Proposed Mixed-Use Development

Preliminary Hydrogeological Investigation Report

Project Location:

3115 Hurontario Street
Mississauga, Ontario

Prepared for:

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MTE File No.: 50347-100

Engineers, Scientists, Surveyors.

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1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Clearbrook Developments Ltd to conduct a Preliminary Hydrogeological Investigation for a proposed mixed-use development at 3115 Hurontario Street in Mississauga, Ontario (herein referred to as the 'Site'). The Site location is illustrated on **Figure 1**.

The objectives of the Preliminary Hydrogeological Investigation are to:

- Characterize the local hydrogeological conditions;
- Provide hydrogeological input to the Site design;
- Provide a preliminary assessment of the dewatering and permitting requirements;
- Identify groundwater receptors and assess the potential for hydrogeological impacts on these receptors as a result of the proposed development; and
- Provide recommendations for additional work, groundwater monitoring and/or mitigation, as required.

1.1 Scope and Methodology

In order to meet the above stated objectives of this investigation, the following scope of work was implemented:

1.1.1 Background Review

- Site description;
- Neighboring land uses;
- Development Features;
- Ontario Geologic Survey Mapping;
- Source Water Protection Mapping;
- Ministry of Natural Resources and Forestry (MNRF) database;
- Credit Valley Conservation Authority (CVCA) Regulated Area Mapping; and
- Ministry of the Environment, Conservation and Parks (MECP) well records.

1.1.2 Field Investigation

- Borehole advancement and installation of monitoring wells beneath the Site to establish the local hydrogeological information across the Site;
- Collect manual groundwater level measurements to determine local groundwater flow direction;
- Install electronic pressure transducers (data loggers) within selected groundwater monitoring wells to facilitate continuous groundwater level monitoring;
- Perform single well response tests within representative monitoring wells to determine hydraulic conductivity and average linear groundwater velocity; and
- Collect groundwater quality samples to document pre-construction baseline conditions and to evaluate the possible discharge options during temporary/short term dewatering.

1.1.3 Analysis and Reporting

- Identification of the geological and hydrogeological setting of the Site;
- Preparation of geological cross-sections through the Site;
- A detailed description of Site hydrogeology including hydraulic conductivity, hydraulic gradients, groundwater velocity, and groundwater flow direction;
- Overview and discussion on construction dewatering requirements in terms of volume and discharge; and
- Assess potential hydrogeological impacts from the proposed development on the Site.

This report should be read in conjunction with the following report which has also been completed for the Site:

> MTE Consultants Inc. (2022) *Geotechnical Investigation, 3115 Hurontario Street, Mississauga, Ontario*, prepared for Clearbrook Developments File No. 50347-100, dated July 26, 2022.

2.0 Site Condition and Description

2.1 Site Location and Description

The Site is approximately 0.25 hectares (0.62 acres) in area and is located on the east side of Hurontario Street, south of Kirwin Avenue in a mixed residential and commercial area of Mississauga. The Site is currently occupied by a two-storey residential building including a basement and garage. The remaining Site area includes an asphalt surface parking area/laneway between the dwelling and Hurontario Street, and grassed area with some mature trees. The Site location is illustrated on **Figure 1**.

Based on the boreholes advanced at the Site, the ground surface elevation across the Site varies from approximately 118.7 m to 117.6 m above mean sea level (AMSL) from west to east/southeast. Furthermore, the surface drainage appears to be directed overland to the catch basins located along Hurontario Street.

The Site is proposed to be developed to a 35-storey tower with two and six-storey podiums resting on four levels of underground parking. It is understood that the proposed development will be provided with full municipal services. The development details are referenced from *3115 Hurontario St. Mixed Use, Project No. 2106, Dated: 2022.06.22* prepared by Sweeny&Co Architects.

2.2 Credit Valley Conservation Authority (CVCA) Policies and Regulations (O. Reg. 160/06)

The Site in noted to be located within the jurisdiction of the Credit Valley Conservation Authority (CVCA) and Cooksville Creek subwatershed. 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 CVCA, through its regulatory mandate, is responsible for issuing permits under Ontario Regulation (Ont. Reg. 160/06), 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.

The CVCA regulated Area online map was reviewed for the current assessment on June 22, 2022. It is our understanding that the Site is not located within a CVCA Conceptual Regulated Area. As such, it is not anticipated that a permit from the CVCA under O. Reg. 160/06 will be required for the proposed development.

2.3 Active Permit to Take Water (PTTW) Records Review

The MECP website was reviewed for any active PTTW application records within a 1.0 km radius of the Site on June 22, 2022 to establish any third party dewatering activities surrounding the Site. Record review indicates that there are no records of active PTTW within 1.0 km from the Site.

2.4 Source Water Protection

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. The objectives of source water protection are to identify areas where municipal drinking water sources may be at risk from quantity or quality threats, to assess the level of risk, and to put in place measures to eliminate or manage the threat.

The source water protection assessment was conducted using the online Source Protection Information Atlas (SPIA) provided by the MECP. Information provided by the SPIA was used to assess whether the Site is within a vulnerable area i.e. close to a municipal drinking water well or other drinking water intake. The SPIA also provides information pertaining to aquifer vulnerability and significant groundwater recharge areas. Based on SPIA mapping, the Site is located within the Credit Valley Source Protection Area (SPA).

2.4.1 Wellhead Protection Area (WHPA) Vulnerability Assessment

Based on the SPIA, the Site is not located within a WHPA. The closest municipal wells are located approximately 24 km northwest of the Site (Wells 3A, 4A and 4 220001655 Georgetown Well Supply).

2.4.2 Intake Protection Zone (IPZ)

Based on the SPIA, the Site is not located within an IPZ. The closest Intake Protection Zone is located approximately 180 km east the Site (Intake Protection Zone 2 associated with South Peel Drinking Water System – Lakeview 210000568).

2.4.3 Groundwater Vulnerability & Issue Contributing Areas

Factors taken into consideration when determining the vulnerability of a municipal aquifer include:

- Municipal aquifer thickness and depth;
- Travel time of water moving through the ground; and
- Types of man-made transport pathways which can create a direct pathway between water at the surface and the underlying aquifer that is a source of drinking water (i.e. quarries, pipelines, etc.).

Based on the SPIA, the Site is not located within a HVA.

The SPIA defines Issue Contributing Areas (ICA) as:

> "An area where land based activities contribute to the presence of an unwanted substance in the water source. Activities producing the substance may be prohibited or need to be managed more effectively."

As the Site is not located within a source area for a municipal supply, and based on a review of the SPIA, the Site is not located within an ICA.

2.4.4 Significant Groundwater Recharge Areas (SGRA)

SGRAs are generally in areas where permeable soils are present (i.e. sand or gravel) which allows the water to easily infiltrate to the subsurface. Areas deemed 'significant' are those which recharge aquifers that supply a community with drinking water, or supply groundwater recharge to a cold water ecosystem that is dependent on this recharge to maintain its ecological function.

SGRAs are assigned a vulnerability scoring which provide an indication of the level of vulnerability. The SGRA vulnerability scores are determined by overlaying the groundwater vulnerability score (outlined above) with the SGRA.

Based on a review of the SPIA, the Site is not located within a SGRA

2.5 Local Surface Water and Natural Heritage Features

Mapping from the Ontario Ministry of Natural Resources and Forestry (MNRF) was reviewed to determine if water bodies, wetland and woodland features were present on the Site and/or within the Study Area. For the purposes of this investigation, the Study Area is defined as the Site and an area 500 m from the Site boundary. The Ontario Ministry of Natural Resources National Heritage Information Centre database for listings of Areas of Natural or Scientific Interest (ANSIs) was also reviewed.

Records review indicates that the nearest surface water feature is Cooksville Creek located approximately 240 m east from the Site which ultimately drains to Lake Ontario located approximately 4.6 km east/southeast from the Site. There are no records for any evaluated and/or unevaluated wetland features or natural heritage features within or in close proximity to the Site. The nearest woodland feature is located 240 m east from the Site.

Furthermore, the Site is not located within the Niagara Escarpment Plan Area, the Oak Ridges Moraine Plan Area and the Greenbelt Protection Act Area.

2.6 Water Well Record Search

The MECP Water Well Information System (WWIS) online mapping was reviewed on June 22, 2022 and indicates a total of 57 wells are located within the Study Area of the Site. Of these:

- The final status of 51 records were listed as monitoring and test hole/observation wells.
- The final status of 2 records (MECP Well No. 4902210 and 4902211) were listed as water supply wells constructed in the year from 1964 and 1958 with depths 8.2 m and 15.5 m BGS respectively. Given the dates of construction and the development of the municipal water system in the study area, it is likely that these wells have been decommissioned and/or destroyed and are no longer in use.
- The final status of 1 record was listed as abandoned.
- The final status of 3 records were not listed.

The locations of the MECP wells are shown on **Figure 2**. MECP well records are summarized in **Table 1**.

3.0 Regional Geology and Hydrogeology

3.1 Physiography and Quaternary Geology

The current understanding of the geological setting of the Site is based on scientific work conducted by the Ontario Geological Survey. Oak Ridges Moraine Groundwater Program (ORMGP) digital mapping tool is utilized to understand the regional setting of the Site. The ORMGP has built upon an original geological interpretation of the Oak Ridges Moraine sediments undertaken by the Geological Survey of Canada (GSC).

The Site is located within the Iroquois Plain physiographic region (41) and characterized as being comprised of Sand Plains (11). The Iroquois Plain was created along the shoreline of the ancient glacial Lake Iroquois, and is characteristic of shallow water sandy deposits (Chapman & Putnam, 1984). Furthermore, the surficial geology at the Site consists of coarse textured glaciolacustrine deposits (9) predominantly gravelly sand and silty sand.

Figure 3 and 4 illustrates physiographic landforms the quaternary geology respectively.

3.2 Paleozoic Bedrock Geology

The ORMGP mapping indicates the Site is underlain by the Ordovician Aged Georgian Bay Formation consisting of interbedded grey-green to dark grey shale and fossiliferous calcareous siltstone to bioclastic limestone. Based on the boreholes advanced at the Site, the bedrock was encountered at depths of approximately 3.0 to 4.0 m BGS (Elevation 114.1 to 115.3 m AMSL)

3.3 Regional Groundwater Flow Direction

Based on a review of the Oak Ridges Moraine Groundwater Program (ORMGP) interactive mapping, groundwater has been mapped to flow southeasterly following local topography towards Cooksville Creek.

4.0 Field Program and Methodology

MTE completed Phase One & Phase Two Environmental Site Assessments and a Geotechnical Investigation at the Site (MTE, 2022). Information from these assessments that was considered relevant to the Hydrogeological Investigation was reviewed and included herein to assist in Site characterization for the Hydrogeological Investigation. The findings of these reports are presented under separate cover.

4.1 Borehole Drilling and Monitoring Well Installation & Development

The fieldwork for this investigation was carried out between February 14 to 18, 2022 and involved the drilling of ten boreholes to depths ranging from 1.2 to 15.6 meters below ground surface (m BGS). The locations of the boreholes are shown on **Figure 1**

With the exception of borehole BH103-22 which was advanced in the basement of the existing on-Site building with a pneumatic Pionjar, the boreholes were advanced with a CME55 track mounted drill rig equipped with continuous flight hollow stem augers, supplied and operated by Geo-Environmental Drilling Inc. The encountered bedrock was cored using a HQ diameter core barrel.

Upon completion of drilling, seven boreholes (MW101-22, MW102-22, MW104-22, MW105-22 and MW107-22 to MW109-22) were completed as monitoring wells to allow for the measurement of stabilized groundwater levels, groundwater sampling and testing for

environmental and hydrogeological investigation. Each of the monitoring wells were constructed with 1.5 meters long, nominal 50 mm inside diameter (ID), Slot 10, Schedule 40 polyvinyl chloride (PVC) well screens threaded to PVC riser pipes. A sand pack consisting of commercially available silica sand was used to backfill the borehole annulus surrounding the well screen. The annulus above the sand pack was backfilled with bentonite to near ground surface and hydrated in place. All monitoring wells were completed with either a flushmount or monument steel protective casing, which was cemented in place.

The remaining boreholes were backfilled with soil cuttings and bentonite in accordance with Ontario Regulation 468/10 (formerly O. Reg. 903) under the provinces Water Resources Act.

Following installation, monitoring wells were developed using dedicated low density polyethylene (LDPE) tubing and a foot valve or dedicated LDPE tubing and a peristaltic pump to remove standing water and foreign material that may have been introduced during drilling. Well development included the removal of three well volumes and/or purging the well dry on three occasions.

The monitoring well installation details are illustrated on the borehole logs provided in **Appendix A**.

4.2 Groundwater Monitoring

The depth to groundwater was measured manually in on-Site monitoring wells on March 9, 2022, March 22 & 23, 2022 and June 27, 2022. The continuous groundwater monitoring in four monitoring wells (MW101-22, MW105-22, MW107-22 and MW108-22) was accomplished using dedicated pressure transducers (data loggers) which were installed on March 23, 2022 and programmed to measure groundwater levels every hour. The data from these data loggers were downloaded on June 27, 2022 after the completion of three months of groundwater monitoring. Groundwater level monitoring (through the use of data loggers) at the Site will be continued to assess seasonal variation in groundwater elevations.

The measured groundwater levels and their respective elevations are summarized in **Table 2**. Hydrographs illustrating the continuous groundwater elevations at each of these monitoring wells are provided in **Appendix B**.

Section 5.2 below provides a discussion on the groundwater monitoring results.

4.3 Groundwater Sampling

Unfiltered groundwater samples were collected from monitoring wells (MW104-22 and MW109-22) on March 22, 2022 to represent the groundwater quality of overburden and bedrock unit and to assess treatment requirements and discharge options for groundwater pumped at the Site. The samples were collected using dedicated inertial pumps and low-density polyethylene tubing. Prior to sampling, the wells were purged a minimum of three equivalent well volumes of groundwater or purged dry three consecutive times.

The samples were collected into appropriate bottles supplied by the analytical laboratory with the applicable preservatives added by the laboratory. Upon collection, the water samples were placed on ice in coolers and submitted under chain of custody to the Bureau Veritas Laboratories (BV Labs) laboratory in Mississauga, Ontario for analysis. The groundwater analytical results for the Site were compared to the limits outlined in the Region of Peel Sewer Use By-Law (By-Law No. 53-2010) and City of Mississauga Storm Sewer Use By-Law (By-Law No. 0046-2022).

A summary of the water quality results can be found in **Table 3.** The **l**aboratory certificate of analysis for the groundwater sample collected during the Hydrogeological Investigation is presented in **Appendix C**.

In addition, groundwater samples collected throughout the Phase Two ESA investigation (MTE, 2022) were also reviewed as part of the hydrogeological investigation.

Section 5.2 below provides a discussion of the groundwater quality results.

4.4 Hydraulic Conductivity (K) Estimation

Qualitatively, hydraulic conductivity (K) is a parameter describing the ease with which groundwater flows through a porous medium. Relatively large K values are attributed to permeable units, i.e. sand and gravel, while small values are attributed to less permeable material, i.e. silt or clay.

MTE conducted single well hydraulic response tests (SWRT) in three monitoring wells MW101-22, MW 108-22 and MW107-22 on March 22, 2022 and March 23, 2022 to estimate the hydraulic conductivity of the screened interval.

The SWRT utilized one of two methods: slug testing (i.e. falling and rising head tests) which typically involves the rapid introduction and/or removal of a slug of known volume/displacement to raise the water level in a well, or recovery testing whereby the monitoring well was purged dry and allowed to recover to its static condition while the response was recorded. The testing method selected for each well was dependent on the amount of water column present in the well and the observed recovery during well development. The response or relative change in water level over time can then be used to calculate a hydraulic conductivity.

Groundwater level recovery to static in all tests was monitored using a data logger programmed to collect a measurement every 0.5 to 1 seconds. AquiferTest Pro 10.0 software (Waterloo Hydrogeologic, 2020) was used to analyze the single well hydraulic response tests.

A summary of the hydraulic conductivity estimation from single well hydraulic response tests can be found in **Table 4**. AquiferTest© Pro analysis data sheets are provided in **Appendix D**.

Furthermore, selected samples obtained during the drilling program were submitted for gradation and hydrometer analysis at a CCIL certified geotechnical laboratory. Hydraulic conductivity values were estimated based on particle distribution analysis using geometric mean of applicable empirical relations.

A summary of the hydraulic conductivity estimation from Particle Size Distribution can be found in **Table 5.** A copy of the particle size distribution analyses is provided in **Appendix E.**

Section 5.3 below provides a discussion of hydraulic conductivity estimation.

5.0 Local Hydrogeological Setting

5.1 Encountered Stratigraphy

The soil conditions encountered at the Site typically include asphaltic concrete and/or fill materials overlying native sand, glacial till, and shale bedrock. The geotechnical investigation report (MTE, 2022) was reviewed to characterize the local stratigraphic conditions at the Site. The details of encountered stratigraphy are summarized below:

5.1.1 Asphalt, Concrete and Fill Materials

Asphaltic concrete was encountered surficially in boreholes MW101-22, MW104-22 and MW109-22 and was approximately 0.1 m thick.

Fill was encountered below the pavement structure and concrete floor in boreholes MW101-22, MW104-22, MW109-22, and BH103-22, as well as surficially in all remaining boreholes and extended to depths ranging from 0.1 m to 2.4 m BGS. The fill was brown to dark brown in colour and typically ranged in composition from sand and gravel to sandy silt. In-situ moisture contents in the fill indicated moist to saturated conditions.

5.1.2 Native Deposits

Native deposits were encountered below the fill material in all boreholes and are summarized below:

- **Granular Deposits** consisting of sand, silty sand to sand and silt were encountered below the fill material in all boreholes at depths ranging from 2.4 to 3.8 m BGS. In-situ moisture contents in the native granular soils indicated moist to saturated conditions.
- **Glacial Till Deposits** consisting of clayey silt till to clayey sandy silt till were encountered below the fill material in boreholes MW107-22, MW108-22, BH110-22, and BH111-22 at depths ranging from at depths of 3.0 to 4.0 m BGS. The cohesive till deposits appeared to be drier than the plastic limit.
- **Shale Bedrock** was encountered below the granular deposits and glacial till in all boreholes with the exception of borehole BH103-22 and extended beyond the termination depth of each borehole. The bedrock was encountered at depths of approximately 3.0 to 4.0 m BGS (Elevation 114.1 to 115.3 m AMSL) The upper portions of the shale bedrock were weathered. In general, the weathered zone for shale in this region is typically in the order of 3.0 m thick, becoming more sound with depth.

The simplified stratigraphy inferred from the boreholes are shown on the cross-sections provided on **Figure 5** and **Figure 6.** Locations of cross-sections depicting the Site-wide geology are presented on **Figure 1**. Groundwater Levels and Elevations

The measured groundwater levels and their respective elevations are summarized in **Table 2**. **Hydrograph 1** through **Hydrograph 4** illustrating the continuous groundwater elevations of monitoring wells MW101-22, MW105-22, MW107-22 and MW108 are provided in **Appendix B**.

Precipitation data obtained from Environment Canada's Historical Data online database for the Toronto International Airport (Climate ID No. 6158731) (Environment Canada, 2020) was also plotted with groundwater elevations on **Hydrograph 1** through **Hydrograph 4** to assess groundwater seasonal fluctuations with the precipitation events.

Based on the monitoring wells screened in the shallow overburden bedrock contact (MW 101-22, MW 102-22, MW104-22, MW 105-22 and MW 108-22), the groundwater elevations at the Site vary from 116.15 m AMSL (MW101-22) to 114.66 m AMSL (MW105-22) throughout the monitoring period (March 23, 2022 to June 27, 2022). Furthermore, groundwater elevations from monitoring wells screened in the bedrock (MW107-22 and MW109-22) varied from 112.76 m AMSL to 112.19 m AMSL (MW107-22).

5.2 Groundwater Quality

Groundwater results indicated that groundwater samples collected from both MW104-22 and MW109-22 meet the permissible limits for Region of Peel Sanitary Sewer Discharge, but had exceedances compared to the permissible limits for Region of Peel Storm Sewer Discharge and City of Mississauga Storm Sewer.The exceeded parameters are summarized in table below:

Summary of Groundwater Quality Exceedance

Parameter	Units	Region of Peel Sanitary Sewer Discharge By Law No. 53-2010	Region of Peel Storm Sewer Discharge By Law No. 53-2010	City of Mississauga Storm Sewer Use By Law No. 0046-2022	MW104-22 Sampling Date: 3/22/2022	MW109-22 Sampling Date: 3/22/2022
Total Kjeldahl Nitrogen (TKN)	mg/L	100	1	-	1	**5.3**
Total Suspended Solids (TSS)	mg/L	350	15	15	**16**	**210**
Total Manganese (Mn)	ug/L	5000	50	2000	**250**	**330**
Total Aluminum (Al)	ug/L	50000	-	1000	58	**4000**
Total Phosphorus (P)	ug/L	10000	-	400	<100	**620**
Bold	Exceeds Region of Peel Storm Sewer Discharge By Law No. 53-2010					
Bold & Underline	Exceeds City of Mississauga Storm Sewer Use By Law No. 0046-2022					
Bold	Exceeds Both Region of Peel Storm Sewer Discharge By Law No. 53-2010 and City of Mississauga Storm Sewer Use By Law No. 0046-2022					

A summary of the water quality results can be found in **Table 3.** Laboratory certificate of analysis for the groundwater sample collected during the Hydrogeological Investigation is presented in **Appendix C**.

