown, moist | SS | 3 | 100 | 9 | 9 | | | | |
| | | - - - Wet seams - - - | SS | 4 | 100 | 6 | 24 | | | | |
| | | | SS | 5 | 100 | 23 | 10 | | | | |
| | | - - - Wet seams - - - | SS | 6 | 100 | 31 | 21 | | | | |
| 6.1 | 240.4 | SAND: Some silt, dense to very dense, greyish brown, moist | SS | 7 | 100 | 50 | 2 | | | | |
| | | | SS | 8 | 100 | 38 | 3 | | | | |
| | | | SS | 9 | 100 | 50 | 3 | | | | |
| | | | SS | 10 | 100 | 60 | 3 | 0 | 85 | 15 | 0 |
| | | - - - Very moist - - - | SS | 11 | 100 | 68 | 9 | | | | |
| 12.6 | 233.9 | Borehole Terminated at 12.6 m | | | | | | | | | |

Depth scale (m): 0, 2.1, 4.2, 6.3, 8.4, 10.5, 12.6
Elevation scale (m): 245.7, 243.6, 241.5, 239.4, 237.3, 235.2

FIELD TESTING — Shear Strength Testing (kPa): × Other Test; + Pocket Penetrometer; ▲ Field Vane (Intact); △ Field Vane (Remolded); 50, 100, 150, 200. Penetration Testing: ○ SPT ● DCPT; 10, 20, 30, 40

LAB TESTING — △ Combustible Organic Vapour (ppm); ▲ Combustible Organic Vapour (%LEL); ◇ Total Organic Vapour (ppm); 100, 200, 300, 400. Atterberg Limits: PL — LL; ○ Water Content (%); 10, 20, 30, 40

Instrumentation Installation

COMMENTS & GRAIN SIZE DISTRIBUTION (%)

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Apr 17/26 at depth of: Dry

Groundwater Elevation:

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Scale 1 :105

# RECORD OF BOREHOLE No. 15

| | | | | | |
|---|---|---|---|---|---|
| Project Number: | 2506478 | | | | |
| Project Client: | Pine Valley Estates | | | | |
| Project Name: | Residential Development 9332 Cty Road 93 | Drilling Method: | Hollow Stem Augers | Drilling Machine: | Track Mount |
| Project Location: | 9332 County Rd 93, Midland, ON | Logged By: | BH | Northing: | 4954344 | 
| Drilling Location: | See Borehole Location Plan | Reviewed By: | MH | Easting: | 585800 |
| Local Benchmark: | | | | | |

Date Started: Mar 23/26
Date Completed: Mar 23/26

Legend – Field Testing: Shear Strength Testing (kPa): Other Test (×), Pocket Penetrometer (+), Field Vane (Intact) (▲), Field Vane (Remolded) (△); scale 50, 100, 150, 200. Penetration Testing: SPT (○), DCPT (●); scale 10, 20, 30, 40.

Legend – Lab Testing: Combustible Organic Vapour (ppm) (△), Combustible Organic Vapour (%LEL) (▲), Total Organic Vapour (ppm) (◇); scale 100, 200, 300, 400. Atterberg Limits: PL, LL. Water Content (%) (○); scale 10, 20, 30, 40.

| Depth (m) | Elevation (m) | Description | Sample Type | Sample Number | Recovery (%) | SPT "N" Value | Water Content (%) | Comments & Grain Size Distribution (%) GR / SA / SI / CL |
|---|---|---|---|---|---|---|---|---|
| 0.0–0.2 | 245.5–245.4 | TOPSOIL: 150 mm | AS | 1 | 100 | 5 | 31 | |
| 0.2–1.5 | 245.4–244.0 | SILTY FINE SAND: Trace organics/ rootlets upper 100 mm, loose, brown, moist | SS | 2 | 100 | 6 | 21 | |
| 1.5–10.7 | 244.0–234.9 | SAND AND SILT: Trace clay, loose to dense, brown, moist | SS | 3 | 100 | 7 | 15 | |
| | | | SS | 4 | 100 | 10 | 9 | |
| | | | SS | 5 | 100 | 9 | 10 | |
| | | | SS | 6 | 100 | 47 | 6 | |
| | | - - - Greyish brown - - - | SS | 7 | 100 | 35 | 14 | |
| | | | SS | 8 | 100 | 47 | 6 | |
| | | - - - Wet seams - - - | SS | 9 | 100 | 50 | 20 | |
| 10.7–15.2 | 234.9–230.3 | SAND: Trace to some silt, dense to very dense, brown, moist | SS | 10 | 100 | 44 | 3 | |
| | | | SS | 11 | 100 | 70 | 3 | |
| 15.2–17.2 | 230.3–228.3 | SILT: Some sand, trace clay, very dense, greyish brown, moist to wet | SS | 12 | 100 | 57 | 21 | 0 / 13 / 81 / 6; First Water Strike SS12 |
| | | | AS | 13 | - | - | 15 | |

Borehole Terminated at 17.2 m

Depth / elevation markers: 2.1 m – 243.6; 4.2 m – 241.5; 6.3 m – 239.4; 8.4 m – 237.3; 10.5 m – 235.2; 12.6 m – 233.1; 14.7 m – 231; 16.8 m – 228.9

Groundwater depth encountered on completion of drilling: Dry

Cave depth after auger removal: Open

Groundwater depth observed on: Apr 17/26 at depth of: Dry

Groundwater Elevation:

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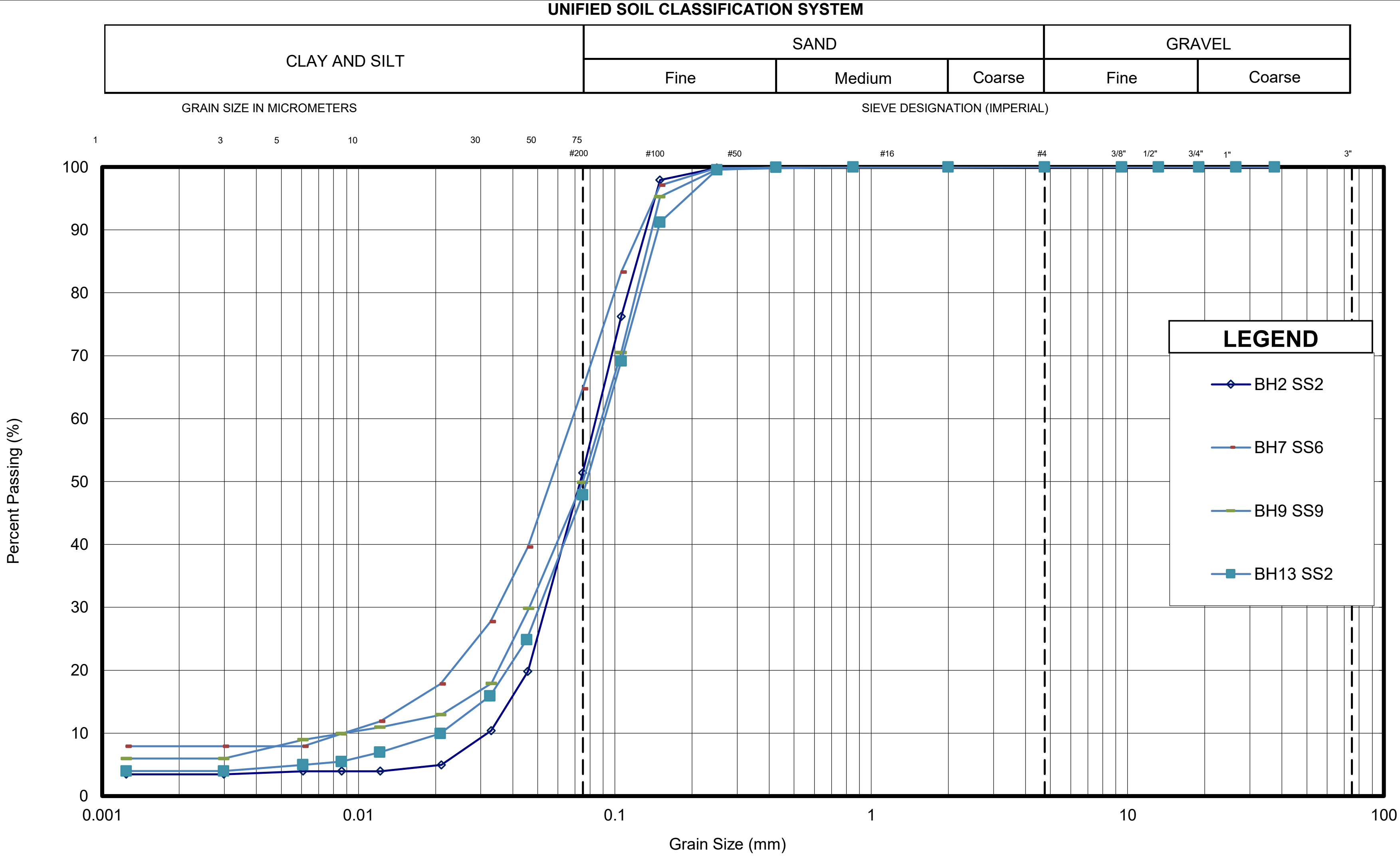
Borehole details presented do not constitute a thorough understanding of all potential conditions present and require interpretive assistance from a qualified professional. Borehole information must be read in conjunction with the accompanying report and any explanation of terms provided.

Scale 1 :105

# Appendix C Geotechnical Laboratory Testing




| Sample | Description | Gr. | Sa. | Si. | Cl. | $D_{10}$ | $D_{30}$ | $D_{60}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|---|---|---|---|
| BH2 SS2 | SAND AND SILT, Trace Clay | 0 | 49 | 48 | 3 | 0.032 | 0.054 | 0.085 | 2.7 | 1.1 |
| BH7 SS6 | SILT AND SAND, Trace Clay | 0 | 35 | 57 | 8 | 0.009 | 0.035 | 0.068 | 7.8 | 2.0 |
| BH9 SS9 | SAND AND SILT, Trace Clay | 0 | 50 | 44 | 6 | 0.009 | 0.046 | 0.089 | 10.2 | 2.8 |
| BH13 SS2 | SAND AND SILT, Trace Clay | 0 | 52 | 44 | 4 | 0.021 | 0.051 | 0.091 | 4.4 | 1.4 |

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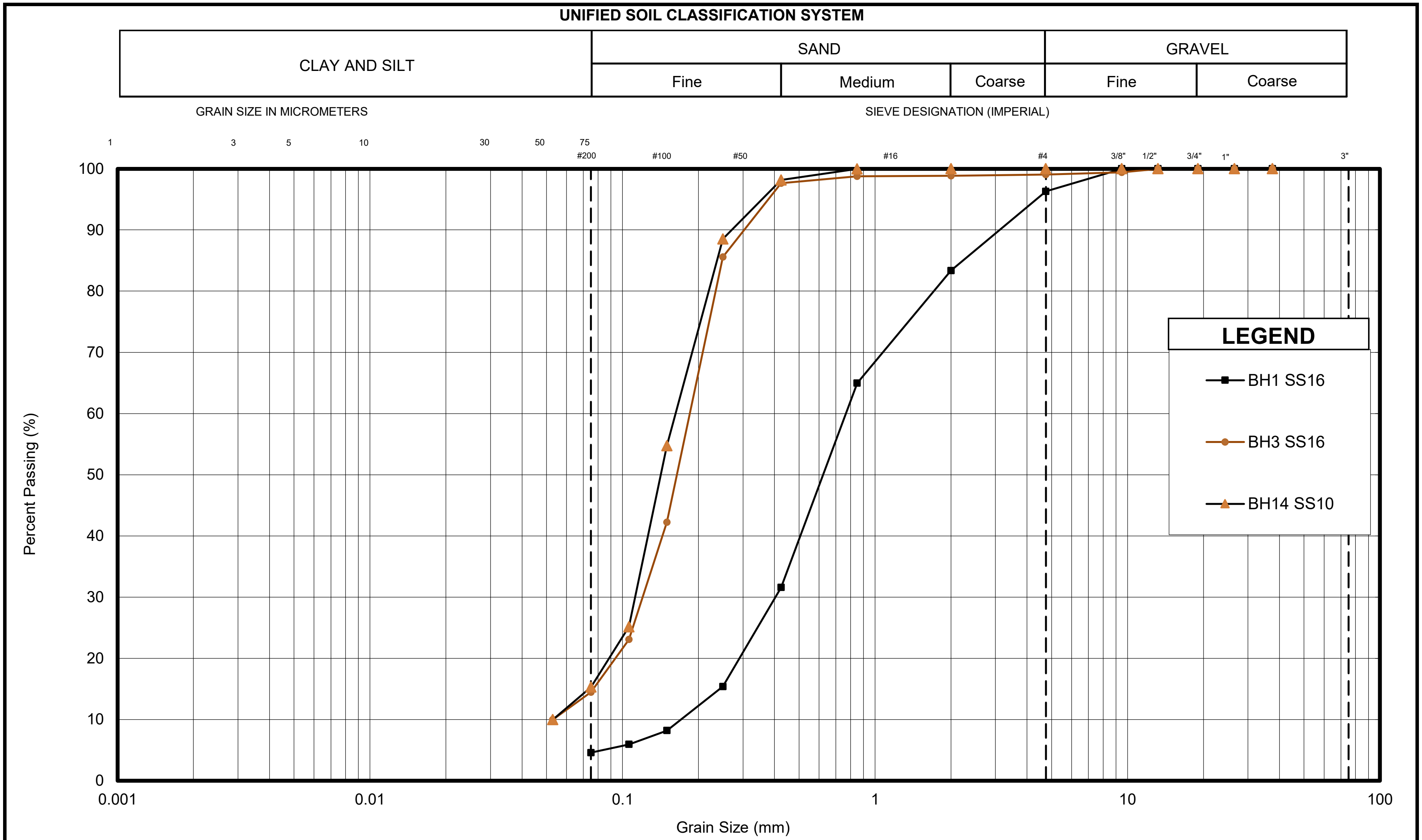
GRAIN SIZE DISTRIBUTION - Pine Valley Estates Development

