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A REPORT TO
SORBARA/TRIBUTE BRUBACHER HOLDINGS INC.

PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT

6586 BEATTLY LINE NORTH
TOWNSHIP OF CENTRE WILLINGTON (FERGUS)

REFERENCE NO. 2311-W044

JANUARY 28, 2025

DISTRIBUTION

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1.0 EXECUTIVE SUMMARY

Soil Engineers Ltd. (SEL) was retained by Mr. James Bujak of Sobara/Tribute Brubacher Holdings Inc. to conduct a preliminary hydrogeological assessment for the property with a municipal address of 6586 Beatty Line North, in the Township of Centre Wellington (Fergus), Ontario (the Subject Site).

The Subject Site is located on the west side of Beatty Line North, south of the Beatty Line North and Sideroad 15 intersection, and directly north of Fergus and Elora-Salem's delineated urban settlement area. The Subject Site is approximately 43.2 hectares in size, rectangular in shape and has approximately 300 metres of frontage along Beatty Line North. It is currently vacant except for one single-detached dwelling and an abandoned railway traverses through the Subject Site in a northwest/southeast direction. Phases 2A+ and 2B of the existing Storybrook Subdivision are located immediately south of the Subject Site.

At the time of the investigation, the majority of the Subject Site was open field, with tree covering most of the north, and central portions as well as the southwest corner, and an abandoned dwelling. A railway was also crossing the Subject Site.

Based on the Conceptual Block Plan prepared by Weston Consulting dated January 15, 2025, the proposed development at the Subject Site includes residential subdivision with associated roads, underground services, parks and a Stormwater Management (SWM) pond within the developable portions.

The current investigation revealed that:

- Record review indicates that wetland features classified as provincial along with wooded areas are located northeast, southwest, northwest, and center portion of the of the Subject Site. The wetlands are called Irvine Creek Wetland Complex and comprise of swamps. There is a tributary of Irvine Creek which is located at the southeastern portion of the Subject Site.
- The subsoil investigation has revealed that beneath the topsoil and a layer of earth fill in places, the Subject Site mainly comprises of sandy silt till, sand, silt and silty clay deposits extending to the maximum termination depth of investigated at 10.9 metres below ground surface (mbgs).
- The findings of the current study confirms that the groundwater level elevations in the monitoring wells range from 418.0 metres above sea level (masl) to 411.7 masl. The monitoring program is ongoing and the groundwater levels will be updated to reflect the seasonal high levels.
- The estimated hydraulic conductivity ranging from 1.6×10^{-8} m/s to 1.2×10^{-5} m/s for the sandy silt till and sand units presented in the monitoring wells screen intervals, respectively.
- One (1) set of groundwater samples was collected for analysis for the monitoring well BH/MW 1S. The results of analysis for the unfiltered groundwater indicate no exceedances when compared and evaluated against the Township of Centre Wellington Sanitary and Storm Sewer Use By-Laws Parameters.
- A review of the proposed conceptual servicing plan indicated that the land will be subdivided into residential lots and blocks, and a stormwater management facility at the southwest portion of the Subject Site, along with associated roads and municipal services and infrastructure. The Finished

Floor Elevations (FFE) for the lots and invert elevations for the proposed underground services and the SWM pond were not available for review at the time of preparation of this report. Therefore, the dewatering requirement and the short-term dewatering and long-term foundation drainage flow rates should be assessed once the detail design become available.

- Considering the early stage of the project, the construction approach, detail design drawings and excavation phases are not available. As such, recommendations on permit requirements should be assessed once the data become available for review.
- Potential dewatering impact should be assessed once the detail design become available for the proposed development.
- The EIS report findings reveal that that there three Provincial Significant Wetlands (PSWs) are identified by MBRF on their Natural Heritage Information Centre mapping. The central wetland located in the middle of the property is candidate for revaluation based on the observed topography and vegetation. A qualified biologist in 2025 to confirm whether it meets the criteria of a Provincially Significant Wetland.

2.0 INTRODUCTION

2.1 Site Location and Project Description

Soil Engineers Ltd. (SEL) was retained Sobara/Tribute Brubacher Holdings Inc. to conduct a preliminary hydrogeological assessment for the property with a municipal address of 6586 Beatty Line North, in the Township of Centre Wellington (Fergus), Ontario (the Subject Site).

The Subject Site is located on the west side of Beatty Line North, south of the Beatty Line North and Sideroad 15 intersection, and directly north of Fergus and Elora-Salem's delineated urban settlement area. The Subject Site is approximately 43.2 hectares in size, rectangular in shape and has approximately 300 metres of frontage along Beatty Line North. It is currently vacant except for one single-detached dwelling and an abandoned railway traverses through the Subject Site in a northwest/southeast direction. Phases 2A+ and 2B of the existing Storybrook Subdivision are located immediately south of the Subject Site. Location of the Subject Site is shown on **Drawing 1**.

At the time of the investigation, the majority of the Subject Site was open field, with tree covering most of the north, and central portions as well as the southwest corner, and an abandoned dwelling. A railway was also crossing the Subject Site.

Based on the Conceptual Block Plan prepared by Weston Consulting dated January 15, 2025, the proposed development at the Subject Site includes residential subdivision along with associated roads, underground services, parks and a Stormwater Management (SWM) pond within the developable portions. It is understood that the development will be provided with municipal services, landscaped areas, and paved roadways, meeting current municipal standards.

2.2 Project Objectives

The current preliminary hydrogeological assessment report presents regional and local setting of the Subject Site. The findings of the fieldwork, including subsoil investigation, groundwater level monitoring. Additionally, groundwater quality assessment and hydraulic conductivity testing results are presented in the report. Potential needs for short-term dewatering and long-term foundation drainage control are discussed, and hydrogeological impacts of the proposed development to the nearby groundwater receptors including water supply wells, natural heritage features, and structures are presented (if applicable).

2.3 Scope of Work

The scope of work for the preliminary hydrogeological assessment is summarized below:

- *Background Review:* Available background geological and hydrogeological information for the Subject Site including topographic mapping, surface geological, natural heritage features databases, Township of Centre Wellington (Fergus) official plans, Grand River Conservation Authority (GRCA) regulated area plans, and MECP water well records were reviewed.

- *Fieldwork:* Fieldwork includes inspecting Subject Site and surrounding properties with respect to the natural features, groundwater receptors, and structures, as well as installing and developing the monitoring wells and piezometers. Additionally, groundwater levels within some of the installed monitoring wells were monitored over four (4) monitoring events, in-situ hydraulic conductivity testing was completed within the installed monitoring wells. Additionally, one (1) set of groundwater samples was collected and submitted to a CALA laboratory to characterize groundwater quality in comparison with the Township of Centre Wellington Sanitary and Storm Sewer Use By-Law parameters. Furthermore, water table in the installed piezometers were monitored over four (4) monitoring events.
- *Short-Term Dewatering Needs:* Due to early stage of the project details of the proposed development were not available for review at the time of preparation of the current report. As such, potential needs for short-term dewatering will be assessed later, when further details become available for review.
- *Long-term foundation Drainage Control Requirement:* Due to early stage of the project details of the proposed development were not available for review at the time of preparation of the current report. As such, potential needs for short-term dewatering will be assessed later, when further details become available for review..
- *Permit Requirements:* Due to early stage of the project details, short-term dewatering and long-term foundation drainage control needs were not assessed. As such, potential permit requirements should be assessed when the anticipated short-term dewatering and long-term foundation drainage flow rates are estimated..

3.0 APPLICABLE REGULATIONS AND OFFICIAL PLANS

The regulations and policies relevant to this preliminary hydrogeological assessment and the location of the Subject Site within the official plans are summarized below.

3.1 Grand River Conservation Authority (GRCA) Policies and Regulation (O. Reg. 41/24)

Under Section 28 of the Conservation Authorities Act, local conservation authorities are mandated to protect the health and integrity of the regional greenspace system, and to maintain or improve the hydrological and ecological functions performed by valley and stream corridors. The GRCA, through its regulatory mandate, is responsible for issuing permits under Ontario Regulation (O. Reg.) 41/24, Development, Interference with Wetlands and Alterations to Shorelines and Watercourses for development proposal or Site alteration work to shorelines and watercourses within the regulated areas.

GRCA Online Mapping Tool was reviewed on December 6, 2024. It is our understanding that the watercourse which traverses through the north potion of Subject Site and the area in its vicinity are located within GRCA Regulated Area. As such, it is anticipated that obtaining a permit from the GRCA under O. Reg. 41/24 will be required for the proposed development.

3.2 Clean Water Act

The MECP mandates the protection of existing and future sources of drinking water under the Clean Water Act, 2006 (CWA). Initiatives under the CWA include the delineation of Wellhead Protection Areas (WHPAs), significant groundwater recharge areas (SGRAs) and Highly Vulnerable Aquifers (HVAs) as well as the assessment of drinking water quality and quantity threats within Source Protection Regions. Source Protection Plans are developed under the CWA and include the restriction and prohibition of certain types of activities and land uses within WHPAs.

Based on a regional-scale source water protection mapping (Source Water Protection Information atlas) provided by the MECP on December 6, 2024, the Subject Site is located within the following policy area:

- It is located within wellhead Protection Area D with a score of 2. It is anticipated, that Source Water Impact Assessment and Mitigation Plan (SWIAMP) will be required for proposed Residential Subdivision Development.
- The Subject Site, is located in Wellhead Protection Area Q1 and Wellhead Protection Area Q2. Thus, Pre- and Post- Development Water Balance Assessment and associated mitigation plan will be required for the proposed development.

3.3 Township of Centre Wellington Official Plan

The Township of Centre Wellington Official Plan sets up policies that deal with legislative and administrative concerns, guides physical growth, and addresses social, economic, and environmental concerns. The Official Plan provides land use planning designations and identifies areas of environmental significance where more stringent policies may apply for development applications.

Township of Centre Wellington Official Plan maps were reviewed for the current study with the results summarized as below:

- Schedule B1 (Land Use) - A review of the map, dated July 2024, indicates that the majority of the Subject Site is situated within a Primary Urban Centre and a small portion in the greenlands system.
- Schedule C1 (Source Water Protection) - A review of the map, dated July 2024, shows that the Subject Site is located within area designated as wellhead protection.

4.0 METHODOLOGY

4.1 Borehole Advancement and Monitoring Well Installation

Borehole drilling and monitoring well construction were performed between August 29 and September 5, 2024. The program consisted of the drilling of thirteen (13) boreholes (BH) and the installation of twelve (12) monitoring wells (MW) including two (2) nested monitoring wells for geotechnical and hydrogeological assessment purposes. Additionally, six (6) piezometers (PZ) were installed within the wetland areas on November 12 and 14, 2024. The approximated boreholes/monitoring well and piezometers' locations are shown on **Drawing 2**.

The borehole drilling and monitoring well construction were completed by a licensed water well contractor, under the full-time supervision of a geotechnical technician from SEL, who also logged the subsoil strata, encountered during borehole advancement, and collected representative subsoil samples for textural classification. The boreholes were drilled using continuous, flight-power augers. Detailed descriptions of the encountered subsoil strata and groundwater conditions are presented on the boreholes, showing the monitoring well construction details, on the enclosed A**ppendix A**.

The monitoring wells were constructed using 50-mm diameter Trilock pipes and 1.5 and 3.0 m long 10-slot well screens, which were installed in each of the boreholes in accordance with Ontario Regulation (O. Reg.) 903. All of the monitoring wells were provided with the monument-type, protective steel casings at and above the ground surface.

The UTM coordinates and ground surface elevations at the monitoring wells' locations, as well as the monitoring well construction details, are presented in **Table 4-1**. The ground surface elevations and horizontal coordinates at the monitoring well locations were surveyed by SEL at the time of the investigation, using a handheld Global Navigation Satellite System survey equipment (Trimble Geoexplorer unit TSC3) which has an accuracy of ±0.10 m.

Table 4-1- Monitoring Well Installation Details

Monitoring Well ID	Installation Date	UTM Coordinates (m)		Ground El. (masl)	Screen Interval (mbgs)	Soil in the Screen Interval	Casing Dia. (mm)	Protective Casing Type
		Easting	Northing					
BH/MW 1D	Sep. 5, 2024	547728	4840114	418.7	4.5-6.1	Sandy Silt Till	50	Monument
BH/MW 1S	Sep. 5, 2024	547727	484014	418.7	3.1-4.6	Silt/Sandy Silt Till	50	Monument
BH/MW 2	Aug. 29, 2024	547471	4840035	419.7	3.1-6.1	Sand/Sandy Silt Till	50	Monument
BH/MW 3	Sep. 5, 2024	547694	4839900	419.0	4.6-6.1	Sandy Silt Till	50	Monument
BH/MW 4	Aug. 29, 2024	547296	4839981	419.7	3.5-5.0	Sand	50	Monument
BH/MW 5	Sep. 4, 2024	547394	4839811	417.2	3.1-6.1	Sandy Silt Till	50	Monument
BH/MW 6	Sep. 4, 2024	547503	4839702	416.7	4.6-6.1	Sandy Silt Till	50	Monument
BH/MW 7	Aug. 30, 2024	547006	4839682	416.7	4.3-5.8	Sand/Sandy Silt Till	50	Monument
BH/MW 8D	Sep. 3, 2024	547204	4839687	415.5	4.6-6.1	Sandy Silt Till	50	Monument
BH/MW 8S	Sep. 3, 2024	547204	4839686	415.5	3.1-4.6	Sand/Sandy Silt Till	50	Monument

Monitoring Well ID	Installation Date	UTM Coordinates (m)		Ground El. (masl)	Screen Interval (mbgs)	Soil in the Screen Interval	Casing Dia. (mm)	Protective Casing Type
		Easting	Northing					
BH/MW 10	Aug. 30, 2024	547014	4839500	416.2	3.7-5.2	Sandy Silt Till	50	Monument
BH/MW 13	Aug 29. 2024	547294	4839473	415.2	8.6-10.1	Silty Clay/Sandy Silt Till	50	Monument

Notes:
mbgs metres below ground surface
masl metres above sea level

4.2 MECP Water Well Records Review

MECP Water Well Records (WWRs) were reviewed for the registered wells located at the Subject Site and within 500 m radius of the Subject Site boundaries (Study Area). The water well records indicate that sixty-eight (68) wells are located within the 500 m zone of influence Study Area relative to the Subject Site. The findings of the MECP well records are summarized in the **Section 5.6** of the current report.

4.3 Groundwater Monitoring

All twelve (12) installed monitoring wells were utilized to measure and monitor groundwater levels. Monitoring wells were developed, and the groundwater monitoring program confirmed the stabilized groundwater level beneath the Subject Site. The stabilized groundwater levels were manually measured over four (4) monitoring events from September 24 to November 28, 2024, with the results presented in **Section 7.1**.

4.4 In-Situ Hydraulic Conductivity Test

SEL has conducted in-situ hydraulic conductivity tests (falling head) at 11 BH/MW locations. The in-situ hydraulic conductivity test (falling head and rising head) provides estimated hydraulic conductivity (K) for subsoil strata at the depths of the well screens. The monitoring wells were developed in advance of the tests. Well development involves the purging and removal of groundwater from each monitoring well to remove remnants of clay, silt and other debris introduced into the monitoring well during construction, and to induce the flow of formation groundwater through the well screens, thereby improving the transmissivity of the subsoil strata formation at the well screen depths.

The in-situ falling head hydraulic conductivity test involves the placement of a slug of known volume into the monitoring well, below the water table, to displace the groundwater level upward. The in-situ rising head hydraulic conductivity test involves removing a volume of water from the monitoring well to displace the groundwater level downward. The rate at which the water level recovers to static conditions (rising head/falling head) is tracked manually using a water level tape and a data logger. The rate at which the water table recovers to static conditions is used to estimate the K value for the water-bearing strata formation at the well screen depth using the Bouwer and Rice method (1976). The findings for the hydraulic conductivity testing are presented in **Section 7.3** of the current report.

4.5 Groundwater Quality Assessment

Groundwater quality assessment was completed by SEL on October 21, 2024. One (1) set of groundwater samples were collected from one (1) selected monitoring well (BH/MW 1S) to characterize its quality for evaluation against the Township of Centre Wellington Sanitary and Storm Sewer Use By-Law (BL_2022_66). This is performed to assess whether any anticipated dewatering effluent can be disposed of into the town's sewer system during construction, or following site development for any long-term foundation drainage.

The sample analysis was performed by SGS Canada Inc. and the results of the analysis are discussed in **Section 7.4** of the current report.

4.6 Review of Regional Data and Available Reports for the Subject Site

The maps, data, and documents provided by the MECP, Ontario Geological Survey (OGS), Ministry of Natural Resource and Forestry (MNRF),) and GRCA were reviewed. Additionally, *A Geotechnical Investigation for Proposed Residential Development, 6586 Beatty Line North, Township of Centre Wellington (Fergus)*", Reference No. 2311-S044, dated November 2024 was reviewed at the time of preparation of the current hydrogeological assessment report, with the findings summarized in S**ections 5 and 6**.

5.0 REGIONAL AND LOCAL SITE SETTING

5.1 Regional Geology

The current understanding of the surface geological setting of the Subject Site is based on scientific work conducted by the OGS (OGS, 2003). A review of the map indicates that majority of the Subject Site is located within an area mapped as Till deposits known as Wentworth Till (5b), consisting of predominantly stone-poor, sandy silt to silty sand textured till deposits. A small portion of the Subject Site along the northeastern limit is mapped within the Lacustrine, kame and outwash (7a), consisting of sand. A small portion of the Subject Site along the eastern limit is mapped within the Outwash sediments (7b), consisting of gravel sand. Additionally, portions of the northern limit of the Subject Site are mapped within the Swamps and bogs sediments (20), consisting of organic deposits. **Drawing 3** illustrates the mapped surficial geology for the Subject Site and the surrounding area.

5.2 Regional Physiography

The Subject Site is mainly located within a regional physiography of Southern Ontario known as Guelph Drumlin Field. Much of the Subject Site is situated on the Till Plans (Drumlinized) and one third portion of it towards the north is mapped within the Spillways physiographic features (Chapman and Putnam, 1984). **Drawing 4** shows the location of the Subject Site within the regional physiography map.

5.3 Regional Topography and Drainage

A review of a regional topography map presented on **Drawing 5** indicates that topography of the Subject Site slopes in a southeast direction. The ground surface elevation ranges approximately between 419.7 metres above sea level (masl) to 415.2 masl based on ground surface elevations measured at the borehole and monitoring wells' locations.

5.4 Watershed Setting

The Subject Site is located within the Irvine Creek Sub-watershed that falls in the Grand River watershed.

5.5 Local Surface Water and Natural Heritage Features

MNRF database was reviewed for any natural heritage features including, watercourses, bodies of water, wetland features, Area of Natural and Scientific Interest (ANSI) and wooded areas. **Drawing 6** shows the location of the Subject Site within the surrounding Natural Heritage Features.

Record review indicates that wetland features classified as provincial along with wooded areas are located northeast, southwest, northwest, and center portion of the of the Subject Site. The wetlands are called Irvine

Creek Wetland Complex and comprise of swamps There is a tributary of Irvine Creek which is located at the southeastern portion of the Subject Site.

An Environmental Impact Study (EIS) has been completed for the Subject Site. A review of the report prepared by GeoProcess Research Associated Inc. dated January 15, 2025, indicates that:

1. Three Provincially Significant Wetlands (PSWs) are identified by the MNRF on their Natural Heritage Information Centre mapping. The central wetland located in the middle of the property is candidate for revaluation based on the observed topography and vegetation community. Surveys be undertaken by a qualified biologist in 2025 to confirm whether it meets the criteria of a Provincially Significant Wetland.
2. According to the Grand River Conservation Authority, these regulated features receive a 30 m buffer. It is recommended that these buffers are planted in native, self-sustaining vegetation to reduce the impact of the proposed development on the natural features.
3. A watercourse regulated by the GRCA flows from north to southeast for about 180 meters and is located in a provincially significant wetland at the eastern edge of the property. Since it lies within the wetland, the required 15-meter setback for the watercourse is replaced by the 30-meter setback of the wetland, ensuring proper protection.

5.6 Ground Water Resources (MECP Well Records)

MECP well record database was reviewed for records located within a radius of 500 m from the approximate Site boundary (Study Area). The records indicate that sixty-eight (68) well records are located within the Study Area relative to the Subject Site boundaries. A summary of data obtained from records review is presented in **Appendix B**.

The locations of the well records, based on the UTM coordinates provided by the records, are shown on **Drawing No. 7**. Details of the MECP water well records that were reviewed are provided in **Appendix B**. The first and final status of the reviewed records are summarized in **Table 5-1**.

Table 5-1 - MECP Well Record Summary

Water Use (Final Status)		Water Use (First Use)	
Status	**Number of Records**	**Status**	**Number of Records**
Observation Well	21	Monitoring	21
Abandoned-Other	18	Domestic Wells	25
Abandoned-Supply	1	Livestock	1
Abandoned-Quality	1	Municipal	1
Water Supply Well	24	Unknown Status	20
Unknown	3		

A summary indicates that 24 water supply wells are listed in close proximity of the Subject Site.

5.7 Active Permit to Take Water Application Record Review

MECP website was reviewed for any active PTTW application records within 1.0 km radius of the Subject Site on December 6, 2024. Record review indicates there are no records for active PTTW within the Study Area.

6.0 SOIL LITHOLOGY AND SUBSURFACE INVESTIGATION

The subsoil investigation has revealed that beneath the topsoil and a layer of earth fill in places, the Subject Site mainly comprises of sandy silt till, sand, silt and silty clay deposits extending to the maximum termination depth of investigated at 10.9 metres below ground surface (mbgs). Information regarding borehole logs are presented in **Appendix A**. The approximate locations of boreholes are shown on **Drawing 2**. Additionally, a subsurface profile key plan and geological subsurface profile are presented on **Drawings 8-1** and **8-2**, respectively. Based on a review of the geotechnical investigation report prepared by SEL, the stratigraphy beneath the investigated areas of the Subject Site generally consists of the followings:

6.1 Topsoil

The topsoil veneer, which was approximately 150 mm to 230 mm in thickness, was contacted in all BH/MW, except for BH/MW 1.

6.2 Earth Fill

A layer of earth fill comprising sand and gravel along with a layer of peat overlaying a grey silty clay fill was identified at BH/MW 1 extending to the depth of 2.3 mbgs.

6.3 Sandy Silt Till

Sandy Silt Till was identified at all BH/MW locations. The till is very loss to very dense, in relative density. The moisture contents for the retrieved subsoil samples ranges from 7% to 19%, indicating moist to wet conditions. The material in this layer is brown to grey in colour. The estimated permeability for the sandy silt till unit encountered at BH 1D at depth of 4.6 mbgs and BH 3 at a depth of 6.1 mbgs respectively is about 10^{-6} cm/sec and at BH 6 at depth of 6.1 mbgs and BH 7 at a depth of 4.9 mbgs respectively is about 10^{-5} cm/sec. Grain size analyses was performed on four (4) subsoil sample, and the gradation is plotted in **Appendix A** (**Figure 16)**.