Furthermore, the analytical results for groundwater from MTE's Phase Two ESA were below the 2011 Table 2 RPI SCSs for all of the analyzed parameters and no Contaminants of Concern (COCs) were identified (MTE, 2022).

5.3 Hydraulic Conductivity

5.3.1 In-Situ Hydraulic Conductivity Testing

As indicated in Section 4.4, MTE conducted single well hydraulic response tests (SWRT) in three monitoring wells MW101-22, MW 108-22 and MW107-22 on March 22, 2022 and March 23, 2022 to estimate the hydraulic conductivity of the screened interval.

Prior to data analysis, the recovery data was normalized by dividing the observed head change (Ho) by the expected head change (Ho*) for the solid slug used during testing where applicable. Normalized data plots from repeat tests were compared to determine coincidence between slug tests. Coincidence between tests suggests that assumptions underlying conventional analysis methods may be valid at that well (Butler et. al, 1996; Butler et. al., 2003).

The normalized plots from the analyzed monitoring wells show an acceptable coincidence suggesting the assumptions underlying conventional analysis methods are valid. MTE analyzed SWRT test data using the Bouwer and Rice (1976) methodology to provide a hydraulic conductivity estimate (geometric mean) using the AquiferTest Pro 10.0 software (Waterloo Hydrogeologic, 2020). The table below summarizes the K-value estimates for each analyzed data set:

Summary of Hydraulic Conductivity Estimates from Single Well Hydraulic Response Tests

Well ID	Screened Unit	Screened Interval (m BGS)		Estimated Hydraulic Conductivity (m/sec)
		Screen Top	Screen Bottom	
MW101-22	Overburden Bedrock Contact	2.1	3.7	7.7×10^{-7}
MW107-22	Shale (Bedrock)	12.6	14.1	3.7×10^{-6}
MW108-22	Overburden Bedrock Contact	2.1	3.7	1.3×10^{-6}

Based on above table, the hydraulic conductivity for the overburden bedrock contact and the bedrock deposits were estimated to be in order of 10^{-6} to 10^{-7} m/sec. Estimated hydraulic conductivity values for the bedrock were found to be consistent with average published values for each respective soil type (Freeze and Cherry, 1979).

The hydraulic conductivity in the bedrock is primarily controlled by the occurrence of secondary porosity features such as fractures, joints, and bedding planes along horizontal direction. The occurrence of such features is largely associated with the upper weathered portions of the bedrock or discrete zones. The higher hydraulic conductivity estimate for the bedrock unit is considered to be related to the extent of weathering of the bedrock unit surrounding the well. In addition, a water-bearing fracture may have been encountered at this location which would contribute to a relatively higher hydraulic conductivity value.

A summary of the hydraulic conductivity estimation from SWRT can be found in **Table 4**. AquiferTest© Pro analysis data sheets for each test are provided in **Appendix D**

5.3.2 Particle Size Distribution Analyses Estimation

Selected samples obtained during the drilling program were submitted for gradation and hydrometer analysis at a CCIL certified geotechnical laboratory. Hydraulic conductivity values were estimated based on particle distribution analysis using geometric mean of applicable empirical relations. The table below summarizes the hydraulic conductivity estimates for the soil samples collected:

Summary of Hydraulic Conductivity Estimates from Particle Size Distribution

Sample ID	Sample Depth (m BGS)	Soil Description	Estimated Hydraulic Conductivity (m/sec)
MW 101-22 SS-4	2.3 – 2.9	SAND and SILT, trace Gravel	1.9×10^{-7}
MW 102-22 SS-4	2.3 – 2.9	SAND, trace Silt and Clay	1.6×10^{-4}
MW 104-22 SS-5	3.0 – 3.7	SAND, trace Gravel, Silt, and Clay	6.3×10^{-5}
MW 107-22 SS5	3.0 – 3.7	Clayey Sandy SILT, trace Gravel (Till)	3.6×10^{-10}
MW 109-22 SS4	2.3 – 2.9	SAND, trace Silt, Clay, and Gravel	9.2×10^{-5}

Based on the above table, the hydraulic conductivity for the sand and till deposits were estimated to be in order of 10^{-4} to 10^{-7} m/sec and 10^{-10} m/sec respectively. Estimated hydraulic conductivity values were found to be consistent with average published values for each respective soil type (Freeze and Cherry, 1979).

A summary of the hydraulic conductivity estimation from Particle Size Distribution can be found in **Table 5.** A copy of the particle size distribution analyses is provided in **Appendix E**

5.4 Horizontal Hydraulic Gradients and Groundwater Velocity

Groundwater flow mapping was conducted for the Site using the June 27, 2022, groundwater elevation data. The local shallow groundwater flow direction in overburden bedrock contacts interpreted to be southeasterly following local topography towards Cooksville Creek =(**Figure 7**).

The horizontal hydraulic gradient based on the June 27, 2022, groundwater elevations, were calculated to be 0.01 m/m in overburden bedrock contact, and 0.009 m/m in the bedrock unit based on the groundwater elevations measured in MW107-22 and MW109-22.

The average linear groundwater velocity was estimated based on three variables: hydraulic conductivity, horizontal hydraulic gradient and effective porosity. The average linear groundwater velocity can be calculated using Darcy's Law, as follows:

$$q = (-Ki)/n_e$$

Where:

- q = groundwater flux (m/sec)
- K = hydraulic conductivity (m/sec)
- i = horizontal hydraulic gradient (dh/dl) (m/m)
- n_e = effective soil porosity

The hydraulic conductivity used to calculate the average groundwater velocity of the overburden bedrock contact was $1.8x10^{-6}$ m/sec which represents the geometric mean of estimated hydraulic conductivities from the particle size distribution and in-situ hydraulic conductivity testing. An effective aquifer porosity of 0.3 was selected for overburden unit (Freeze and Cherry, 1979). Based on this calculation, the average horizontal linear groundwater velocity of the overburden bedrock contact unit was estimated to be approximately $6.0x10^{-8}$ m/sec (1.9 m/year).

The hydraulic conductivity used to calculate the average groundwater velocity within the bedrock unit was $3.7x10^{-6}$ m/sec which represents the estimated hydraulic conductivity of the formation surrounding MW107-22. The aquifer porosity values of 10% (0.10) was used for the shale bedrock unit (Freeze and Cherry, 1979). Based on this calculation, the average horizontal linear groundwater velocity of the bedrock unit was estimated to be approximately $3.3x10^{-7}$ m/sec (10.5 m/year).

The hydraulic conductivity of the bedrock unit was estimated under the assumption that the bedrock surrounding MW107-22 is sufficiently fractured that groundwater flow acts similarly to flow in porous sediments (Freeze and Cherry, 1979). It is noted that the directionality and spacing of fractures greatly impacts groundwater movement through bedrock (Freeze and Cherry, 1979) and therefore, flow in fractured bedrock can be highly variable.

6.0 Groundwater Control Requirements

6.1 Proposed Development and Construction Methodology

Based on the review of development plans *3115 Hurontario St. Mixed Use, Project No. 2106, Dated 2022.06.22* prepared by Sweeny&Co Architects it is noted that the Site is proposed to be developed with 35-storey tower with two and six-storey podiums resting on four levels of underground parking. It is assumed that the development will be serviced with full municipal services. The finished floor elevations of proposed underground parking structure were not available at the time of preparation of the report. It is assumed that the finished floor level for the lowest level of underground parking P4 will be at a depth of approximately 13.5 m BGS (Elevation 105.2 m AMSL) considering the average ground surface elevation 118.17 m AMSL.

The soil conditions encountered at the Site typically include asphaltic concrete and/or fill materials overlying native sand, glacial till, and shale bedrock. The boreholes advanced during the current investigation were terminated in the shale bedrock at a maximum depth of 15.6 m BGS (Elevation 102.6 m AMSL) and based on the anticipated founding elevations, it is anticipated that the foundations will be constructed on the shale bedrock.

Groundwater inflow is interpreted to occur where the excavation extends below the highest measured groundwater level of 116.15 m AMSL. The fractured permeability of the bedrock is likely to diminish with increasing depth as a result of the increase in the soundness of the bedrock.

No excavation shall extend below the foundations of existing adjacent structures without adequate alternative support being provided. The shoring requirements for the Site will have to be examined in detail with respect to the proximity of existing structures and Site boundary constraints. The Site conditions must be carefully assessed by the shoring designer to select appropriate type of shoring system in light of the close proximity of the existing buildings/structures.

MTE recommends that a professional dewatering contractor be consulted to review the subsurface conditions and to design a Site-specific dewatering system. It is the dewatering contractor’s responsibility to make an assessment of the factual data and to provide recommendations on dewatering system requirements.

6.2 Preliminary Construction Dewatering Assessment

Dewatering at the Site is required to allow for excavation in dry and stable conditions below the natural groundwater level and for construction to proceed in a safe manner. The shoring design was not finalized at the time of preparation of this report. The dewatering calculations provided below are based on the groundwater control using pumping which assumes continuous dewatering to lower the groundwater in the vicinity of the excavation. The details are discussed below:

6.2.1 Construction Dewatering – Overburden Unit

The continuous dewatering volume when can be estimated using the formula (Powers et. al., 2007 – Eq. 6.3):

(Eq.1)

$$Q = \frac{\pi K (H^2 - h_{w^2})}{\ln\left(\frac{R_o}{r_s}\right)}$$

Where:

Q = Steady state pumping rate (m^3/day)
K = Aquifer hydraulic conductivity (m/day)
H = Aquifer thickness pre-dewatering (m)
h_w = Stabilized aquifer thickness during dewatering (m)
R_o = Radius of influence from excavation center (m)
r_s = effective radius of excavation (m)

A description of the rationale for the factors used in the above formula to estimate the dewatering volumes is provided below:

Area of Excavation (A)

Development Plans *3115 Hurontario St. Mixed Use, Project No. 2106* prepared by Sweeny&Co Architects*, Dated: 2022.06.22* shows the proposed extent of the underground level P4 at the Site. The total area of excavation was estimated to be 2,355 m^2.

Hydraulic Conductivity (K)

The hydraulic conductivity used in the dewatering volume estimate of the overburden unit was considered as 1.8 x 10^{-6} m/sec which represents the geometric mean of estimated hydraulic conductivities from the particle size distribution and in-situ hydraulic conductivity testing for overburden bedrock contact.

Aquifer Saturated Thickness Pre-Dewatering (H)

The dewatering thickness represents the total height of which the overburden water table must be lowered to successfully dewater the excavation. This value for the overburden can be determined by subtracting the elevation of the top of the bedrock unit from the elevation of the water table. The maximum groundwater table elevation measured in overburden to date was 116.15 m AMSL (MW101-22) and the minimum elevation of the bedrock surface was encountered in the proposed excavation footprint (based on the borehole logs provided by the geotechnical report) was 114.1 m AMSL (MW111-22). Therefore, the maximum overburden dewatering thickness was estimated to be 2.05 m.

Stabilized Aquifer Thickness in the Excavation During Dewatering (h_w)

Based on a comparison of the target water table elevation to the reported elevations where bedrock was encountered in borehole logs provided in the geotechnical report, it is apparent that the target water elevation generally coincides with the bedrock unit within the excavation area. Therefore, the saturated extent of the aquifer unit overlying the bedrock will require dewatering resulting in a stabilized aquifer thickness in the excavation during dewatering (h_w) value of 0 m.

Radius of Influence (R_o)

In order to assess potential impacts to the shallow groundwater system, an estimation of the radius of influence (R_o) needs to be calculated from the estimated aquifer properties. The R_o can be estimated using a modified version of the Jacob equation (Powers et. al., 2007 – Eq. 6.11). While the equation was initially developed for confined aquifers, errors in estimating the radius of influence in an unconfined aquifer are small so long as a representative storage coefficient is used (Powers et. al., 2007). The modified Jacob equation also assumes that the aquifer would act as an ideal aquifer with the following assumed characteristics (Powers et. al., 2007):

- The aquifer is homogeneous and extends horizontally in all directions beyond the area of interest without encountering recharge or other boundaries;
- Thickness is uniform throughout;
- The aquifer is isotropic (hydraulic conductivity in every direction is the same); and
- Water is instantaneously released from storage when head is reduced.

According to Powers et. al. (2007), the R_o in an ideal aquifer, without recharge, is a function of transmissivity (T), storage coefficient (S), and the duration of pumping (t). As such, the following adaptation of the Jacob equation can be used to estimate the radius of influence:

(Eq.2)

$$R_o = r_s + \sqrt{\frac{Tt}{CS}}$$

Where:

R_o = Radius of influence from well center (m)
r_s = Effective radius of the well (in this case radius of excavation) (m)
T = Transmissivity (m^2/day)
t = Pumping time to reach steady state (min)
S = Storage coefficient (unit less)
C = Empirical Constant

Using the above formula, MTE estimated R_o using 7 days, 14 days, and 30 days dewatering scenarios. The scenarios were run using the following assumptions:

- Steady state conditions have been achieved;
- Continuous dewatering prior to reaching steady state would be conducted for 7, 14, or 30 days;
- The empirical constant value (C) was 135^{-1} (Table 4.3, Powers et. al., 2007);
- A storage coefficient (S) of 0.21 (21%) (average) was used to represent the encountered soil conditions as provided in Table 3.5 of Fetter (2001);
- An aquifer transmissivity of 3.69×10^{-6} m^2/sec was used based on the estimated hydraulic conductivity (K) value of 1.8×10^{-6} m/sec and the estimated aquifer thickness (b) of 2.05 m (T=KH);

- The excavation ends would act as a large diameter well with an equivalent radius (r_s) of 27 m which assumes that the dewatering excavation would act as a circular system of the same equivalent area. r_s is calculated by the following (Powers et. al., 2007 – Eq. 6.8):

(Eq.3)

$$r_s = \sqrt{\frac{Area}{\pi}}$$

Therefore, $r_s = \sqrt{(2{,}322\ m^2 / \pi)} = \sim 27$ m

The results for the scenario to estimate the radius of influence from dewatering are provided in **Appendix F**. As shown, the estimated radius of influence from the center of the excavation in the overburden unit for 7, 14, and 30-day dewatering scenarios was calculated to be approximately 32 m, 34 m, and 38 m, respectively. Subsequently, as dewatering continues to maintain the depressed water table (i.e. steady-state dewatering), the radius of influence in the overburden unit was calculated to reach approximately 63 m if dewatering activities occur for a period of 1 year.

Estimated Dewatering Volumes – Overburden Unit

The estimated discharge rates and volumes for overburden unit based on 7, 14, and 30 days of initial dewatering and 365 days of continuous dewatering are summarized below. Detailed calculations are provided in **Appendix F**.

Summary of Dewatering Volumes – Continuous Dewatering (Overburden Unit)

Dewatering Duration	Q Estimated Discharge Rate (L/day)	Total Q 1.50 Factor of Safety (L/day)
7 Days Initial Dewatering	12,498	18,747
14 Days Initial Dewatering	9,119	13,679
30 Days Initial Dewatering	6,528	9,791
Steady-State Dewatering (365 Days)	2,479	3,718

6.2.2 Construction Dewatering – Bedrock Unit

Groundwater in the bedrock unit was not considered to be within a confined aquifer unit based on the water levels measured in monitoring locations. Therefore, the groundwater inflow from the bedrock unit into the excavation can be calculated using Equation indicated above.

Area of Excavation (A)

The area requiring dewatering was estimated to be 2,355 m^2 which was determined using the methodology outlined above.

Hydraulic Conductivity (K)

The hydraulic conductivity used in the dewatering volume estimate of the bedrock unit was $3.7x10^{-6}$ m/sec, as estimated from in-situ hydraulic conductivity testing. The anisotropic permeability for the bedrock was not considered in the dewatering analysis for conservative estimates. Therefore, it is considered that the bedrock aquifer is isotropic (hydraulic conductivity in every direction is the same).

Aquifer Saturated Thickness Pre-Dewatering (H)

For the purposes of this assessment, it was assumed that the bedrock would act as an aquifer and that the top of the bedrock unit represents the top of the aquifer unit. Based on the borehole logs the maximum elevation for top of the bedrock unit is at 115.3 m AMSL (MW101-22).

It is assumed that the finished floor level for the lowest level of underground parking will be at a depth of approximately 13.5 m BGS (Elevation 105.2 m AMSL) considering the average ground surface elevation 118.17 m AMSL. The foundation thicknesses will extend an additional 1 m below this level. The dewatering target elevation is assumed to be 0.5 m below the foundation elevation i.e. 103.7 m AMSL. Therefore, it is estimated that the maximum saturated thickness of the bedrock aquifer requiring dewatering is 115.3 m – 103.17 m = 12.13 m.

Stabilized Aquifer Thickness in the Excavation during Dewatering (h_w)

Based on a comparison of the target water table elevation to the reported elevations where bedrock was encountered in borehole logs provided in the geotechnical report, it is apparent that the target water elevation generally coincides with the bedrock unit within the excavation area. Therefore, the saturated extent of the aquifer unit within the bedrock will require dewatering which results in a stabilized aquifer thickness in the excavation during dewatering (h_w) value of 0 m.

Radius of Influence (R_o)

In order to assess potential impacts to the bedrock groundwater system, an estimation of the radius of influence (R_o) need to be calculated from the estimated aquifer properties. The radius of influence within the bedrock unit was calculated using equation 2, provided above, with the same assumptions.

Using equation 2, MTE estimated R_o using 7-day, 14-day, and 30-day dewatering scenarios. The scenarios were run using the following assumptions:

- Steady state conditions have been achieved;
- Continuous dewatering prior to reaching steady state would be conducted for 7, 14, or 30 days;
- The empirical constant value (C) was 135^{-1} (Table 4.3, Powers et. al., 2007);
- A storage coefficient (S) of 0.05 (5%) for shale (after Morris and Johnson 1967; Hamill and Bell 1986) as provided in in Table 8.1 of R.P Gupta and B.B.S Singhal (2010);
- An aquifer transmissivity of 4.49×10^{-5} m^2/sec was used based on the estimated hydraulic conductivity (K) value of 3.7×10^{-6} m/sec and the estimated aquifer thickness (b) of 12.13 m (T=KH); and
- The excavation ends would act as a large diameter well with an equivalent radius (r_s) of 27 m, which was calculated using equation 3, above.

The results for the scenario to estimate the radius of influence from dewatering are provided in **Appendix F**. As shown, the estimated radius of influence from the center of the excavation in the bedrock unit for 7, 14, and 30-day dewatering scenarios were calculated to be approximately 62 m, 77 m, and 100 m, respectively. Subsequently, as dewatering continues to maintain the depressed water table (i.e. steady-state dewatering), the radius of influence in the bedrock unit was calculated to reach approximately 280 m if dewatering activities occur for a period of 1 year.

Estimated Dewatering Volumes – Bedrock Unit

Using Equation 1, estimated discharge rates and volumes based on 7 days, 14 days, and 30 days of initial dewatering and 365 days of continuous dewatering of the bedrock unit are summarized below. Detailed calculations are provided in **Appendix F**.

Dewatering Duration	Q Estimated Discharge Rate (L/day)	Total Q 1.50 Factor of Safety (L/day)
7 Days Initial Dewatering	179,660	269,490
14 Days Initial Dewatering	143,281	214,922
30 Days Initial Dewatering	114,327	171,491
Steady-State Dewatering (365 Days)	63,587	95,381

6.2.3 Precipitation Control During Dewatering

The short-term (during construction) control of ground water should also take into account stormwater management from rainfall events. Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events.

A value of 26.6 mm rainfall over a 2-hour period for a 2-year return period was used to determine the incidental precipitation volumes to the proposed excavations based on the review of Intensity-duration-frequency (IDF) curves (Ontario Ministry of Transportation).

Based on the excavation area of 2,355 m^2, the contribution from rainfall event is estimated as 62,643 L/d. The purpose is to ensure that contractor is prepared to handle a similar rainfall event during construction without impeding the construction progress.

6.2.4 Construction Dewatering Permitting Requirements

Under the Ontario Water Resources Act, for water takings greater than 50,000 L/d and less 400,000 L/d, a simplified process to register the dewatering activity on the Environmental Activity and Sector Registry (EASR) with MECP is required. Given the pumping rates estimated above, an Environmental Activity and Sector Registry (EASR) with MECP is required. Moreover, a Sewer Discharge Agreement must be obtained to permit discharge into the City's sewers prior to any construction dewatering discharge.

Note:

The analytical model used to estimate the dewatering rates does not account for elevated water table conditions above those measured to date. Factors of safety have been applied throughout the calculations and on the calculated dewatering rate in an effort to account for variability in water table fluctuations in response to seasonality and precipitation events and the heterogeneity of the overburden deposits. Despite the conservative approach and incorporation of factors of safety, the dewatering volumes should be considered an estimate only.

A standard factor of safety of 50% used in dewatering calculations is to account for variability of sediments, rain events, and other factors that cause the "real world" situation to differ from the ideal situation described by the dewatering equations.

Groundwater taking estimates are based on the assumed construction duration, excavation dimensions, construction sequencing, and methodology, therefore should there be changes in these items, revised groundwater taking volumes will be required. It is contractor's responsibility

to determine the type and extent of the dewatering system required. It should be noted that the actual required dewatering effort will depend on several factors, including excavation depth, sequencing, season and weather conditions and the length of time the excavation is left open. It should be noted that the interpretation of the dewatering estimates presented in this report and selection of an appropriate dewatering program is the responsibility of contractor.