**SAND AND SILT**

FIGURE No. B1

REF. No. 2506478

DATE April 2026




| Sample | Description | Gr. | Sa. | Si. | Cl. | $D_{10}$ | $D_{30}$ | $D_{60}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|---|---|---|---|
| BH1 SS16 | SAND, Trace Gravel, Trace Silt | 4 | 92 | 4 | - | 0.170 | 0.404 | 0.767 | 4.5 | 1.3 |
| BH3 SS16 | SAND, Some Silt, Trace Gravel | 1 | 85 | 14 | - | 0.053 | 0.120 | 0.185 | 3.5 | 1.5 |
| BH14 SS10 | SAND, Some Silt | 0 | 85 | 15 | - | 0.053 | 0.112 | 0.162 | 3.1 | 1.5 |

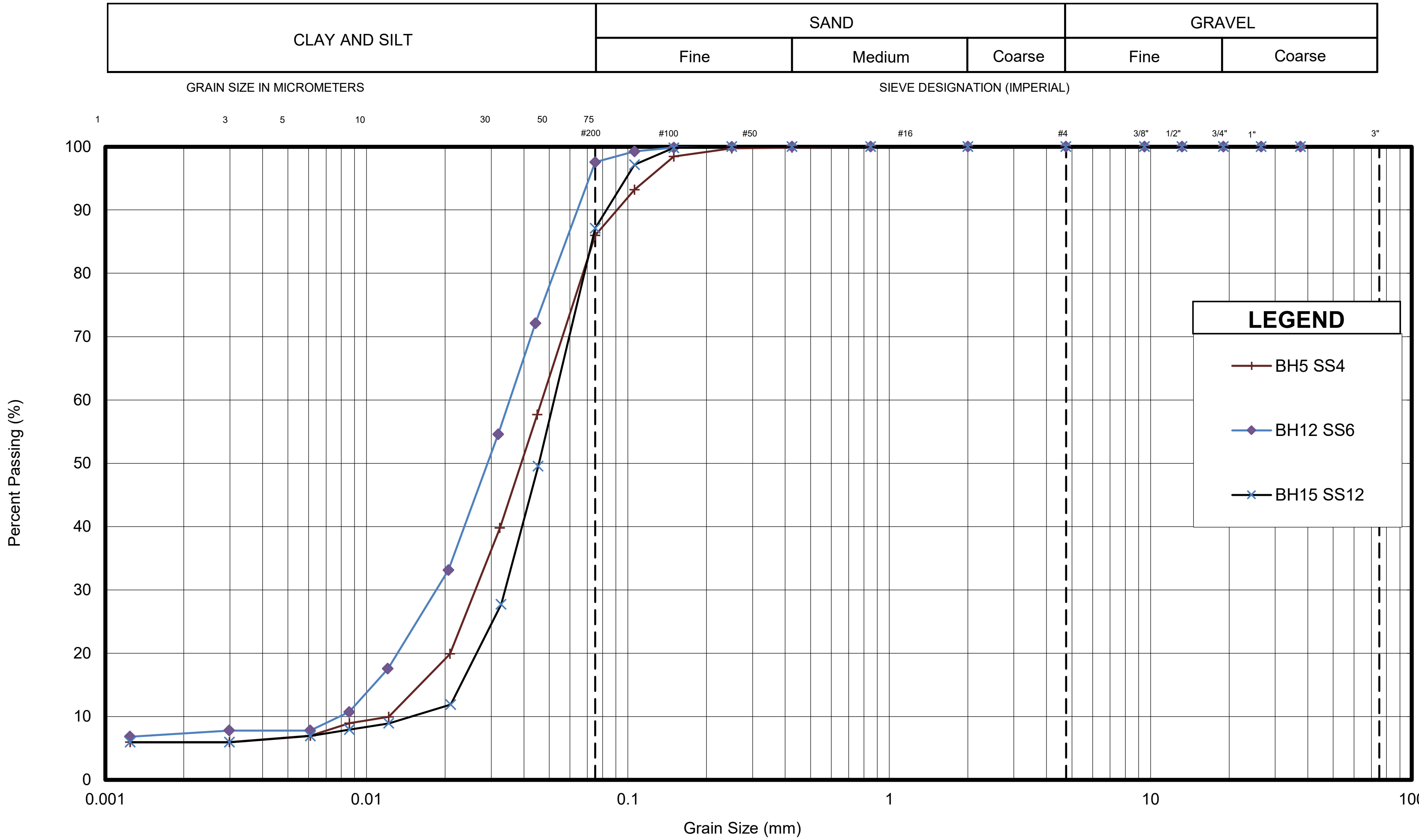
GEI Consultants Canada

GRAIN SIZE DISTRIBUTION - Pine Valley Estates Development

**SAND**

| | |
|---|---|
| FIGURE No. | B3 |
| REF. No. | 2506478 |
| DATE | April 2026 |

## UNIFIED SOIL CLASSIFICATION SYSTEM




| Sample | Description | Gr. | Sa. | Si. | Cl. | $D_{10}$ | $D_{30}$ | $D_{60}$ | $C_u$ | $C_c$ |
|---|---|---|---|---|---|---|---|---|---|---|
| BH5 SS4 | SILT, Some Sand, Trace Clay | 0 | 14 | 80 | 5 | 0.012 | 0.026 | 0.047 | 3.9 | 1.2 |
| BH12 SS6 | SILT, Trace Clay, Trace Sand | 0 | 2 | 91 | 7 | 0.008 | 0.018 | 0.035 | 4.5 | 1.2 |
| BH15 SS12 | SILT, Some Sand, Trace Clay | 0 | 13 | 81 | 6 | 0.015 | 0.034 | 0.052 | 3.5 | 1.5 |