6.4 Sand

Sand deposit was contacted beneath the silty clay, overlaying the sandy silt till deposit at all BH/MW locations except BH 1, 5, 9 and 13. The sand consists of fine grained with a trace of some silt. The sand is loose to very dense, in relative density. The moisture contents for the retrieved subsoil samples ranges from 12 to 21%, indicating very moist to wet conditions. The material in this layer is brown in colour. The estimated permeability for the sand sample encountered at BH 2 at depth of 3.0 mbgs and BH 4 at a depth of 3.0 mbgs, is about 10^{-2} cm/sec and 10^{-3} cm/sec, respectively. Grain size analyses was performed on two (2) subsoil sample, and the gradation is plotted in **Appendix A** (**Figures 17)**.

6.5 Silt

Silt unit was encounter either above or below the sandy silt till at BH/MWs 1, 3, 4, 7, 10,13 and BH 9 location. The silt consists of some sand to being sandy, with a trace of clay. The silt is loose to dense, generally compacted consistency. The moisture contents for the retrieved subsoil samples ranges from 12 to 22%, indicating generally moist to wet conditions. The materials in this layer are grey in colour. The estimated permeability for the silt and sandy silt units is about 10^{-4} cm/sec. Grain size analyses was performed on five (5) subsoil samples, and the gradation is plotted in **Appendix A (Figures 18** and **19)**.

6.6 Silty Clay

Silty Clay unit was encounter near the ground surface at BH/MWs 2, 3, 8, 13 and BH 12 location. The silty clay consists of trace of sand and gravel. The silty clay is soft to hard, generally stiff in consistency. The moisture contents for the retrieved subsoil samples ranges from 14 to 21%, indicating generally moist conditions. The materials in this layer are brown in colour. The estimated permeability for the silty clay unit is about 10^{-7} cm/sec. Grain size analyses was performed on one (1) subsoil sample, and the gradation is plotted in **Appendix A (Figure 20)**.

7.0 LOCAL HYDROGEOLOGICAL STUDY

7.1 Monitoring Well Development and Groundwater Level Monitoring

The groundwater levels in the monitoring wells were measured, manually between September 24 to November 28, 2024 to record the fluctuation of the shallow groundwater table beneath the Subject Site.

Monitoring wells were developed and groundwater levels were monitored over four (4) monitoring events. SEL measured the groundwater levels using an interface probe (Heron Water Tape Series #1900). A summary of the groundwater level observations and their corresponding elevations are provided in **Table 7-1**.

Table 7-1- A Summary of Groundwater Monitoring

MW ID	Unit	Groundwater Level			
		September 24, 2024	October 7, 2024	October 21, 2024	November 28, 2024
BH/MW 1D	mbgs	0.9	0.9	0.9	0.6
	masl	417.8	417.8	417.8	418.1
BH/MW 1S	mbgs	0.8	0.8	0.9	0.5
	masl	**418.0**	418.0	417.9	418.0
BH/MW 2	mbgs	2.2	2.1	2.1	2.1
	masl	417.5	417.6	417.6	417.6
BH/MW 3	mbgs	1.5	1.5	1.6	1.5
	masl	417.5	417.5	417.4	417.5
BH/MW 4	mbgs	2.1	2.2	2.2	2.1
	masl	417.6	417.5	417.5	417.6
BH/MW 5	mbgs	1.3	1.4	1.5	1.1
	masl	415.9	415.8	415.7	416.1
BH/MW 6	mbgs	4.2	4.7	5.0	4.8
	masl	412.5	412.0	**411.7**	411.9
BH/MW 7	mbgs	0.7	0.8	0.9	0.6
	masl	416.0	415.9	415.8	416.1
BH/MW 8D	mbgs	1.6	2.7	2.7	1.6
	masl	413.9	412.8	412.8	413.9
BH/MW 8S	mbgs	0.8	0.9	0.9	0.4
	masl	414.7	414.6	414.6	415.1
BH/MW 10	mbgs	1.9	2.0	2.1	1.6
	masl	414.3	414.2	414.1	414.6
BH/MW 13	mbgs	Dry	Dry	Dry	Dry
	masl	<405.2	<405.2	<405.2	<405.2

Notes:
mbgs metres below ground surface
masl metres above sea level
NI: Piezometer was not installed

As shown in **Table 7-1**, the highest and lowest groundwater levels within the monitoring wells were measured at El. 418.0 masl at BH/MW 1S and 411.7 masl at BH/MW 6, respectively.

A review of the groundwater level in the shallow and deep nested monitoring wells BH/MW 1S and D and BH/MW 8S and D installed within close proximity of the wetland features indicates a downward vertical hydraulic gradient during the monitoring period.

The monitoring wells will be monitored during the spring of 2025 to record the seasonal high shallow groundwater levels. The monitoring program is ongoing and the findings will be reported when the monitoring program is completed.

7.2 Groundwater Flow Pattern

Groundwater level elevations measured on November 28, 2024 were considered to interpret the groundwater flow pattern beneath the Subject Site. This interpretation suggests that it generally flows in a south/southeasterly direction towards a tributary of Irvine Creek. The interpreted shallow groundwater flow pattern beneath the Subject Site is illustrated on **Drawing 9**.

7.3 Single Well Response Test

All BH/MWs underwent a single well response testing (SWRTs) to assess the hydraulic conductivity (K) for saturated shallow aquifer or water bearing unit at the depths of the well screens expect for BH/MW 13 due to inefficient water level. Each monitoring well was equipped with a digital transducer to record the fluctuation made to complete the SWRT. The results of the SWRT tests are presented in **Appendix C**, with a summary of the findings provided in **Table 7-2**.

Table 7-2- A Summary of Falling Head Hydraulic Conductivity Testing

Well ID	Ground El. (masl)	Screen Interval (mbgs)	Screened Soil Strata	Hydraulic Conductivity (m/sec)	Test Method
BH/MW 1D	418.7	4.5-6.1	Sandy Silt Till	1.6×10^{-8}	Falling Head Test
BH/MW 1S	418.7	3.1-4.6	Silt/Sandy Silt Till	2.3×10^{-6}	Falling Head Test
BH/MW 2	419.7	3.1-6.1	Sand/Sandy Silt Till	1.2×10^{-7}	Falling Head Test
BH/MW 3	419.0	4.6-6.1	Sandy Silt Till	2.6×10^{-7}	Falling Head Test
BH/MW 4	419.7	3.5-5.0	Sand	1.2×10^{-5}	Falling Head Test
BH/MW 5	417.2	3.1-6.1	Sandy Silt Till	2.5×10^{-8}	Falling Head Test
BH/MW 6	416.7	4.6-6.1	Sandy Silt Till	2.3×10^{-8}	Falling Head Test
BH/MW 7	416.7	4.3-5.8	Sand/Sandy Silt Till	2.0×10^{-6}	Falling Head Test
BH/MW 8D	415.5	4.6-6.1	Sandy Silt Till	5.4×10^{-8}	Falling Head Test
BH/MW 8S	415.5	3.1-4.6	Sand/Sandy Silt Till	2.9×10^{-6}	Falling Head Test
BH/MW 10	416.2	3.7-5.2	Silt/Sandy Silt Till	1.3×10^{-6}	Falling Head Test

Notes:
mbgs metres below ground surface
masl metres above sea level

The estimated hydraulic conductivity ranges from 1.6 x 10^{-8} m/s to 1.2 x 10^{-5} m/sec for the sandy silt till and sand units presented in the monitoring wells screen intervals, respectively.

7.4 Groundwater Quality

One (1) set of groundwater samples was collected for analysis for the monitoring well BH/MW 1S on October 21, 2024 by SEL. The samples were submitted for analysis to assess groundwater quality compared to the Township of Centre Wellington Sanitary and Storm Sewer Use By-Laws. Upon sampling, all of the bottles were placed in a cooler for shipment to the analytical laboratory. Sample analysis was performed by SGS Canada Inc., which is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA). Results of the analysis are provided in **Appendix D**, with a discussion of the findings provided below. The chain of custody number for the submitted samples that underwent analysis 034837.

The collected groundwater samples were comprised of unfiltered groundwater. The results of analysis for the unfiltered groundwater indicate no exceedances when compared and evaluated against the Township of Centre Wellington Sanitary and Storm Sewer Use By-Laws Parameters.

These results suggest that any short-term construction dewatering should be acceptable for disposal to the Township of Centre Wellington Sanitary and Storm Sewer, without any significant pre-treatment being required. However, the dewatering discharged water must be appropriately filtered in order to prevent the pumping of fines and loss of ground during the dewatering activities.

The final design for any dewatering effluent pre-treatment system is the responsibility of the contractors responsible for construction, or of the water treatment system design specialist, or mechanical engineer, if required.

7.5 Installation of Piezometers and Water Table Monitoring

A total of six (6) piezometers (PZ) were installed within the Subject Site in close proximity to the existing wetlands within the Subject Site on November 12 and 14, 2024 to monitor water table fluctuation.

Sonic Soil Sampling was hired to auge holes and install the PZs. 25-mm PVC pipe with 0.6 m screen was installed at a depth of 1.2 mbgs at each location. The location of the PZs is shown on **Drawing 2**, with the details presented in **Table 7-3**. Water table in the installed PZs was monitored on November 28, 2024. A review of the results indicates that water tables were recorded close or at the existing ground surface except for PZ6, where the water table was measured 0.7 mbgs. The monitoring program is ongoing and findings including water table elevation at each PZ location will be presented in the updated report when the monitoring program is completed.

Table 7-3- A Summary of Installed Piezometers and Water Table Records

Piezometr ID	UTM Coordinates (m)		Ground El. (masl)	Screen Interval (mbgs)	Soil in the Screen Interval	Water Table Nov. 28, 2024 (mbgs)
	Easting	Northing				
PZ1	547698	4840051	NA	1.2 - 0.6	Sandy Silt Till	0.1
PZ2	547760	4840008	NA	1.2 - 0.6	Sandy Silt Till	-0.1
PZ3	547650	4840150	NA	1.2 - 0.6	Silty Clay	0
PZ4	547482	4840139	NA	1.2 - 0.6	Silty Clay	0.1
PZ5	547209	4839748	NA	1.2 - 0.6	Sandy Silt Till	0.1
PZ6	546938	4839571	NA	1.2 - 0.6	Sandy Silt Till	0.7

8.0 DISCHARGE WATER CONTROL

8.1 A review of Proposed Development Plans

The proposed conceptual block plan prepared by Weston Consulting, dated January 15, 2025 was reviewed for the current assessment. It is understood that the existing dwelling structure will be demolished and Subject Site will be subdivided into lots and blocks for a residential development, and a stormwater management facility at the southwest portion of the Subject Site. The development will be provided with municipal services, landscaped areas, and paved roadways, meeting current municipal standards. Reviewed set of drawings are presented in **Appendix E**.

8.2 A review of Geotechnical Investigation Report

The following report was reviewed in preparation of this preliminary hydrogeological study: "*A Report to Sobrara/Tribute Brubacher Holdings Inc., A Geotechnical Investigation for Proposed Residential Development, 6586 Beatty Line North, Township of Centre Wellington (Fergus)*", Reference No. 2311-S044, dated November 2024.

The report indicates that:

- The investigation has disclosed that beneath a topsoil veneer and layer of earth fill at 1 location, the site is underlain by strata of sandy silt till, sand silt, and silty clay.
- The topsoil must be removed from the area of construction. Spread and strip footing founded on engineered fill or sound native soils can be designed for soil bearing resistance Serviceability Limit States of 150 kPa, and a factored geotechnical resistance at Ultimate Soil States of 240 kPa.
- The subgrade should consist of sound native soil or properly compacted engineered earth fill for the foundation construction. It should be inspected and/or proof-rolled prior to any fill placement. placement of the granular bedding. The concrete slab must be constructed on a granular bedding, consisting of minimum 15 cm thick 19-mm CRL or equivalent, compacted to 98% Standard Proctor Dry Density (SPDD).
- The frost penetration depth for the Subject Site is estimated at 1.4 m. All footings subject to frost action should be provided with a minimum of 1.4 m of soil cover.
- All trench excavations for foundations must comply with Ontario Regulation 213/91 (Construction Projects) under the Occupational Health and Safety Act. The sandy silt till contacted in the boreholes would be classified as Type 2 soils. Saturated silt and sand contacted in the boreholes would be classified as Type 4 soils.

8.3 Preliminary Construction Dewatering Requirements

A review of the proposed conceptual blockplan, prepared by Weston Consulting indicated that the land will be subdivided into residential lots and blocks, and a stormwater management facility at the southwest portion of the site, along with associated roads and municipal services and infrastructure, meeting urban standards. It is assumed that all of the proposed residential units are anticipated to have basement structures. The grading elevation and Finished Floor Elevations (FFE) for the lots and invert elevations for the proposed underground services and the SWM pond were not available for review at the time of preparation of this report. Therefore, the dewatering requirement and the short-term dewatering and long-term foundation drainage flow rates should be assessed once the detail design become available.

8.4 Preliminary Permit Requirements

Considering the early stage of the project, the construction approach, detail design drawings and excavation phases are not available. As such, recommendations on permit requirements should be assessed once the data become available for review.

8.5 Preliminary Potential Dewatering Impacts and Mitigation Plan

8.5.1 Short-Term Discharge Water Quality

The dewatering system must be appropriately filtered in order to prevent the pumping of fines and loss of ground due to cave-in during the dewatering activities.

A review of the groundwater quality test results suggests groundwater quality meets the Township of Centre Wellington sanitary and storm Sewer Use By-Law. As such, disposal of the dewatering effluent into town's sewer system is acceptable without pre-treatment.

The final design for any temporary or long-term construction dewatering effluent pre-treatment system is the responsibility of contractors responsible for construction, or the water treatment system design specialists, if required.

8.5.2 Ground Settlement

The recommendation for ground settlement and conceptual zone of influence needs to be assessed once the detail design becomes available for the project.

8.5.3 Surface Water, Wetlands and Areas of Natural Significance

As previously mentioned in **Section 5.5,** record review indicates that there are wetlands classified as provincial along with wooded areas located northeast, southwest, northwest, and center portion of the of the Subject Site. There is a tributary of Irvine Creek which is located at the northern portion of the Subject Site.

An Environmental Impact Study (EIS) has been completed for the Subject Site. A review of the report prepared by GeoProcess Research Associated Inc. dated January 15, 2025, indicates that:

1. Three Provincially Significant Wetlands (PSWs) are identified on the property. The central wetland located in the middle of the property is candidate for revaluation based on the observed topography and vegetation. A qualified biologist in 2025 to confirm whether it meets the criteria of a Provincially Significant Wetland.
2. The Grand River Conservation Authority, requires a 30 m buffer around these wetlands. It is recommended that these buffers are planted in native, self-sustaining vegetation to reduce the impact of the proposed development on the natural features.
3. A watercourse regulated by the GRCA flows from north to southeast for about 180 meters and is located in a provincially significant wetland at the eastern edge of the property. Since it lies within the wetland, the required 15-meter setback for the watercourse is replaced by the 30-meter setback of the wetland, ensuring proper protection.

8.5.4 Water Supply Wells and Zone of Influence

A review of the MECP well records confirmed that there are twenty-four (24) records for water supply wells that are registered within 500 m of the Subject Site. However, potential impacts to nearby MECP water supply wells should be reassessed when further details become available for review.

9.0 CONCLUSIONS AND RECOMMENDATIONS

- The Subject Site is mainly located within a regional physiography of Southern Ontario known as Guelph Drumlin Field. Much of the Subject Site is situated on the Till Plans (Drumlinized) and one third portion of it towards the north is mapped within the Spillways physiographic features.
- the Subject Site is located within an area mapped as Till deposits known as Wentworth Till (5b), consisting of predominantly stone-poor, sandy silt to silty sand textured till deposits. A small portion of the Subject Site along the northeastern limit is mapped within the Lacustrine, kame and outwash (7a), consisting of sand. A small portion of the Subject Site along the eastern limit is mapped within the Outwash sediments (7b), consisting of gravel sand. Additionally, portions of the northern limit of the Subject Site are mapped within the Swamps and bogs sediments (20), consisting of organic deposits.
- The Subject Site is located within the Irvine Creek Sub-watershed that falls in the Grand River watershed.
- Record review indicates that wetland features classified as provincial along with wooded areas are located northeast, southwest, northwest, and center portion of the of the Subject Site. The wetlands are called Irvine Creek Wetland Complex and comprise of swamps There is a tributary of Irvine Creek which is located at the southeastern portion of the Subject Site.
- The subsoil investigation has revealed that beneath the topsoil and a layer of earth fill in places, the Subject Site mainly comprises of sandy silt till, sand, silt and silty clay deposits extending to the maximum termination depth of investigated at 10.9 mbgs.
- The findings of the current study confirms that the groundwater level elevations in the monitoring wells range from 418.0 masl to 411.7 masl. The monitoring program is ongoing and the groundwater levels will be updated to reflect the seasonal high levels.
- The estimated hydraulic conductivity ranging from 1.6×10^{-8} m/s to 1.2×10^{-5} m/s for the sandy silt till and sand units presented in the monitoring wells screen intervals, respectively.
- One (1) set of groundwater samples was collected for analysis for the monitoring well BH/MW 1S. The results of analysis for the unfiltered groundwater indicate no exceedances when compared and evaluated against the Township of Centre Wellington Sanitary and Storm Sewer Use By-Laws Parameters.
- A review of the proposed conceptual servicing plan indicated that the land will be subdivided into residential lots and blocks, and a stormwater management facility at the southwest portion of the Subject Site, along with associated roads and municipal services and infrastructure. The Finished Floor Elevations (FFE) for the lots and invert elevations for the proposed underground services and the SWM pond were not available for review at the time of preparation of this report. Therefore, the dewatering requirement and the short-term dewatering and long-term foundation drainage flow rates should be assessed once the detail design become available.

- Considering the early stage of the project, the construction approach, detail design drawings and excavation phases are not available. As such, recommendations on permit requirements should be assessed once the data become available for review.
- Potential dewatering impact should be assessed once the detail design become available for the proposed development.
- The EIS report finding reveal that there are three Provincially Significant Wetlands (PSWs) which are identified on the property. The central wetland located in the middle of the property is candidate for revaluation based on the observed topography and vegetation. A qualified biologist in 2025 to confirm whether it meets the criteria of a Provincially Significant Wetland.

10.0 CLOSURE

We trust that the above-noted information is suitable for your review. If you have any questions regarding this information, please do not hesitate to contact the undersigned.

Yours truly,
SOIL ENGINEERS LTD.

Bhawandeep Singh Brar, B.Sc
Project Manager-Hydrogeological Services

Narjes Alijani, M.Sc., P.Geo.
Department Manager-Hydrogeological Services

11.0 REFERENCES

1. Chapman, L.J. and D.F. Putnam, 1984. The Physiography of Southern Ontario. Ontario.
2. Freeze, A. and Cherry, J., 1979. Groundwater, Prentice-Hall Inc., New Jersey.
3. Geological Survey. Ontario Geological Survey (OGS), 2003. Surficial Geology of Southern Ontario. Miscellaneous Release – Data 128 – revised.
4. Geological Survey. Ontario Geological Survey (OGS), 2007. Bedrock Geology of Ontario. Miscellaneous Release – MRD 219.
5. Grand River Region Conservation Authority, 2024, Online Regulated Area Map.
6. Ministry of the Environment, Conservation and Parks, 2023, Source Protection Information Atlas Interactive Map.
7. Ministry of Natural Recourses and Forestry, 2023. Natural Heritage Interactive Map.
8. Township of Centre Wellington Official Plan – 2024.

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CONSULTING ENGINEERS
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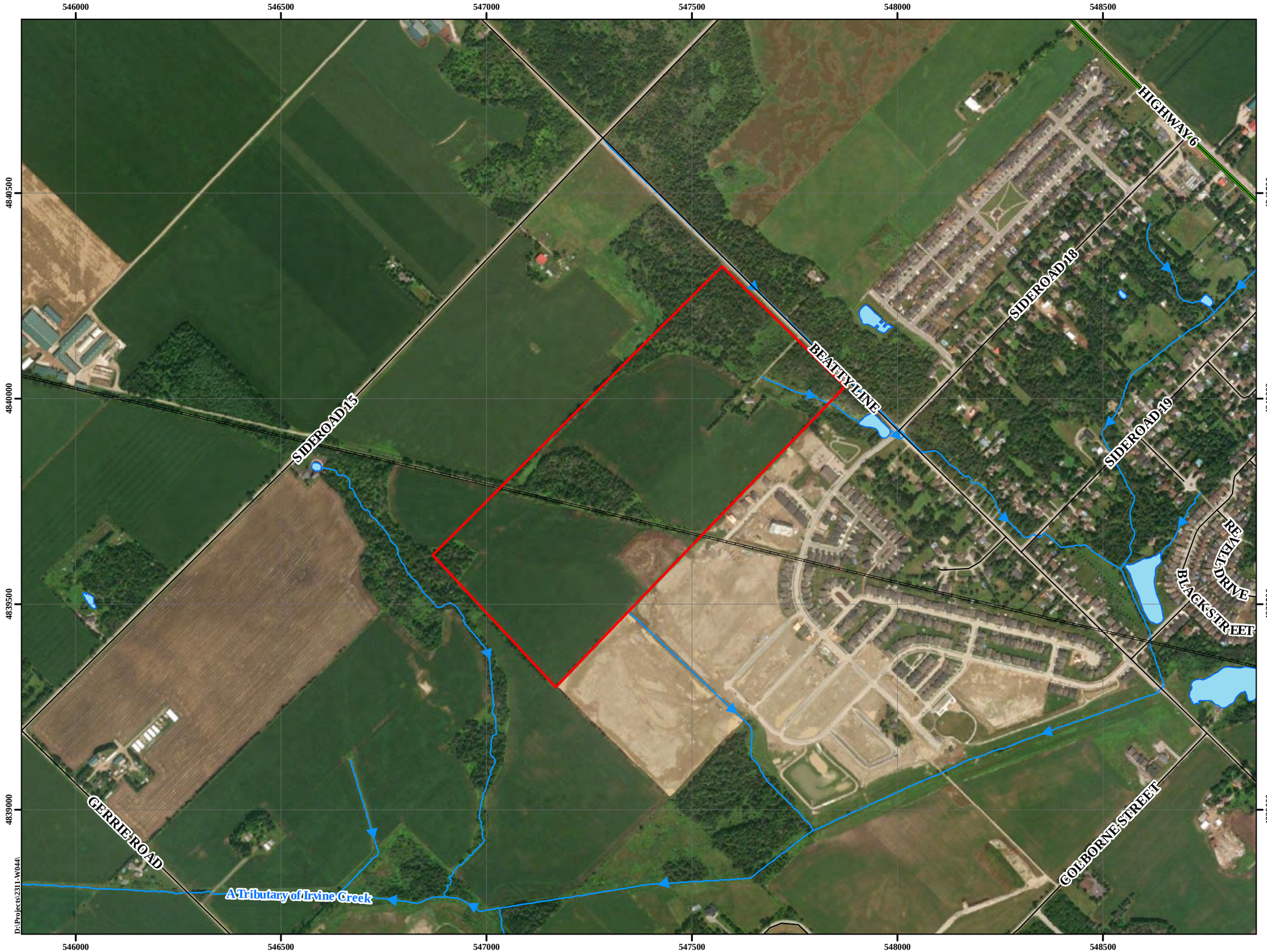
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

DRAWINGS 1 to 8

REFERENCE NO. 2311-W044



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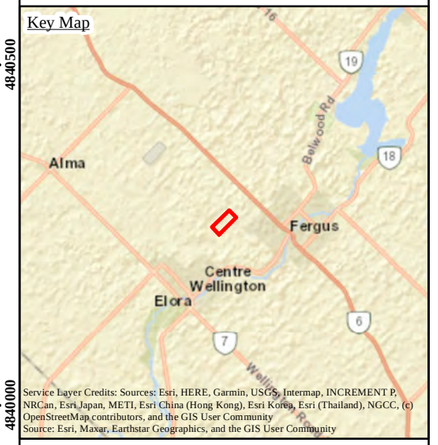
References: Ontario Ministry of Natural Resources and Forestry
Ⓒ Queen's Printer for Ontario, 2022

Key Map



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Local Road
- Railway
- Waterbody
- Watercourse

Soil Engineers Ltd.