6.3 Permanent (Long-Term) Groundwater Control Requirements

If the proposed development is designed as a water tight/water proof structure, then a private water drainage system will not be required. However, the structure must then be designed to resist hydrostatic pressure and uplift forces. If the proposed development is not a water tight structure, then a private water drainage system will be required which will consist of sub floor drainage system in conjunction with a perimeter drainage system to avoid wet conditions in the underground levels. The permanent drainage system is intended to collect passive groundwater seepage flow from the surrounding soils. The flow to the system will be a function of hydraulic gradient within the surrounding soils, any possible leakage through the shoring system around the building perimeter, and infiltration from surface run-off during any precipitation events.
MTE recommends that if there is a requirement of construction of sub-floor drainage system, permanent (long term) groundwater control assessment should be completed once the design plans/layouts are available and finalized. Furthermore, a long term private discharge permit should be secured if the sub drain system is to be connected to City's/Region's sewer system.

7.0 Impact Assessment

7.1 Discharge of Pumped Groundwater

As indicated in Section 5.3, the groundwater samples collected meet the permissible limits for Region of Peel Sanitary Sewer Discharge, but exceeds the permissible limits for Region of Peel Storm Sewer Discharge and City of Mississauga Storm Sewer Discharge.

Therefore, groundwater treatment will be required prior to discharge from the Site to Region of Peel Storm Sewer Discharge and City of Mississauga Storm Sewer Discharge. A groundwater treatment and discharge plan will be required for the Site by the dewatering contractor that will include quality criteria and a proposed discharge location for the dewatering effluent. The treatment system will be designed by the dewatering contractor as part of the groundwater treatment and discharge plan.

This report does not speak about the sewer capacities. The final design for any dewatering effluent is the responsibility of the retained contractor undertaking construction and a team designing the pre-treatment system.

7.2 Potential Private Well Interference

As stated in Section 2.6, the MECP WWIS online database identified 36 wells within 500 m of the Site. Of these, the final status of 2 records (MECP Well No. 4902210 and 4902211) were listed as water supply wells constructed in the year from 1964 and 1958 with depths 8.2 m and 15.5 m BGS respectively. Given the dates of construction and the development of the municipal water system in the study area, it is likely that these wells have been decommissioned and/or destroyed and are no longer in use. Therefore, no water supply wells are anticipated to be impacted by the proposed development.

However, if a complaint of well interference is received during or after the construction activities, MTE's licensed professionals will investigate the complaint in a timely fashion, and the client will

provide a short-term alternative potable water supply until the complaint has been resolved. If, after dewatering ceases and the private well remains negatively impacted (i.e. damaged beyond repair, or dry), it is the responsibility of the permit holder to provide a permanent water supply to the impacted water user (such as drilling a new well or providing municipal services to the private water user).

7.3 Groundwater Flow Patterns

Groundwater flow pattern changes – as a result of dewatering operations – will be limited to the time during which dewatering occurs and localized within the predicted radius-of-influence. Groundwater flow patterns are expected to return to normal or background conditions once dewatering has ceased.

However, if the excavation works will be advanced using an impermeable shoring system (caisson wall) providing fully-continuous groundwater cut-off barrier there will be a lower impact on groundwater levels outside the cut-off area.

7.4 Surface Water Features and Natural Environment

The maximum 30-day radius of influence is calculated as approximately 250 m from beyond the edge of excavation if a cut-off shoring system is not used. The nearest surface water feature is Cooksville Creek located approximately 240 m east from the Site and might intersects with the estimated radius of influence generated as a result of potential construction dewatering activities for the proposed development.

Based on the review of Cooksville Creek Watershed Study and Impact Monitoring Characterization Report (CVC, 2011), the subject Site is located in middle watershed of Cooksville Creek which is not inhabited by fish communities. Moreover, the recharge to the middle watershed of Cooksville Creek is considered to be “low” as it is likely already been affected by urbanization resulting in reduced recharge. Based on this any adverse impacts on Cooksville Creek are unlikely to occur.

However, a monitoring program may need to be implemented during construction dewatering to assess any adverse impacts to the Cooksville Creek related to proposed dewatering activities. MTE understands that any groundwater that will be taken from the Site will be discharged into the City’s/Region’s sewer systems and not into any natural water body.

Furthermore, there are no records for any evaluated and/or unevaluated wetland features or natural heritage features within or in close proximity to the Site. The nearest woodland feature is located 240 m east from the Site. Therefore, no natural features are anticipated to be impacted by the proposed water takings.

7.5 Radius of Influence & Impact on Surrounding Properties

No excavation shall extend below the foundations of existing adjacent structures without adequate alternative support being provided. The Site conditions must be carefully assessed by the shoring designer/geotechnical engineer to select appropriate type of shoring system in light of the close proximity of the existing buildings.

The approximate distance from the Site boundary to the maximum radius of influence boundary is estimated to be 250 m. Since the radius of influence would extend beyond the Site boundary, a preconstruction assessment/survey should be completed on neighbouring properties and structures.

A settlement monitoring plan if required should be submitted by a contractor detailing the frequency of pre construction & post- construction baseline data collection and daily observations during construction, monitoring locations and reporting process including the establishment of stop work process and implementation of remedial actions. However, if the

excavation works will be advanced using an impermeable shoring system (caisson wall), the zone of influence will be limited to the excavation box.

8.0 Proposed Preliminary Dewatering Monitoring Program

Based on the potential impacts described above, MTE recommends the following preliminary monitoring program for pre- and during construction of the proposed development:

8.1 Pre-Construction

- Continue on-going groundwater monitoring at the Site.
- The quality of groundwater should be re-assessed before the construction dewatering activities for the Region of Peel Sewer Use By-Law (By-Law No. 53-2010) and/or City of Mississauga Storm Sewer Use By-Law (By-Law No. 0046-2022).
- The pre-treatment system should be tested prior to active dewatering to confirm that the system is functioning and can reduce the parameters of concern to acceptable limits.
- On-Site monitoring wells located within the development limits should be decommissioned, when required, by a qualified professional and in accordance with O. Reg. 903 (as amended).

8.2 During Construction

- Daily recording of flow rates and volumes of groundwater taken should be completed by a calibrated in-line flow meter or by another method acceptable to the Director. MTE recommends the use of a calibrated flow meter installed in-line with the discharge line. It is required to keep daily records as daily water takings will need to be reported by March 31 of the following year under O. Reg. 387/04.
- The daily record shall be maintained in graphical and digital formats and shall be made available for inspection by the MECP, upon request.
- Records should be maintained of Site activities and any significant events which may affect the volume or quality of discharge water. This may include the description of the depth and extent of excavation, records of discharge durations and volumes, duration and intensity of rainfall events and observations of any irregular activities which can affect the quality and/or volume of groundwater discharge.
- Flow rates and total volume readings should be compared to the EASR to ensure daily water takings are not being exceeded. If exceeded, the contractor is advised to notify a local member (EASR coordinator) of the MECP immediately and water taking volumes should be restricted to maintain compliance within the limits specified in the EASR until measures can be taken to decrease the volumes of water taking.
- If discharging to the City's/Region's sewer, collect regular samples from the discharge water and analyze for the Region of Peel Sewer Use By-Law (By-Law No. 53-2010) and/or City of Mississauga Storm Sewer Use By-Law (By-Law No. 0046-2022) whichever applicable. If groundwater fails to meet the Sewer Discharge Limits, on-Site treatment of groundwater to the Sewer Discharge Limits would be required before discharge to the desired location.

- A settlement monitoring plan if required should be submitted by a contractor detailing the frequency of pre construction & post- construction baseline data collection and daily observations during construction, monitoring locations and reporting process including the establishment of stop work process and implementation of remedial actions. If unacceptable levels of ground settlements occur related to groundwater dewatering , the groundwater dewatering operations should be ceased or reduced. The retained contractor should incorporate a contingency plan in the settlement monitoring plan to address any issues related to ground settlement.

9.0 Conclusions and Recommendations

Based on the above hydrogeological investigation, MTE provides the following conclusions:

- Soil conditions encountered at the Site typically include asphaltic concrete and/or fill materials overlying native sand, glacial till, and shale bedrock. The bedrock was encountered at depths of approximately 3.0 to 4.0 m BGS (Elevation 114.1 to 115.3 m AMSL).
- Groundwater elevations at the Site varies from 116.15 m AMSL to 114.66 m AMSL throughout the monitoring period (March 23, 2022 to June 27, 2022). The deeper groundwater measurements measured in bedrock unit vary from 112.76 m AMSL to 112.42 m AMSL.
- The local shallow groundwater flow direction in the overburden/bedrock contact is interpreted to be southeasterly following local topography towards Cooksville Creek. The horizontal hydraulic gradient was calculated to be 0.01 m/m and 0.009 m/m in overburden/bedrock contact and bedrock unit respectively.
- Based on single well hydraulic response tests, MTE estimates the hydraulic conductivity for the overburden bedrock contact and the bedrock deposits were estimated to be in order of 10^{-6} to 10^{-7} m/sec . The hydraulic conductivity in the bedrock is primarily controlled by the occurrence of secondary porosity features such as fractures, joints, and bedding planes along horizontal direction.
- Analytical results from groundwater samples collected from overburden and bedrock meet the permissible limits for Region of Peel Sanitary Sewer Discharge, but had exceedances compared to the permissible limits for Region of Peel Storm Sewer Discharge and City of Mississauga Storm Sewer for Total Kjeldahl Nitrogen (TKN), Total Suspended Solids (TSS), Total Manganese (Mn), Total Aluminum (Al) and Total Phosphorus (P). Therefore, groundwater treatment will be required prior to discharge from the Site to either of these locations.

- MTE estimates the discharge rates based on 7, 14, and 30 days of initial dewatering and 365 days of continuous dewatering in overburden unit as:

Dewatering Duration	Q Estimated Discharge Rate (L/day)	Total Q 1.5 Factor of Safety (L/day)	Estimated Radius of Influence from Center of Excavation (m)
7 Days Initial Dewatering	12,498	18,747	32
14 Days Initial Dewatering	9,119	13,679	34
30 Days Initial Dewatering	6,528	9,791	38
Steady-State Dewatering (365 Days)	2,479	3,718	63

- MTE estimates the discharge rates based on 7, 14, and 30 days of initial dewatering and 365 days of continuous dewatering in bedrock unit as:

Dewatering Duration	Q Estimated Discharge Rate (L/day)	Total Q 1.5 Factor of Safety (L/day)	Estimated Radius of Influence from Center of Excavation (m)
7 Days Initial Dewatering	179,660	269,490	62
14 Days Initial Dewatering	143,281	214,922	77
30 Days Initial Dewatering	114,327	171,491	100
Steady-State Dewatering (365 Days)	63,587	95,381	280

- Given the estimated pumping rates, an Environmental Activity and Sector Registry (EASR) with MECP is required. Moreover, a Sewer Discharge Agreement must be obtained to permit discharge into the City's sewers prior to any construction dewatering discharge.
- The short-term (during construction) control of groundwater should also take into account stormwater management from rainfall events. Additional pumping capacity may be required to maintain dry conditions within the excavation during and following significant precipitation events. The contribution from a rainfall event is estimated to be 62,643 L/d over the proposed excavation based on 26.6 mm incidental rainfall event over a 2-hour period for a 2-year return period.
- The maximum 30-day radius of influence is calculated as 250 m from beyond the edge of excavation. However, if the excavation works will be advanced using an impermeable shoring system (caisson wall), the zone of influence will be limited to the excavation box.
- No water supply wells, surface water or natural features are anticipated to be impacted by the proposed water takings.

MTE Recommends:

- All permitting requirements outlined in Section 6.2.3 be implemented.
- The monitoring program outlined in Section 8.0 be implemented.
- During the development application process, existing on-Site groundwater monitoring wells be maintained in accordance with Ontario Regulation 903 (as amended).
- All monitoring wells installed along the excavation route be decommissioned in accordance with O. Reg. 90.
- Site conditions must be carefully assessed by the shoring designer to select appropriate type of shoring system in light of the close proximity of the existing buildings. Since the radius of influence would extend beyond the Site boundary, a preconstruction assessment should be completed on neighbouring properties and structures. However, if the excavation works will be advanced using an impermeable shoring system (caisson wall), the zone of influence will be limited to the excavation box.
- The nearest surface water feature (Cooksville Creek) is located approximately 240 m east from the Site which intersects the estimated radius of influence generated as a result of potential construction dewatering activities for the proposed redevelopment. A monitoring program may need to be implemented during construction dewatering to assess any adverse impacts to the Cooksville Creek related to proposed dewatering activities
- Groundwater taking estimates are based on the assumed construction duration, excavation dimensions, construction sequencing, and methodology, therefore should there be changes in these items, revised groundwater taking volumes will be required.
- If there is a requirement of construction of sub-floor drainage system, permanent (long term) groundwater control assessment should be completed once the design plans/layouts are available and finalized.

10.0 Limitations

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the Client. The assignment was carried out in accordance with the Scope of Work described in Section 1.1 as reviewed with and agreed to by the Client. MTE makes no representation that the present report has dealt with all of the important environmental issues, except as provided in the Scope of Work. This report is not intended to be exhaustive in scope or to imply a risk-free facility. As such, this report may not deal with all issues potentially applicable to the Site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a soil sample or groundwater level measurement represents one discrete portion of the Site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the Site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change, along with regulatory requirements. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

All of which is respectfully submitted,

MTE Consultants Inc.

2022-07-27

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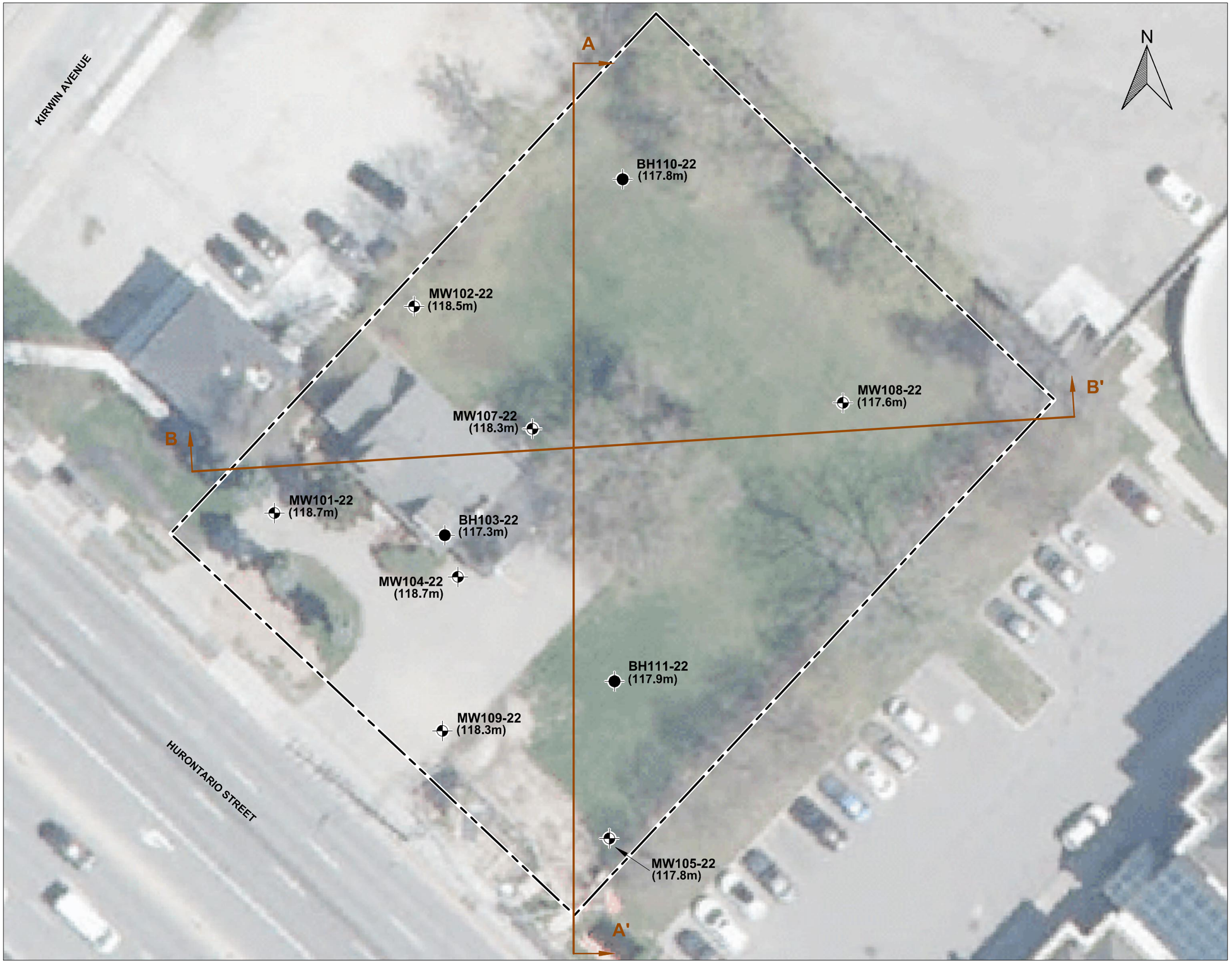
Figures



KEY PLAN (nts)

LEGEND

- SITE BOUNDARY
- BOREHOLE
- BOREHOLE/MONITORING WELL
- (118.3m) ELEVATION (m AMSL)
- A A' CROSS-SECTION

REFERENCES

AERIAL IMAGERY © QUEEN'S PRINTER FOR ONTARIO, 2022;
R-PE SURVEYING LTD., PLAN OF SURVEY AND TOPOGRAPHY, OCTOBER 28 - 2021; AND CITY OF MISSISSAUGA, ROAD, RAIL, AND WATER NETWORK, OPEN DATA SET (key plan).

NOTES

THIS FIGURE IS SCHEMATIC ONLY AND TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.

ALL LOCATIONS ARE APPROXIMATE.

SCALE IN METRES
0 5 10m
1:300

MTE
Engineers, Scientists, Surveyors

PROJECT
HYDROGEOLOGICAL ASSESSMENT
3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
SITE AND BOREHOLE/MONITORING WELL LOCATION PLAN

Drawn DCH	Scale AS SHOWN
Checked	Project No. 50347-100
Date June 17/22	Rev No. 0

FIGURE 1

Client: Clearbrook Developments Ltd.
Plot Date: 17 June 2022 Time: 11:39:49
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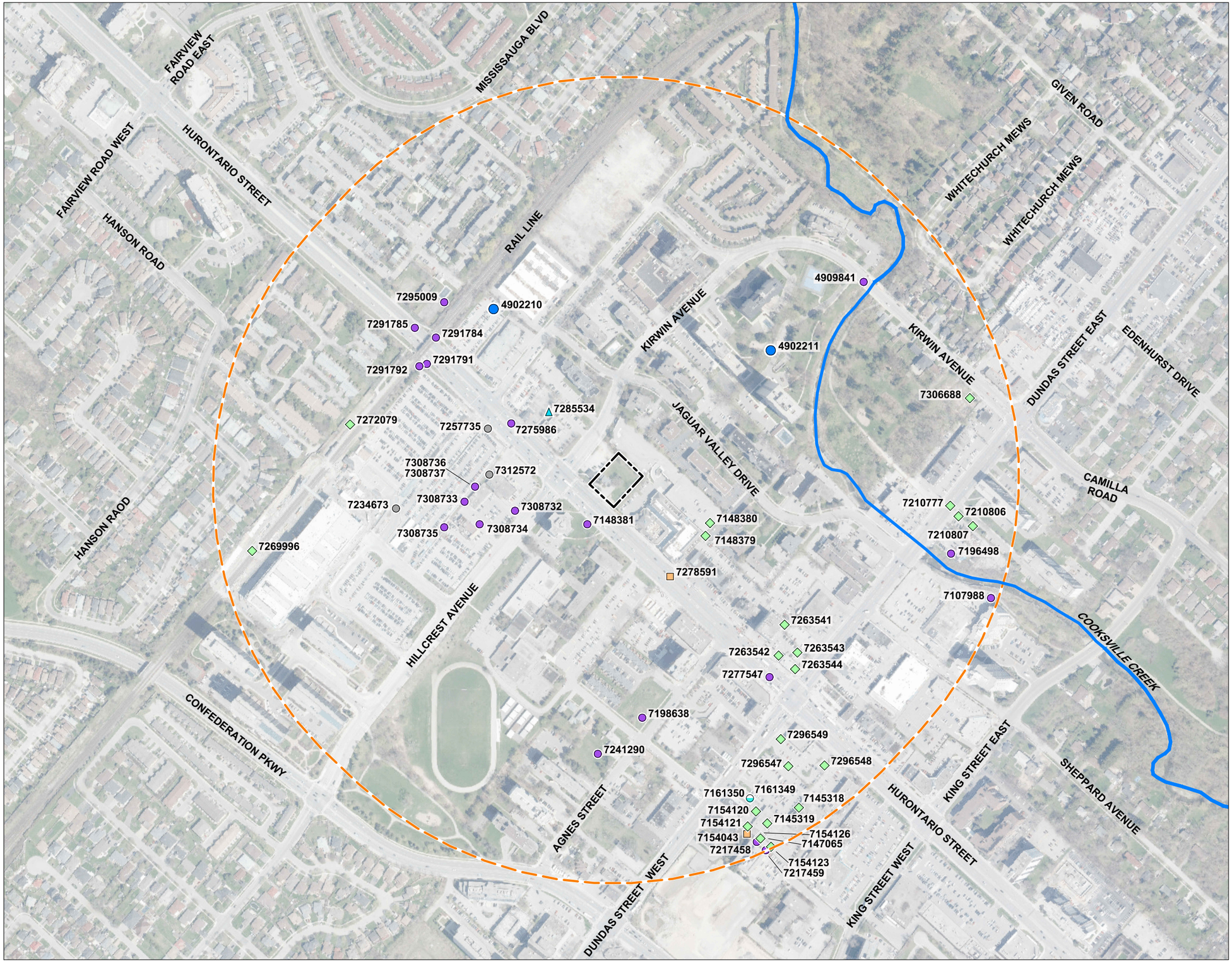

N

LEGEND

- SITE BOUNDARY
- STUDY AREA (500m Buffer from Site Boundary)
- WATERCOURSE (LIO)

MECP WELL RECORDS:

- ABANDONED
- DEWATERING
- OBSERVATION WELL
- TEST HOLE
- UNKNOWN
- MONITORING WELL / TEST HOLE
- WATER SUPPLY

REFERENCES

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WATER WELL RECORDS PROVIDED BY THE ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, © QUEEN'S PRINTER OF ONTARIO, ALL RIGHTS RESERVED; AND
LAND INFORMATION ONTARIO (LIO), WATER NETWORK.