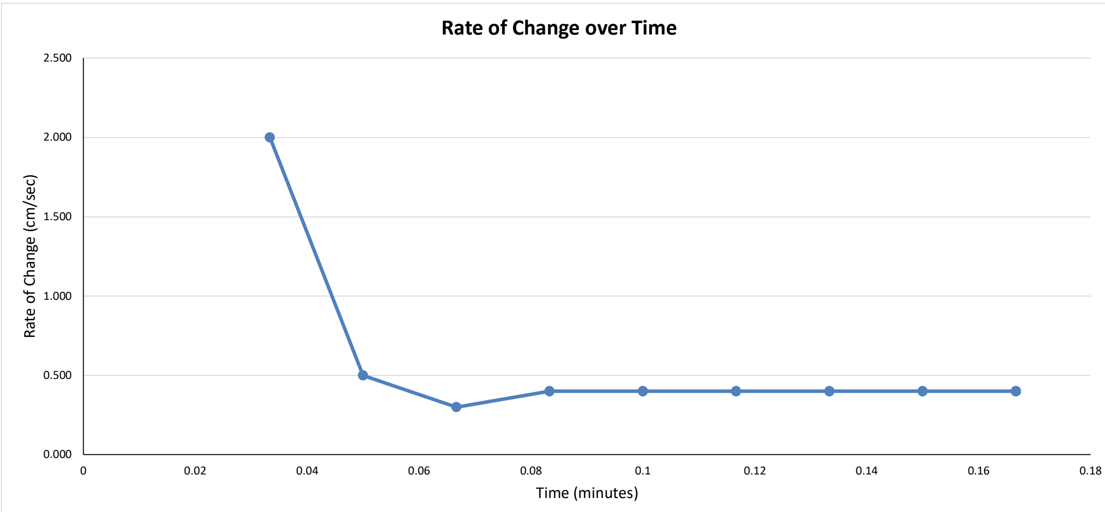
| | | |
|---|---|---|
| GEI Consultants Canada | GRAIN SIZE DISTRIBUTION - Pine Valley Estates Development | FIGURE No. B2 |
| | **SILT** | REF. No. 2506478 |
| | | DATE April 2026 |

# Appendix D Infiltration Testing

# Guelph Permeameter
# Infiltration Rate Determination

GEI Consultants

## Test Location: Test Pit 15




### INPUT PARAMETERS

| | | |
|---|---|---|
| α* = | 0.12 | $cm^{-1}$ |
| H = | 5 | cm |
| a = | 3 | cm |
| X = | 35.22 | $cm^2$ |
| R = | 0.4 | cm/sec |

### SHAPE FACTOR

| | |
|---|---|
| Shape Factor (1, 2 or 3) = | 1 |
| Shape Factor Value ($cm^{-1}$) = | 0.803 |

### CALCULATED PARAMETERS

| | | |
|---|---|---|
| $H_a$ = | 1.67 | unitless |
| $Q_1$ = | 14.088 | $cm^3$/sec |

### CALCULATED DESIGN VALUES

| | | |
|---|---|---|
| $k_{fs}$= | 2.56E-02 | cm/sec |
| $\Phi_m$= | 2.14E-01 | $cm^2$/s |
| Infiltration: | 204.13 | mm/hr |
| FOS: | 2.00 | unitless |
| Design Infiltration: | 102.06 | mm/hr |

### Variable Glossary

**α*** **1)** is the ratio of gravity to capillarity forces during infiltration or drainage
**2)** determined from table 1 on page 47 of the manual (or the adjacent table)

**H** **1)** is the water head in the BH
**2)** determined by the height that the inner tube is pulled up during field operation

**a** **1)** is the radius of the borehole
**2)** determine by the size of the auger

**X** **1)** is the resevoir constant
**2)** determined by the reservoir knob at the top of the unit
- if the knob is up X = 35.22 (outer and inner reservoir)
- if the knob is down X = 2.16 (inner reservoir)

**R** **1)** is the steady state rate of flow per minute
**2)** is determined by timing the drop of water in the Guelph Permeameter

### Equation Glossary

**Ha** is the ratio of head to borehole radius

**Q1** is the flow rate

**$C_{(1, 2 \text{ or } 3)}$** is the shape factor which accounts for the saturated area of the soil
- Select $C_1$ if α* is ≥ 0.12 $cm^{-1}$
- Select $C_2$ if α* = 0.04 $cm^{-1}$
- Select $C_3$ if α* = 0.01 $cm^{-1}$

**$k_{fs}$** is the field saturated hydraulic conductivity of the soil

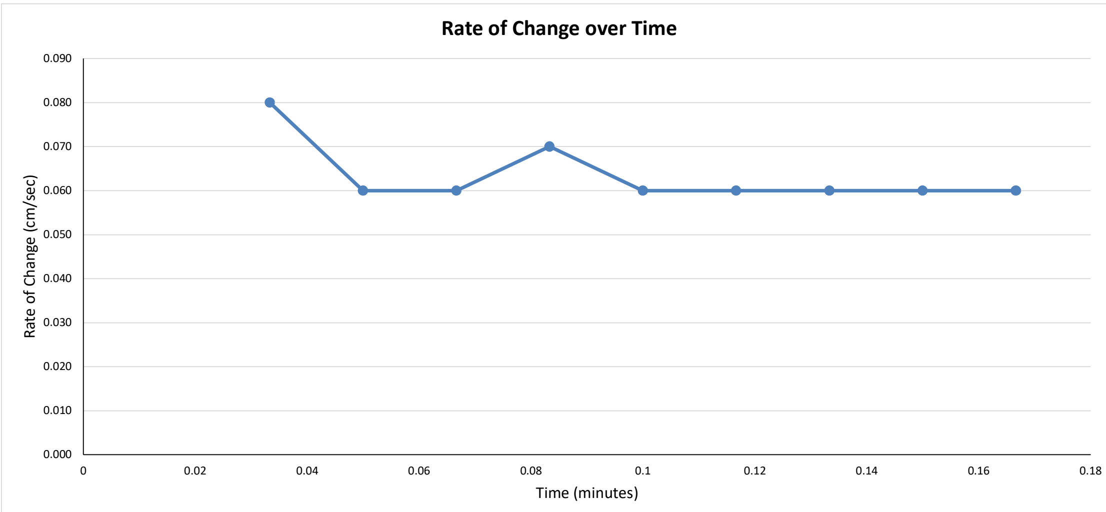
**$\Phi_m$** is an indicator of the capillary pull exerted by the unsaturated soil on the water