Site Location Plan

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:

0 50 100 200 300 400 500
Metres

Drawing No. 1

547000
547500
548000
4840000
4839500

SIDEROAD 15
BEATTY LINE
SIDEROAD 18
A Tributary of Irvine Creek

BH/MW 1S
BH/MW 1D
BH/MW 2
BH/MW 3
BH/MW 4
BH/MW 5
BH/MW 6
BH/MW 7
BH/MW 8D
BH/MW 8S
BH 9
BH 11
BH/MW 10
BH/MW 13
BH 12

1
2
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6

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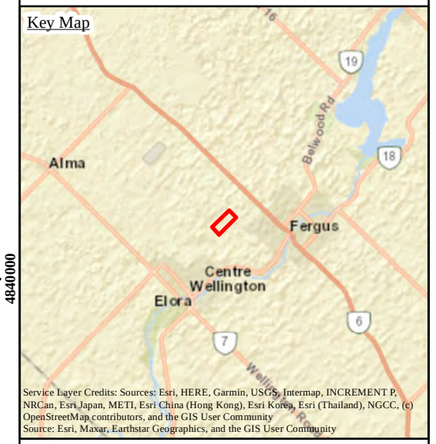
N

References: Ontario Ministry of Natural Resources and Forestry

Key Map



Legend

- Approximate Boundary of Subject Site
- Borehole
- Borehole with Monitoring Well
- Pizometer
- Local Road
- Railway
- Waterbody
- Watercourse

Soil Engineers Ltd.

Borehole and Monitoring Well Location Plan

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:
0 25 50 100 150 200 250
Metres

Drawing No. 2

546000 546500 547000 547500 548000 548500

4840500 4840000 4839500 4839000

HIGHWAY 6
SIDEROAD 18
SIDEROAD 19
BEATTY LINE
SIDEROAD 15
REEVE DRIVE
MILLAGE LINE
BLACK STREET
COLBORNE STREET
GERRIE ROAD

20
5b
7a
6
7b

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N

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Key Map

Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Local Road
- 5b: Wentworth Till; consisting of diamicton
- 6: Kames and eskers; consisting of sand, gravel: ice-contact
- 7a: Lacustrine, kame, and outwash; consisting of sand: proglacial outwash
- 7b: Outwash; consisting of gravel sand: proglacial outwash
- 20: Swamps and bogs; consisting of organic deposits

Soil Engineers Ltd.

Surface Geology Map

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:
0 100 200 300 400 500
Metres

Drawing No. 3

546000
546500
547000
547500
548000
548500

4840500
4840000
4839500
4839000

HIGHWAY 6
SIDEROAD 18
SIDEROAD 15
SIDEROAD 19
BEATTY LINE
REEVE DRIVE
MILLAGE LINE
BLACK STREET
GERRIE ROAD
COLBORNE STREET

Guelph Drumlin Field

Till Plains (Drumlinized)

Spillways

N

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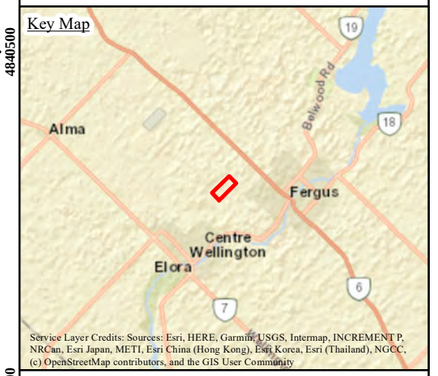
Key Map



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Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Local Road
- Region Boundary
- Till Plains (Drumlinized)
- Spillways

Soil Engineers Ltd.

Physiographic Map

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:
0 50 100 200 300 400 500
Metres

Drawing No. 4

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Source: Chapman, L.J. and Putnam, D.F. 2007. Physiography of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 228 ISBN 978-1-4249-5158-1

546000 546500 547000 547500 548000 548500

4840500 4840000 4839500 4839000

430 425 420 415 410 405

HIGHWAY 6

SIDEROAD 18

BEATTY LINE

SIDEROAD 19

SIDEROAD 15

GERRIE ROAD

MILLAGE LINE

BLACK STREET

REID DRIVE

COLBORNE STREET

A Tributary of Irvine Creek

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N

References: Ontario Ministry of Natural Resources and Forestry
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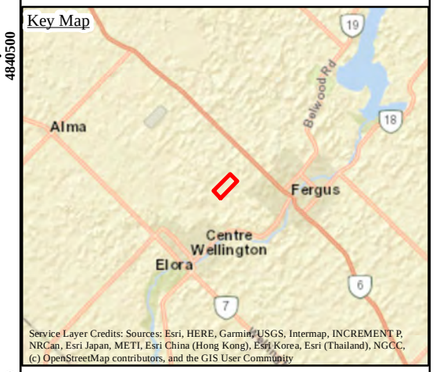
Key Map



Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Local Road
- Railway
- Waterbody
- Watercourse
- Ontario - 5 m

Soil Engineers Ltd.

Topographic Map

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:

0 50 100 200 300 400 500
Metres

Drawing No. 5

546000
546500
547000
547500
548000
548500
4840500
4840000
4839500
4839000
HIGHWAY 6
SIDEROAD 18
SIDEROAD 19
SIDEROAD 15
BEATTY LINE
MILLAGE LINE
BLACK STREET
KENNEDY DRIVE
GERRIE ROAD
COLBORNE STREET
A Tributary of Irvine Creek
D:\Projects\2311-W044\

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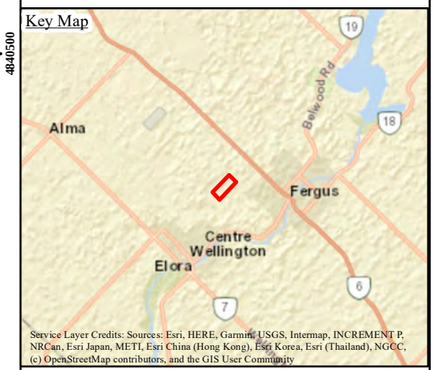

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Legend

- Approximate Boundary of Subject Site
- Expressway/Freeway
- Local Road
- Watercourse
- Waterbody
- Wooded Area *Wooded Area*
- Wetland (classified as Provincial)
- Wetland (Not evaluated per OWES)

Soil Engineers Ltd.

Natural Features and Protection Area Plan

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:

0 100 200 300 400 500
Metres

Drawing No. 6

N

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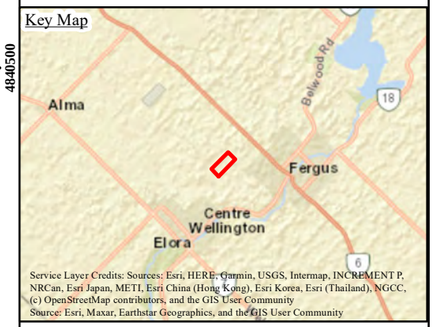
Key Map



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Approximate Boundary of Subject Site
- 500 Metres From Subject Site Boundary
- Expressway/Freeway
- Local Road
- Waterbody
- Watercourse
- Unknown (3)
- Abandoned-Other (18)
- Abandoned-Quality (1)
- Abandoned-Supply (1)
- Observation Wells (21)
- Water Supply (24)

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MECP Well Location Plan

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

Scale:

0 50 100 200 300 400 500
Metres

Drawing No. 7

547000
547500
548000
4840000
4839500

SIDEROAD 15
BEATTY LINE
SIDEROAD 18
A Tributary of Irvine Creek

BH/MW 1S
BH/MW 1D
BH/MW 2 (Projected)
BH/MW 4
BH/MW 3
BH/MW 5
BH/MW 6
BH/MW 7
BH/MW 8D
BH/MW 8S
BH 9
BH 11
BH/MW 10
BH/MW 13
BH 12

A
A'

N

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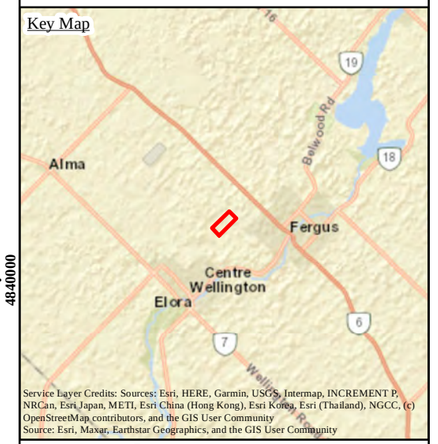
Key Map



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Approximate Boundary of Subject Site
- A A' Cross Section
- Borehole
- Borehole with Monitoring Well
- Local Road
- Railway
- Waterbody
- Watercourse

Soil Engineers Ltd.

Cross Section Key Plan

Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 10, 2024

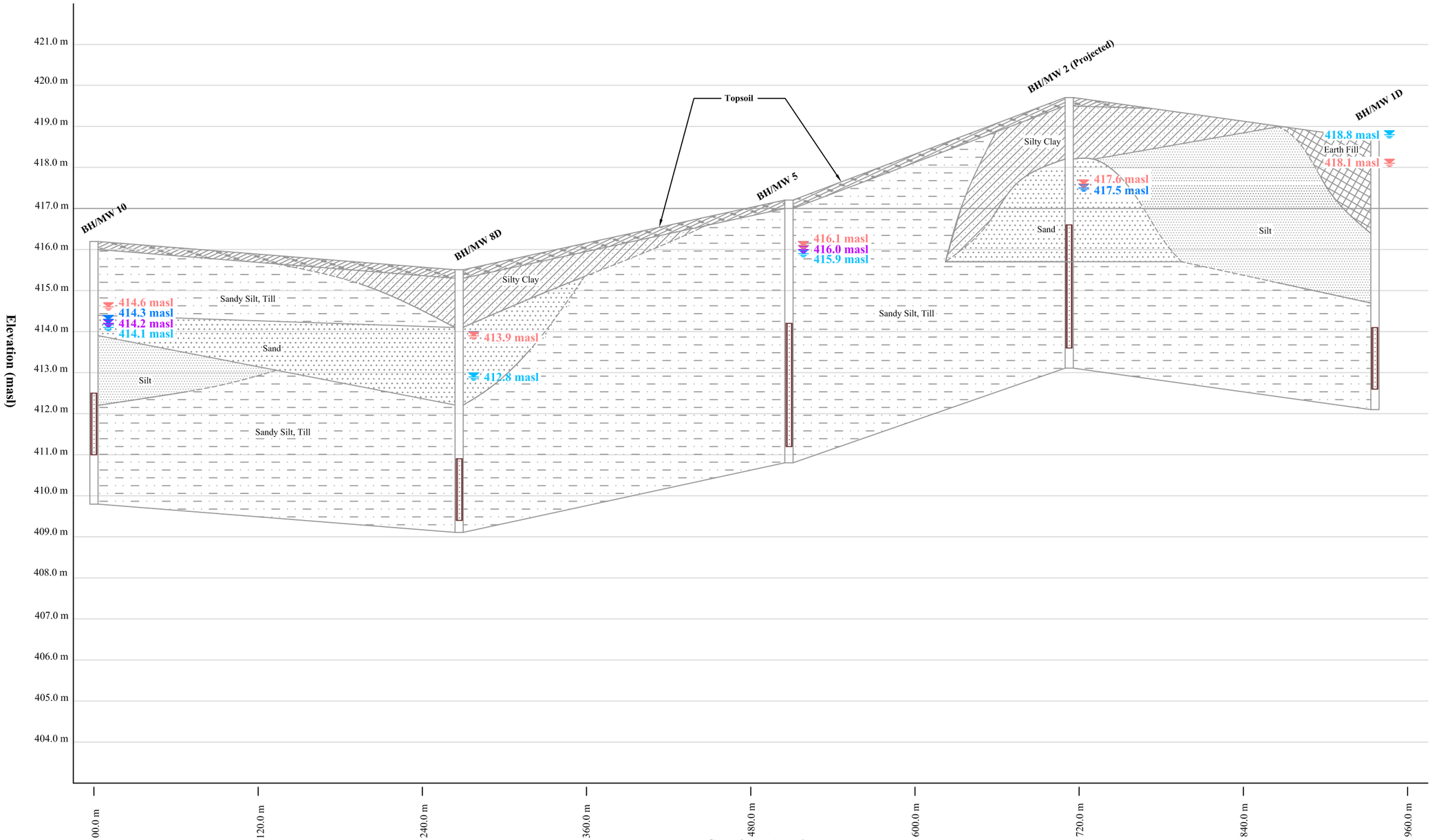
Scale:
0 25 50 100 150 200 250
Metres

Drawing No. 8-1

D:\Projects\2211-W154\

Southwest
A

Northeast
A'



Section A-A'

Topsoil
Earth Fill
Sandy Silt Till
Sand
Silt
Earth Fill
Silty Clay
Screen

Water Table on September 24, 2024
Water Table on October 7, 2024
Water Table on October 21, 2024
Water Table on November 28, 2024

Soil Engineers Ltd.
CONSULTING SOIL, FOUNDATION & ENVIRONMENTAL ENGINEERS

Title: Geological Cross-Section (A-A')

Project: Hydrogeological Assessment
Proposed Residential Development
6586 Beatty Line North, Township of Centre Wellington (Fergus)

Reference No:	Date:	Scale: V	Scale: H	Drawing No.
2311-W044	December, 2024	1:100	1:3000	8-2A

547000
547500
548000
4840000
4839500

SIDEROAD 15
BEATTY LINE
SIDEROAD 18

BH/MW 1D
(418.1)
BH/MW 2
(417.6)
BH/MW 4
(417.6)
BH/MW 3
(417.5)
BH/MW 5
(416.1)
BH/MW 7
(416.1)
BH/MW 8D
(413.9)
BH/MW 6
(411.9)
BH/MW 10
(414.6)

418
417
416
415
414
413
425
420
415

A Tributary of Irvine Creek

D:\Projects\2311-W044\

N

References: Ontario Ministry of Natural Resources and Forestry
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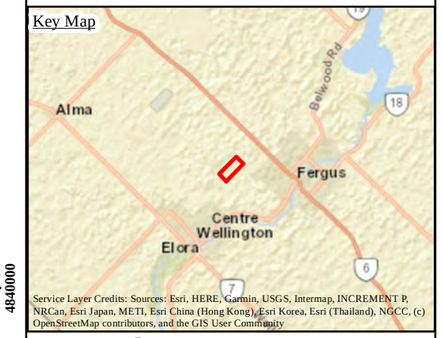
Key Map



Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- Approximate Boundary of Subject Site
- Borehole with Monitoring Well
- Local Road
- Waterbody
- Watercourse
- Ontario - 5 m
- Highest Interpreted Shallow Groundwater
- Highest Inferred Shallow Groundwater Elevation Contour
- Interpreted Shallow Groundwater Flow Direction
- (418.1) Highest Shallow Groundwater Level Measured on November 28, 2024

Soil Engineers Ltd.

Shallow Groundwater Flow Pattern Plan

Hydrogeological Assessment Proposed Residential Development 6586 Beatty Line North
Township of Centre Wellington (Fergus)

Reference No. 2311-W044

Date: December 11, 2024

Scale:

0 25 50 100 150 200 250
Metres

Drawing No. 9

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'A'

BOREHOLE LOGS/MONITORING WELL LOGS
AND
GRAIN SIZE DISTRIBUTION GRAPH

REFERENCE NO. 2311-W044

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 1D

FIGURE NO.: 1

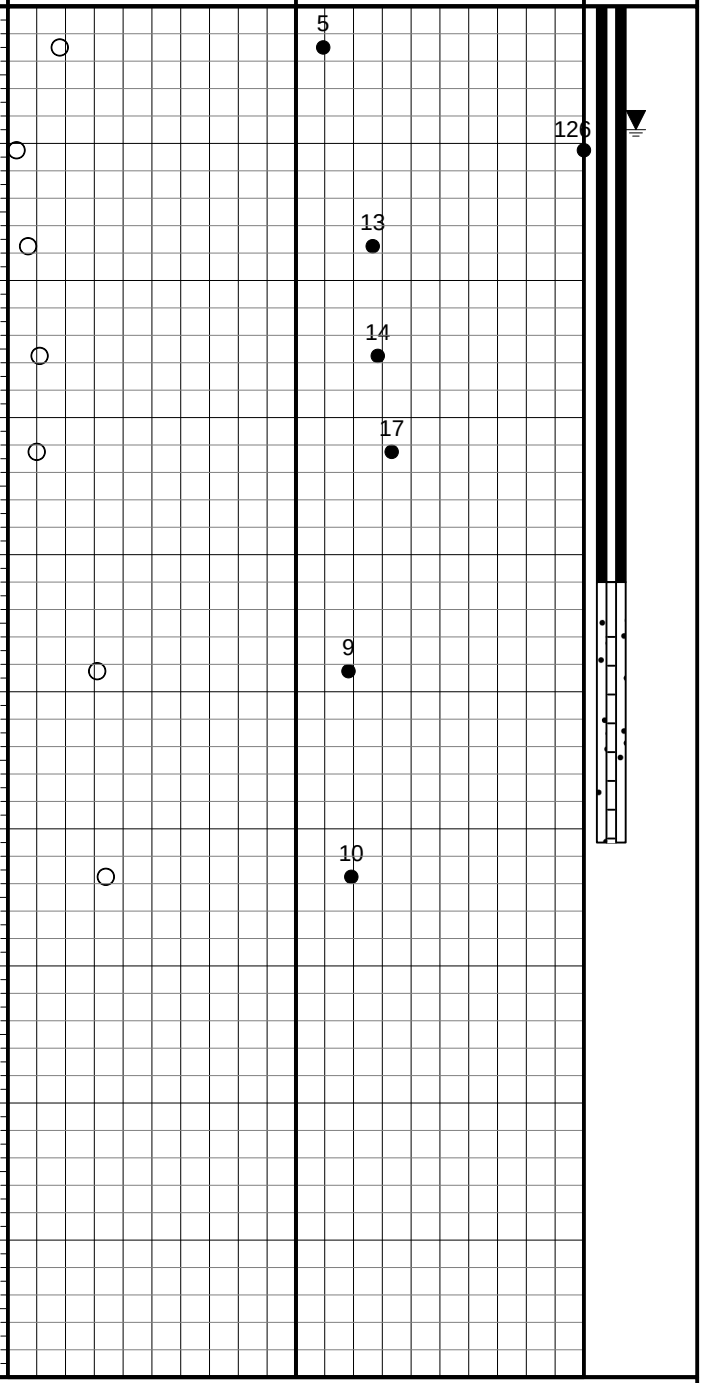
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 5, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
418.7	Ground Surface				
0.0	Black **EARTH FILL** sand and gravel	1	DO	18	0
	PEAT LAYER	2	AS	3	1
	Grey **EARTH FILL** silty clay with sand and gravel	3	DO	7	2
416.4 2.3	Brown, compact **SILT** some sand to sandy occ. sand layers wet	4	DO	11	3
		5	DO	10	4
414.7 4.0	Grey, dense **SANDY SILT TILL** some clay, a trace of gravel occ. cobbles	6	DO	31	5
		7	DO	34	6
412.1 6.6	**END OF BOREHOLE** Installed 50 mm Ø PVC monitoring well to 6.1 m with 1.5 m screen Sand backfill from 4.3 to 6.1 m Bentonite seal from 0.0 m to 4.3 m Provided with a steel monument casing **Water Level Reading:** W.L. @ El. 417.8 masl on Sep 24, 2024 W.L. @ El. 417.8 masl on Oct 7, 2024 W.L. @ El. 417.8 masl on Oct 21, 2024 W.L. @ El. 418.1 masl on Nov 28, 2024				7 8 9 10



Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 1S

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 5, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
418.7	Ground Surface							
0.0	Black **EARTH FILL** sand and gravel				0			
	PEAT LAYER				1			
	Grey **EARTH FILL** silty clay with sand and gravel				2			
416.4 2.3	Brown, compact **SILT** some sand to sandy occ. sand layers wet				3			
414.7 4.0	Grey, dense **SANDY SILT TILL** some clay, a trace of gravel occ. cobbles				4			
414.1 4.6	**END OF BOREHOLE**				5			
	(Shallow Well) Installed 50 mm Ø PVC monitoring well to 4.6 m with 1.5 m screen Sand backfill from 2.7 to 4.6 m Bentonite seal from 0.0 m to 2.7 m Provided with a steel monument casing				6			
	Water Level Reading: W.L. @ El. 417.9 masl on Sep 24, 2024 W.L. @ El. 417.9 masl on Oct 7, 2024 W.L. @ El. 417.8 masl on Oct 21, 2024 W.L. @ El. 417.9 masl on Nov 28, 2024				7			
					8			
					9			
					10			