NOTES

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SCALE IN METRES
0 100 200m
1:5,000

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HYDROGEOLOGICAL ASSESSMENT
3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
EXISTING FEATURES

Drawn: DCH	Scale: AS SHOWN	**FIGURE 2**
Checked:	Project No.: 50347-100	
Date: July 20/22	Rev No.: 0	

Client: Clearbrook Developments Ltd.
Plot Date: 20 July 2022 Time: 11:34:54
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0

N

LEGEND

- SITE BOUNDARY
- STUDY AREA (500m Buffer from Site Boundary)
- 6 Till Plains
- 11 Sand Plains
- 14 Beaches

REFERENCES

AERIAL IMAGERY © QUEEN'S PRINTER FOR ONTARIO, 2022;
ONTARIO GEOLOGICAL SURVEY 2010, SURFICIAL GEOLOGY OF SOUTHERN ONTARIO, ONTARIO GEOLOGICAL SURVEY MISCELLANEOUS RELEASE-128-REVISED.

NOTES

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SCALE IN METRES
0 100 200m
1:5,000

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HYDROGEOLOGICAL ASSESSMENT
3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
PHYSIOGRAPHIC LANDFORMS

Drawn	DCH	Scale	AS SHOWN
Checked		Project No.	50347-100
Date	July 15/22	Rev No.	0

FIGURE 3

Client: Clearbrook Developments Ltd.
Plot Date: 15 July 2022 Time: 12:09:18
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25mm Original Format in Tabloid (279mm x 432mm; 11" x 17")
0

N

LEGEND

- SITE BOUNDARY
- STUDY AREA (500m Buffer from Site Boundary)
- 3 — Exposed Or Thin Drift Covered Shale And Dolostone
- 5d — Red To Brown Gritty Silt To Clayey Silt Till
- 9b — Beach gravel
- 9c — Predominantly Gravelly Sand And Silty Sand
- 19 — Undifferentiated Gravel, Sand, Silt, Clay, Muck

REFERENCES

AERIAL IMAGERY © QUEEN'S PRINTER FOR ONTARIO, 2022; AND
ONTARIO GEOLOGICAL SURVEY 2010, SURFICIAL GEOLOGY OF SOUTHERN ONTARIO, ONTARIO GEOLOGICAL SURVEY MISCELLANEOUS RELEASE-128-REVISED.

NOTES

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ALL LOCATIONS ARE APPROXIMATE.

SCALE IN METRES
0 100 200m
1:5,000

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HYDROGEOLOGICAL ASSESSMENT
3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
QUATERNARY GEOLOGY

Drawn: DCH	Scale: AS SHOWN
Checked:	Project No.: 50347-100
Date: July 15/22	Rev No.: 0

FIGURE 4

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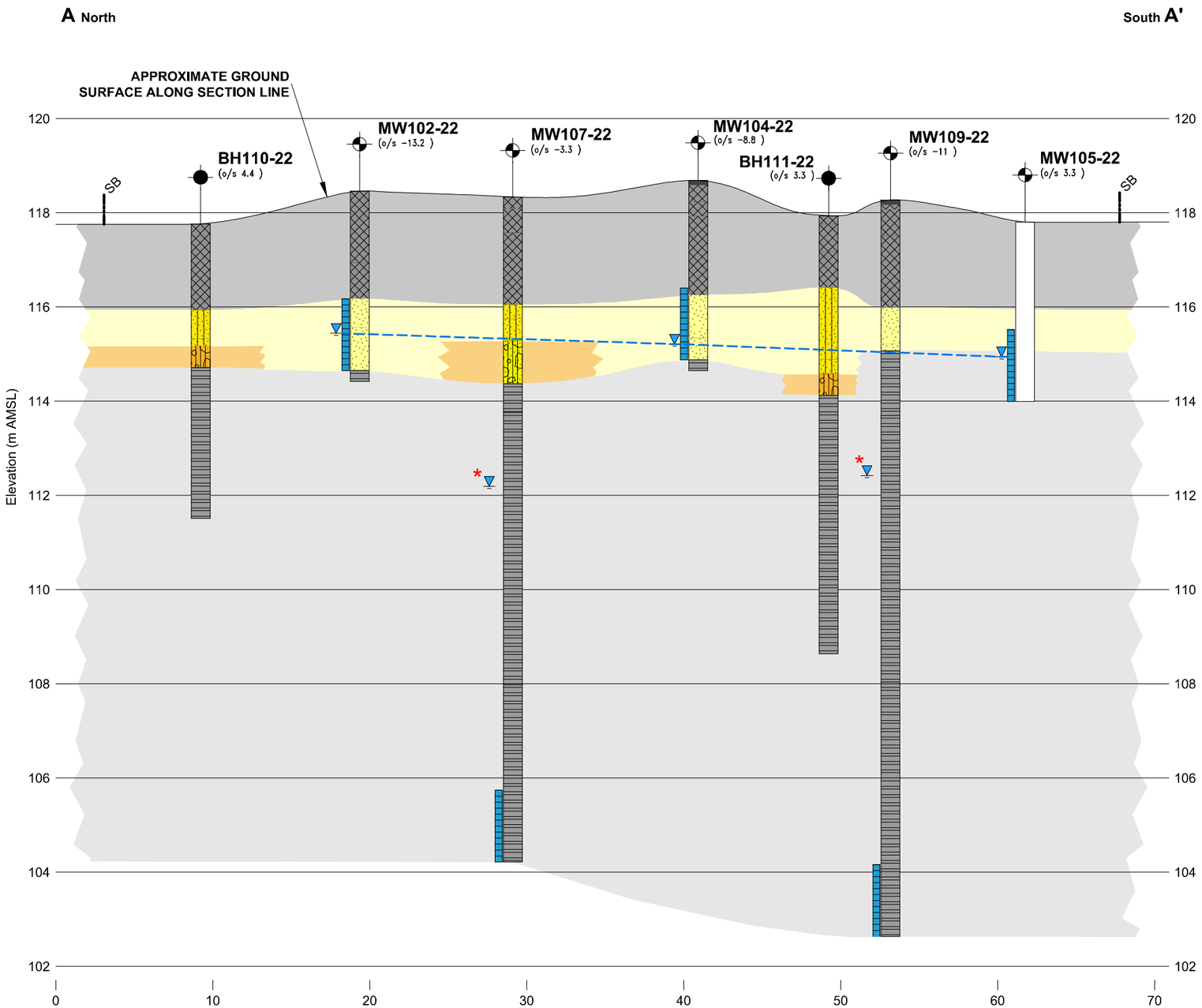

NOTES

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WIDTH OF BOREHOLES FOR ILLUSTRATION PURPOSES ONLY AND DO NOT CORRESPOND TO ACTUAL SPATIAL EXTENT.

THE GEOLOGIC SEQUENCE PRESENTED HEREIN IS BASED ON PROFESSIONAL INTERPRETATION FROM THE OVERBURDEN SEDIMENTS RECORDED DURING DRILLING, ACTUAL GEOLOGICAL CONDITIONS MAY VARY BETWEEN AND BEYOND LOCATIONS.

ALL LOCATIONS ARE APPROXIMATE.

VERTICAL SCALE IN METRES
0 2 4m
1:100

HORIZONTAL SCALE IN METRES
0 5 10m
1:300

LEGEND

- INFERRED GROUNDWATER TABLE
- SITE BOUNDARY (SB)
- BOREHOLE
- BOREHOLE/MONITORING WELL
- * SCREEN IN DEEPER STRATA (not used for Water Table Interpretation)

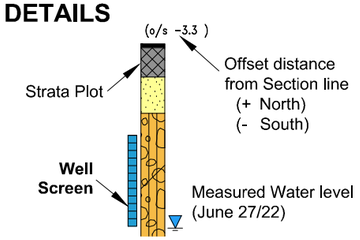
SIMPLIFIED STRATIGRAPHY

- CONCRETE
- FILL
- SAND
- SILTY SAND
- CLAYEY SANDY SILT TILL
- CLAYEY SILT TILL
- SHALE
- NOT SAMPLED

HYDROSTRATIGRAPHY

- FILL/CONCRETE
- CLAYEY SILT TILL
- SANDS & SILTS
- SHALE

TYPICAL INSTALLATION DETAILS



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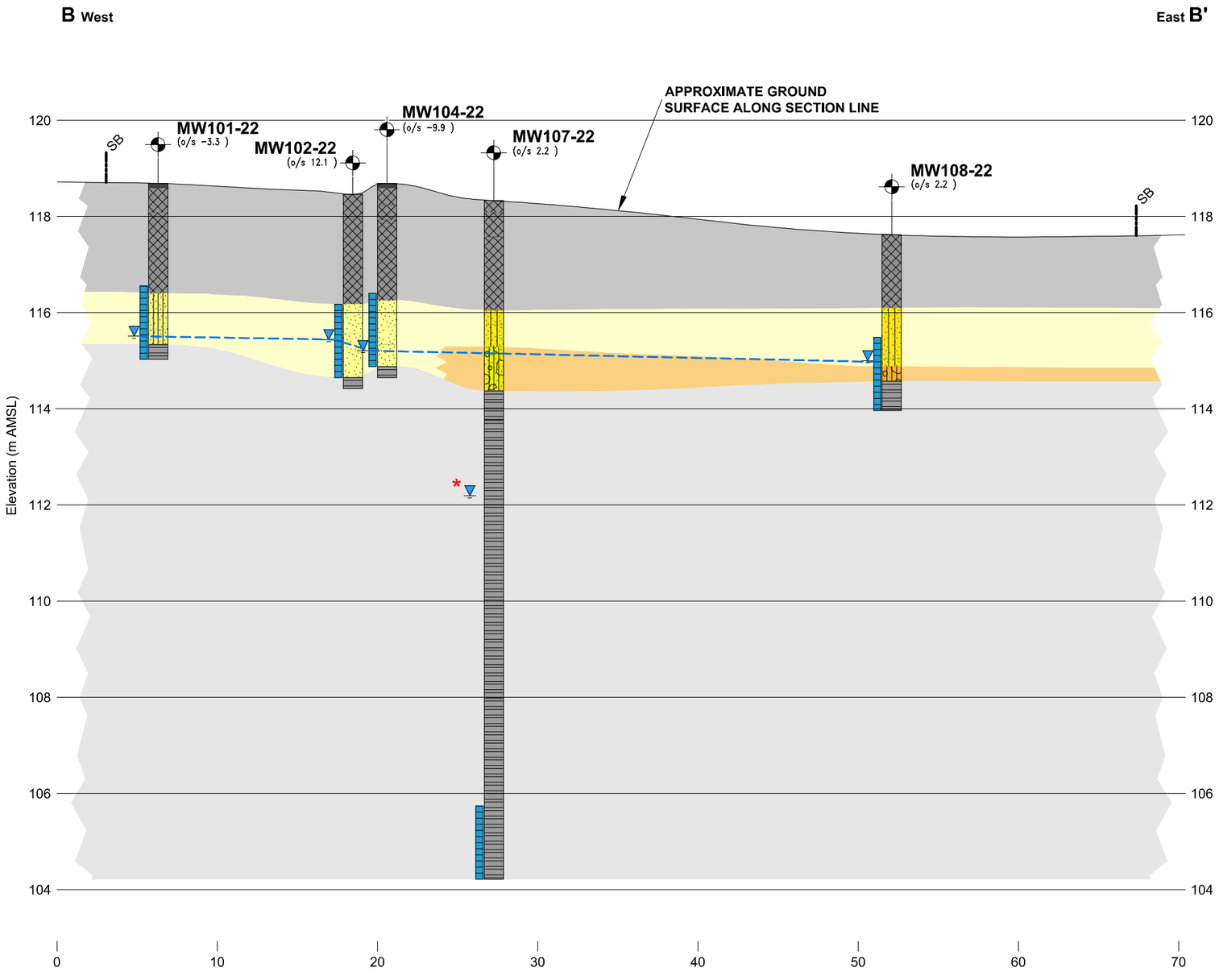
HYDROGEOLOGICAL ASSESSMENT
3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
CROSS-SECTION A-A'

Drawn DCH	Scale AS SHOWN
Checked	Project No. 50347-100
Date July 14/22	Rev No. 0

FIGURE 5



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WIDTH OF BOREHOLES FOR ILLUSTRATION PURPOSES ONLY AND DO NOT CORRESPOND TO ACTUAL SPATIAL EXTENT.

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ALL LOCATIONS ARE APPROXIMATE.

LEGEND

- INFERRED GROUNDWATER TABLE
- SITE BOUNDARY (SB)
- BOREHOLE
- BOREHOLE/MONITORING WELL
- * SCREEN IN DEEPER STRATA (not used for Water Table Interpretation)

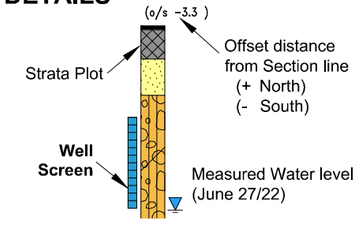
SIMPLIFIED STRATIGRAPHY

- CONCRETE
- FILL
- SAND
- SAND & SILT
- SILTY SAND
- CLAYEY SANDY SILT TILL
- CLAYEY SILT TILL
- SHALE

HYDROSTRATIGRAPHY

- FILL/CONCRETE
- SANDS & SILTS
- CLAYEY SILT TILL
- SHALE

TYPICAL INSTALLATION DETAILS



VERTICAL SCALE IN METRES
0 2 4m
1:100

HORIZONTAL SCALE IN METRES
0 5 10m
1:300

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3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
CROSS-SECTION B-B'

Drawn DCH	Scale AS SHOWN
Checked	Project No. 50347-100
Date July 14/22	Rev No. 0

FIGURE 6

N

LEGEND

- SITE BOUNDARY
- MONITORING WELL
- 115.21 MEASURED WATER LEVEL JUNE 27, 2002 (m AMSL)
- 115.2 INTERPRETED WATER TABLE ELEVATION (m AMSL)
- INTERPRETED GROUNDWATER FLOW DIRECTION
- * SCREEN IN DEEPER STRATA (not used for Water Table Interpretation)

REFERENCES

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R-PE SURVEYING LTD., PLAN OF SURVEY AND TOPOGRAPHY, OCTOBER 28 - 2021.

NOTES

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SCALE IN METRES
0 5 10m
1:300

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3115 HURONTARIO STREET
MISSISSAUGA, ONTARIO

TITLE
INTERPRETED SHALLOW GROUNDWATER FLOW

Drawn DCH	Scale AS SHOWN
Checked	Project No. 50347-100
Date July 14/22	Rev No. 0

FIGURE 7

Tables

Table 1: MECP Well Record Summary

MECP Well No.	MECP Well Tag No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing Start (mBGS)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Top (mBGS)	Bottom (mBGS)	Static Level (mBGS)	Final Level (mBGS)	Rate (LPM)	Duration (Hours)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3	Well Record Link
4902210	-	611311	4826698	1964	762	-	8.2	Boring	Water Supply	Industrial	Fresh	4.6	8.23	-	-	4.6	7.6	4.5	1	2.7	Brown	Clay	Medium Sand		
																				7.9	Brown	Medium Sand			
																				8.2	Blue	Clay	Medium Sand		
4902211	-	611679	4826643	1958	152.4	-	15.5	Cable Tool	Water Supply	Domestic	Fresh	12.2	15.54	-	-	3	3	45.5	4	5.2	Brown	Medium Sand	Gravel		mecp well record
																				15.5	Blue	Shale			
4909841	A027603	611802	4826734	2005	19	0	4.5	Boring	Observation Wells	Not Used	Fresh	4.5	7.6	4.5	7.6	-	-	-	-	7.6	Grey	Silt	Clay	Shale	mecp well record
7107988	A068177	611971	4826314	2008	0.5	-	2.1	Boring	Observation Wells	Monitoring	-	-	6.1	-	-	-	-	-	-	0.1	Black			Packed	mecp well record
																				0.3	Brown	Gravel	Coarse Gravel	Packed	
																				6.1	Grey	Silt	Fine Sand	Dense	
																							Fine Gravel		
7145318	A096456	611716	4826036	2010	40.3	0	3.3	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	4.8	3.3	4.8	-	-	-	-	0.1	Black	Other		Soft	mecp well record
																				2.7	Brown	Sand		Soft	
																				4.8	Grey	Shale	Silt	Hard	
7145319	A085575	611674	4826015	2010	40.3	0	3.3	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	4.8	3.3	4.8	-	-	-	-	0.1	Black	Other		Soft	mecp well record
																				2.7	Brown	Sand		Soft	
																				4.8	Grey	Shale	Silt	Soft	
7147065	A097266	611665	4825995	2010	35.1	0	2.7	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.79	2.7	5.8	-	-	-	-	0.3	Black	Fill		Soft	mecp well record
																				1.8	Brown	Clay	Silt	Soft	
																				3.7	Brown	Clay	Silt	Soft	
																				5.8	Brown	Shale		Hard	
7148379	A103044	611592	4826397	2010	35.5	0	1.5	Direct Push	Monitoring And Test Hole	Test Hole	-	-	3.1	1.5	3.1	-	-	-	-	1.8	Brown	Sand	Gravel	Loose	mecp well record
																				3.1	Brown	Clay	Silt	Dense	
7148380	A103036	611598	4826414	2010	34.5	0	1.8	Direct Push	Monitoring And Test Hole	-	-	-	3.35	1	3.4	-	-	-	-	1.8	Brown	Sand	Gravel	Loose	mecp well record
																				3.4	Grey	Clay	Silt	Dense	
7148381	A103045	611435	4826412	2010	38.1	0	1.8	Rotary (Convent.)	Observation Wells	-	-	-	-	1.8	4.9	-	-	-	-						mecp well record
7154043	A107681	611694	4825957	2010	-	0	10.7	Air Percussion	Test Hole	Monitoring And Test Hole	-	-	12.19	-	-	-	-	-	-	0.3	Brown	Fill	Gravel	Soft	mecp well record
																				4	Brown	Fine Sand		Soft	
																				4.3	Grey	Clay	Silt	Soft	
																				12.2	Grey	Shale		Hard	
7154043	A107681	611701	4825941	2010	-	-	4	-	Test Hole	Monitoring And Test Hole	-	-	12.19	4	7	-	-	-	-						mecp well record
7154043	A107681	611704	4825949	2010	-	-	4	-	Test Hole	Monitoring And Test Hole	-	-	12.19	4	7	-	-	-	-						mecp well record
7154043	A107681	611695	4825959	2010	-	-	4	-	Test Hole	Monitoring And Test Hole	-	-	12.19	4	7	-	-	-	-						mecp well record
7154043	A107681	611647	4826001	2010	-	-	4.6	-	Test Hole	Monitoring And Test Hole	-	-	12.19	4.6	7.6	-	-	-	-						mecp well record
7154120	A092483	611659	4826031	2010	-	0	4	Air Percussion	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.49	4	5.5	-	-	-	-	0.3	Brown	Fill	Gravel	Loose	mecp well record
																				3.4	Brown	Sand	Stones	Loose	
																				4	Brown	Sand		Water-Bearing	
																				5.5	Grey	Shale		Hard	
7154121	A092484	611648	4826011	2010	-	0	4.6	Other Method	Monitoring And Test Hole	Monitoring And Test Hole	-	-	6.1	4.6	6.1	-	-	-	-	0.3	Brown	Fill	Gravel	Loose	mecp well record
																				3.4	Brown	Sand	Gravel	Soft	
																				4	Brown	Sand	Stones	Soft	
																				6.1	Grey	Shale		Hard	
7154123	A092477	611679	4825984	2010	-	0	4.6	Air Percussion	Monitoring And Test Hole	Monitoring And Test Hole	-	-	6.1	4.6	6.1	-	-	-	-	0.3	Brown	Fill	Gravel	Loose	mecp well record
																				2.7	Brown	Sand	Gravel	Soft	
																				4	Brown	Sand	Stones	Soft	
																				6.1	Grey	Shale		Hard	
7154126	A092480	611665	4825997	2010	-	0	4	Air Percussion	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.49	4	5.5	-	-	-	-	0.3	Brown	Fill	Gravel	Loose	mecp well record
																				3.4	Brown	Sand	Stones	Soft	
																				4	Brown	Sand	Soft	Water-Bearing	
																				5.5	Grey	Shale		Hard	
7161349	A102995	611651	4826048	2011	34.5	0	1.5	Air Percussion	Monitoring And Test Hole	Monitoring And Test Hole	-	-	6.71	1.5	6.7	-	-	-	-	3.1	Brown	Clay	Gravel	Soft	mecp well record
																				6.7	Grey	Shale		Hard	
7161350	A103016	611651	4826048	2011	34.5	0	1.5	Air Percussion	Dewatering	Monitoring And Test Hole	-	-	3.05	1.5	3.1	-	-	-	-	3.1	Brown	Clay		Soft	mecp well record
7196498	A084011	611918	4826373	2012	50	0	3.6	Boring	Observation Wells	Monitoring And Test Hole	Untested	3	7.6	3.6	7.6	-	-	-	-	4.6	Brown			Fill	mecp well record
																				6.2	Grey	Silt			
																				7.6	Grey			Dense	
7198638	A144253	611508	4826155	2013	39	0	6.1	Boring	Observation Wells	Monitoring	-	-	12.1	6.1	12.1	-	-	-	-	3.6		Sand	Fill		no digital well log
																				12.1	Grey	Shale	Rock	Hard	
7210777	A156353	611917	4826437	2013	50.8	0	2.4	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.49	2.4	5.5	-	-	-	-	0.9	Brown	Fill			mecp well record
																				3	Brown	Sand	Silty		
																				5.5	Grey	Clay	Silty		
7210806	A156350	611928	4826423	2013	50.8	0	1.8	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	4.88	1.8	4.9	-	-	-	-	1.2	Black				mecp well record
																				2.4	Brown	Sand	Silty		
																				4.9	Grey	Clay	Silty		
7210807	A156352	611947	4826410	2013	50.8	0	1.7	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	4.72	1.7	4.7	-	-	-	-	0.9	Brown	Fill			mecp well record
																				2.4	Brown	Sand	Silty		
																				4.7	Grey	Clay	Silty		
7217458	A159214	611660	4825990	2014	50.8	0	1.5	Direct Push	Observation Wells	Monitoring And Test Hole	-	-	4.27	1.5	4.3	-	-	-	-	3					no digital well log
																				4.3	Grey	Silt	Clay		
7217459	A159213	611672	4825979	2014	50.8	0	1.5	Direct Push	Observation Wells	Monitoring And Test Hole	-	-	4.27	1.5	1.2	-	-	-	-	3					no digital well log
																				4.3	Grey	Silt	Clay		
7234673	A175368	611181	4826433	2014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						no digital well log
7241290	A179693	611449	4826107	2015	52	0	6.5	Diamond	Observation Wells	Monitoring	-	-	9.5	6.5	9.5	-	-	-	-	0.3	Black	Topsoil		Loose	mecp well record
																				3.1	Brown	Fine Sand		Loose	
																				7.6	Grey	Shale		Hard	
																				9.5	Grey	Shale		Hard	
7257735	A175368	611303	4826539	2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						no digital well log
7263541	A197898	611697	4826279	2016	50.8	0	2.1	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.18	2.1	5.2	-	-	-	-	0.1	Black				mecp well record
																				1.5	Brown	Sand	Silt		
																				4.4	Brown	Silt	Clay	Sand	
																				5.2	Grey				
7263542	A197938	611689	4826238	2016	50.8	0	2.1	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.18	2.1	5.2	-	-	-	-	0.1	Black				mecp well record
																				1.5	Brown	Sand	Silt		
																				3.8	Brown	Silt	Sand	Clay	
																				5.2	Grey	Shale			
7263543	A194940	611714	4826242	2016	50.8	0	2.1	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	5.18	2.1	5.2	-	-	-	-	0.1	Black				mecp well record
																				1.5	Brown	Sand	Silt		
																				4.3	Brown	Silt	Clay		
																				5.2	Grey	Shale			
7263544	A197985	611711	4826220	2016	31.8	0	0.6	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	1.37	0.6	1.4	-	-	-	-	0.2	Grey				mecp well record
																				0.6	Brown	Fill			
																				1.4	Grey	Clay			
7269996	A184832	610990	4826377	2016	50.8	0	0.9	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	3.96	0.9	4	-	-	-	-	1.5	Brown	Sand	Clay		mecp well record
																				4	Grey	Shale		Weathered	
7272079	-	611120	4826545	2016	31.8	0	0.6	Direct Push	Monitoring And Test Hole	Monitoring And Test Hole	-	-	-	0.6	1.5	-	-	-	-						mecp well record
7275986	A209781	611334	4826546	2016	51	0.1	3.8	Boring	Observation Wells	Monitoring	Untested	3.3	5.3	3.8	5.3	-	-	-	-	0.9	Brown	Sand	Fill	Packed	no digital well log
																				3.7	Brown	Silt	Clay	Soft	
																				5.3	Grey	Shale	Limestone	Layered	
7277547	A209919	611677	4826209	2016	51	0.1	1.5	Boring	Observation Wells	Monitoring	-	-	3	1.5	3	-	-	-	-	1	Brown	Sand	Gravel	Packed	no digital well log
																				3	Brown	Sand		Loose	
7278591	A210079	611545	4826343	2016	51	0	3.8	Boring	Test Hole	Monitoring	Untested	-	5.3	3.8	5.3	-	-	-	-	2.8	Brown	Silt	Clay	Hard	no digital well log
																				5.3	Grey	Shale		Rock	