**Table 1.** Soil texture-structure categories for site-estimation of α* (adapted from Elrick et al., 1989)

| Soil Texture - Structure Category | α* ($cm^{-1}$) |
|---|---|
| Compacted, structureless, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc. | 0.01 |
| Soils which are both fine textured (clayey or silty) and unstructured, may also include some fine sands | 0.04 |
| Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils. | 0.12 |
| Coarse and gravelly sands; may also include some highly structured soils with large and/or numerous cracks, macropores, etc. | 0.36 |

# Guelph Permeameter
# Infiltration Rate Determination

## Test Location: Test Pit 14




**INPUT PARAMETERS**

| | | |
|---|---|---|
| α* = | 0.12 | $cm^{-1}$ |
| H = | 5 | cm |
| a = | 3 | cm |
| X = | 35.22 | $cm^2$ |
| R = | 0.06 | cm/sec |

**SHAPE FACTOR**

| | | |
|---|---|---|
| Shape Factor (1, 2 or 3) = | 1 | |
| Shape Factor Value ($cm^{-1}$) = | 0.803 | |

**CALCULATED PARAMETERS**

| | | |
|---|---|---|
| $H_a$ = | 1.67 | unitless |
| $Q_1$ = | 2.1132 | $cm^3$/sec |

**CALCULATED DESIGN VALUES**

| | | |
|---|---|---|
| $k_{fs}$= | 3.84E-03 | cm/sec |
| $\Phi_m$= | 3.20E-02 | $cm^2$/s |
| Infiltration: | 122.85 | mm/hr |
| FOS: | 2.00 | unitless |
| Design Infiltration: | 61.43 | mm/hr |

### Variable Glossary

**α*** **1)** is the ratio of gravity to capillarity forces during infiltration or drainage
**2)** determined from table 1 on page 47 of the manual (or the adjacent table)

**H** **1)** is the water head in the BH
**2)** determined by the height that the inner tube is pulled up during field operation

**a** **1)** is the radius of the borehole
**2)** determine by the size of the auger

**X** **1)** is the resevoir constant
**2)** determined by the reservoir knob at the top of the unit
- if the knob is up X = 35.22 (outer and inner reservoir)
- if the knob is down X = 2.16 (inner reservoir)

**R** **1)** is the steady state rate of flow per minute
**2)** is determined by timing the drop of water in the Guelph Permeameter

### Equation Glossary

**Ha** is the ratio of head to borehole radius

**Q1** is the flow rate

**$C_{(1, 2 \text{ or } 3)}$** is the shape factor which accounts for the saturated area of the soil
- Select $C_1$ if α* is ≥ 0.12 $cm^{-1}$
- Select $C_2$ if α* = 0.04 $cm^{-1}$
- Select $C_3$ if α* = 0.01 $cm^{-1}$

**$k_{fs}$** is the field saturated hydraulic conductivity of the soil

**$\Phi_m$** is an indicator of the capillary pull exerted by the unsaturated soil on the water

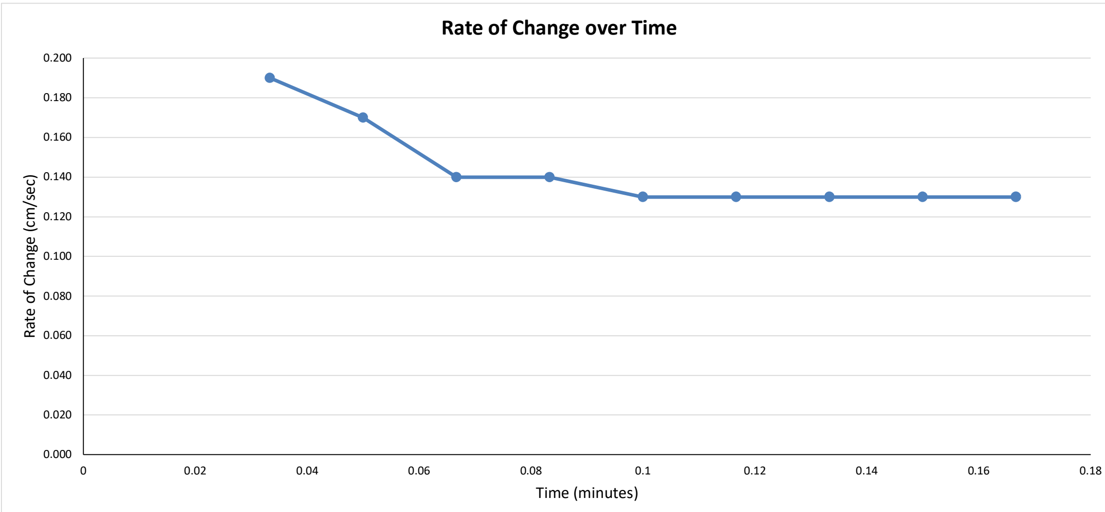
**Table 1.** Soil texture-structure categories for site-estimation of α* (adapted from Elrick et al., 1989)

| Soil Texture - Structure Category | α* ($cm^{-1}$) |
|---|---|
| Compacted, structureless, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc. | 0.01 |
| Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands | 0.04 |
| Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils. | 0.12 |
| Coarse and gravelly sands; may also include some highly structured soils with large and/or numerous cracks, macropores, etc. | 0.36 |