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 2

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 29, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
419.7	Ground Surface							
0.0	**18 cm TOPSOIL**	1	DO	3	0		14	
	Brown, soft to firm **SILTY CLAY** traces of sand and gravel weathered	2	DO	7	1		19	
418.2								
1.5	Brown, loose to compact **SAND** fine grained a trace to some silt wet	3	DO	17	2		17	
		4	DO	8			20	
		5	DO	13	3		15	
415.7								
4.0	Grey, very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	6	DO	50/8	4		8	
		7	DO	67	5		7	
413.1					6			
6.6	**END OF BOREHOLE**				7			
	Installed 50 mm Ø PVC monitoring well to 6.1 m with 3.0 m screen Sand backfill from 2.4 to 6.1 m Bentonite seal from 0.0 m to 2.4 m Provided with a steel monument casing				8			
	Water Level Reading: W.L. @ El. 417.5 masl on Sep 24, 2024 W.L. @ El. 417.6 masl on Oct 7, 2024 W.L. @ El. 417.6 masl on Oct 21, 2024 W.L. @ El. 417.6 masl on Nov 28, 2024				9			
					10			

Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 3

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

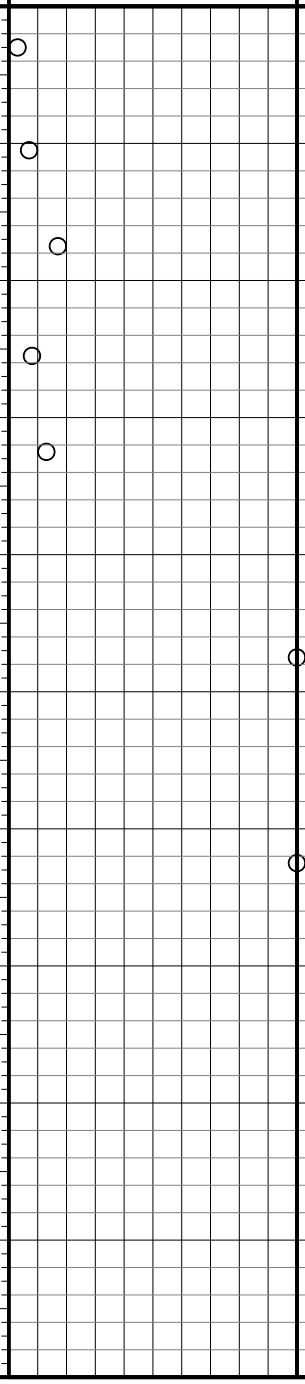
PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

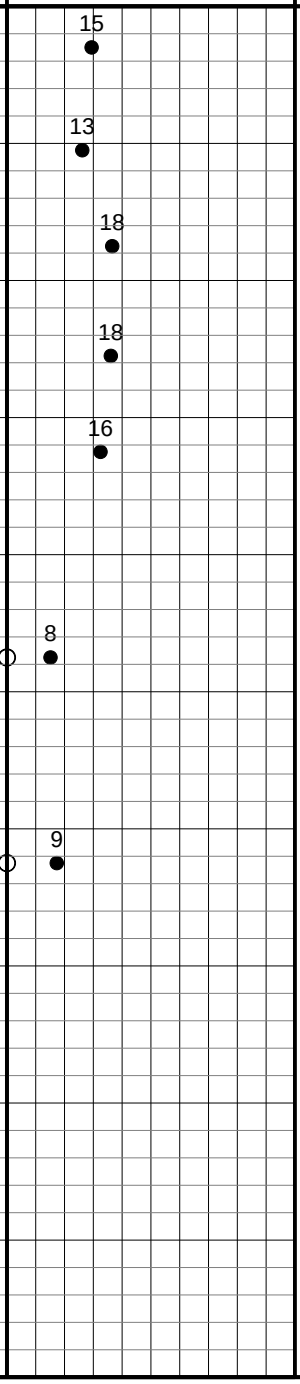
DRILLING DATE: September 5, 2024

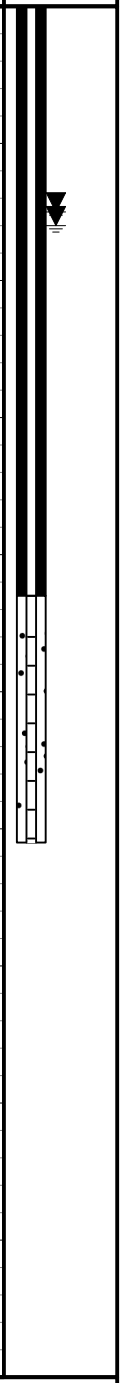
El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
419.0 / 0.0	Ground Surface				0
	15 cm TOPSOIL	1	DO	8	
	Brown, loose to compact **SILT** some sand to sandy a trace of clay — weathered	2	DO	16	1
417.6 / 1.4	Brown, very stiff **SILTY CLAY** a trace of gravel	3	DO	20	2
416.8 / 2.2	Brown, compact **SAND** fine grained a trace to some silt wet	4	DO	19	
		5	DO	17	3
415.0 / 4.0	Grey, very dense **SANDY SILT TILL** traces of clay and gravel	6	DO	50/13	4 5 6
412.6 / 6.4	**END OF BOREHOLE**	7	DO	50/13	7 8 9 10

Installed 50 mm Ø PVC monitoring well to 6.1 m with 1.5 m screen
Sand backfill from 4.3 to 6.1 m
Bentonite seal from 0.0 m to 4.3 m
Provided with a steel monument casing

Water Level Reading:
W.L. @ El. 417.5 masl on Sep 24, 2024
W.L. @ El. 417.5 masl on Oct 7, 2024
W.L. @ El. 417.4 masl on Oct 21, 2024
W.L. @ El. 417.5 masl on Nov 28, 2024







JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 4

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 29, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
419.7 / 0.0	Ground Surface							
	15 cm TOPSOIL	1	DO	5	0		19	
	Brown, firm **SILTY CLAY** a trace of sand	2	DO	6	1		21	
418.3 / 1.4	weathered							
	Brown, compact **SAND** fine grained a trace to some silt wet	3	DO	23	2		19	
		4	DO	25			21	
		5	DO	18	3		20	
414.8 / 4.9	Brown, compact **SILT** some sand to sandy wet	6A / 6B	DO	21	4 5		20 19	
414.2 / 5.5	Grey, compact to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	7	DO	50/15	6		8	
413.3 / 6.4	**END OF BOREHOLE**				7 8 9 10			

Installed 50 mm Ø PVC monitoring well to 6.1 m with 1.5 m screen
Bentonite seal backfill from 5 m to 6.1 m
Sand backfill from 2.7 to 6.1 m
Bentonite seal from 0.0 m to 2.7 m
Provided with a steel monument casing

Water Level Reading:
W.L. @ El. 417.6 masl on Sep 24, 2024
W.L. @ El. 417.5 masl on Oct 7, 2024
W.L. @ El. 417.5 masl on Oct 21, 2024
W.L. @ El. 417.6 masl on Nov 28, 2024

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 5

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 4, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
417.2 / 0.0	Ground Surface				
	20 cm TOPSOIL	1	DO	5	0
	weathered	2	DO	13	1
	Loose to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	3	DO	14	2
	brown grey	4	DO	7	
		5	DO	18	3
					4
	clay layers	6	DO	47	5
					6
410.8 / 6.5		7	DO	65/20	
	END OF BOREHOLE				7
					8
					9
					10

Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

17 12 13 14 9 17 8

WATER LEVEL

Installed 50 mm Ø PVC monitoring well
to 6.1 m with 3.0 m screen
Sand backfill from 2.7 to 6.1 m
Bentonite seal from 0.0 m to 2.7 m
Provided with a steel monument casing

Water Level Reading:
W.L. @ El. 415.9 masl on Sep 24, 2024
W.L. @ El. 415.8 masl on Oct 7, 2024
W.L. @ El. 415.7 masl on Oct 21, 2024
W.L. @ El. 416.1 masl on Nov 28, 2024

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 6

FIGURE NO.: 7

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 4, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
416.7 / 0.0	Ground Surface **15 cm TOPSOIL**				0
	Brown, compact **SANDY SILT TILL** traces of clay and gravel	1	DO	10	
415.7 / 1.0	weathered	2A 2B	DO	15	1
	Brown, compact **SAND** fine grained a trace to some silt wet	3	DO	12	2
414.5 / 2.2		4	DO	45	
	Compact to very dense **SANDY SILT TILL** traces of clay and gravel seepage below 4.6 m	5	DO	24	3
	brown grey				4
		6	DO	10	5
					6
		7	DO	55	
					7
408.6 / 8.1		8	DO	60	8
	END OF BOREHOLE				9
	Installed 50 mm Ø PVC monitoring well to 6.1 m with 1.5 m screen Bentonite seal backfill from 6.7 m to 7.6 m Sand backfill from 6.1 m to 6.7 m and 4.3 to 6.1 m Bentonite seal from 0.0 m to 4.3 m Provided with a steel monument casing				10
	Water Level Reading: W.L. @ El. 412.5 masl on Sep 24, 2024 W.L. @ El. 412.0 masl on Oct 7, 2024 W.L. @ El. 411.7 masl on Oct 21, 2024 W.L. @ El. 411.9 masl on Nov 28, 2024				11
					12

Dynamic Cone (blows/30 cm) 10 30 50 70 90

Shear Strength (kN/m²) 50 100 150 200

Penetration Resistance (blows/30 cm) 10 30 50 70 90

Atterberg Limits PL LL

Moisture Content (%) 10 20 30 40

Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 7

FIGURE NO.: 8

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

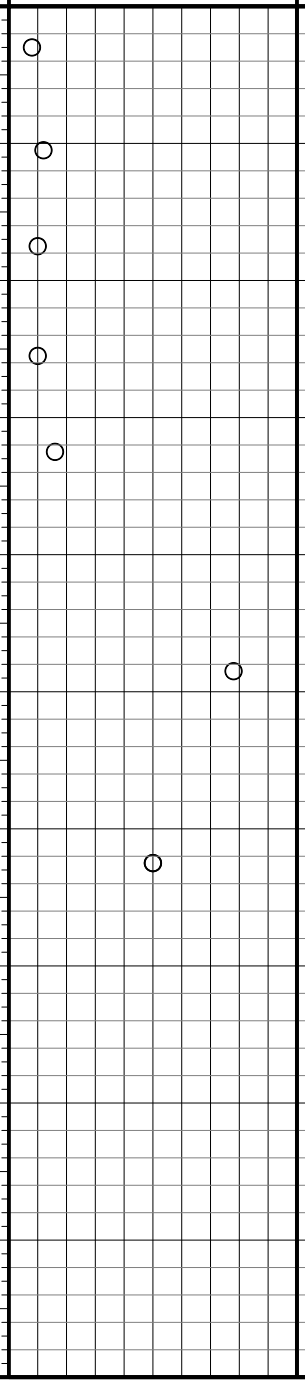
PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

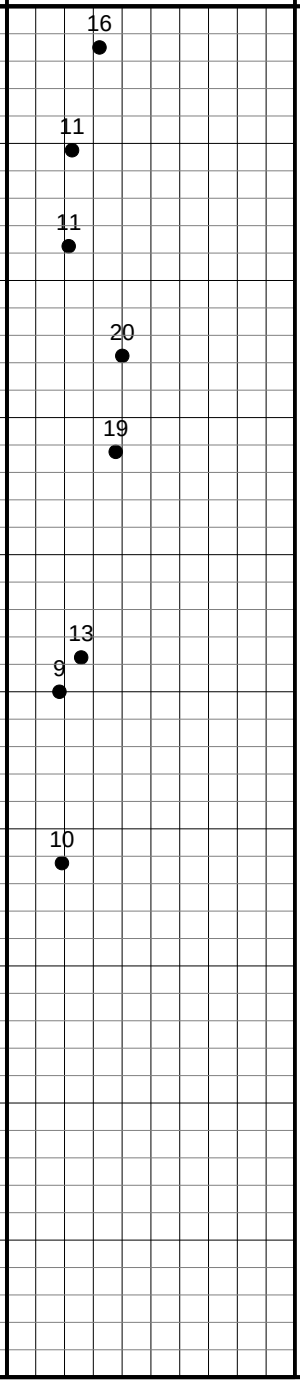
DRILLING DATE: August 30, 2024

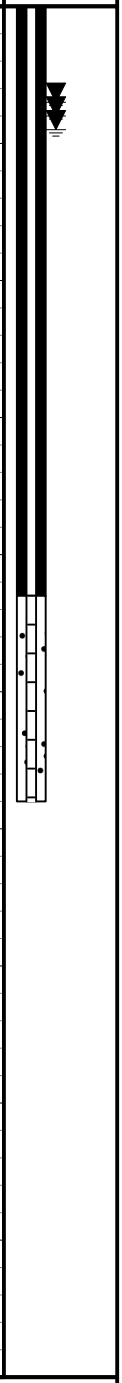
El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
416.7 / 0.0	Ground Surface				
	18 cm TOPSOIL	1	DO	8	0
	Brown,loose to compact **SANDY SILT TILL** weathered some clay, a trace of gravel	2	DO	12	1
		3	DO	10	2
414.5 / 2.2	Brown, compact **SILT** sandy, a trace of gravel wet	4	DO	10	
		5	DO	16	3
412.9 / 3.8	Brown, very dense **SAND** fine grained a trace to some silt wet	6A / 6B	DO	78	4 / 5
411.8 / 4.9	Grey, very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	7	DO	50/15	6
410.3 / 6.4	**END OF BOREHOLE**				7 / 8 / 9 / 10

Installed 50 mm Ø PVC monitoring well
to 5.8 m with 1.5 m screen
Sand backfill from 4.3 to 5.8 m
Bentonite seal from 0.0 m to 4.3 m
Provided with a steel monument casing

Water Level Reading:
W.L. @ El. 416.0 masl on Sep 24, 2024
W.L. @ El. 415.9 masl on Oct 7, 2024
W.L. @ El. 415.8 masl on Oct 21, 2024
W.L. @ El. 416.1 masl on Nov 28, 2024







Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 8D

FIGURE NO.: 9

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 3, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
415.5	Ground Surface							
0.0	**18 cm TOPSOIL**	1	DO	9	0		16	
	Brown, stiff **SILTY CLAY** a trace of gravel	2	DO	8	1		18	
	weathered							
414.1 / 1.4	Brown, compact **SAND** fine grained a trace to some silt wet	3	DO	19	2		16	
		4	DO	27			14	
412.2 / 3.3		5	DO	27	3		12	
	Grey, compact to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	6	DO	26	4 5		11	
409.1		7	DO	50/13	6		8	
6.4	**END OF BOREHOLE**				7 8 9 10			

Installed 50 mm Ø PVC monitoring well
to 6.1 m with 1.5 m screen
Sand backfill from 4.3 to 6.1 m
Bentonite seal from 0.0 m to 4.3 m
Provided with a steel monument casing

Water Level Reading:
W.L. @ El. 413.9 masl on Sep 24, 2024
W.L. @ El. 412.8 masl on Oct 7, 2024
W.L. @ El. 412.8 masl on Oct 21, 2024
W.L. @ El. 413.9 masl on Nov 28, 2024

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH/MW 8S

FIGURE NO.: 10

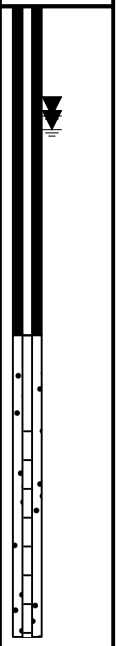
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 3, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES: Number	SAMPLES: Type	SAMPLES: N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
415.5 / 0.0	Ground Surface				0			
	18 cm TOPSOIL							
	Brown, stiff **SILTY CLAY** a trace of gravel weathered				1			
414.1 / 1.4								
	Brown, compact **SAND** fine grained a trace to some silt wet				2 3			
412.2 / 3.3								
	Grey, compact to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles				4			
410.9 / 4.6	**END OF BOREHOLE**				5			
	(Shallow Well) Installed 50 mm Ø PVC monitoring well to 4.6 m with 1.5 m screen Sand backfill from 2.4 to 4.6 m Bentonite seal from 0.0 m to 2.4 m Provided with a steel monument casing				6			
	Water Level Reading: W.L. @ El. 414.7 masl on Sep 24, 2024 W.L. @ El. 414.6 masl on Oct 7, 2024 W.L. @ El. 414.6 masl on Oct 21, 2024 W.L. @ El. 415.1 masl on Nov 28, 2024				7 8 9 10			



Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH 9

FIGURE NO.: 11

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: September 4, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
415.3	Ground Surface							
0.0	**15 cm TOPSOIL**	1	DO	11	0		14	
	Brown, compact **SANDY SILT TILL** traces of clay and gravel — weathered	2	DO	14	1		18	
		3	DO	15	2		14	
413.1								
2.2	Brown, compact **SILT** sandy, a trace of clay wet	4A	DO	18			12	
412.7		4B					9	
2.6	clayey	5	DO	21	3		13	
	Grey, compact to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles and boulders	6	DO	63	4 5		9	
409.1		7	DO	50/10	6		7	
6.2	**END OF BOREHOLE**				7 8 9 10			

Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE:BH/MW 10

FIGURE NO.: 12

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 30, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
416.2	Ground Surface							
0.0	**18 cm TOPSOIL**	1	DO	5	0		19	
	Brown, very loose to loose **SANDY SILT TILL** a trace to some clay a trace of gravel — weathered	2	DO	2	1		11	
414.4		3A	DO	11			17	
1.8	Brown, compact **SAND** fine grained, a trace to some silt wet	3B			2		14	
413.9								
2.3	Brown, compact to dense **SILT** sandy, a trace of clay wet	4	DO	21			21	
		5	DO	33	3		22	
412.2								
4.0	Grey, very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	6	DO	65	4		9	
409.8		7	DO	50/13	5		10	
6.4	**END OF BOREHOLE**				6			
	Installed 50 mm Ø PVC monitoring well to 5.2 m with 1.5 m screen Bentonite seal backfill from 5.2 m to 6.1 m Sand backfill from 3.4 to 5.2 m Bentonite seal from 0.0 m to 3.4 m Provided with a steel monument casing				7			
	Water Level Reading: W.L. @ El. 414.3 masl on Sep 24, 2024 W.L. @ El. 414.2 masl on Oct 7, 2024 W.L. @ El. 414.1 masl on Oct 21, 2024 W.L. @ El. 414.6 masl on Nov 28, 2024				8			
					9			
					10			

Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH 11

FIGURE NO.: 13

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 29, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) / Shear Strength (kN/m²) / Penetration Resistance (blows/30 cm)	Atterberg Limits PL LL / Moisture Content (%)	WATER LEVEL
415.9	Ground Surface							
0.0	**23 cm TOPSOIL**				0			
	Brown, loose **SANDY SILT TILL** a trace to some clay a trace of gravel	1	DO	4			12	
	weathered	2	DO	8	1		12	
414.5								
1.4	Brown, compact **SAND** fine grained, a trace to some silt wet	3	DO	15			20	
413.7					2			
2.2	Brown, compact **SANDY SILT TILL** a trace to some clay, a trace of gravel	4	DO	20			14	
413.0								
2.9	Brown, very dense **SAND** fine grained, a trace to some silt wet	5A	DO	76	3		14	
412.6		5B					10	
3.3	Dense to very dense **SANDY SILT TILL** a trace to some clay a trace of gravel	6	DO	43	4		11	
		7	DO	33	6		8	
409.3								
6.6	**END OF BOREHOLE**				10			

JOB NO.: 2311-S044

LOG OF BOREHOLE: BH 12

FIGURE NO.: 14

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 29, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)	Dynamic Cone (blows/30 cm) 10 30 50 70 90 / Shear Strength (kN/m²) 50 100 150 200 / Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL / Moisture Content (%) 10 20 30 40	WATER LEVEL
415.2	Ground Surface							
0.0	**23 cm TOPSOIL**	1	DO	6	0		19	
414.4 / 0.8	Brown, firm **SILTY CLAY** a trace of sand — weathered	2	DO	19	1		9	
		3	DO	19	2		10	
	Compact to very dense **SANDY SILT TILL** a trace to some clay, a trace of gravel	4	DO	47	3		9	
		5	DO	35	4		11	
	brown / grey	6	DO	28	5		9	
		7	DO	51	6		8	
408.3 / 6.9	Brown, hard **SILTY CLAY** traces of sand and gravel	8	DO	56	7		19	
406.9 / 8.3	Grey, very dense **SAND** fine grained, a trace to some silt wet	9	DO	50/10	8		13	
405.8 / 9.4	**END OF BOREHOLE**				9			
					10			
					11			
					12			
					13			
					14			
					15			

Soil Engineers Ltd.