Table 1: MECP Well Record Summary

7285534	A217259	611384	4826560	-	50	2	2.5	-	Abandoned-Other	-	Untested	2.7	-	2.5	4	-	-	-	-					mecp well record
7291784	A224480	611234	4826660	2017	129.5	0	0.9	Diamond	Observation Wells	Monitoring	-	-	2.23	0.9	1.8	-	-	-	-	0.4	Brown	Sand	Gravel	Fill	mecp well record
																				2.2	Grey	Shale	Limestone	Layered	
7291785	A224218	611206	4826673	2017	51	0.1	2.8	Diamond	Observation Wells	Monitoring	-	-	5.8	2.8	5.8	-	-	-	-	1.2	Brown	Sand	Gravel	Fill	mecp well record
																				5.8	Grey	Shale	Limestone	Layered	
7291791	A224187	611222	4826625	2017	51	0.1	4.4	Diamond	Observation Wells	Monitoring	-	-	7.4	4.4	7.4	-	-	-	-	2.1	Grey	Sand	Silty	Fill	mecp well record
																				7.4	Grey	Shale	Limestone	Layered	
7291792	A224188	611212	4826622	2017	51	0.1	4.5	Diamond	Observation Wells	Monitoring	Untested	2.1	7.6	4.5	7.6	-	-	-	-	0.3	Brown	Sand	Gravel	Fill	mecp well record
																				2.1	Grey	Silt	Clay	Dense	
																				2.6	Brown	Sand		Loose	
																				3.6	Grey	Silt	Clay	Dense	
																				7.6	Grey	Shale	Limestone	Layered	
7295009	A232578	611245	4826707	2017	51	0	3	Boring	Observation Wells	Monitoring	Untested	-	6	3	6	-	-	-	-	1	Brown	Topsoil	Sand	Soft	mecp well record
																				3.6	Brown	Sand	Clay	Soft	
																				4.8	Grey	Silt	Clay	Dense	
																				6	Grey	Shale	Silt	Layered	
7296547	A199311	611702	4826091	2017	50.8	0	0.9	Rotary (Convent.)	Monitoring And Test Hole	Test Hole	-	-	3.96	0.9	4	-	-	-	-	0.9	Black				mecp well record
																				1.8	Brown	Sand	Silt		
																				2.7	Brown	Clay	Silt		
																				4	Grey	Shale			
7296548	A199312	611750	4826092	2017	50.8	0	0.9	Rotary (Convent.)	Monitoring And Test Hole	Test Hole	-	-	3.96	0.9	4	-	-	-	-	0.9	Black				mecp well record
																				3	Brown	Silt	Clay		
																				4	Grey	Shale			
7296549	A199313	611692	4826127	2017	50.8	0	1.2	Rotary (Convent.)	Monitoring And Test Hole	Test Hole	-	-	4.27	1.2	4.3	-	-	-	-	0.9	Black				mecp well record
																				3	Brown	Clay	Silt		
																				4.3	Grey	Shale			
7306688	A223241	611943	4826580	2017	50.8	0	4.6	Rotary (Convent.)	Monitoring And Test Hole	Test Hole	Untested	3.8	7.62	4.6	7.6	-	-	-	-	3.8	Brown	Topsoil	Fill	Silt	mecp well record
																				4.6	Brown	Fine Sand	Silt	Gravel	
																				7.6	Grey	Silt	Clay	Till	
7308732	-	611339	4826430	2018	50.8	0	4.6	Auger	Observation Wells	Monitoring	Untested	6.1	6.1	4.6	6.1	-	-	-	-	1.5		Fill			no digital well log
																				3		Sand			
																				6.1		Shale			
7308733	-	611272	4826442	2018	50.8	0	3	Auger	Observation Wells	Monitoring	Untested	6.1	6.1	3	6.1	-	-	-	-	1.5		Fill			no digital well log
																				3		Sand			
																				6.1		Shale			
7308734	-	611292	4826412	2018	50.8	0	3	Auger	Observation Wells	Monitoring	-	-	3.81	3	3.8	-	-	-	-	1.5		Fill			no digital well log
																				3		Sand			
																				3.8		Shale			
7308735	-	611245	4826408	2018	50.8	0	3	Auger	Observation Wells	Monitoring	Untested	6.1	6.1	3	6.1	-	-	-	-	1.5		Fill			no digital well log
																				3		Sand			
																				6.1		Shale			
7308736	-	611286	4826462	2018	50.8	0	1.2	Auger	Observation Wells	Monitoring	-	-	2.44	1.2	2.7	-	-	-	-	0.6	Brown	Topsoil			no digital well log
																				2.4	Brown	Fill	Clay		
7308737	-	611286	4826462	2018	50.8	0	3.8	Auger	Observation Wells	Monitoring	-	-	6.1	3.8	6.1	-	-	-	-	3.8	Brown	Topsoil			no digital well log
																				6.1	Brown	Fill	Clay		
																					Grey	Shale			
7312572	A244321	611305	4826478	2018	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						no digital well log

Notes
"mBGS" - meters below ground surface
"LPM"- liters per minute
"MECP" - Ministry of the Environment, Conservation and Parks

Table 2: Summary of Groundwater Elevations

Well ID	Ground Surface Elevation (masl)	Top of Pipe Elevation (masl)	Well Depth (mbgs)	Type of Casing	Data logger Installed	9-Mar-22			22-Mar-22			23-Mar-22			27-Jun-22		
						Water Level (mbtop)	Water Level (mbgs)	Elevation (masl)	Water Level (mbtop)	Water Level (mbgs)	Elevation (masl)	Water Level (mbtop)	Water Level (mbgs)	Elevation (masl)	Water Level (mbtop)	Water Level (mbgs)	Elevation (masl)
MW101-22	118.69	118.54	3.7	Flushmount	23-Mar-22	2.96	3.10	115.59	2.39	2.54	116.15	2.88	3.02	115.67	3.03	3.18	115.51
MW102-22	118.46	119.32	3.8	Monument	-	3.83	2.97	115.49	3.76	2.90	115.56	-	-	-	3.89	3.02	115.44
MW104-22	118.69	118.56	3.8	Flushmount	-	3.31	3.44	115.25	3.26	3.38	115.31	-	-	-	3.35	3.47	115.21
MW105-22	117.81	119.01	3.8	Monument	23-Mar-22	4.04	2.84	114.98	3.99	2.78	115.03	3.98	2.77	115.04	4.08	2.88	114.94
MW107-22	118.33	119.49	14.1	Monument	23-Mar-22	6.96	5.80	112.53	7.00	5.84	112.50	6.97	5.81	112.53	7.30	6.14	112.19
MW108-22	117.62	118.74	3.7	Monument	23-Mar-22	3.68	2.56	115.06	3.64	2.52	115.10	3.63	2.51	115.11	3.75	2.63	115.00
MW109-22	118.27	118.17	15.6	Flushmount	-	4.45	4.54	113.73	-	-	-	-	-	-	5.75	5.85	112.42

Notes:
Date of elevation survey: March 22, 2022
March 9, 2022 unstablized water levels prior to well development
"mbgs" - meters below ground surface
"masl" - meters above sea level
"mbtop" - meters below top of pipe
"-" not measured or not applicable

Table 3: Water Quality Results

Parameter	Region of Peel Sanitary Sewer Discharge By Law No. 53-2010	Region of Peel Storm Sewer Discharge By Law No. 53-2010	City of Mississauga Storm Sewer Use By-Law No. 0046-2022	Units	MW104-22 [1] 3/22/2022 2:30:00 PM 8.0°C		MW109-22 [2] 3/22/2022 2:30:00 PM 6.0°C	
					Result	RDL	Result	RDL
Total Animal/Vegetable Oil and Grease	150	-	-	mg/L	0.5	0.5	0.7	0.5
Inorganics								
Total Carbonaceous BOD	300	15	-	mg/L	<2	2	<2	2
Fluoride (F-)	10	-	-	mg/L	<0.10	0.1	0.95	0.1
Total Kjeldahl Nitrogen (TKN)	100	1	-	mg/L	1	0.1	**5.3**	0.2
pH	5.5 - 10.0	6.0 - 9.0	6:9	pH	7.66		7.96	
Phenols-4AAP	1	0.008	0.008	mg/L	<0.0010	0.001	<0.0010	0.001
Total Suspended Solids	350	15	15	mg/L	**16**	10	**210**	10
Dissolved Sulphate (SO4)	1500	-	-	mg/L	100	1	250	1
Total Cyanide (CN)	2	0.02	0.02	mg/L	<0.0050	0.005	0.015	0.005
Petroleum Hydrocarbons								
Total Oil & Grease	-	-	-	mg/L	1.4	0.5	0.7	0.5
Total Oil & Grease Mineral/Synthetic	15	-	-	mg/L	0.9	0.5	<0.50	0.5
Miscellaneous Parameters								
Nonylphenol Ethoxylate (Total)	0.2	-	-	mg/L	<0.025	0.025	<0.025	0.025
Nonylphenol (Total)	0.02	-	-	mg/L	<0.001	0.001	<0.001	0.001
Metals								
Mercury (Hg)	0.01	0.0004	0.0004	mg/L	<0.00010	0.0001	<0.00010	0.0001
Total Aluminum (Al)	50000	-	1000	ug/L	58	4.9	**4000**	4.9
Total Antimony (Sb)	5000	-	-	ug/L	<0.50	0.5	<0.50	0.5
Total Arsenic (As)	1000	20	20	ug/L	<1.0	1	2.4	1
Total Cadmium (Cd)	700	8	8	ug/L	<0.090	0.09	<0.090	0.09
Total Chromium (Cr)	5000	80	80	ug/L	<5.0	5	8.6	5
Total Cobalt (Co)	5000	-	-	ug/L	<0.50	0.5	3.3	0.5
Total Copper (Cu)	3000	50	40	ug/L	<0.90	0.9	14	0.9
Total Lead (Pb)	3000	120	120	ug/L	<0.50	0.5	1.7	0.5
Total Manganese (Mn)	5000	50	2000	ug/L	**250**	2	**330**	2
Total Molybdenum (Mo)	5000	-	-	ug/L	0.6	0.5	2.9	0.5
Total Nickel (Ni)	3000	80	80	ug/L	<1.0	1	7	1
Total Phosphorus (P)	10000	-	400	ug/L	<100	100	**620**	100
Total Selenium (Se)	1000	20	20	ug/L	<2.0	2	<2.0	2
Total Silver (Ag)	5000	120	120	ug/L	<0.090	0.09	0.95	0.09
Total Tin (Sn)	5000	-	-	ug/L	<1.0	1	1.5	1
Total Titanium (Ti)	5000	-	-	ug/L	<5.0	5	43	5
Total Zinc (Zn)	3000	40	200	ug/L	<5.0	5	39	5
Semivolatile Organics								
Bis(2-ethylhexyl)phthalate	12	8.8	-	ug/L	<2.0	2	<2.0	2
Di-N-butyl phthalate	80	15	-	ug/L	<2.0	2	<2.0	2
Volatile Organics								
Benzene	10	2	2	ug/L	<0.40	0.4	<0.40	0.4
Chloroform	40	2	-	ug/L	<0.40	0.4	<0.40	0.4
1,2-Dichlorobenzene	50	5.6	5.6	ug/L	<0.80	0.8	<0.80	0.8
1,4-Dichlorobenzene	80	6.8	6.8	ug/L	<0.80	0.8	<0.80	0.8
cis-1,2-Dichloroethylene	4000	5.6	-	ug/L	<1.0	1	<1.0	1
trans-1,3-Dichloropropene	140	5.6	-	ug/L	<0.80	0.8	<0.80	0.8
Ethylbenzene	160	2	2	ug/L	<0.40	0.4	<0.40	0.4
Methylene Chloride(Dichloromethane)	2000	5.2	5.2	ug/L	<4.0	4	<4.0	4
Methyl Ethyl Ketone (2-Butanone)	8000	-	-	ug/L	<20	20	<20	20
Styrene	200	-	-	ug/L	<0.80	0.8	<0.80	0.8
1,1,2,2-Tetrachloroethane	1400	17	17	ug/L	<0.80	0.8	<0.80	0.8
Tetrachloroethylene	1000	4.4	4.4	ug/L	<0.40	0.4	<0.40	0.4
Toluene	270	2	2	ug/L	<0.40	0.4	<0.40	0.4
Trichloroethylene	400	8	7.6	ug/L	<0.40	0.4	<0.40	0.4
p+m-Xylene	-	-	-	ug/L	<0.40	0.4	<0.40	0.4
o-Xylene	-	-	-	ug/L	<0.40	0.4	<0.40	0.4
Total Xylenes	1400	4.4	4.4	ug/L	<0.40	0.4	<0.40	0.4
PCBs				ug/L				
Total PCB	1	0.4	0.4		<0.05	0.05	<0.05	0.05
Microbiological								
Escherichia coli	-	200	200	CFU/100mL	<10	10	<10	10

No Fill **No Exceedances**

Grey **Exceeds Region of Peel Storm Discharge By Law No. 53-2010**

Grey **Exceeds City of Mississauga Storm Sewer Use By Law No. 0046-2022**

Black **Exceeds Both Region of Peel Storm Sewer Discharge By Law No. 53-2010 and City of Mississauga Storm Sewer Use By Law No. 0046-2022**

RDL Reportable Detection Limit

1 Field filtered for Mercury (Hg)

2 Unfiltered Sample

Table 4: Summary of Single Well Response Tests

Monitoring Well	Screened Interval [m BGS]	Screened Stratigraphic Description	SWRT Type	Hydraulic Conductivity (K) (m/s)	Geometric Mean, K (m/s)
MW101-22	2.1 - 3.7	Overburden Bedrock Contact	Recovery Test 1	9.8E-07	7.7E-07
			Recovery Test 2	6.1E-07	
MW107-22	12.6 - 14.1	Shale Bedrock	Falling Head 1	3.0E-06	3.7E-06
			Rising Head 1	2.9E-06	
			Falling Head 2	4.9E-06	
			Rising Head 2	3.4E-06	
			Falling Head 3	5.2E-06	
			Rising Head 3	3.0E-06	
			Falling Head 4	4.5E-06	
			Rising Head 4	3.7E-06	
MW108-22	2.1 - 3.7	Overburden Bedrock Contact	Recovery Test 1	1.3E-06	1.3E-06

Notes:

1. Table to be read in conjunction with accompanying report.
2. K values provided in metres per second (m/s).
3. Screened intervals provided in metres (m) below ground surface (BGS).
4. Refer to Figure 1 for monitoring well locations.
5. Refer to Borehole Logs for monitoring well installation details.