# Guelph Permeameter
# Infiltration Rate Determination

GEI Consultants

## Test Location: Test Pit 9




**INPUT PARAMETERS**

| | | |
|---|---|---|
| α* = | 0.12 | $cm^{-1}$ |
| H = | 5 | cm |
| a = | 3 | cm |
| X = | 35.22 | $cm^2$ |
| R = | 0.13 | cm/sec |

**SHAPE FACTOR**

| | | |
|---|---|---|
| Shape Factor (1, 2 or 3) = | 1 | |
| Shape Factor Value ($cm^{-1}$) = | 0.803 | |

**CALCULATED PARAMETERS**

| | | |
|---|---|---|
| $H_a$ = | 1.67 | unitless |
| $Q_1$ = | 4.5786 | $cm^3$/sec |

**CALCULATED DESIGN VALUES**

| | | |
|---|---|---|
| $k_{fs}$= | 8.33E-03 | cm/sec |
| $\Phi_m$= | 6.94E-02 | $cm^2$/s |
| Infiltration: | 151.10 | mm/hr |
| FOS: | 2.00 | unitless |
| Design Infiltration: | 75.55 | mm/hr |

### Variable Glossary

**α*** **1)** is the ratio of gravity to capillarity forces during infiltration or drainage
**2)** determined from table 1 on page 47 of the manual (or the adjacent table)

**H** **1)** is the water head in the BH
**2)** determined by the height that the inner tube is pulled up during field operation

**a** **1)** is the radius of the borehole
**2)** determine by the size of the auger

**X** **1)** is the resevoir constant
**2)** determined by the reservoir knob at the top of the unit
- if the knob is up X = 35.22 (outer and inner reservoir)
- if the knob is down X = 2.16 (inner reservoir)

**R** **1)** is the steady state rate of flow per minute
**2)** is determined by timing the drop of water in the Guelph Permeameter

### Equation Glossary

**Ha** is the ratio of head to borehole radius

**Q1** is the flow rate

**$C_{(1, 2 \text{ or } 3)}$** is the shape factor which accounts for the saturated area of the soil
- Select $C_1$ if α* is ≥ 0.12 $cm^{-1}$
- Select $C_2$ if α* = 0.04 $cm^{-1}$
- Select $C_3$ if α* = 0.01 $cm^{-1}$

**$k_{fs}$** is the field saturated hydraulic conductivity of the soil

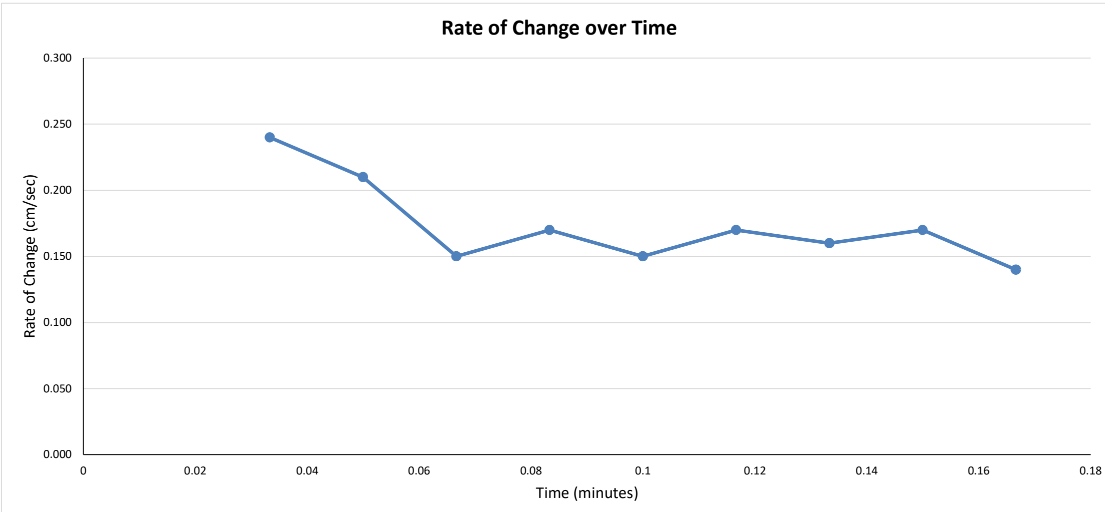
**$\Phi_m$** is an indicator of the capillary pull exerted by the unsaturated soil on the water

Table 1. Soil texture-structure categories for site-estimation of α* (adapted from Elrick et al., 1989)

| Soil Texture - Structure Category | α* ($cm^{-1}$) |
|---|---|
| Compacted, structureless, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc. | 0.01 |
| Soils which are both fine textured (clayey or silty) and unstructured, may also include some fine sands | 0.04 |
| Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils. | 0.12 |
| Coarse and gravelly sands; may also include some highly structured soils with large and/or numerous cracks, macropores, etc | 0.36 |

# Guelph Permeameter
# Infiltration Rate Determination

## Test Location: Test Pit 9




**INPUT PARAMETERS**

| | | |
|---|---|---|
| α* = | 0.12 | $cm^{-1}$ |
| H = | 5 | cm |
| a = | 3 | cm |
| X = | 35.22 | $cm^2$ |
| R = | 0.15 | cm/sec |

**SHAPE FACTOR**

| | |
|---|---|
| Shape Factor (1, 2 or 3) = | 1 |
| Shape Factor Value ($cm^{-1}$) = | 0.803 |

**CALCULATED PARAMETERS**

| | | |
|---|---|---|
| $H_a$ = | 1.67 | unitless |
| $Q_1$ = | 5.283 | $cm^3$/sec |

**CALCULATED DESIGN VALUES**

| | | |
|---|---|---|
| $k_{fs}$= | 9.61E-03 | cm/sec |
| $\Phi_m$= | 8.01E-02 | $cm^2$/s |
| Infiltration: | 157.00 | mm/hr |
| FOS: | 2.00 | unitless |
| Design Infiltration: | 78.50 | mm/hr |

### Variable Glossary

**α*** **1)** is the ratio of gravity to capillarity forces during infiltration or drainage
**2)** determined from table 1 on page 47 of the manual (or the adjacent table)

**H** **1)** is the water head in the BH
**2)** determined by the height that the inner tube is pulled up during field operation

**a** **1)** is the radius of the borehole
**2)** determine by the size of the auger

**X** **1)** is the resevoir constant
**2)** determined by the reservoir knob at the top of the unit
• if the knob is up X = 35.22 (outer and inner reservoir)
• if the knob is down X = 2.16 (inner reservoir)