JOB NO.: 2311-S044

LOG OF BOREHOLE:BH/MW 13

FIGURE NO.: 15

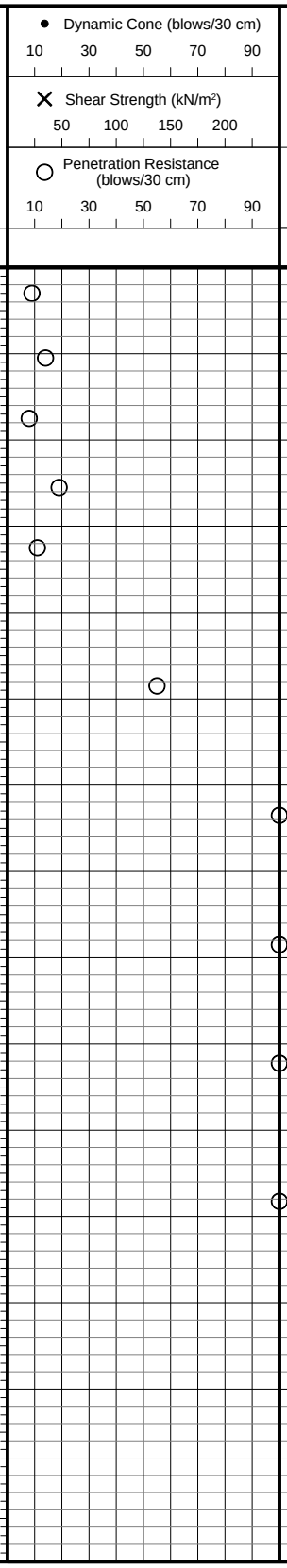
PROJECT DESCRIPTION: Proposed Residential Development

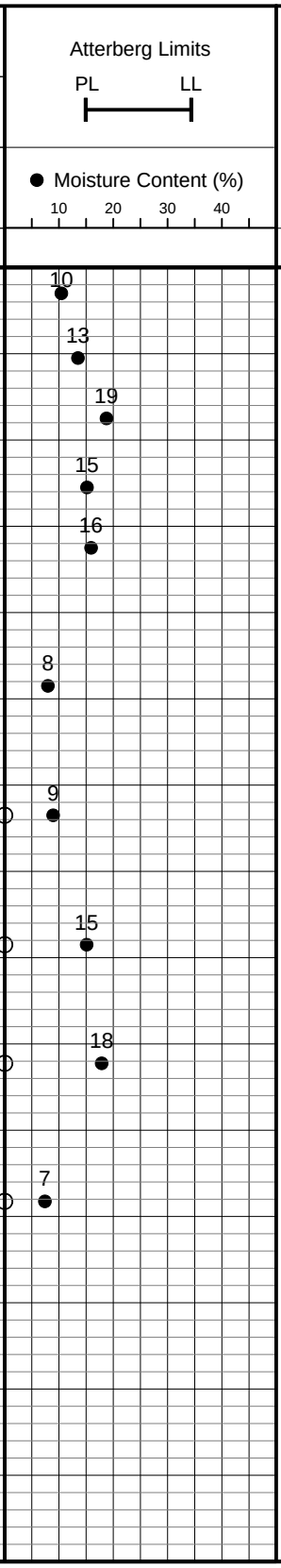
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

DRILLING DATE: August 29, 2024

El. (m) / Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
415.2 / 0.0	Ground Surface				
	18 cm TOPSOIL				0
	Brown, loose to compact — weathered **SANDY SILT TILL** a trace to some clay a trace of gravel	1	DO	9	
414.2 / 1.0		2	DO	14	1
	Brown, loose to compact **SILT** some sand to sandy, a trace of clay wet	3	DO	8	
		4	DO	19	2
412.3 / 2.9	— — seepage	5	DO	11	3
	Grey, compact to very dense **SANDY SILT TILL** a trace to some clay a trace of gravel	6	DO	55	4
		7	DO	85/23	5
408.2 / 7.0					6
	Grey, hard **SILTY CLAY** traces of sand and gravel	8	DO	91/25	7
406.0 / 9.2		9	DO	50/8	8
	Grey, very dense **SANDY SILT TILL** a trace to some clay a trace of gravel	10	DO	50/8	9
404.3 / 10.9	**END OF BOREHOLE**				10
	Installed 50 mm Ø PVC monitoring well to 10.1 m with 1.5 m screen Sand backfill from 8.2 to 10.1 m Bentonite seal from 0.0 m to 8.2 m Provided with a steel monument casing				11
	Water Level Reading: W.L. Dry on Sep 24, 2024 W.L. Dry on Oct 7, 2024 W.L. Dry on Oct 21, 2024 W.L. Dry on Nov 28, 2024				12
					13
					14
					15





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GRAIN SIZE DISTRIBUTION

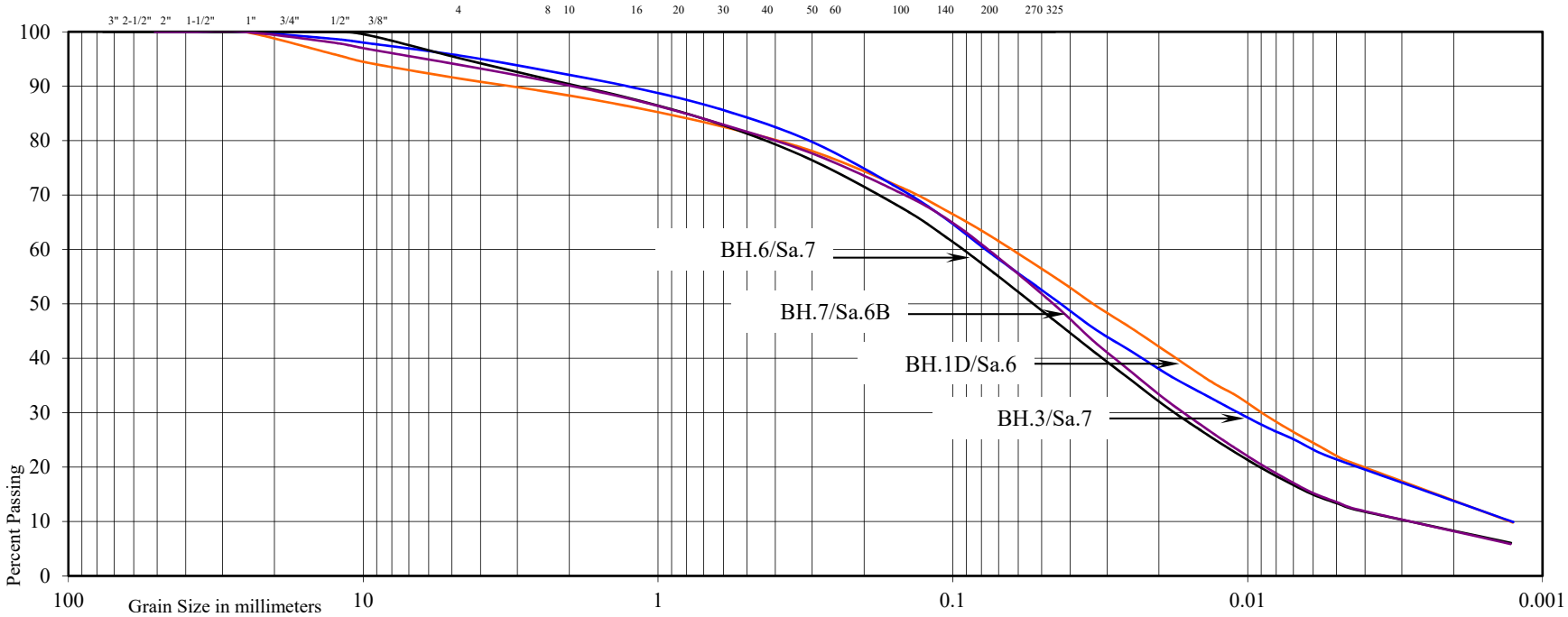
Reference No: 2311-S044

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

Borehole No:	1D	3	6	7
Sample No:	6	7	7	6B
Depth (m):	4.6	6.1	6.1	4.9
Elevation (m):	414.1	412.9	410.6	411.8

BH./Sa.	1D/6	3/7	6/7	7/6B
Liquid Limit (%) =	20	-	-	-
Plastic Limit (%) =	15	-	-	-
Plasticity Index (%) =	5	-	-	-
Moisture Content (%) =	9	9	8	9
Estimated Permeability (cm./sec.) =	10^{-6}	10^{-6}	10^{-5}	10^{-5}

Classification of Sample [& Group Symbol]: SANDY SILT TILL
a trace to some clay, a trace of gravel

Figure: 16

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

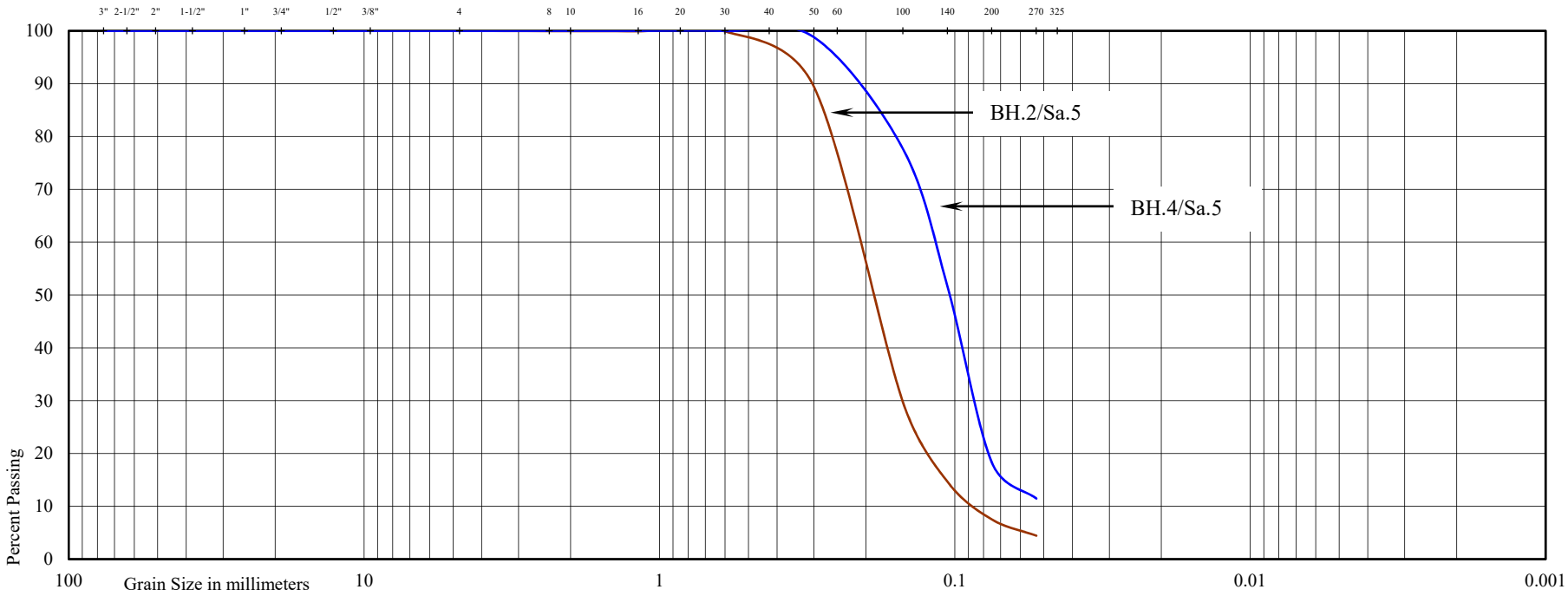
Reference No: 2311-S044

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 6686 Beatty Line North, Township of Centre Wellington (Fergus)

Borehole No:	2	4
Sample No:	5	5
Depth (m):	3.0	3.0
Elevation (m):	416.7	416.7

BH./Sa.	2/5	4/5
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	15	20
Estimated Permeability (cm./sec.) =	10^{-2}	10^{-3}

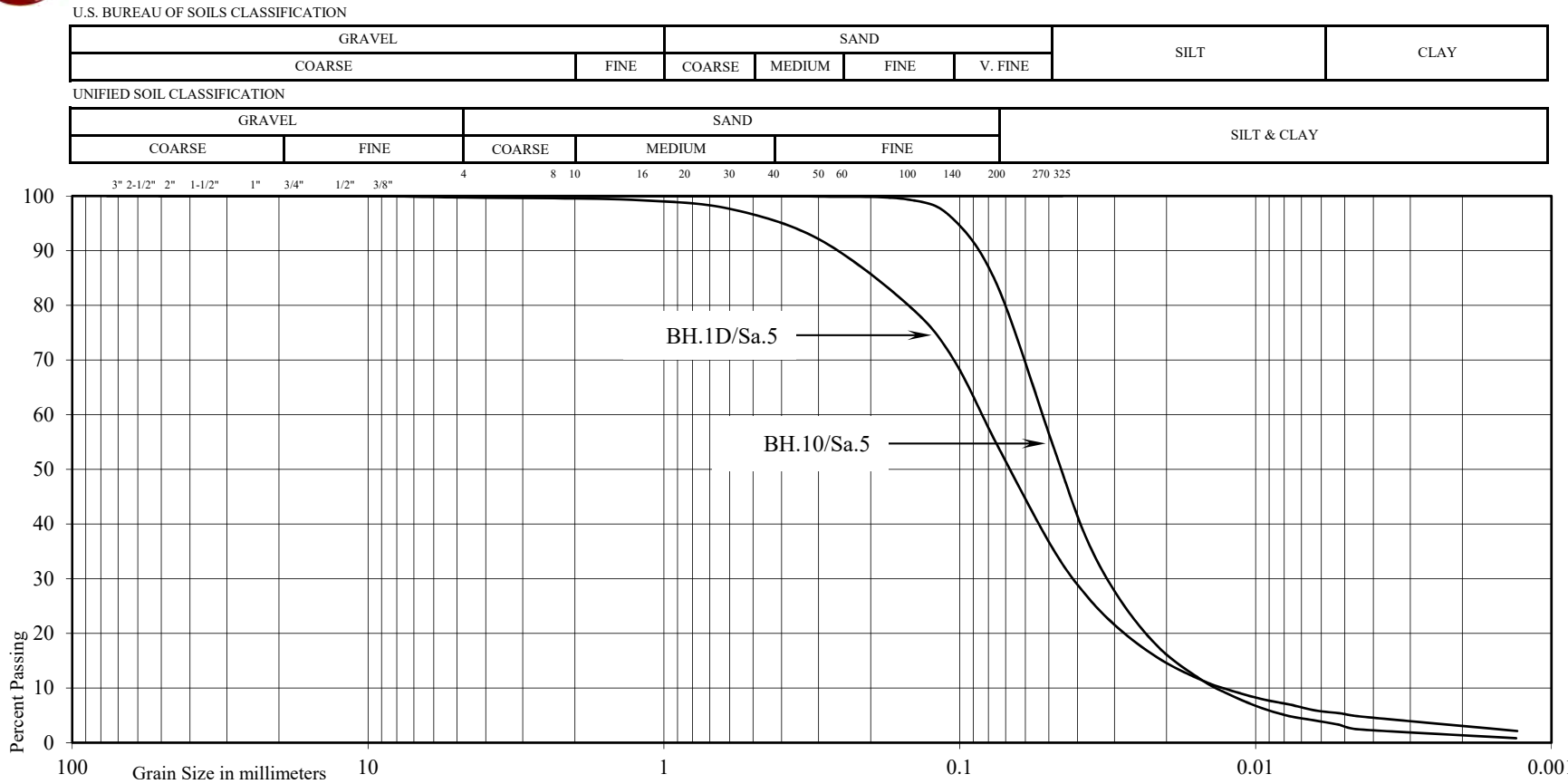
Classification of Sample [& Group Symbol]: FINE SAND, a trace to some silt, a trace of medium sand

Figure: 17

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2311-S044



Project: Proposed Residential Development

Location: 6686 Beatty Line North, Township of Centre Wellington (Fergus)

	Borehole No:	Sample No:	Depth (m):	Elevation (m):
	1D	5	3.0	415.7
	10	5	3.0	413.2

BH./Sa.	1D/5	10/5
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	17	22
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

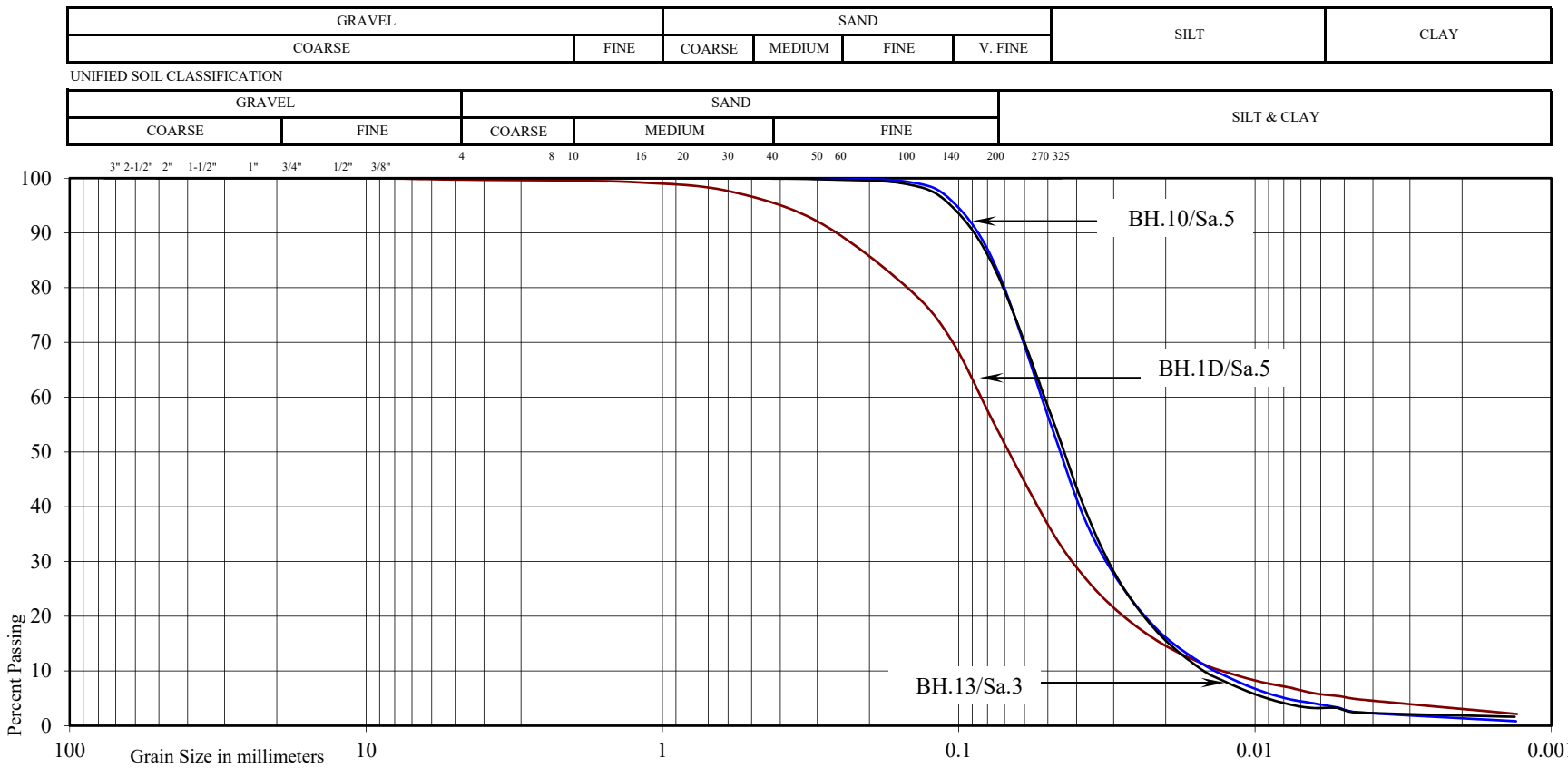
Classification of Sample [& Group Symbol]: SANDY SILT, a trace of clay

Figure: 18

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2311-S044



Project: Proposed Residential Development

Location: 12734 and 12750 Keele Street, Township of King

Borehole No:	1D	10	13
Sample No:	5	5	3
Depth (m):	3.0	3.0	1.5
Elevation (m):	415.7	413.2	413.7

BH./Sa.	1D/5	10/5	13/3
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	17	22	19
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: SILT

some sand to sandy, a trace of clay

Figure: 19

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

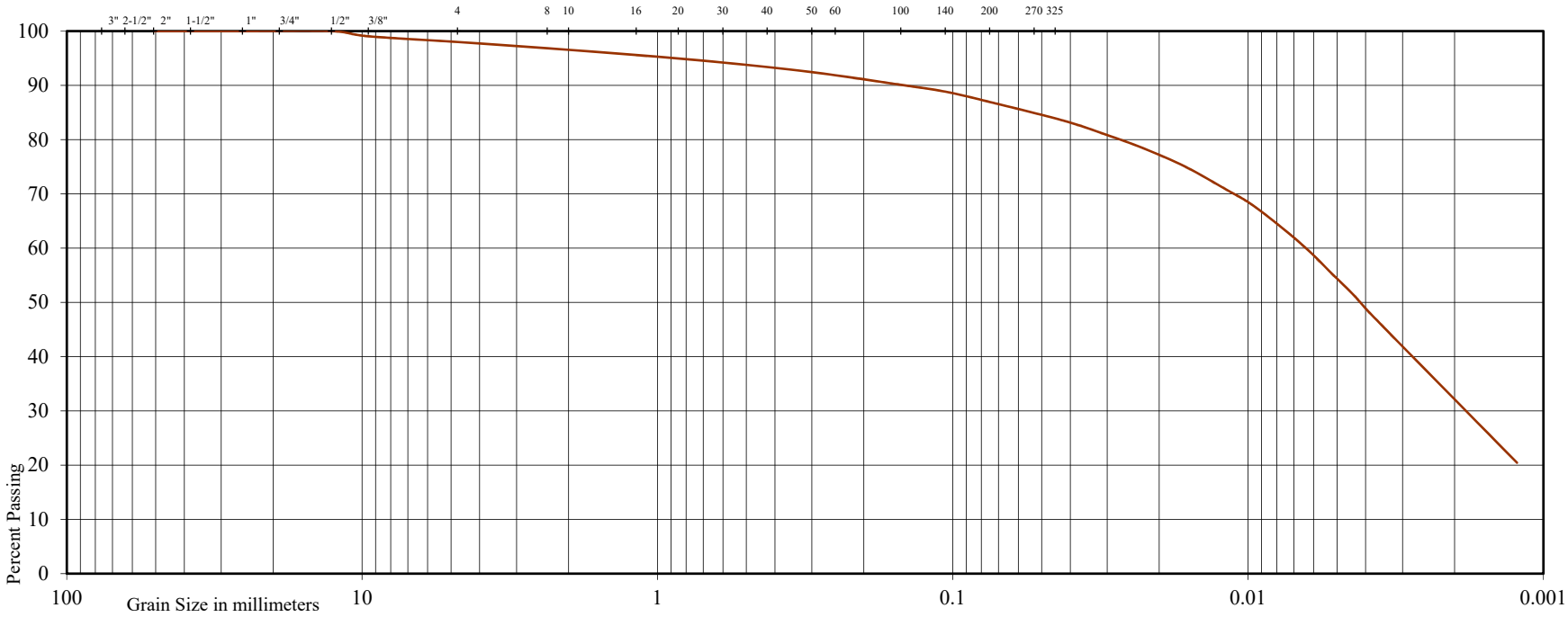
Reference No: 2311-S044

U.S. BUREAU OF SOILS CLASSIFICATION

GRAVEL		SAND				SILT	CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	V. FINE		

UNIFIED SOIL CLASSIFICATION

GRAVEL		SAND			SILT & CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



Project: Proposed Residential Development

Location: 6586 Beatty Line North, Township of Centre Wellington (Fergus)

Borehole No: 13

Sample No: 8

Depth (m): 7.6

Elevation (m): 407.6

Liquid Limit (%) = 33

Plastic Limit (%) = 18

Plasticity Index (%) = 15

Moisture Content (%) = 15

Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY
some sand, a trace of gravel

Figure 20

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'B'