Table 5: Hydraulic Conductivity Estimation from Particle Size Distribution

Sample ID	Depth Top	Depth Bottom	Soil Description	Grain Size at which 10% is finer	Grain size at which 60% is finer	% passing .02mm sieve	% passing .06mm sieve	Hazen Coefficient	Uniformity Index[1]	Porosity[2]	Estimated Hydraulic Conductivity					
	(m)	(m)		(mm)	(mm)	%	%	(-)	(-)	(-)	(m/sec)					
				d_{10}	d_{60}	P_1	P_2	C	$C_u = d_{60}/d_{10}$	$n = 0.255(1+0.83^{Cu})$	Hazen[3]	Beyer[3]	Kozeny-Carmen[3]	Wang[3]	Kaubisch[4]	Geometric Mean
MW 101-22 SS-4	2.3	2.9	SAND and SILT, trace Gravel	0.0163	0.1927	16	35	-	11.8	0.28	N/A	N/A	5.3E-07	N/A	6.6E-08	1.9E-07
MW 102-22 SS-4	2.3	2.9	SAND, trace Silt and Clay	0.1071	0.2231	5	7	100	2.1	0.43	1.1E-04	3.1E-04	1.2E-04	1.4E-04	N/A	1.6E-04
MW 104-22 SS-5	3.0	3.7	SAND, trace Gravel, Silt, and Clay	0.0717	0.2653	5	9	-	3.7	0.38	N/A	1.2E-04	3.4E-05	5.8E-05	N/A	6.3E-05
MW 107-22 SS5	3.0	3.7	Clayey Sandy SILT, trace Gravel	0.0006	0.0195	62	68	-	34.2	0.26	N/A	N/A	N/A	N/A	3.6E-10	3.6E-10
MW 109-22 SS4	2.3	2.9	SAND, trace Silt, Clay, and Gravel	0.0858	0.2867	6	9	-	3.3	0.39	N/A	1.8E-04	5.4E-05	7.9E-05	N/A	9.2E-05

Notes

"N/A" - The formula is not appropriate to use for grain size distribution of the sample

Hazen Formula:

$$K = C d_{10}^{\,2}$$

Where:

- K Hydraulic conductivity (cm/sec)
- d_{10} Grain size at which 10% is finer (cm)
- C Coefficient as follows:

Very fine sand, poorly sorted	40-80
Fine sand with appreciable fines	40-80
Medium sand, well sorted	80-120
Coarse sand, poorly sorted	80-120
Coarse sand, well sorted	120-150

Applicability: where $0.1 < d_{10} < 3.0$ mm AND Cu <5

Beyer Formula:

$$K = 6 \times 10^{-4} \frac{g}{v} ln\left(\frac{500}{U}\right) d_{10}^{\,2}$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s^2)
- v Kinematic viscosity of water(1.2×10^{-6} m^2/s)
- d_{10} Grain size at which 10% is finer (m)

Applicability: where $0.06 < d_{10} < 0.6$ mm AND $C_u <= 20$

Kozeny-Carmen Formula:

$$K = \frac{1}{180} \frac{g}{v} \left(\frac{n^3}{(1-n)^2}\right) d_{10}^{\,2}$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s^2)
- v Kinematic viscosity of water(1.2×10^{-6} m^2/s)
- d_{10} Grain size at which 10% is finer (m)

Applicability: where $d_{10} < 3.0$ mm AND $P_1 < 20\%$

Wang Et Al. Formula:

$$K = 2.9 \times 10^{-3} \frac{g}{v} \left(log \frac{g d_{60}^{\,3}}{v^2}\right)^{-1} d_{10}^{\,2}$$

Where:

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s^2)
- v Kinematic viscosity of water(1.2×10^{-6} m^2/s)
- d_{10} Grain size at which 10% is finer (m)
- d_{60} Grain size at which60% is finer (m)

Applicability: where $0.05 < d_{10} < 0.83$ mm, $0.09 < d_{60} < 4.29$ mm, AND $1.3 <$ CU $< 18.3\%$

Kaubisch Formula:

$$K = 10^{0.0005P_2^2 - 0.12P_2 - 3.59}$$

Where:

- K Hydraulic conductivity (m/sec)
- P_2 percent passing .06mm sieve

Applicability: where $5 < C_u < 400$ AND P2 > 20%

References

[1] Craig, R.F. 1992. "Soil Mechanics, Fifth Edition". Chapman and Hill.

[2] Vukovic, M., and Soro, A. 1992. "Determination of Hydraulic Conductivity of Porous Media from Grain-Size Composition"

[3] Duffield, G.M. "Representative Values of Hydraulic Properties" http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm

[4] Cai, Jialiang, Taute, Thomas, Hamann, Enrico, and Schneider, Michael. 2013. " An Integrated Laboratory Method to Measure and Verify Directional Hydraulic conductivity in Fine-to-Medium Sandy Sediments". Groundwater.

Appendix A

Borehole Logs

ID No.: MW101-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

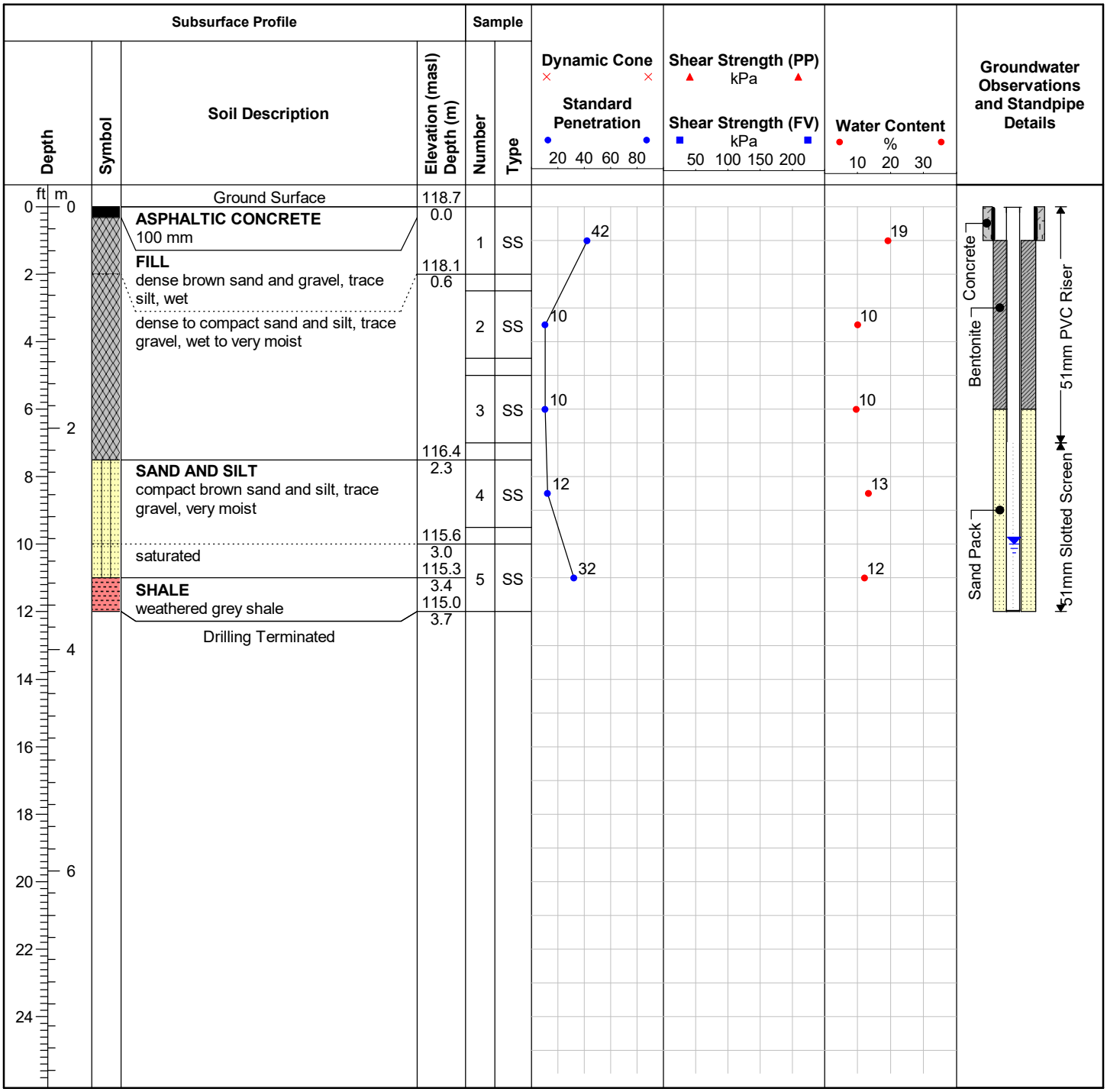
Date Completed: 2/18/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Flushmount



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 1 of 1

Water encountered at 3.1 mbgs (Elevation 115.6masl) during drilling. Water measured at 3.0 mbgs (Elevation 115.7 masl) on March 23, 2022.

ID No.: MW102-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

Date Completed: 2/18/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	118.5					
	FILL compact dark brown sandy silt (topsoil), trace sand, gravel, and organics, very moist (760mm)	0.0	1	SS	10		12
		117.7					
	compact brown sand and silt, trace gravel, moist	0.8	2	SS	11		6
		116.9					
	loose	1.5	3	SS	8		8
2 /		116.2					
	SAND compact brown sand, trace silt and clay, very moist	2.3	4	SS	19		13
		115.6					
	saturated	2.9	5	SS	20		15
		114.6					
4 /	**SHALE** weathered grey shale	3.8	6	SS	50/75mm		
	Drilling Terminated						
6 /							

Groundwater Observations and Standpipe Details: Concrete; Bentonite; Sand Pack; 51mm PVC Riser; 51mm Slotted Screen

Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 1 of 1

Water encountered at 2.9 mbgs (Elevation 115.6 masl) during drilling. Water measured at 2.9 mbgs (Elevation 115.6 masl) on March 22, 2022.

ID No.: BH103-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

Date Completed: 2/15/2022

Drilling Contractor: Geo-Environmental Drilling Inc

Drill Rig: N/A

Drill Method: Pneumatic Pionjar

Protective Cover: N/A

Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
0 ft / 0 m		Ground Surface	117.3						
		Concrete 100 mm	0.0						
		FILL brown gravel, moist		1	SS			4	
2 ft / 2 m		**SILTY SAND** light brown silty sand, trace gravel, moist slight odour	116.7 0.6	2	SS			5	
4 ft / 2 m		Drilling Terminated	116.1 1.2						Bentonite; Dry Cave; Borehole dry upon drilling completion
6 ft									
8 ft									
10 ft									
12 ft									

Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

MTE

Sheet: 1 of 1

ID No.: MW104-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

Date Completed: 2/18/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Flushmount

Depth (ft / m)	Soil Description	Elevation (masl) / Depth (m)	Sample Number	Sample Type	Dynamic Cone / Standard Penetration	Shear Strength (PP) kPa / Shear Strength (FV) kPa	Water Content %
0 / 0	Ground Surface	118.7					
0 / 0	**ASPHALTIC CONCRETE** 100 mm	0.0 / 118.2	1	SS	10		17
2 / 0.5	**FILL** compact brown sand and gravel, trace silt, very moist	0.5 / 117.9					
2 / 0.8	sand and silt, trace gravel		2	SS	18		5
4	sand and gravel, some silt						
6 / 2			3	SS	13		8
8		116.2					
8 / 2.4	**SAND** compact brown sand, trace gravel, silt and clay, moist to very moist		4	SS	11		9
10		115.3					
12 / 3.4	saturated		5	SS	18		14
12		114.9					
12 / 3.8	**SHALE** weathered grey shale		6	SS	50/75mm		
14	Drilling Terminated						
16 / 4							
18							
20 / 6							
22							
24							

Groundwater Observations and Standpipe Details

Concrete

Bentonite

Sand Pack

51mm PVC Riser

51mm Slotted Screen

Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

MTE

Sheet: 1 of 1

Water encountered at 3.4 mbgs (Elevation 115.3 masl) during drilling. Water measured at 3.4 mbgs (Elevation 115.3 masl) on March 22, 2022.

ID No.: MW105-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

Date Completed: 2/15/2022

Drilling Contractor: Geo-Environmental Drilling Inc

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Subsurface Profile				Sample		Dynamic Cone / Standard Penetration	Shear Strength (PP) / Shear Strength (FV)	Water Content	Groundwater Observations and Standpipe Details
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	20 40 60 80	kPa: 50 100 150 200	%: 10 20 30	
0 / 0		Ground Surface	117.8						
		UNSAMPLED Straight drilled to 3.8 mbgs for monitoring well installation	0.0						
			114.0						
		Drilling Terminated	3.8						

Concrete; Bentonite; Sand Pack; 51mm PVC Riser; 51mm Slotted Screen

Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Water measured at 2.8 mbgs (Elevation 115.0 masl) on March 23, 2022.

ID No.: MW107-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

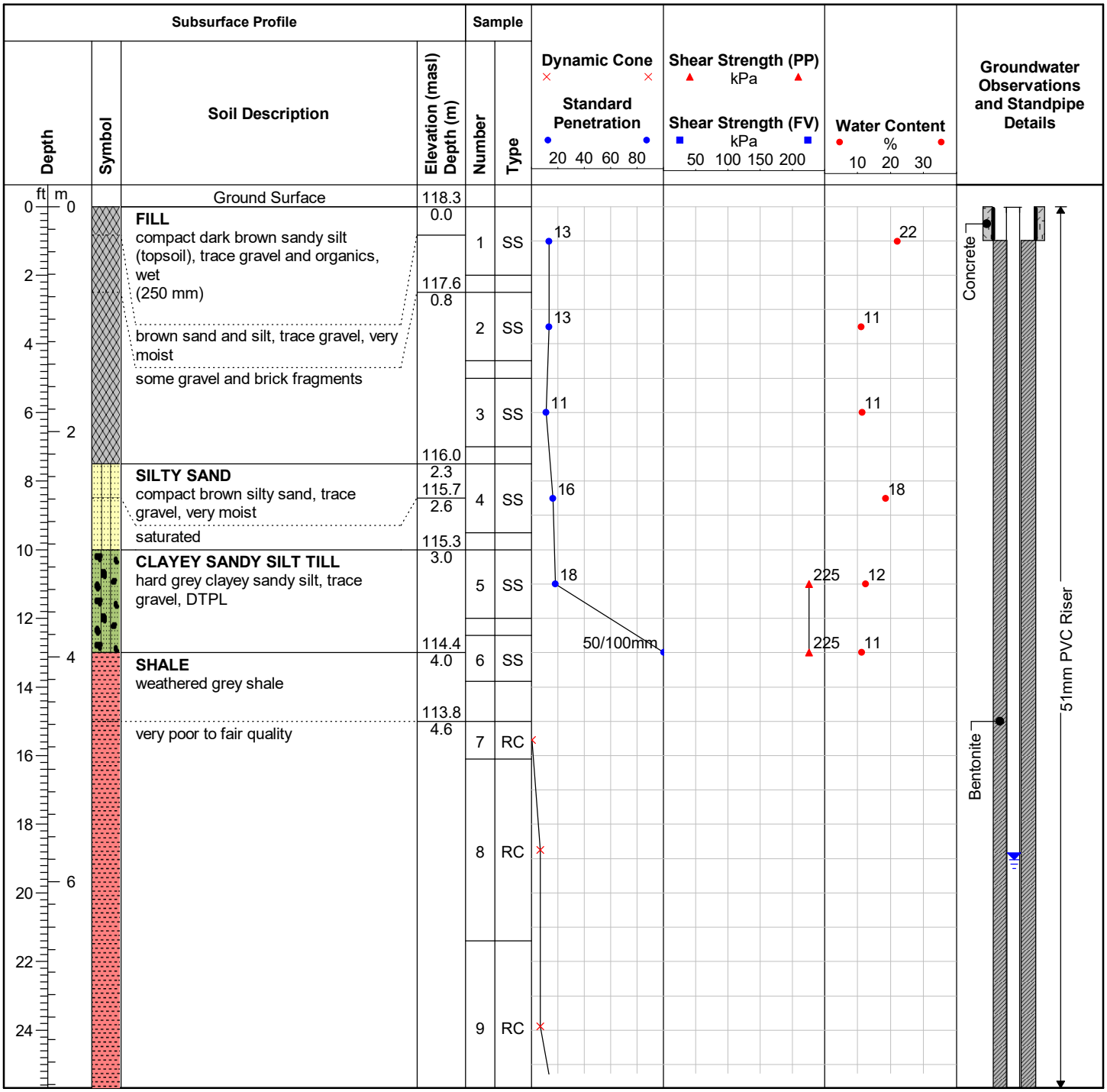
Date Completed: 2/16/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Water encountered at 2.6 mbgs (Elevation 115.7 masl) during drilling. Water measured at 5.8 mbgs (Elevation 112.5 masl) on March 23, 2022.

ID No.: MW107-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

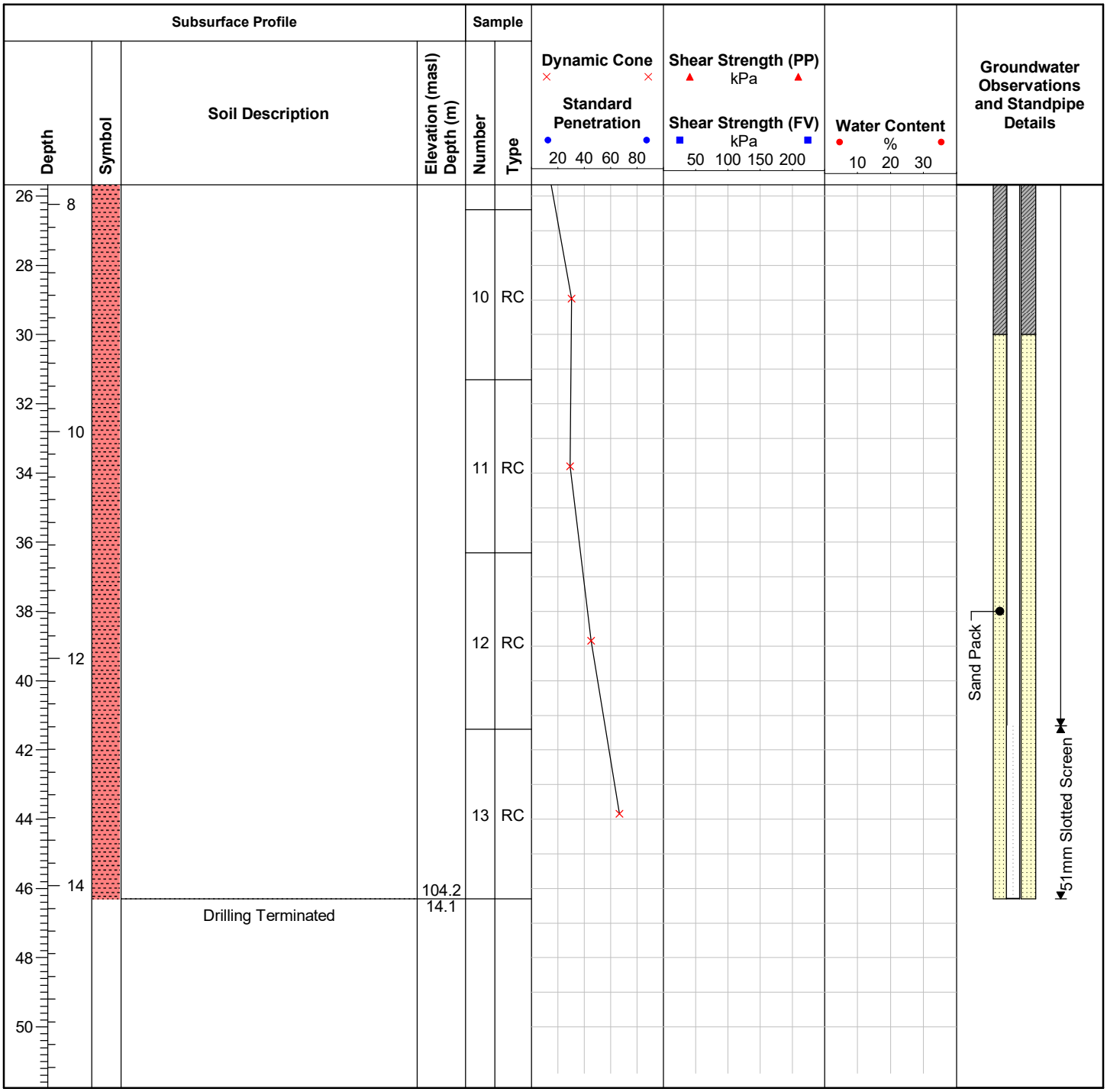
Date Completed: 2/16/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 2 of 2

Water encountered at 2.6 mbgs (Elevation 115.7 masl) during drilling. Water measured at 5.8 mbgs (Elevation 112.5 masl) on March 23, 2022.

ID No.: MW108-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

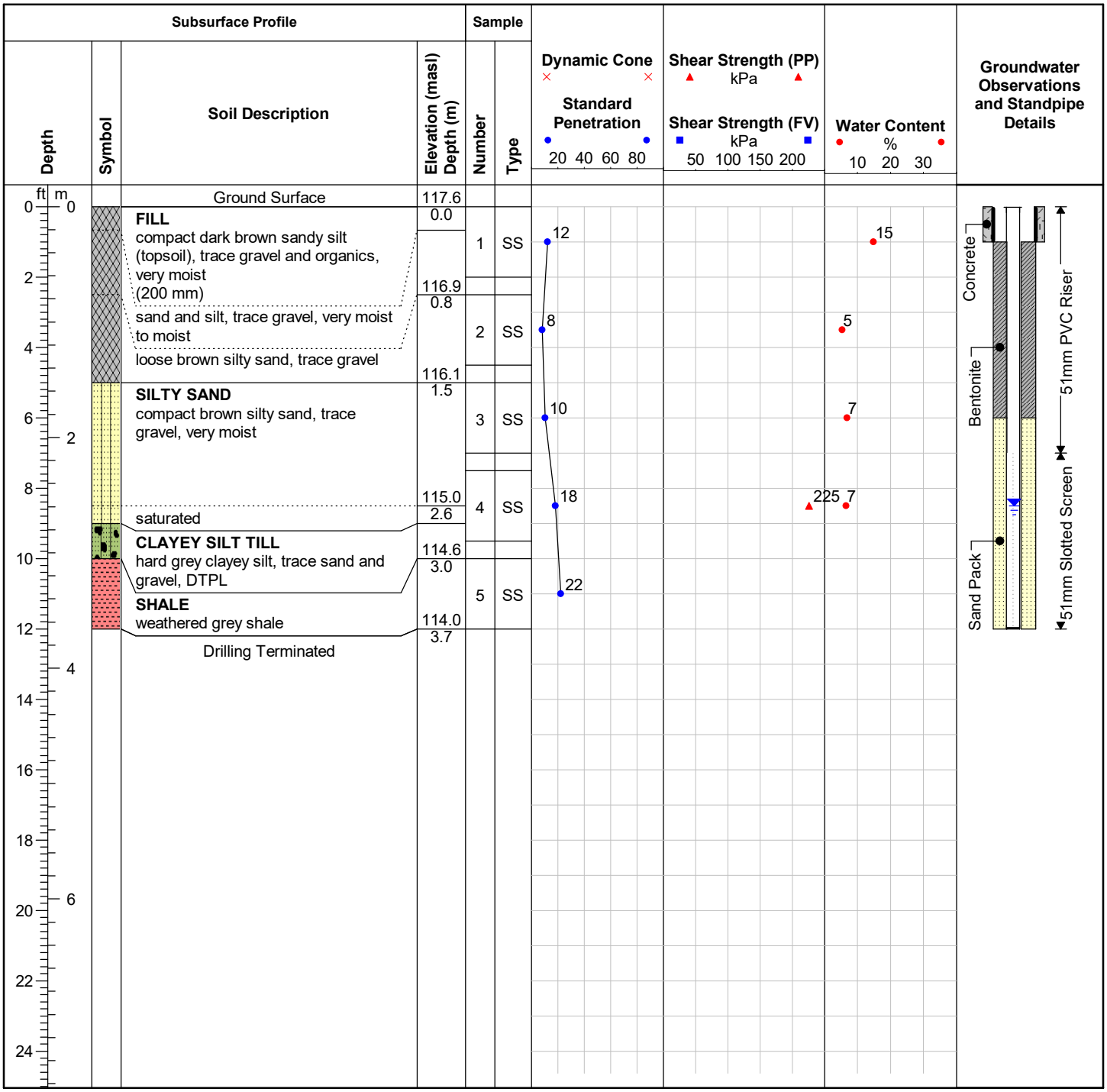
Date Completed: 2/15/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

MTE

Sheet: 1 of 1

Water encountered at 2.6 mbgs (Elevation 115.0 masl) during drilling. Water measured at 2.5 mbgs (Elevation 115.1 masl) on March 23, 2022.