**R** **1)** is the steady state rate of flow per minute
**2)** is determined by timing the drop of water in the Guelph Permeameter

### Equation Glossary

**Ha** is the ratio of head to borehole radius

**Q1** is the flow rate

**$C_{(1, 2 \text{ or } 3)}$** is the shape factor which accounts for the saturated area of the soil
• Select $C_1$ if α* is ≥ 0.12 $cm^{-1}$
• Select $C_2$ if α* = 0.04 $cm^{-1}$
• Select $C_3$ if α* = 0.01 $cm^{-1}$

**$k_{fs}$** is the field saturated hydraulic conductivity of the soil

**$\Phi_m$** is an indicator of the capillary pull exerted by the unsaturated soil on the water

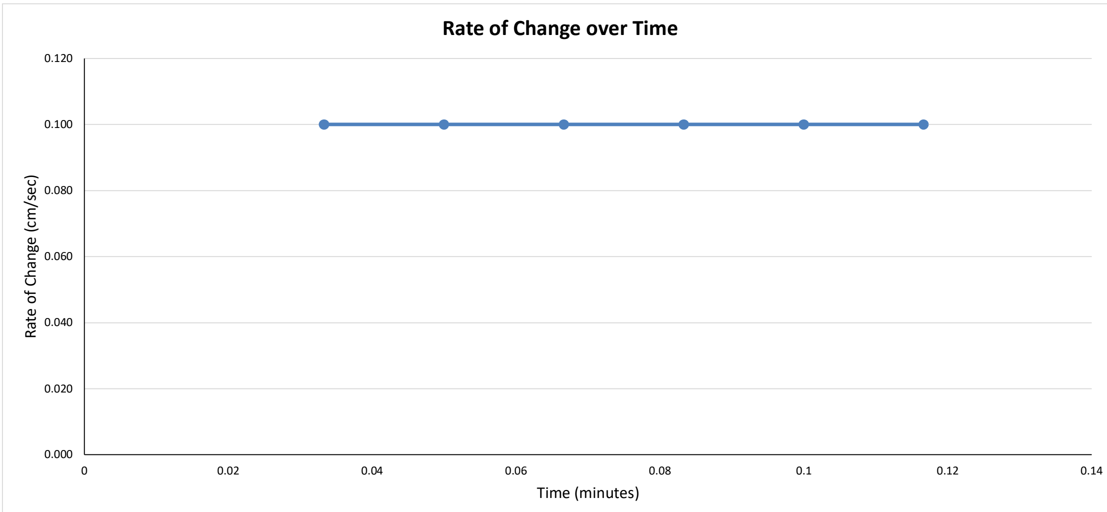
Table 1. Soil texture-structure categories for site-estimation of α* (adapted from Elrick et al., 1989)

| Soil Texture - Structure Category | α* ($cm^{-1}$) |
|---|---|
| Compacted, structureless, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc. | 0.01 |
| Soils which are both fine textured (clayey or silty) and unstructured, may also include some fine sands | 0.04 |
| Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils. | 0.12 |
| Coarse and gravelly sands; may also include some highly structured soils with large and/or numerous cracks, macropores, etc. | 0.36 |

# Guelph Permeameter
# Infiltration Rate Determination

GEI Consultants

## Test Location: Test Pit 9




**INPUT PARAMETERS**

| | | |
|---|---|---|
| $\alpha^*$ = | 0.12 | $cm^{-1}$ |
| H = | 5 | cm |
| a = | 3 | cm |
| X = | 35.22 | $cm^2$ |
| R = | 0.1 | cm/sec |

**SHAPE FACTOR**

| | |
|---|---|
| Shape Factor (1, 2 or 3) = | 1 |
| Shape Factor Value ($cm^{-1}$) = | 0.803 |

**CALCULATED PARAMETERS**

| | | |
|---|---|---|
| $H_a$ = | 1.67 | unitless |
| $Q_1$ = | 3.522 | $cm^3$/sec |

**CALCULATED DESIGN VALUES**

| | | |
|---|---|---|
| $k_{fs}$= | 6.41E-03 | cm/sec |
| $\Phi_m$= | 5.34E-02 | $cm^2$/s |
| Infiltration: | 140.85 | mm/hr |
| FOS: | 2.00 | unitless |
| Design Infiltration: | 70.43 | mm/hr |

### Variable Glossary

**$\alpha^*$** **1)** is the ratio of gravity to capillarity forces during infiltration or drainage
**2)** determined from table 1 on page 47 of the manual (or the adjacent table)

**H** **1)** is the water head in the BH
**2)** determined by the height that the inner tube is pulled up during field operation

**a** **1)** is the radius of the borehole
**2)** determine by the size of the auger

**X** **1)** is the resevoir constant
**2)** determined by the reservoir knob at the top of the unit
- if the knob is up X = 35.22 (outer and inner reservoir)
- if the knob is down X = 2.16 (inner reservoir)

**R** **1)** is the steady state rate of flow per minute
**2)** is determined by timing the drop of water in the Guelph Permeameter

### Equation Glossary

**Ha** is the ratio of head to borehole radius

**Q1** is the flow rate

**$C_{(1, 2 \text{ or } 3)}$** is the shape factor which accounts for the saturated area of the soil
- Select $C_1$ if $\alpha^*$ is ≥ 0.12 $cm^{-1}$
- Select $C_2$ if $\alpha^*$ = 0.04 $cm^{-1}$
- Select $C_3$ if $\alpha^*$ = 0.01 $cm^{-1}$

**$k_{fs}$** is the field saturated hydraulic conductivity of the soil

**$\Phi_m$** is an indicator of the capillary pull exerted by the unsaturated soil on the water

Table 1. Soil texture-structure categories for site-estimation of $\alpha^*$ (adapted from Elrick et al., 1989)

| Soil Texture - Structure Category | $\alpha^*$ ($cm^{-1}$) |
|---|---|
| Compacted, structureless, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc. | 0.01 |
| Soils which are both fine textured (clayey or silty) and unstructured, may also include some fine sands | 0.04 |
| Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils. | 0.12 |
| Coarse and gravelly sands; may also include some highly structured soils with large and/or numerous cracks, macropores, etc. | 0.36 |

# Appendix E Preliminary Water Balance Calculations

Hydrogeological Investigation
Proposed Pine Valley Estates Development
9332 County Road 93, Midland, ON
Project No.: 2506478