MECP WATER WELL RECORDS SUMMARY

REFERENCE NO. 2311-W044

MECP Well Records Summary

WELL ID	MECP* WWR ID	Construction Method	Well Depth (m)**	Well Usage		Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**	Date Completed
				Final Status	First Use				
1	7041992	-	-	-	-	-	-	-	2007-03-13
2	7041993	-	-	-	-	-	-	-	2007-03-13
3	7041996	-	-	Abandoned-Other	Domestic	13.8	-	-	2007-03-13
4	7047068	-	-	Abandoned-Other	-	13.7	-	-	2007-07-09
5	7047070	-	-	Abandoned-Other	-	11.5	-	-	2007-07-09
6	7047076	-	-	Abandoned-Other	-	11.6	-	-	2007-06-06
7	6701924	Cable Tool	33.5	Water Supply	Domestic	9.1	-	-	1961-10-14
8	6701931	Boring	5.5	Water Supply	Livestock	3.7	-	-	1966-08-11
9	6703119	Cable Tool	32.6	Water Supply	Domestic	4.9	-	-	1968-03-14
10	6703342	Cable Tool	39.3	Water Supply	Domestic	8.5	-	-	1969-04-02
11	6704572	Rotary (Convent.)	33.5	Water Supply	Domestic	6.1	-	-	1973-01-25
12	6704879	Rotary (Convent.)	35.7	Water Supply	Domestic	7.6	-	-	1973-10-22
13	6704880	Rotary (Convent.)	35.1	Water Supply	Domestic	7.6	-	-	1973-10-16
14	6704889	Rotary (Convent.)	35.1	Water Supply	Domestic	7.6	-	-	1973-10-19
15	6705250	Rotary (Air)	36.6	Water Supply	Domestic	7.3	-	-	1974-08-22
16	6707614	Cable Tool	33.8	Water Supply	Domestic	8.2	-	-	1981-09-03
17	6709626	Rotary (Convent.)	44.2	Water Supply	Domestic	14.6	-	-	1988-03-11
18	6710081	Rotary (Air)	73.5	Water Supply	Domestic	17.7	-	-	1989-10-30
19	6710619	Cable Tool	19.2	Water Supply	Domestic	8.5	-	-	1990-11-07
20	6711110	Rotary (Convent.)	51.8	Water Supply	Domestic	10.1	-	-	1992-10-02
21	6711139	Rotary (Air)	44.2	Water Supply	Domestic	16.5	-	-	1993-03-18
22	6711836	Rotary (Convent.)	27.4	Water Supply	Domestic	10.4	-	-	1995-08-29
23	6711892	Rotary (Air)	43.0	Water Supply	Domestic	17.1	-	-	1995-12-04
24	6711937	Rotary (Convent.)	38.1	Water Supply	Domestic	11.3	-	-	1996-03-02
25	6711939	-	29.0	Abandoned-Quality	-	-	-	-	1996-03-18
26	6711957	Rotary (Convent.)	40.2	Water Supply	Domestic	14.9	-	-	1996-04-03
27	6712266	Rotary (Convent.)	55.8	Water Supply	Domestic	12.8	-	-	1997-05-13
28	6712705	Rotary (Convent.)	21.3	Water Supply	Domestic	9.4	-	-	1998-09-03
29	6713500	Rotary (Convent.)	92.0	Water Supply	Domestic	18.0	-	-	2000-09-13
30	6715314	Rotary (Air)	138.7	Water Supply	Municipal	-	-	-	2005-03-09
31	6715790	-	-	Abandoned-Other	-	14.2	-	-	2006-04-20
32	7042026	-	-	Abandoned-Other	-	11.9	-	-	2007-03-13
33	7042027	-	-	Abandoned-Other	-	11.4	-	-	2007-03-13
34	7105391	-	-	Abandoned-Other	-	21.0	-	-	2008-05-06
35	7131004	Boring	-	Observation Wells	Monitoring	2.1	3.0	9.1	-
36	7131004	Boring	9.1	Observation Wells	Monitoring	-	3.0	9.1	2009-05-26
37	7189838	Rotary (Convent.)	6.1	Observation Wells	Monitoring	-	3.0	6.1	2012-10-10
38	7189839	Rotary (Convent.)	4.6	Observation Wells	Monitoring	-	1.5	4.6	2012-10-10
39	7189840	Rotary (Convent.)	6.1	Observation Wells	Monitoring	-	3.0	6.1	2012-10-14

WELL ID	MECP* WWR ID	Construction Method	Well Depth (m)**	Well Usage		Static Water Level (m)**	Top of Screen Depth (m)**	Bottom of Screen Depth (m)**	Date Completed
				Final Status	First Use				
40	7195812	Rotary (Convent.)	15.5	Observation Wells	Monitoring	-	12.2	15.2	2012-08-21
41	7195813	Rotary (Convent.)	150.9	Observation Wells	Monitoring	-	38.1	119.2	2012-07-10
42	7197317	-	-	Abandoned-Other	-	-	-	-	2012-12-02
43	7197324	-	-	Abandoned-Other	-	-	-	-	2012-12-05
44	7203470	Driving	1.4	Observation Wells	Monitoring	-	0.9	1.4	2013-06-14
45	7203474	Driving	3.0	Observation Wells	Monitoring	-	1.5	3.0	2013-06-14
46	7209755	-	-	Abandoned-Other	-	-	-	-	2013-10-08
47	7247175	-	-	Abandoned-Other	-	-	-	-	2015-08-05
48	7247176	-	-	Abandoned-Other	-	-	-	-	-
49	7247231	Driving	3.3	Observation Wells	Monitoring	-	1.8	3.3	2015-08-05
50	7247232	Driving	4.4	Observation Wells	Monitoring	-	2.8	4.4	2015-08-05
51	7247233	-	-	Abandoned-Other	-	-	-	-	2015-08-05
52	7247234	-	-	Abandoned-Other	-	-	-	-	2015-08-05
53	7247235	-	-	Abandoned-Other	-	-	-	-	2015-08-05
54	7262675	Boring	6.1	Observation Wells	Monitoring	-	3.0	6.1	2016-04-18
55	7262678	Boring	6.1	Observation Wells	Monitoring	-	3.0	6.1	2016-04-21
56	7262679	Boring	6.1	Observation Wells	Monitoring	-	3.0	6.1	2016-04-22
57	7276312	-	-	-	-	-	-	-	-
58	7303552	Rotary (Convent.)	65.5	Water Supply	Domestic	22.9	-	-	2017-12-27
59	7313777	-	-	Abandoned-Other	-	-	-	-	2018-06-05
60	7319318	Boring	-	Abandoned-Supply	Domestic	7.0	-	-	2017-06-27
61	7335087	Boring	4.5	Observation Wells	Monitoring	-	3.0	4.5	2019-04-23
62	7335165	Boring	6.0	Observation Wells	Monitoring	-	4.5	6.0	2019-04-22
63	7335185	Boring	9.1	Observation Wells	Monitoring	-	7.6	9.1	2019-04-22
64	7360633	Direct Push	3.0	Observation Wells	Monitoring	-	1.5	3.0	2020-06-05
65	7360634	Direct Push	2.4	Observation Wells	Monitoring	-	0.9	2.4	2020-06-05
66	7360663	Direct Push	2.4	Observation Wells	Monitoring	-	0.9	2.4	2020-06-05
67	7360664	Direct Push	3.0	Observation Wells	Monitoring	-	1.5	3.0	2020-06-05
68	7398951	-	-	Abandoned-Other	Domestic	-	-	-	2021-09-03

Notes:
*MECP WWID: Ministry of the Environment, Conservation and Parks Water Well Records Identification
**Metres below ground surface

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

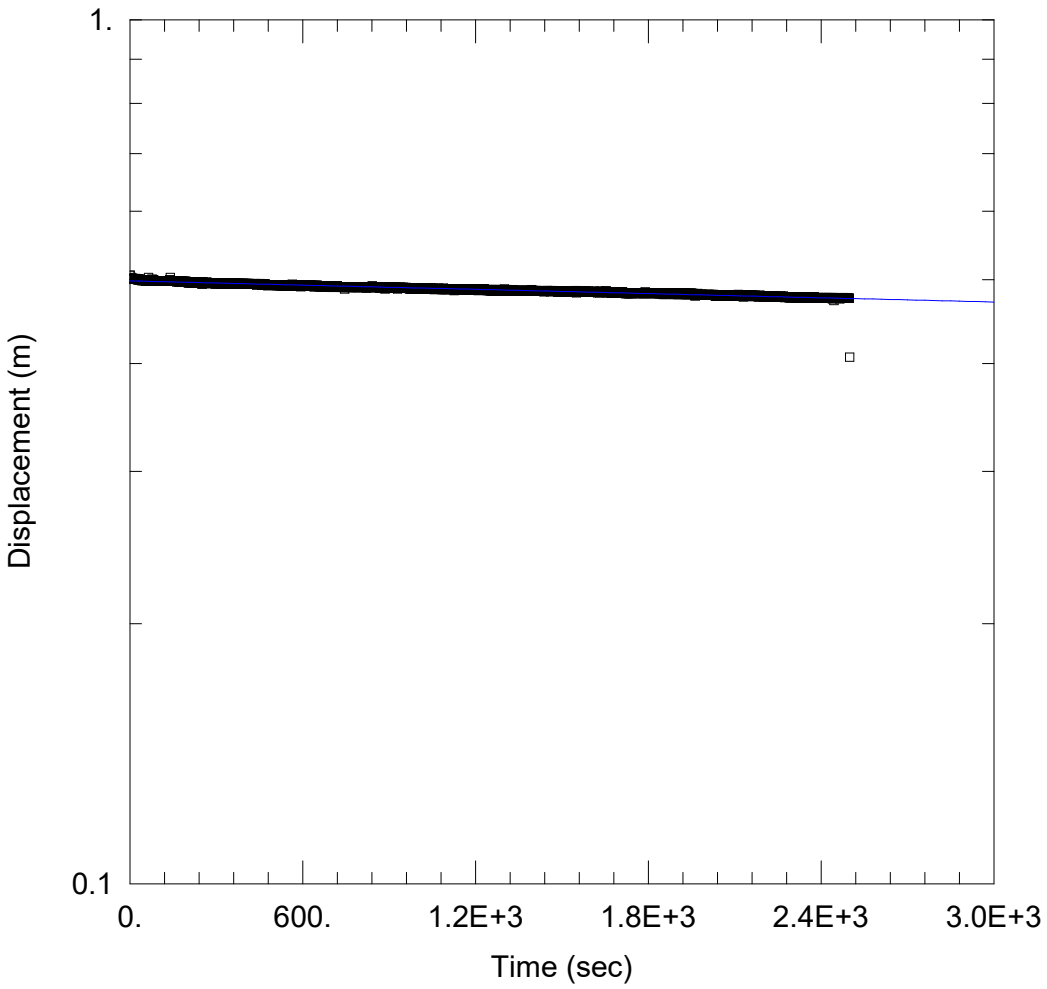
APPENDIX 'C'

RESULTS OF SINGLE WELL RESPONSE TEST

REFERENCE NO. 2311-W044

Falling Head SWRT of BHMW 1D

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.567E-8 m/sec y0 = 0.4985 m

AQUIFER DATA

Saturated Thickness: 5.1 m Anisotropy Ratio (Kz/Kr): 1.

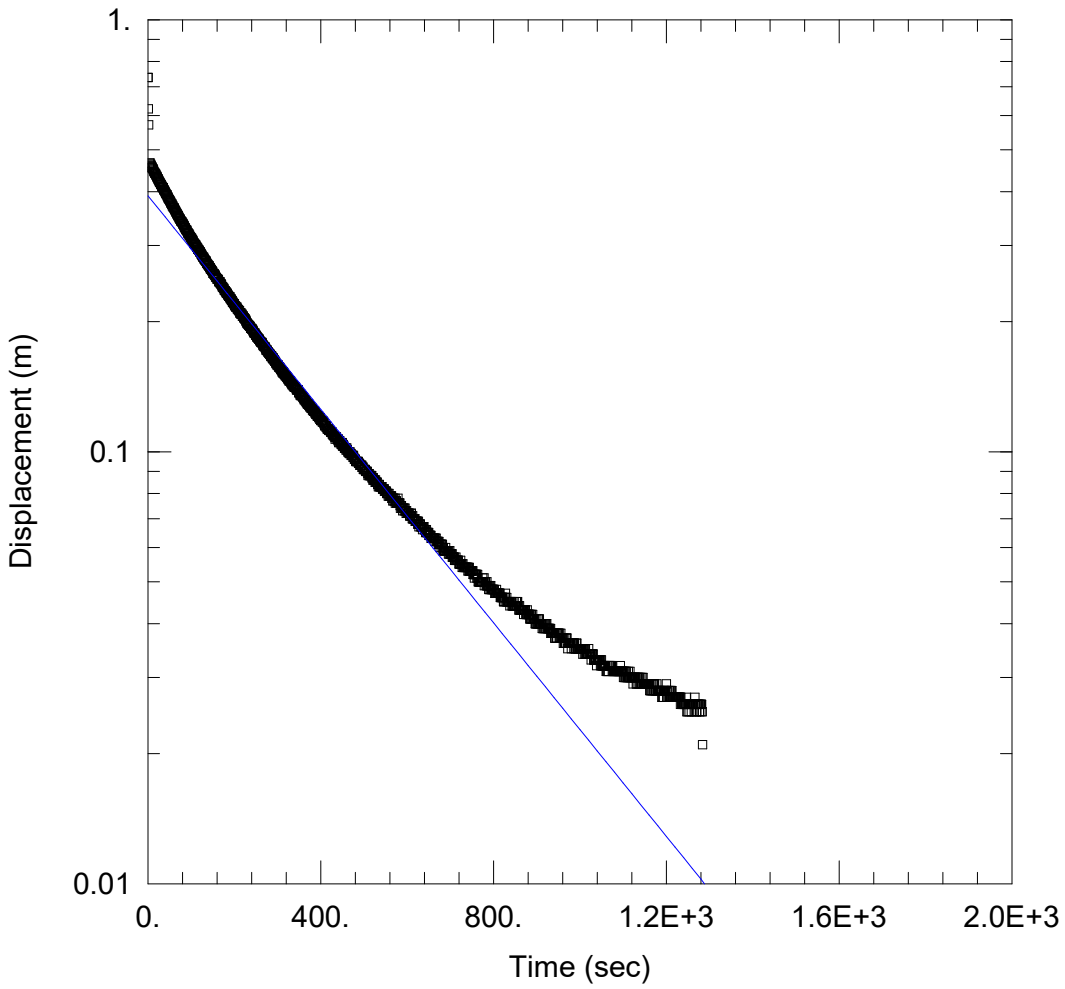
WELL DATA (BHMW 1D)

Initial Displacement: 0.506 m
Static Water Column Height: 5.1 m
Total Well Penetration Depth: 5.1 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 1S

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.269E-6 m/sec y0 = 0.3913 m

AQUIFER DATA

Saturated Thickness: 3.8 m Anisotropy Ratio (Kz/Kr): 1.

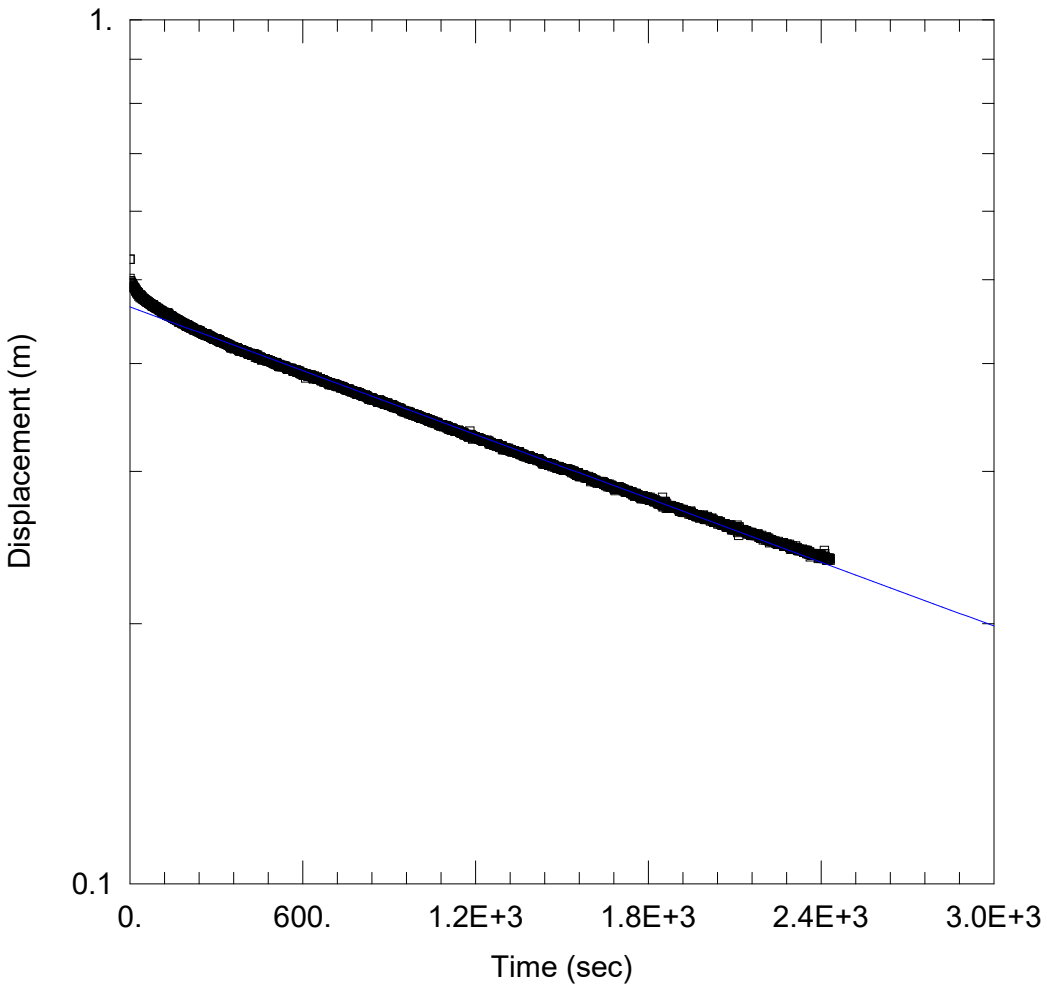
WELL DATA (BHMW 1S)

Initial Displacement: 0.735 m
Static Water Column Height: 3.8 m
Total Well Penetration Depth: 3.8 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 2

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.179E-7 m/sec y0 = 0.4653 m

AQUIFER DATA

Saturated Thickness: 4. m Anisotropy Ratio (Kz/Kr): 1.

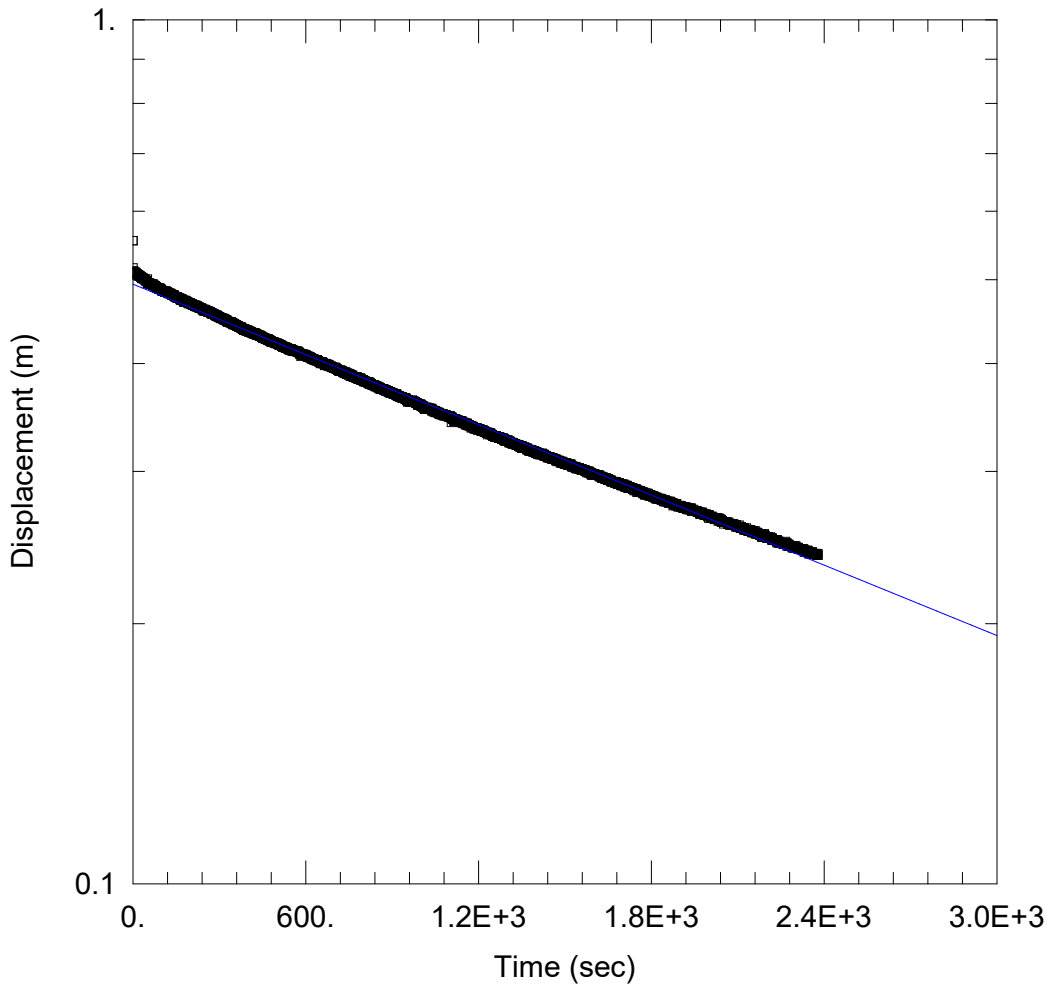
WELL DATA (BHMW 2)

Initial Displacement: 0.528 m
Static Water Column Height: 4. m
Total Well Penetration Depth: 4. m
Screen Length: 3. m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 3

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.555E-7 m/sec y0 = 0.494 m

AQUIFER DATA

Saturated Thickness: 4.5 m Anisotropy Ratio (Kz/Kr): 1.