ID No.: MW109-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

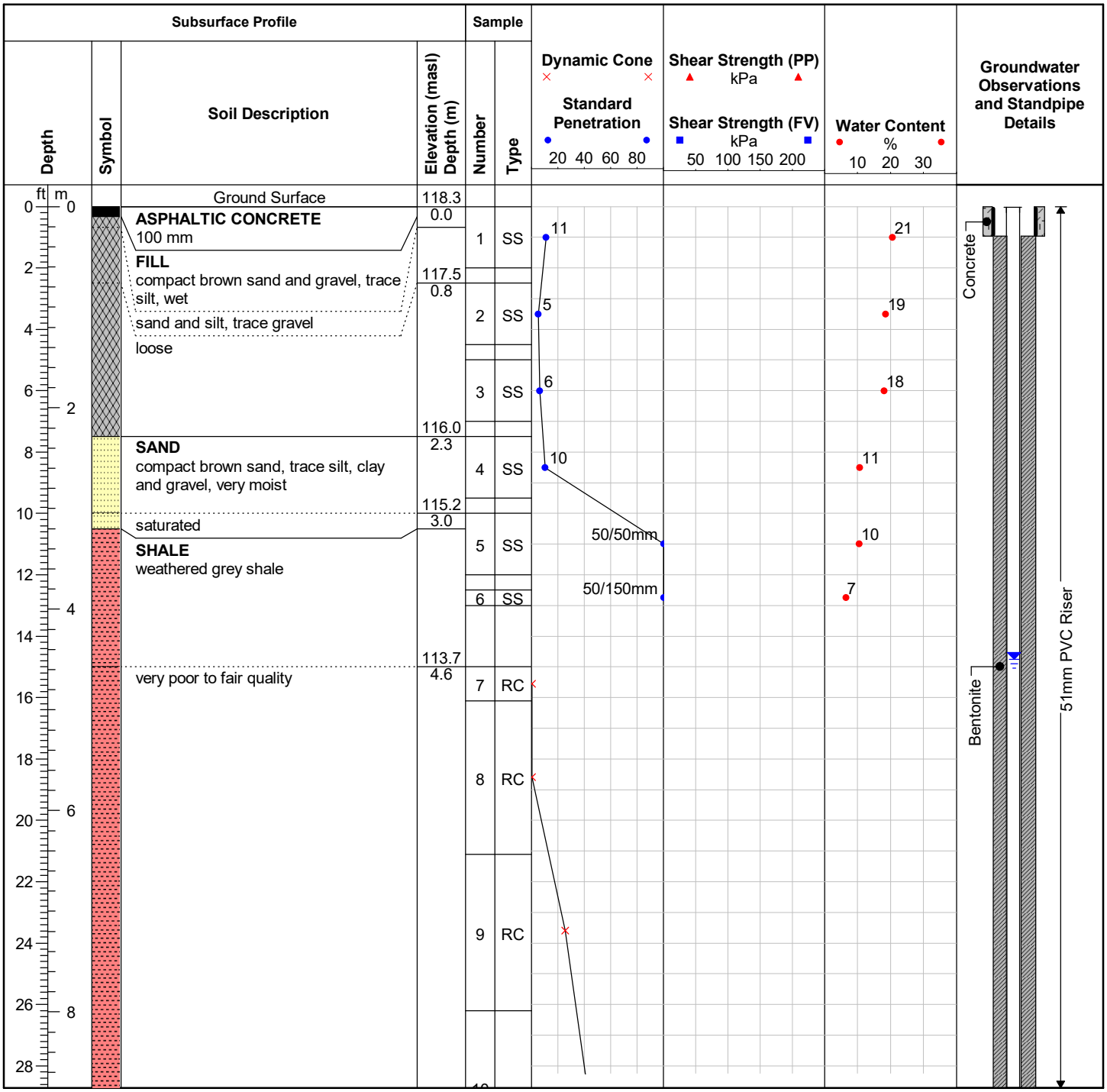
Date Completed: 2/17/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Water encountered at 3.1 mbgs (Elevation 115.2 masl) during drilling. Water measured at 4.5 mbgs (Elevation 113.8 masl) on March 9, 2022.

ID No.: MW109-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

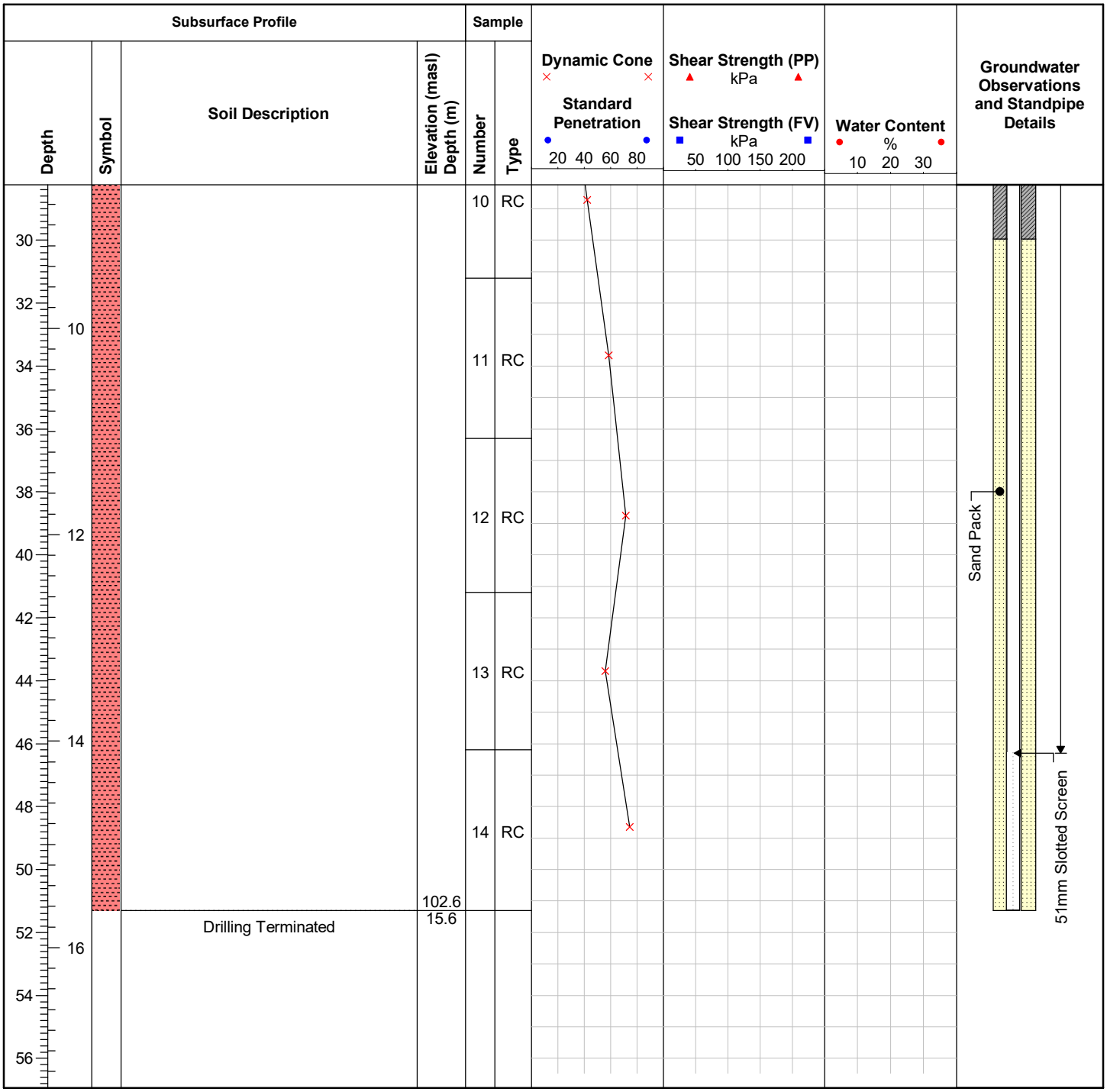
Date Completed: 2/17/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: Monument Casing



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 2 of 2

Water encountered at 3.1 mbgs (Elevation 115.2 masl) during drilling. Water measured at 4.5 mbgs (Elevation 113.8 masl) on March 9, 2022.

ID No.: BH110-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

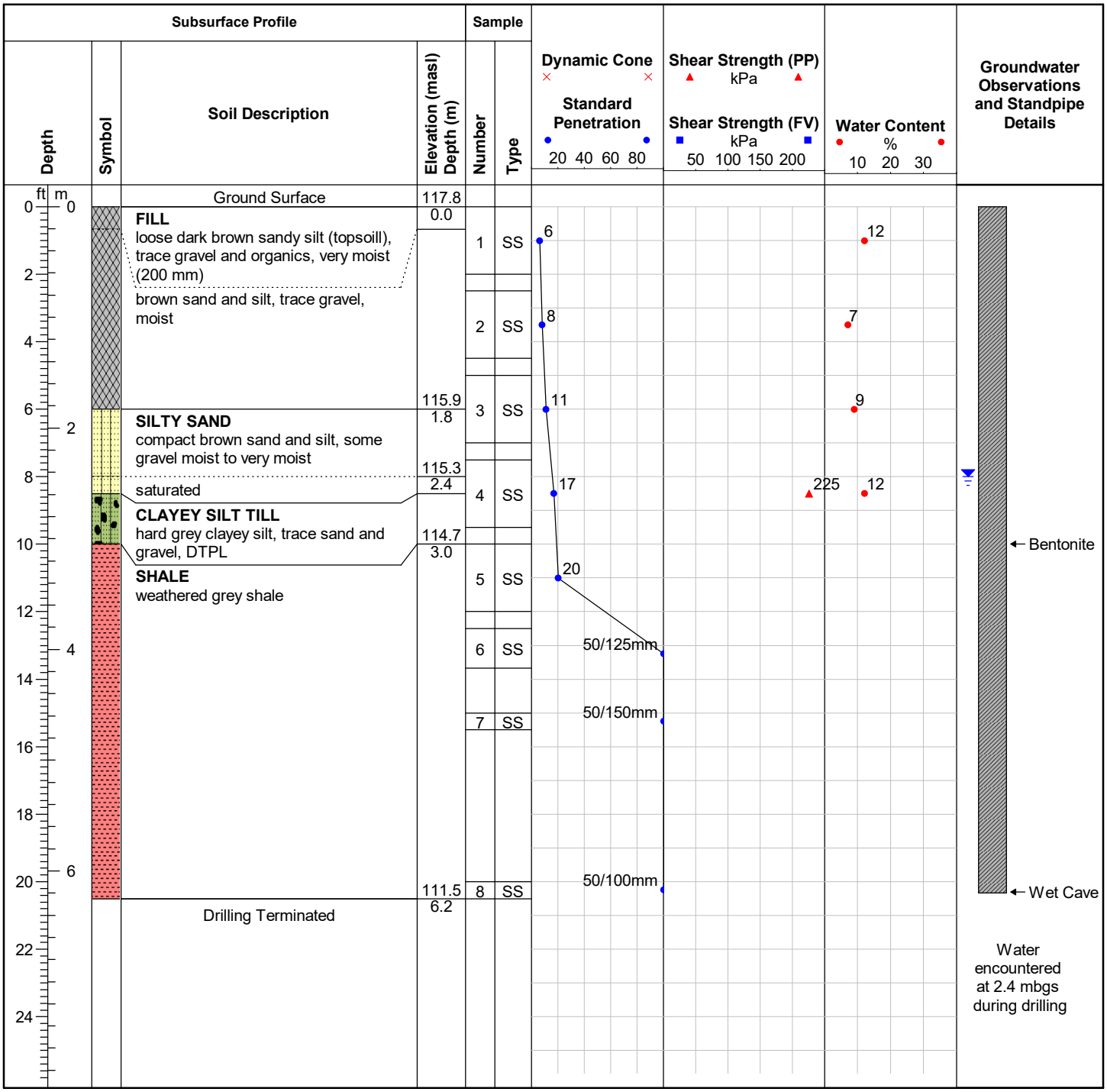
Date Completed: 2/15/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 1 of 1

ID No.: BH111-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

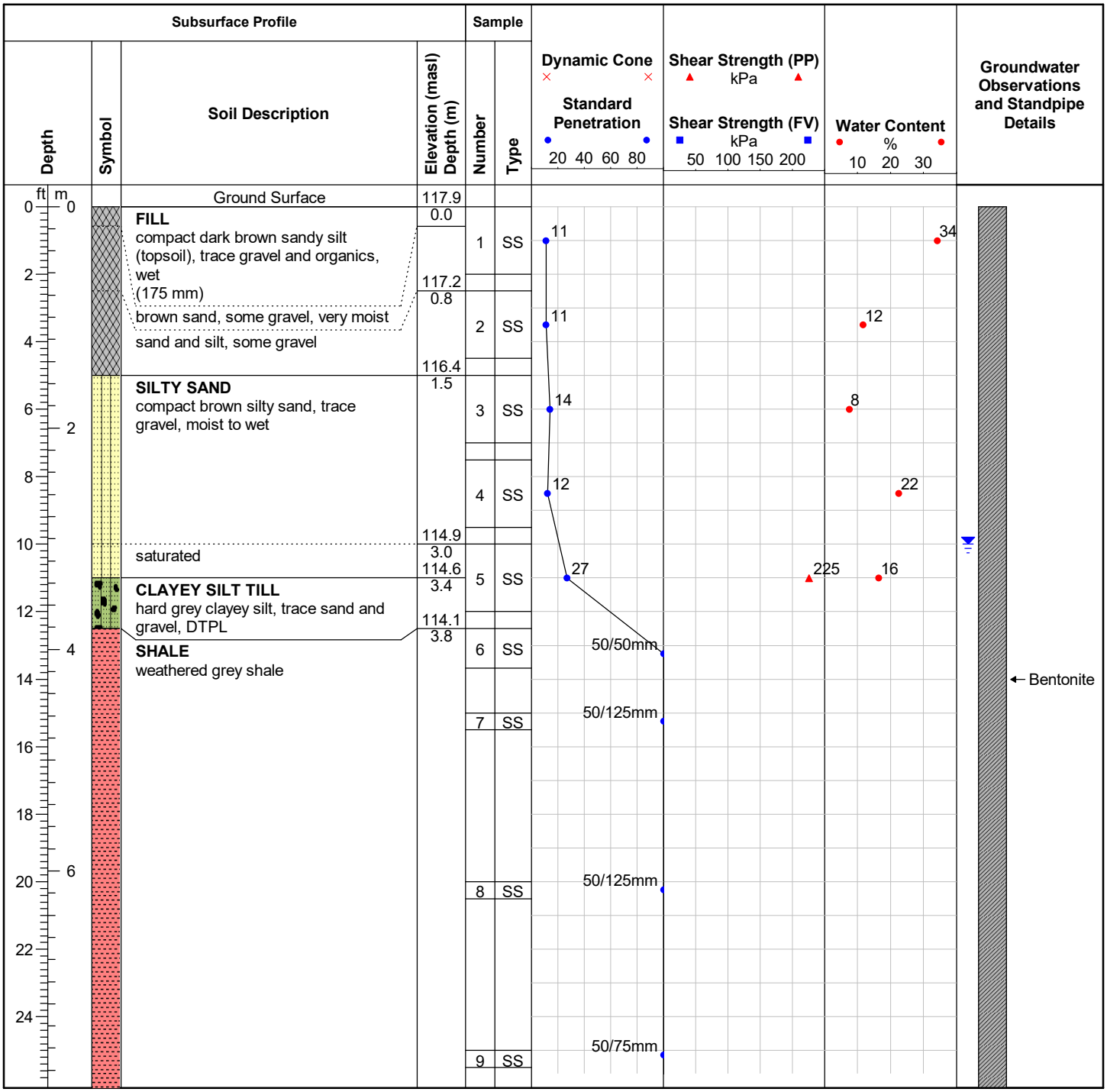
Date Completed: 2/14/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: HXS

Reviewed by: KRD

Sheet: 1 of 2

ID No.: BH111-22

Project Name: Proposed Mixed-Use Development

MTE File No.: 50347-100

Client: Clearbrook Developments Ltd.

Site Location: 3115 Hurontario Street, Mississauga, Ontario

Date Completed: 2/14/2022

Drilling Contractor: Geo-Environmental Drilling Inc.

Drill Rig: LC 55

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Subsurface Profile				Sample		Dynamic Cone / Standard Penetration	Shear Strength (PP) / Shear Strength (FV)	Water Content	Groundwater Observations and Standpipe Details
Depth	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	× / • 20 40 60 80	▲ / ■ kPa 50 100 150 200	• % 10 20 30	
8									Wet Cave
									Water encountered at 3.1 mbgs during drilling
			108.6	10	SS	50/75mm			
		Drilling Terminated	9.3						
10									
12									
14									