# Pre-to-Post Development Water Balance

| MONTHLY AND YEARLY WATER BALANCE COMPONENTS (POST-DEVELOPMENT CONDITION) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | YEAR |
| **Potential Evapotranspiration Calculation** | Average Temperature: T ($^oC$) | -10.0 | -9.1 | -3.3 | 4.4 | 11.5 | 16.7 | 19.1 | 18.1 | 13.8 | 7.4 | 0.9 | -5.4 | 5.3 |
| | Heat Index: $i=(T/5)^{1.514}$ | 0.00 | 0.00 | 0.00 | 0.82 | 3.53 | 6.21 | 7.61 | 7.01 | 4.65 | 1.81 | 0.07 | 0.00 | 31.7 |
| | Unadjusted Daily Potential Evapotranspiration: U (mm) | 0.0 | 0.0 | 0.0 | 22.2 | 58.4 | 84.9 | 97.2 | 92.1 | 70.1 | 37.5 | 4.5 | 0.0 | 466.8 |
| | Adjusting Factor for U (Latitude 44 degrees N) | 0.81 | 0.81 | 1.02 | 1.13 | 1.27 | 1.28 | 1.30 | 1.20 | 1.04 | 0.94 | 0.80 | 0.76 | - |
| | Precipitation: P (mm) | 92.2 | 55.6 | 72.4 | 79.1 | 92.7 | 86.1 | 99.5 | 81.6 | 101.7 | 111 | 103.3 | 87.1 | 1062.3 |
| | Adjusted Potential Evapotranspiration: PET (mm) | 0.0 | 0.0 | 0.0 | 25.1 | 74.1 | 108.7 | 126.3 | 110.5 | 72.9 | 35.2 | 3.6 | 0.0 | 556.5 |
| | P - PET | 92.2 | 55.6 | 72.4 | 54.0 | 18.6 | -22.6 | -26.8 | -28.9 | 28.8 | 75.8 | 99.7 | 87.1 | 505.8 |
| | Accumulated Potential Water Loss (mm) | | | | | | -22.6 | -49.4 | -78.3 | | | | | |
| **Pervious Components: Grassed** | Soil Moisture Storage (Max. 125 mm) | 125.0 | 125.0 | 125.0 | 125.0 | 125.0 | 103.0 | 83.0 | 66.0 | 94.8 | 125.0 | 125.0 | 125.0 | |
| | Change in Soil Moisture Storage (mm) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -22.0 | -20.0 | -17.0 | 28.8 | 30.2 | 0.0 | 0.0 | |
| | Actual Evapotranspiration (mm) | 0.0 | 0.0 | 0.0 | 25.1 | 74.1 | 108.1 | 119.5 | 98.6 | 72.9 | 35.2 | 3.6 | 0.0 | 537.2 |
| | Water Surplus (mm) | 92.2 | 55.6 | 72.4 | 54.0 | 18.6 | 0.0 | 0.0 | 0.0 | 0.0 | 45.6 | 99.7 | 87.1 | 525.1 |
| **Impervious Components** | Precipitation: P (mm) | - | | | | | | | | | | | | 1062.3 |
| | Potential Evaporation: PE (mm), Assume 15% | - | | | | | | | | | | | | 159.3 |
| | Potential Surface Water Runoff: P - PE (mm) | - | | | | | | | | | | | | 903.0 |

**Notes**

1. Both potential infiltration and surface water runoff are independent of temperature
2. Assumption is in January maximum soil moisture storage value is present (100 mm)
3. Water Holding Capacity & Infiltration Factors taken from Table 3.1 of MOE SWMPDM, 2003
4. Average Temp. and Precip. taken from Environment Canada station: Midland Water Pollution Control Plant
5. Adjusting Factor for U based on Lorente, 1961

# Pre-to-Post Development Water Balance

**PRE- AND POST-DEVELOPMENT WATER BALANCE (WITHOUT MITIGATION)**

| | | Total Land Area ($m^2$) | Impervious Factor | Pervious Area ($m^2$) | Impervious Area ($m^2$) | Infiltration Factor | Runoff Factor | Infiltration ($m^3$/year) | Runoff ($m^3$/year) |
|---|---|---|---|---|---|---|---|---|---|
| **Existing Land Use (Pre-Development)** | Forested area | 276400.0 | 0% | 276400.00 | 0.00 | 0.55 | 0.45 | 77,850 | 63,696 |
| | **TOTAL** | **276,400** | **0%** | **276,400** | **0** | **0.55** | **0.45** | **77,850** | **63,696** |
| **Proposed Land Use (Post-Development No Mitigation)** | Forested | 107300.0 | 0% | 107300.00 | 0.00 | 0.55 | 0.45 | 30,989 | 25,355 |
| | Apartments | 6084.0 | 100% | 0.00 | 6084.00 | 0.55 | 0.45 | 0 | 5,494 |
| | Townhouses | 40450.0 | 100% | 0.00 | 40450.00 | 0.55 | 0.45 | 0 | 36,525 |
| | Stormwater management | 19300.0 | 0% | 19300.00 | 0.00 | 0.50 | 0.50 | 5,067 | 5,067 |
| | Open Space | 8700.0 | 0% | 8700.00 | 0.00 | 0.60 | 0.40 | 2,741 | 1,827 |
| | Lawn | 47283.0 | 0% | 47283.00 | 0.00 | 0.50 | 0.50 | 12,414 | 12,414 |
| | Parking + Row | 47283.0 | 100% | 0.00 | 47283.00 | 0.50 | 0.50 | 0 | 42,694 |
| | **TOTAL** | **276,400** | **34%** | **182,583** | **93,817** | **0.53** | **0.47** | **51,212** | **129,376** |

**SUMMARY**

| | **Infiltration** | | **Runoff** | |
|---|---|---|---|---|
| | $m^3$/year | % | $m^3$/year | % |
| **Pre-to-Post Change Without Mitigation** | -26,639 | -34 | + 65681 | + 103 |
| **Required to Meet Pre-Development Conditions** | +26639 | - | -65,681 | - |

**Notes**
1. Both potential infiltration and surface water runoff are independent of temperature
2. Assumption is in January maximum soil moisture storage value is present (100mm)
3. Water Holding Capacity & Infiltration Factors taken from Table 3.1 of MOE SWMPDM, 2003
4. Average Temp. and Precip. taken from Environment Canada station: Midland Water Pollution Control Plant
5. Adjusting Factor for U based on Lorente, 1961