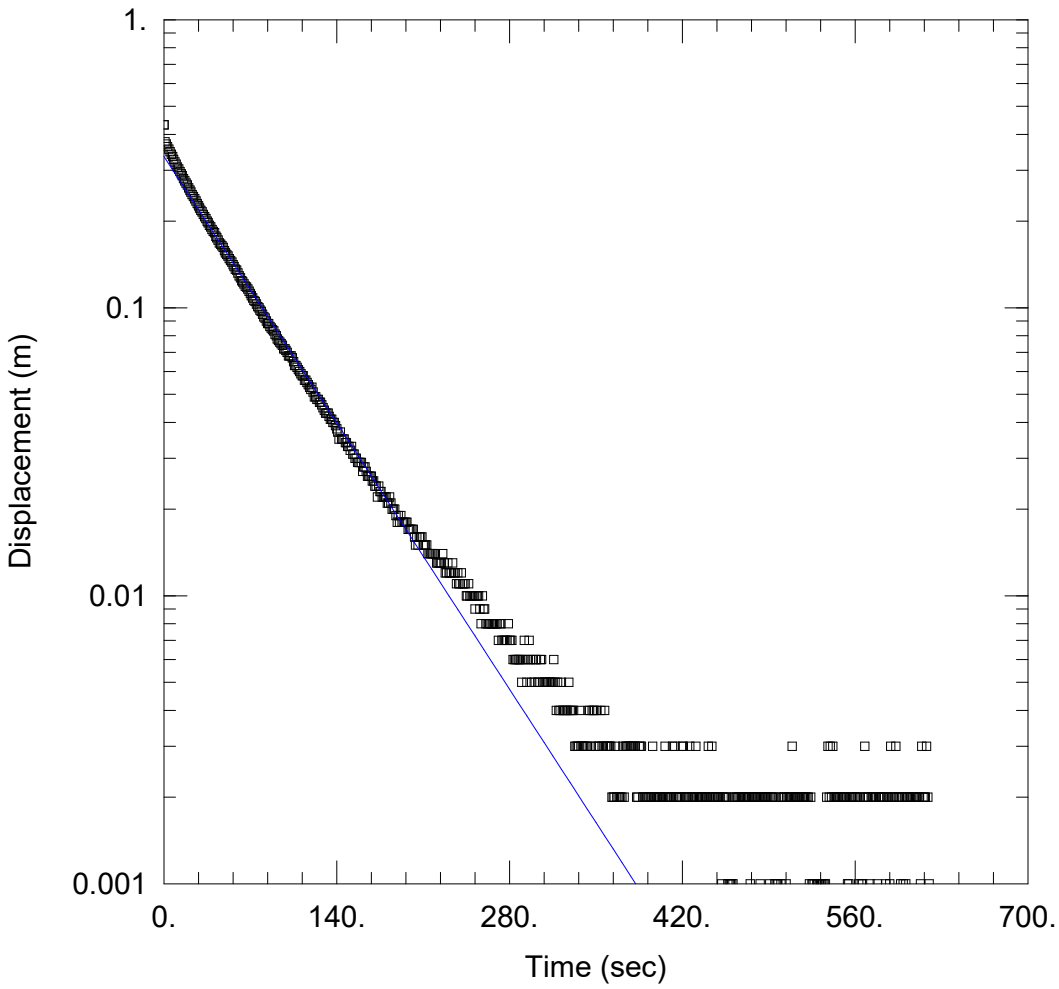
WELL DATA (BHMW 3)

Initial Displacement: 0.555 m
Static Water Column Height: 4.5 m
Total Well Penetration Depth: 4.5 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 4

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.173E-5 m/sec y0 = 0.335 m

AQUIFER DATA

Saturated Thickness: 3.1 m Anisotropy Ratio (Kz/Kr): 1.

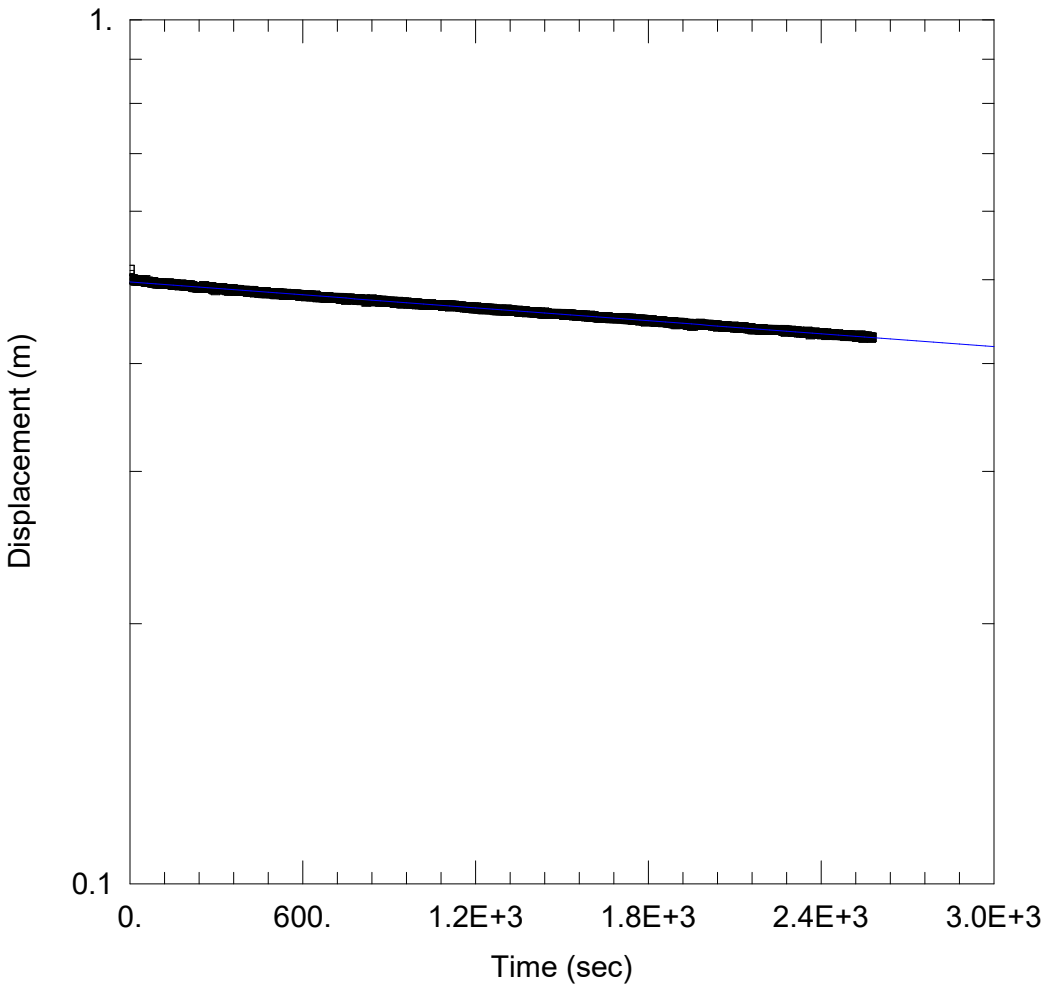
WELL DATA (BHMW 4)

Initial Displacement: 0.432 m
Static Water Column Height: 3.1 m
Total Well Penetration Depth: 3.1 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 5

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.455E-8 m/sec y0 = 0.4972 m

AQUIFER DATA

Saturated Thickness: 4.7 m Anisotropy Ratio (Kz/Kr): 1.

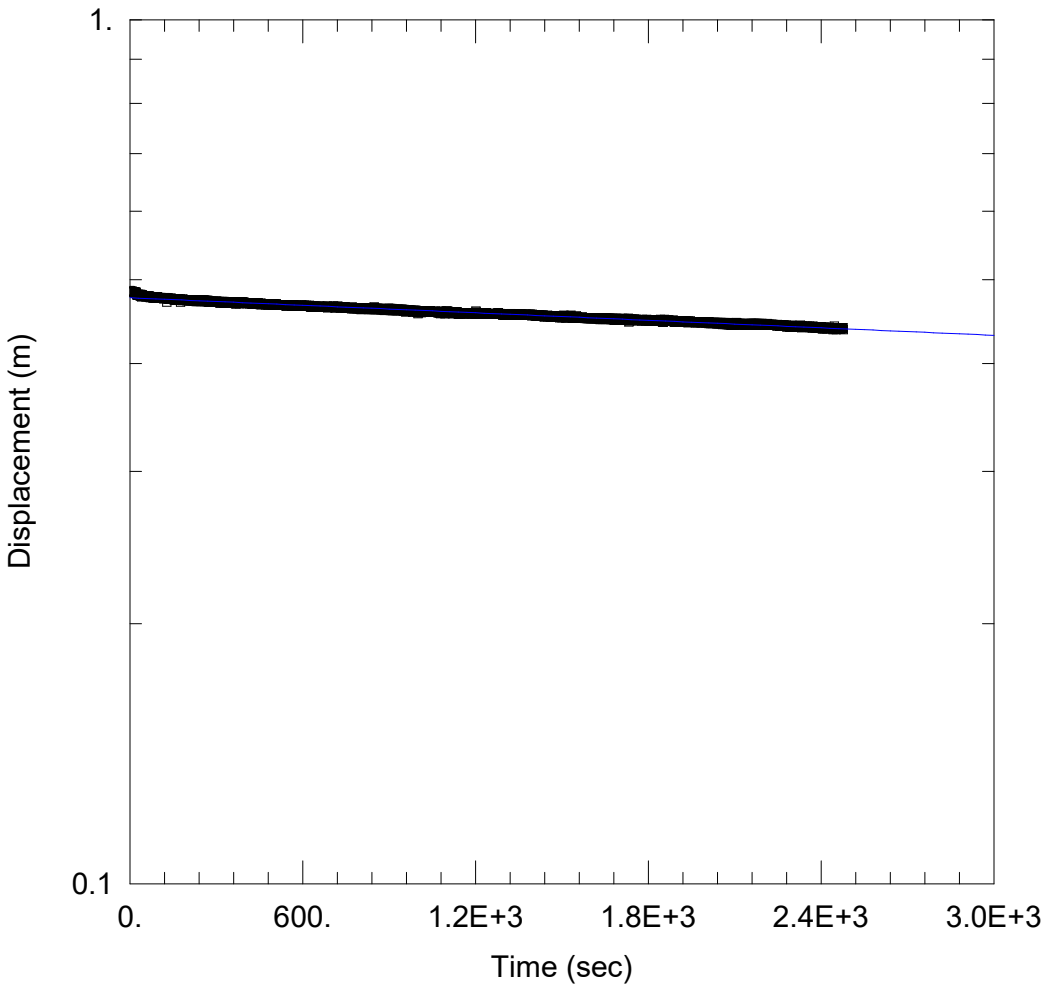
WELL DATA (BHMW 5)

Initial Displacement: 0.514 m
Static Water Column Height: 4.7 m
Total Well Penetration Depth: 4.7 m
Screen Length: 3. m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 6

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.251E-8 m/sec y0 = 0.4766 m

AQUIFER DATA

Saturated Thickness: 1.52 m Anisotropy Ratio (Kz/Kr): 1.

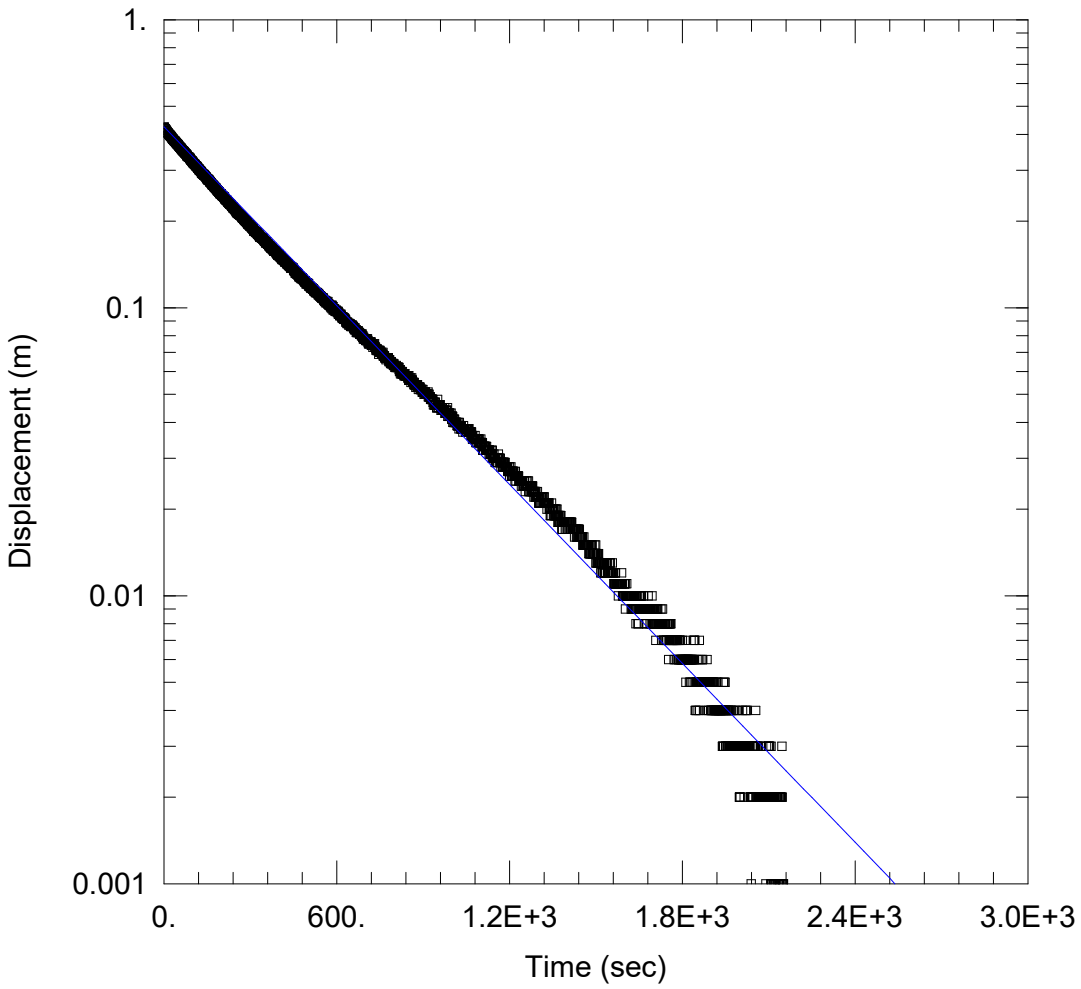
WELL DATA (BHMW 6)

Initial Displacement: 0.486 m
Static Water Column Height: 1.52 m
Total Well Penetration Depth: 1.52 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 7

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.985E-6 m/sec y0 = 0.4249 m

AQUIFER DATA

Saturated Thickness: 5. m Anisotropy Ratio (Kz/Kr): 1.

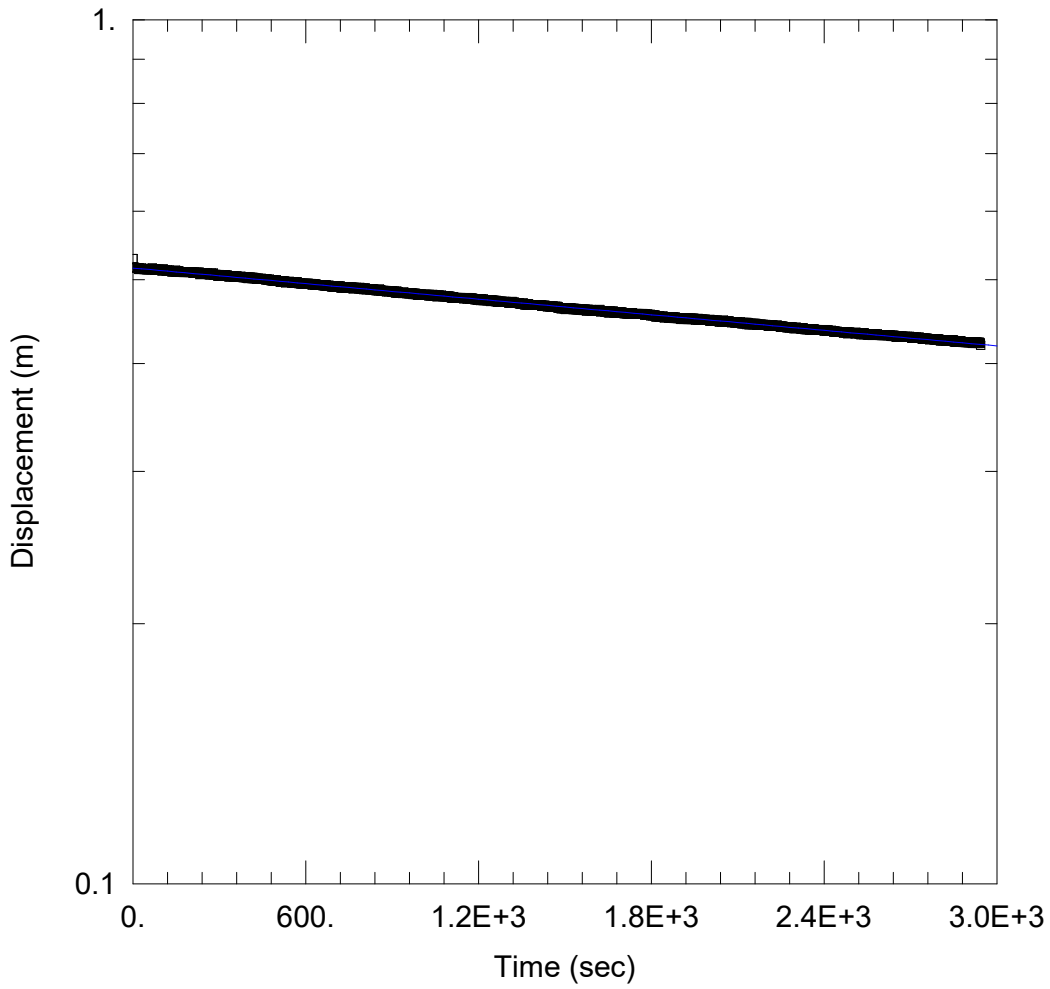
WELL DATA (BHMW 7)

Initial Displacement: 0.424 m
Static Water Column Height: 5. m
Total Well Penetration Depth: 5. m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 8D

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 5.389E-8 m/sec y0 = 0.5159 m

AQUIFER DATA

Saturated Thickness: 3.3 m Anisotropy Ratio (Kz/Kr): 1.

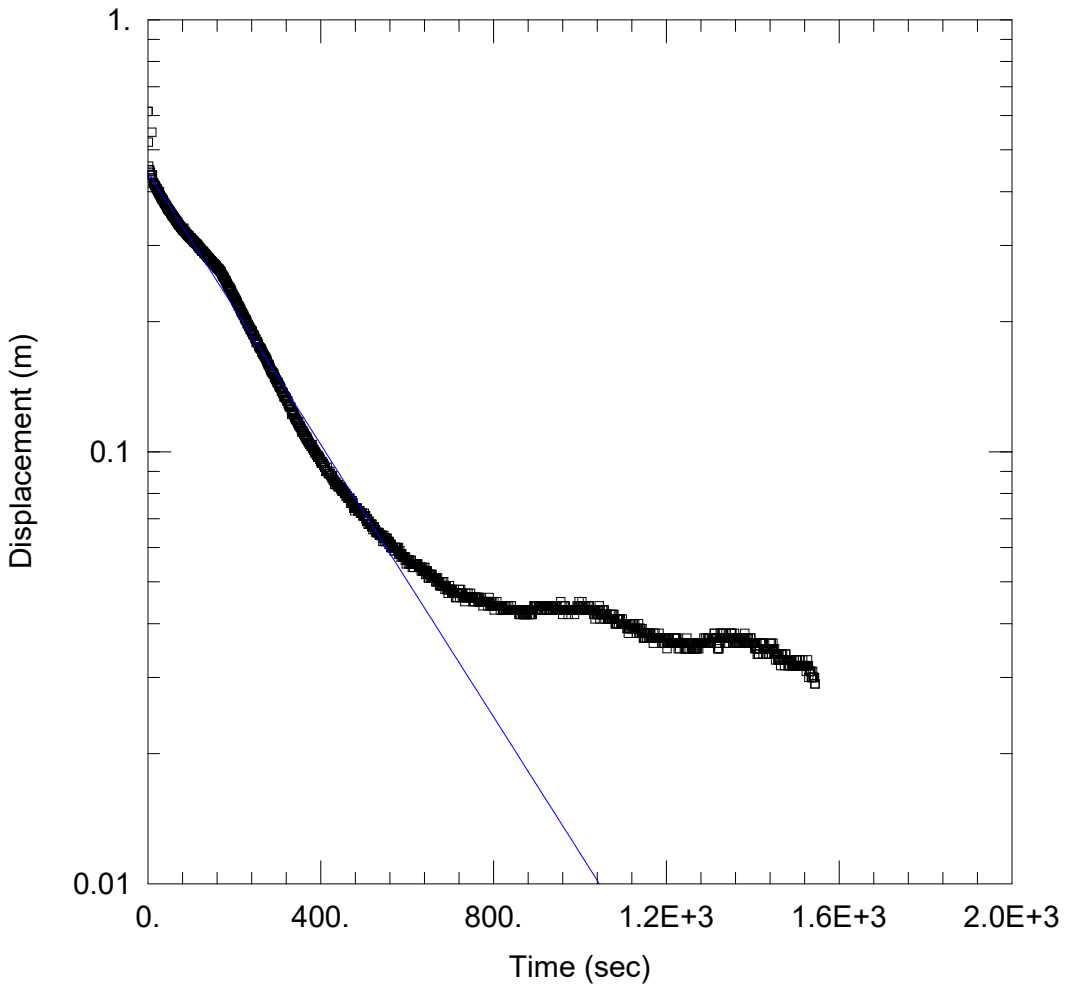
WELL DATA (BHMW 8D)

Initial Displacement: 0.529 m
Static Water Column Height: 3.3 m
Total Well Penetration Depth: 3.3 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 8S

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 2.881E-6 m/sec y0 = 0.4436 m

AQUIFER DATA

Saturated Thickness: 3.7 m Anisotropy Ratio (Kz/Kr): 1.

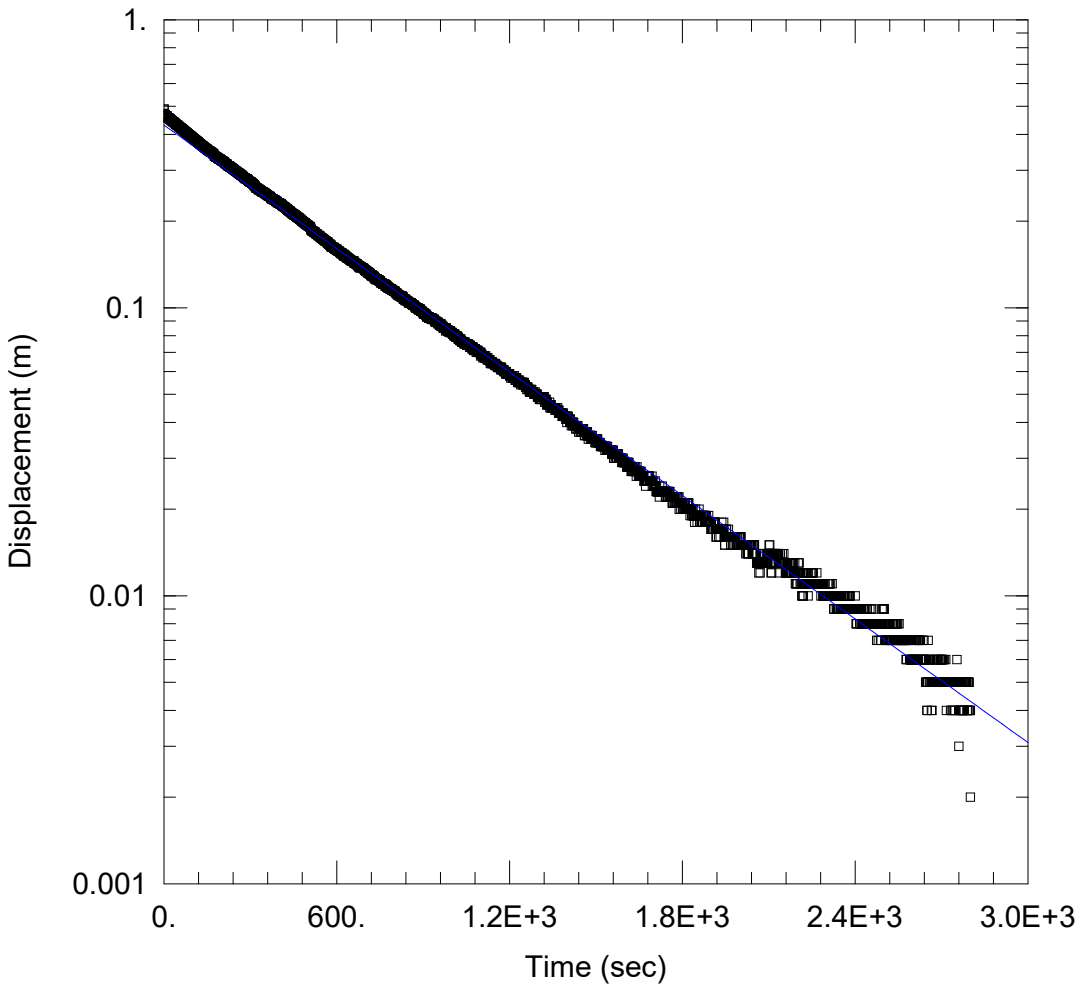
WELL DATA (BHMW 8S)

Initial Displacement: 0.613 m
Static Water Column Height: 3.7 m
Total Well Penetration Depth: 3.7 m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Falling Head SWRT of BHMW 10

Prepared By:	Prepared For:
Soil Engineers Ltd.	Sorbara Group of Companies
Project:	Location:
2311-W044	6586 Beatty Line North, Fergus



SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.261E-6 m/sec y0 = 0.4308 m

AQUIFER DATA

Saturated Thickness: 3. m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BHMW 10)

Initial Displacement: 0.489 m
Static Water Column Height: 3. m
Total Well Penetration Depth: 3. m
Screen Length: 1.5 m
Casing Radius: 0.0254 m
Well Radius: 0.0254 m

Soil Engineers Ltd.

Soil Engineers Ltd.
CONSULTING ENGINEERS
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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX 'D'

GROUNDWATER QUALITY TEST RESULTS

REFERENCE NO. 2311-W044

FINAL REPORT

CA40229-OCT24 R1

2311-W044, 6586 Beatty Line N, Fergus

Prepared for

Soil Engineers Ltd.

FINAL REPORT

CA40229-OCT24 R1

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Soil Engineers Ltd.	Project Specialist	Maarit Wolfe, Hon.B.Sc
		Laboratory	SGS Canada Inc.
Address	90 West Beaver Creek Rd Richmond, ON M1S 3A7. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Bhawandeep Brar	Telephone	705-652-2000
Telephone	416-754-8515	Facsimile	705-652-6365
Facsimile	416-754-8516	Email	Maarit.Wolfe@sgs.com
Email	bbrar@soilengineersltd.com	SGS Reference	CA40229-OCT24
Project	2311-W044, 6586 Beatty Line N, Fergus	Received	10/21/2024
Order Number		Approved	10/28/2024
Samples	Ground Water (1)	Report Number	CA40229-OCT24 R1
		Date Reported	12/12/2024

COMMENTS

RL - SGS Reporting Limit

Anionic Surfacants is requested in the Bylaw. SGS does not perform this analysis.

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 034837

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: Soil Engineers Ltd.
Project: 2311-W044, 6586 Beatty Line N, Fergus
Project Manager: Bhawandeep Brar
Samplers: Amar Depp Regmi

MATRIX: WATER

L1 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Sanitary Sewer Discharge - BL_2022_66

L2 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Storm Sewer Discharge - BL_2022_66

Sample Number	8
Sample Name	BH/MW 1S
Sample Matrix	Ground Water
Sample Date	21/10/2024

Parameter	Units	RL	L1	L2	Result
General Chemistry					
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	< 4 ↑
Total Suspended Solids	mg/L	2	350	15	2
Total Kjeldahl Nitrogen	as N mg/L	0.5	50		< 0.5
Chemical Oxygen Demand	mg/L	8	600		< 8
Hydrogen Sulphide	mg/L	0.02			< 0.02
Metals and Inorganics					
Cyanide (total)	mg/L	0.01	1.2		< 0.01
Fluoride	mg/L	0.06	10		0.09
Sulphate	mg/L	2	1500		12
Sulphide	mg/L	0.02	1		< 0.02
Aluminum (total)	mg/L	0.001	50		0.014
Antimony (total)	mg/L	0.0009	5		< 0.0009
Arsenic (total)	mg/L	0.0002	1		0.0003
Bismuth (total)	mg/L	0.00001	5		< 0.00001
Cadmium (total)	mg/L	0.000003	0.7	0.001	0.000010
Chromium (total)	mg/L	0.00008	3	0.08	0.00026
Cobalt (total)	mg/L	0.000004	5		0.000029
Copper (total)	mg/L	0.001	2	0.005	< 0.001
Iron (total)	mg/L	0.007	50		0.012
Lead (total)	mg/L	0.00009	0.7	0.03	< 0.00009

Client: Soil Engineers Ltd.
Project: 2311-W044, 6586 Beatty Line N, Fergus
Project Manager: Bhawandeep Brar
Samplers: Amar Depp Regmi

MATRIX: WATER

L1 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Sanitary Sewer Discharge - BL_2022_66

L2 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Storm Sewer Discharge - BL_2022_66

Sample Number	8
Sample Name	BH/MW 1S
Sample Matrix	Ground Water
Sample Date	21/10/2024

Parameter	Units	RL	L1	L2	Result
Metals and Inorganics (continued)					
Manganese (total)	mg/L	0.00001	5		0.00547
Molybdenum (total)	mg/L	0.0004	5		0.0025
Nickel (total)	mg/L	0.0001	2	0.03	0.0005
Phosphorus (total)	mg/L	0.003	10		0.004
Selenium (total)	mg/L	0.00004	2		0.00012
Silver (total)	mg/L	0.00005	1		< 0.00005
Tin (total)	mg/L	0.00006	5		0.00074
Titanium (total)	mg/L	0.0001	5		0.0004
Vanadium (total)	mg/L	0.00001	5		0.00031
Zinc (total)	mg/L	0.002	2	0.03	0.008
Oil and Grease					
Oil & Grease (total)	mg/L	2			< 2
Oil & Grease (animal/vegetable)	mg/L	4	150		< 4
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4

Client: Soil Engineers Ltd.
Project: 2311-W044, 6586 Beatty Line N, Fergus
Project Manager: Bhawandeep Brar
Samplers: Amar Depp Regmi

MATRIX: WATER

L1 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Sanitary Sewer Discharge - BL_2022_66

L2 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Storm Sewer Discharge - BL_2022_66

Sample Number	8
Sample Name	BH/MW 1S
Sample Matrix	Ground Water
Sample Date	21/10/2024

Parameter	Units	RL	L1	L2	Result
Other (ORP)					
Chloride	mg/L	1	1500		22
Mercury (total)	mg/L	0.00001	0.1		< 0.00001
PCBs					
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001	0.004		< 0.0001
Phenols					
4AAP-Phenolics	mg/L	0.002	0.1		< 0.002
SVOCs					
Hexachlorobenzene	mg/L	0.0001	0.0001		< 0.0001
VOCs					
Chloroform	mg/L	0.0005	0.04		< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005	0.05		< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005	0.08		< 0.0005
Methylene Chloride	mg/L	0.0005	0.09		< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	0.06		< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	0.06		< 0.0005
Trichloroethylene	mg/L	0.0005	0.05		< 0.0005

Client: Soil Engineers Ltd.
Project: 2311-W044, 6586 Beatty Line N, Fergus
Project Manager: Bhawandeep Brar
Samplers: Amar Depp Regmi

MATRIX: WATER

Sample Number 8
Sample Name BH/MW 1S
Sample Matrix Ground Water
Sample Date 21/10/2024

L1 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Sanitary Sewer Discharge - BL_2022_66

L2 = SANSEW / WATER / - - Centre Wellington Sewer Discharge By Law - Storm Sewer Discharge - BL_2022_66

Parameter	Units	RL	L1	L2	Result
VOCs - BTEX					
Benzene	mg/L	0.0005	0.01		< 0.0005
Ethylbenzene	mg/L	0.0005	0.06		< 0.0005
Toluene	mg/L	0.0005	0.02		< 0.0005
Xylene (total)	mg/L	0.0005			< 0.0005
m-p-xylene	mg/L	0.0005			< 0.0005
o-xylene	mg/L	0.0005			< 0.0005

EXCEEDANCE SUMMARY

No exceedances are present above the regulatory limit(s) indicated

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO8057-OCT24	mg/L	1	<1	ND	20	99	80	120	103	75	125
Sulphate	DIO8057-OCT24	mg/L	2	<2	ND	20	100	80	120	100	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0047-OCT24	mg/L	2	< 2	7	30	111	70	130	106	70	130

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0528-OCT24	mg/L	8	<8	8	20	100	80	120	97	75	125

QC SUMMARY

Cyanide by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0196-OCT24	mg/L	0.01	<0.01	ND	10	92	90	110	100	75	125

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0546-OCT24	mg/L	0.06	<0.06	ND	10	97	90	110	101	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B I Internal ref.: ME-CA-IENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0047-OCT24	mg/L	0.00001	< 0.00001	ND	20	120	80	120	120	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0245-OCT24	mg/L	0.00005	<0.00005	ND	20	94	90	110	94	70	130
Aluminum (total)	EMS0245-OCT24	mg/L	0.001	<0.001	ND	20	103	90	110	94	70	130
Arsenic (total)	EMS0245-OCT24	mg/L	0.0002	<0.0002	ND	20	100	90	110	106	70	130
Bismuth (total)	EMS0245-OCT24	mg/L	0.00001	<0.00001	ND	20	97	90	110	102	70	130
Cadmium (total)	EMS0245-OCT24	mg/L	0.000003	<0.000003	ND	20	100	90	110	103	70	130
Cobalt (total)	EMS0245-OCT24	mg/L	0.000004	<0.000004	ND	20	96	90	110	97	70	130
Chromium (total)	EMS0245-OCT24	mg/L	0.00008	<0.00008	ND	20	99	90	110	85	70	130
Copper (total)	EMS0245-OCT24	mg/L	0.001	<0.001	ND	20	98	90	110	115	70	130
Iron (total)	EMS0245-OCT24	mg/L	0.007	<0.007	ND	20	103	90	110	125	70	130
Manganese (total)	EMS0245-OCT24	mg/L	0.00001	<0.00001	0	20	100	90	110	98	70	130
Molybdenum (total)	EMS0245-OCT24	mg/L	0.0004	<0.0004	ND	20	102	90	110	103	70	130
Nickel (total)	EMS0245-OCT24	mg/L	0.0001	<0.0001	ND	20	96	90	110	100	70	130
Lead (total)	EMS0245-OCT24	mg/L	0.00009	<0.00009	ND	20	96	90	110	97	70	130
Phosphorus (total)	EMS0245-OCT24	mg/L	0.003	<0.003	ND	20	97	90	110	NV	70	130
Antimony (total)	EMS0245-OCT24	mg/L	0.0009	<0.0009	ND	20	106	90	110	105	70	130
Selenium (total)	EMS0245-OCT24	mg/L	0.00004	<0.00004	ND	20	99	90	110	100	70	130
Tin (total)	EMS0245-OCT24	mg/L	0.00006	<0.00006	ND	20	106	90	110	NV	70	130
Titanium (total)	EMS0245-OCT24	mg/L	0.0001	<0.0001	ND	20	101	90	110	NV	70	130
Vanadium (total)	EMS0245-OCT24	mg/L	0.00001	<0.00001	ND	20	99	90	110	95	70	130
Zinc (total)	EMS0245-OCT24	mg/L	0.002	<0.002	ND	20	99	90	110	98	70	130

QC SUMMARY

Oil & Grease

Method: MOE E3401 | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0358-OCT24	mg/L	2	<2	NSS	20	103	75	125			

Oil & Grease-AV/MS

Method: MOE E3401/SM 5520F | Internal ref.: ME-CA-IENVIGC-LAK-AN-019

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0358-OCT24	mg/L	4	< 4	NSS	20	NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0358-OCT24	mg/L	4	< 4	NSS	20	NA	70	130			

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-IENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0198-OCT24	mg/L	0.002	<0.002	ND	10	99	80	120	NV	75	125

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-IENVIGC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0359-OCT24	mg/L	0.0001	<0.0001	NSS	30	93	60	140	NSS	60	140

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-IENVIGC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Hexachlorobenzene	GCM0374-OCT24	mg/L	0.0001	< 0.0001	NSS	30	91	50	140	NSS	50	140

QC SUMMARY

Sulphide by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-008

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide	SKA0210-OCT24	mg/L	0.02	<0.02	ND	20	101	80	120	NA	75	125

Suspended Solids

Method: SM 2540D I Internal ref.: ME-CA-IENVIEWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0539-OCT24	mg/L	2	< 2	1	10	96	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F I Internal ref.: ME-CA-IENVISFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0200-OCT24	as N mg/L	0.5	<0.5	3	10	99	90	110	94	75	125

QC SUMMARY

Volatile Organics

Method: EPA 5030B/8260C | Internal ref.: ME-CA-[ENVIGC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	94	60	130	99	50	140
1,2-Dichlorobenzene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	94	60	130	98	50	140
1,4-Dichlorobenzene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	95	60	130	97	50	140
Benzene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	96	60	130	96	50	140
Chloroform	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	97	60	130	97	50	140
Ethylbenzene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	96	60	130	98	50	140
m-p-xylene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	95	60	130	98	50	140
Methylene Chloride	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	98	60	130	96	50	140
o-xylene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	95	60	130	98	50	140
Tetrachloroethylene (perchloroethylene)	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	94	60	130	97	50	140
Toluene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	94	60	130	95	50	140
Trichloroethylene	GCM0338-OCT24	mg/L	0.0005	<0.0005	ND	30	96	60	130	97	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

No: 034837

SGS Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Abneer
Received Date: 10/21/24 (mm/dd/yy)
Received Time: 15:00 (hr : min)
Received By (signature): [signature]
Custody Seal Present: Yes ✓ No ☐
Custody Seal Intact: Yes ✓ No ☐
Cooling Agent Present: Yes ✓ No ☐ Type: ICE
Temperature Upon Receipt (°C) 9x3
LAB LIMS #: CA 40228 OCT

REPORT INFORMATION

Company: Soil Engineers Ltd.
Contact: Bhawandeep S. Brar
Address: 90 West Beaver Creek, Richmond Hill, ON
Phone: 647-539-2167
Fax: ~~Fax~~
Email: bbrar@soilengineersltd.com

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 2311 - W044
Site Location/ID: 6586 Beatty Line N, Fergus

TURNAROUND TIME (TAT) REQUIRED

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

☐ Regular TAT (5-7days)

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park
☐ Table 2 ☐ Ind/Com
☐ Table 3 ☐ Agri/Other
☐ Table ____ Appx. ____
Soil Texture: ☐ Coarse ☐ Medium/Fine
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☑ Sanitary
☑ Storm
Municipality: Fergus (Township of Centre Wellington)

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

Analysis columns: Field Filtered (Y/N); M & I: Metals & Inorganics (incl CrVI, CN, Hg pH, (B(HWS), EC, SAR-soil) (Cl, Na-water)), Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI), ICP Metals only (Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, U, V, Zn); SVOC: PAHs only, SVOCs (all incl PAHs, ABNs, CPs); PCB: PCBs (☐ Total ☐ Aroclor); PHC: F1-F4 + BTEX, F1-F4 only (no BTEX); VOC: VOCs (all incl BTEX), BTEX only; Pest: Pesticides (Organochlorine or specify other); Other (please specify): Sewer Use: Centre Wellington (Specify pkg: Sewer Use By-Law), Water Characterization Pkg (☐ General ☐ Extended); SPLP (Specify tests: ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN); TCLP (Specify tests: ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.); COMMENTS:

#	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	Sewer Use	COMMENTS
1	BHMW 1S	10/21/24	12:00	18	GW	N	✓	
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Observations/Comments/Special Instructions

Sampled By (NAME): Amar Deep Regmi Signature: [signature] Date: 10/21/24 (mm/dd/yy) Pink Copy - Client

Relinquished by (NAME): Amar Deep Regmi Signature: [signature] Date: 10/21/24 (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.7
Date of Issue: 07 JUNE 2023

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
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BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

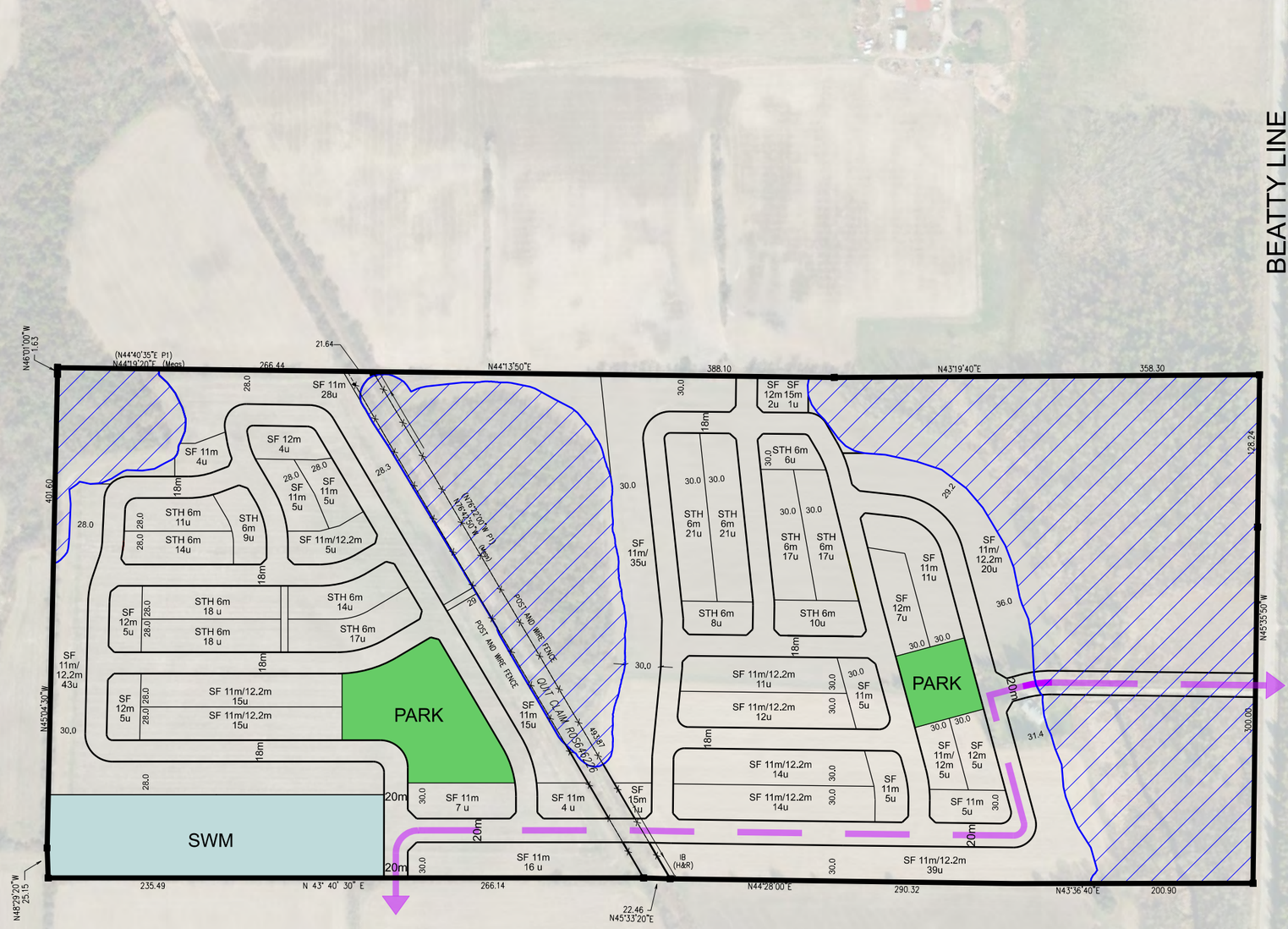
APPENDIX 'E'

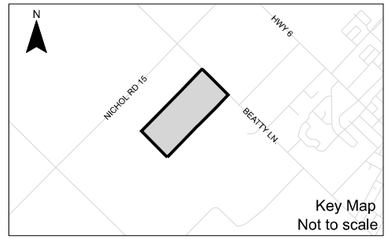
REVIEW PLANS

REFERENCE NO. 2311-W044

DRAFT

FOR DISCUSSION PURPOSES ONLY





LEGEND

- Subject Property
- Developments Limit
- Collector Road
- Constraint Limit

Development Statistics

Gross Study Area	43.2 ha
Constraint Limit Area	14.2 ha
Net Developable Area (Approx.)	29.0 ha
SWM Area	6%*
Park	5%*

*Based of Net Developable Area

Estimated Saleable Frontage:

Single Detached Blocks:	4174 m
Townhouse Blocks:	1323 m
Total:	5497 m

Estimated Unit Yield:

Single Detached Lots (11m-15m):	368 units
Townhouse Blocks (6m):	201 units
Total:	569 units

DRAWN / REVISED	
01 JAN 2025	Update park colouring
15 OCT 2024	Add vista blocks & calculate net res. areas & densities
27 SEP 2024	Add estimated unit calculations; Issued for Review
07 MAR 2024	Issued for Review

CONCEPTUAL BLOCK PLAN

6569 BEATTY LINE NORTH
TOWN OF FERGUS
WELLINGTON COUNTY

SCALE
0 50 100m

WESTON CONSULTING

File Number: 11554
Date: 2025-01-15
Drawn By: SM
Planner: RG
CAD: 11554_Concept C1_2025-01-15.dgn

Drawing
C1

Notes:

- Site Boundary provided Brubacher R-Plan from J.D. Barnes (2207)
- Development Limit provided by SCS Consulting Group on February 20, 2024.
- Areas and dimensions are approximate and subject to confirmation by survey.
- Air photo from First Base Solutions Inc., 2010 image.
- Draft Plan of Subdivision provided by the Town of Centre Wellington and it is dated 2016.
- Density Ranges based on County of Wellington Official Plan Section 4.4.4 and 8.3.5.