26 28 30 32 34 36 38 40 42 44 46 48 50

Field Technician: HXS

Drafted by: HXS

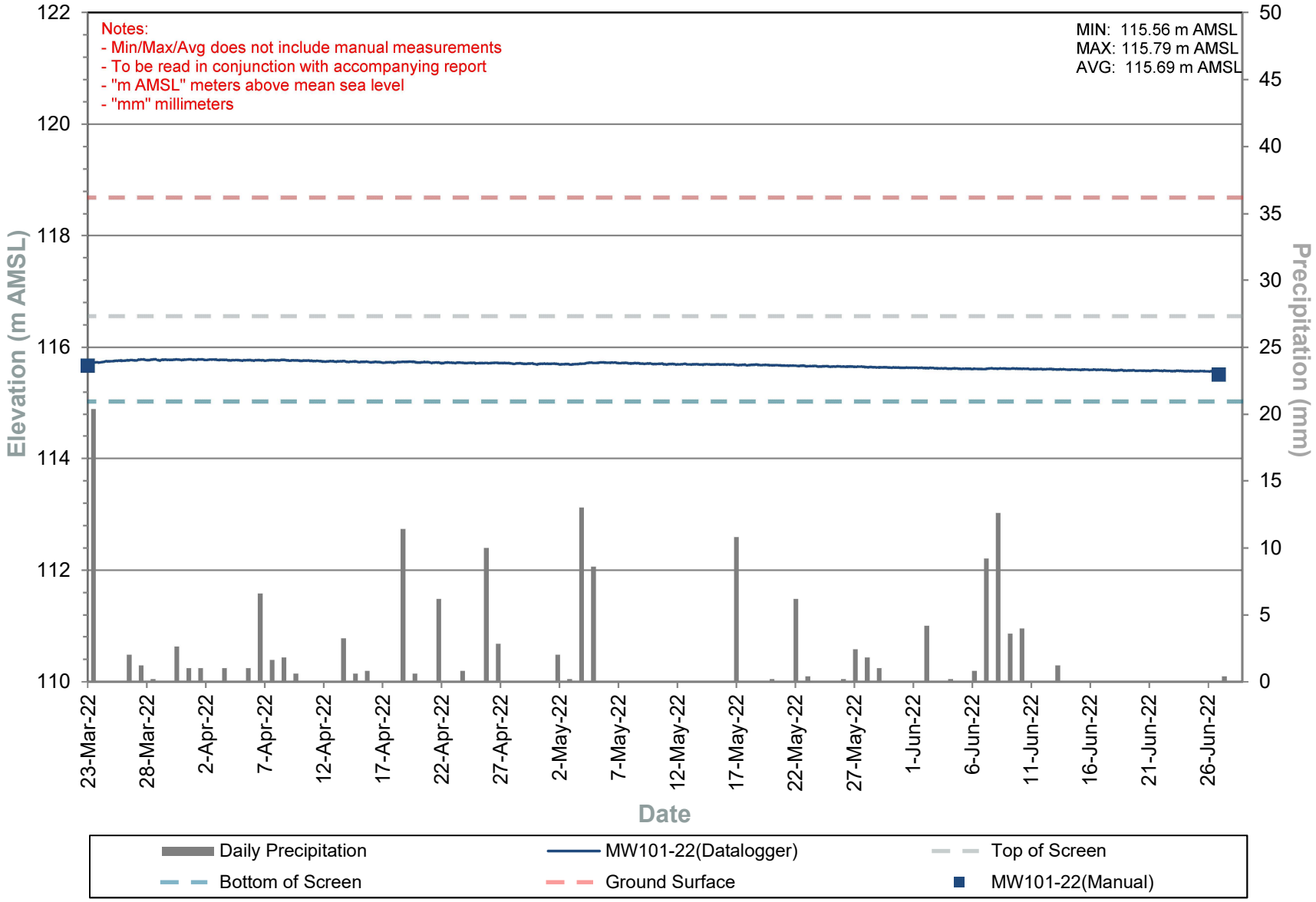
Reviewed by: KRD

MTE

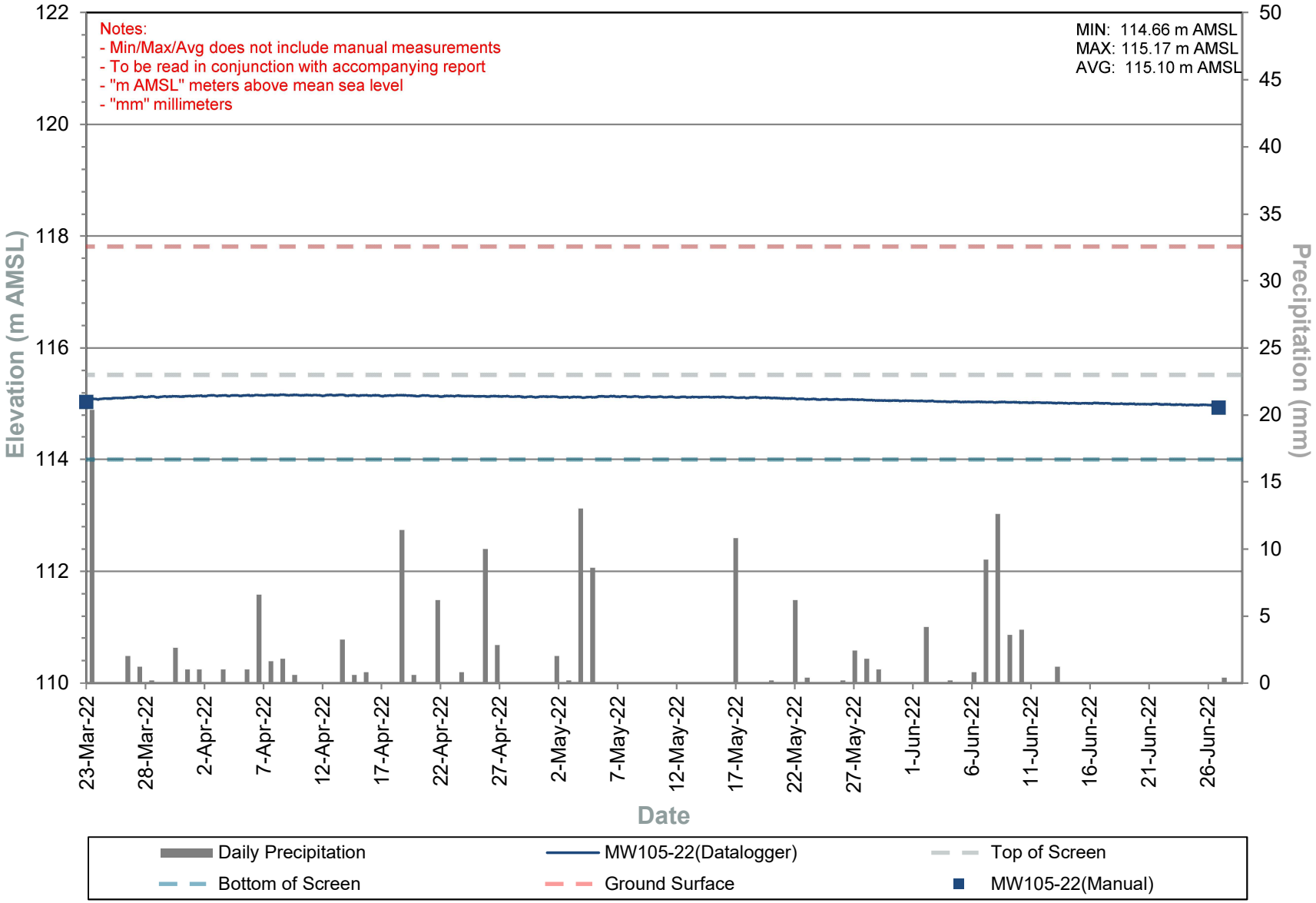
Appendix B

Hydrographs

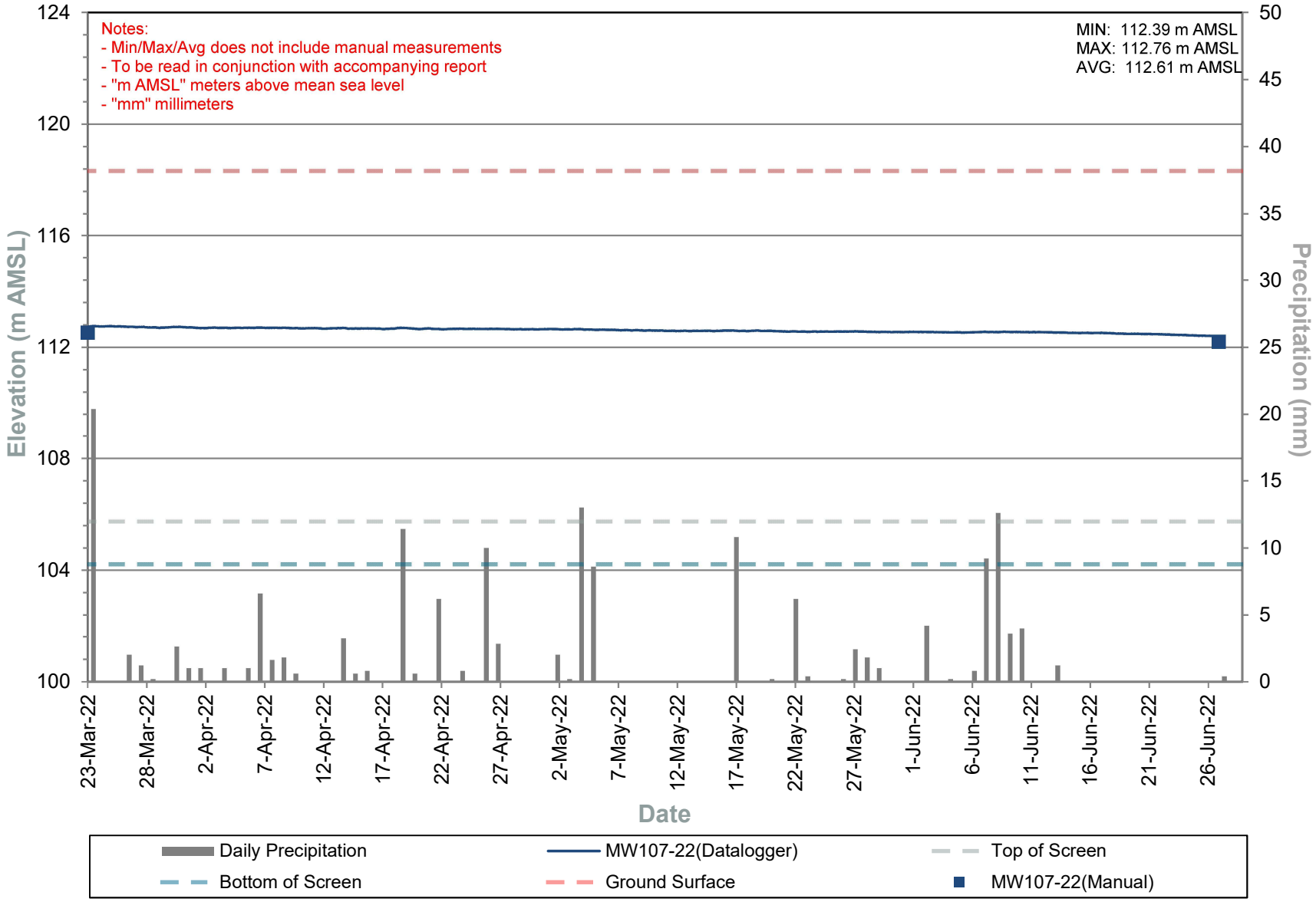
Hydrograph 1: Groundwater Elevations - MW101-22



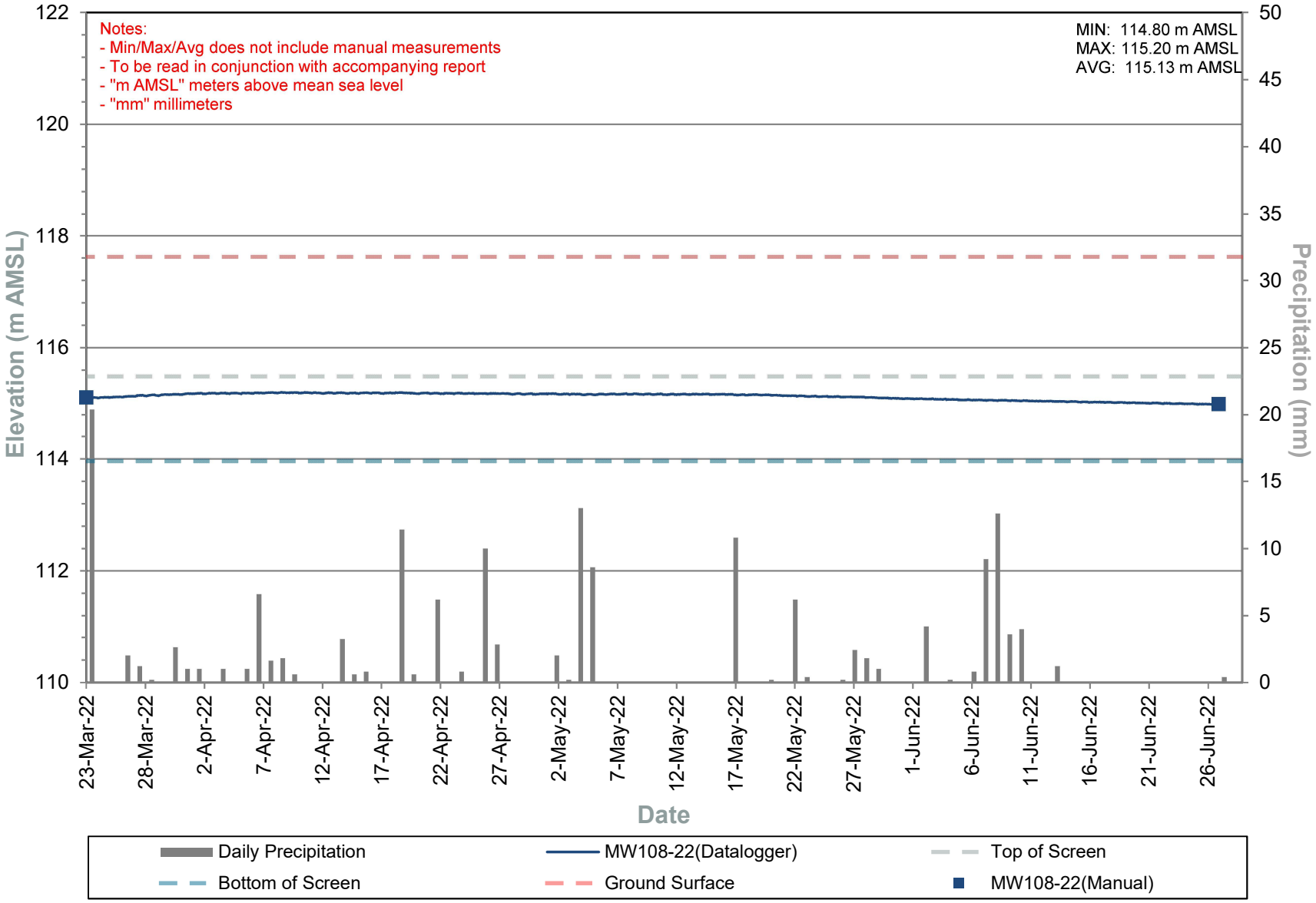
Hydrograph 2: Groundwater Elevations - MW105-22



Hydrograph 3: Groundwater Elevations - MW107-22



Hydrograph 4: Groundwater Elevations - MW108-22



Appendix C

Laboratory Certificates of Analysis

Your Project #: 50347-100
Your C.O.C. #: 869351-01-01

Attention: Alison Schincariol

MTE Consultants Inc
520 Bingemans Centre Dr
Kitchener, ON
CANADA N2B 3X9

Report Date: 2022/07/13
Report #: R7208691
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C275443
Received: 2022/03/22, 18:00

Sample Matrix: Water
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
ABN Compounds in Water by GC/MS	1	2022/03/29	2022/03/29	CAM SOP-00301	EPA 8270 m
ABN Compounds in Water by GC/MS	1	2022/03/29	2022/03/30	CAM SOP-00301	EPA 8270 m
Carbonaceous BOD	2	2022/03/25	2022/03/30	CAM SOP-00427	SM 23 5210B m
Total Cyanide	2	2022/03/24	2022/03/24	CAM SOP-00457	OMOE E3015 5 m
Fluoride	2	2022/03/23	2022/03/25	CAM SOP-00449	SM 23 4500-F C m
Mercury in Water by CVAA	2	2022/03/24	2022/03/24	CAM SOP-00453	EPA 7470A m
Total Metals Analysis by ICPMS	2	N/A	2022/03/29	CAM SOP-00447	EPA 6020B m
E.coli, (CFU/100mL)	2	N/A	2022/03/22	CAM SOP-00552	MOE LSB E3371
Total Nonylphenol in Liquids by HPLC	2	2022/03/29	2022/03/30	CAM SOP-00313	In-house Method
Nonylphenol Ethoxylates in Liquids: HPLC	2	2022/03/29	2022/03/30	CAM SOP-00313	BV Labs Method
Animal and Vegetable Oil and Grease	2	N/A	2022/03/28	CAM SOP-00326	EPA1664B m,SM5520B m
Total Oil and Grease	2	2022/03/26	2022/03/26	CAM SOP-00326	EPA1664B m,SM5520B m
Polychlorinated Biphenyl in Water	2	2022/03/25	2022/03/27	CAM SOP-00309	EPA 8082A m
pH	2	2022/03/23	2022/03/25	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	2	N/A	2022/03/23	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	2	N/A	2022/03/24	CAM SOP-00464	EPA 375.4 m
Total Kjeldahl Nitrogen in Water	1	2022/03/24	2022/03/25	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water	1	2022/03/24	2022/03/28	CAM SOP-00938	OMOE E3516 m
Mineral/Synthetic O & G (TPH Heavy Oil) (1)	2	2022/03/26	2022/03/26	CAM SOP-00326	EPA1664B m,SM5520F m
Total Suspended Solids	2	2022/03/24	2022/03/28	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	2	N/A	2022/03/24	CAM SOP-00228	EPA 8260C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 50347-100
Your C.O.C. #: 869351-01-01

Attention: Alison Schincariol

MTE Consultants Inc
520 Bingemans Centre Dr
Kitchener, ON
CANADA N2B 3X9

Report Date: 2022/07/13
Report #: R7208691
Version: 3 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C275443
Received: 2022/03/22, 18:00

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Note: TPH (Heavy Oil) is equivalent to Mineral / Synthetic Oil & Grease

Encryption Key

Ronklin Gracian
Project Manager
13 Jul 2022 14:55:55

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752
==========
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

Bureau Veritas Job #: C275443
Report Date: 2022/07/13

MTE Consultants Inc
Client Project #: 50347-100
Sampler Initials: KDH

PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU710		
Sampling Date					2022/03/22 14:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW104-22**	**RDL**	**QC Batch**
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	150	-	-	0.50	0.50	7896205
Inorganics							
Total Carbonaceous BOD	mg/L	300	15	-	<2	2	7903215
Fluoride (F-)	mg/L	10	-	-	<0.10	0.10	7900340
Total Kjeldahl Nitrogen (TKN)	mg/L	100	1	-	1.0	0.10	7901641
pH	pH	5.5:10.0	6.0:9.0	6:9	7.66		7900342
Phenols-4AAP	mg/L	1	0.008	0.008	<0.0010	0.0010	7899402
Total Suspended Solids	mg/L	350	15	15	**16**	10	7900001
Dissolved Sulphate (SO4)	mg/L	1500	-	-	100	1.0	7900519
Total Cyanide (CN)	mg/L	2	0.02	0.02	<0.0050	0.0050	7901118
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	-	-	-	1.4	0.50	7905655
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	-	0.90	0.50	7905657
Miscellaneous Parameters							
Nonylphenol Ethoxylate (Total)	mg/L	0.2	-	-	<0.025	0.025	7910361
Nonylphenol (Total)	mg/L	0.02	-	-	<0.001	0.001	7910313
Metals							
Mercury (Hg)	mg/L	0.01	0.0004	0.0004	<0.00010	0.00010	7900884
Total Aluminum (Al)	ug/L	50000	-	1000	58	4.9	7906986
Total Antimony (Sb)	ug/L	5000	-	-	<0.50	0.50	7906986
Total Arsenic (As)	ug/L	1000	20	20	<1.0	1.0	7906986
Total Cadmium (Cd)	ug/L	700	8	8	<0.090	0.090	7906986
Total Chromium (Cr)	ug/L	5000	80	80	<5.0	5.0	7906986
Total Cobalt (Co)	ug/L	5000	-	-	<0.50	0.50	7906986
Total Copper (Cu)	ug/L	3000	50	40	<0.90	0.90	7906986
Total Lead (Pb)	ug/L	3000	120	120	<0.50	0.50	7906986
Total Manganese (Mn)	ug/L	5000	50	2000	**250**	2.0	7906986
Total Molybdenum (Mo)	ug/L	5000	-	-	0.60	0.50	7906986
Total Nickel (Ni)	ug/L	3000	80	80	<1.0	1.0	7906986
Total Phosphorus (P)	ug/L	10000	-	400	<100	100	7906986

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU710		
Sampling Date					2022/03/22 14:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW104-22**	**RDL**	**QC Batch**
Total Selenium (Se)	ug/L	1000	20	20	<2.0	2.0	7906986
Total Silver (Ag)	ug/L	5000	120	120	<0.090	0.090	7906986
Total Tin (Sn)	ug/L	5000	-	-	<1.0	1.0	7906986
Total Titanium (Ti)	ug/L	5000	-	-	<5.0	5.0	7906986
Total Zinc (Zn)	ug/L	3000	40	200	<5.0	5.0	7906986
Semivolatile Organics							
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	-	<2.0	2.0	7908870
Di-N-butyl phthalate	ug/L	80	15	-	<2.0	2.0	7908870
Volatile Organics							
Benzene	ug/L	10	2	2	<0.40	0.40	7898454
Chloroform	ug/L	40	2	-	<0.40	0.40	7898454
1,2-Dichlorobenzene	ug/L	50	5.6	5.6	<0.80	0.80	7898454
1,4-Dichlorobenzene	ug/L	80	6.8	6.8	<0.80	0.80	7898454
cis-1,2-Dichloroethylene	ug/L	4000	5.6	-	<1.0	1.0	7898454
trans-1,3-Dichloropropene	ug/L	140	5.6	-	<0.80	0.80	7898454
Ethylbenzene	ug/L	160	2	2	<0.40	0.40	7898454
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	5.2	<4.0	4.0	7898454
Methyl Ethyl Ketone (2-Butanone)	ug/L	8000	-	-	<20	20	7898454
Styrene	ug/L	200	-	-	<0.80	0.80	7898454
1,1,2,2-Tetrachloroethane	ug/L	1400	17	17	<0.80	0.80	7898454
Tetrachloroethylene	ug/L	1000	4.4	4.4	<0.40	0.40	7898454
Toluene	ug/L	270	2	2	<0.40	0.40	7898454
Trichloroethylene	ug/L	400	8	7.6	<0.40	0.40	7898454
p+m-Xylene	ug/L	-	-	-	<0.40	0.40	7898454
o-Xylene	ug/L	-	-	-	<0.40	0.40	7898454
Total Xylenes	ug/L	1400	4.4	4.4	<0.40	0.40	7898454
PCBs							
Total PCB	ug/L	1	0.4	0.4	<0.05	0.05	7905141
Microbiological							
Escherichia coli	CFU/100mL	-	200	200	<10	10	7897948

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU710		
Sampling Date					2022/03/22 14:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW104-22**	**RDL**	**QC Batch**
Surrogate Recovery (%)							
2,4,6-Tribromophenol	%	-	-	-	73		7908870
2-Fluorobiphenyl	%	-	-	-	45		7908870
2-Fluorophenol	%	-	-	-	25		7908870
D14-Terphenyl	%	-	-	-	86		7908870
D5-Nitrobenzene	%	-	-	-	49		7908870
D5-Phenol	%	-	-	-	15		7908870
Decachlorobiphenyl	%	-	-	-	81		7905141
4-Bromofluorobenzene	%	-	-	-	94		7898454
D4-1,2-Dichloroethane	%	-	-	-	107		7898454
D8-Toluene	%	-	-	-	92		7898454

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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Bureau Veritas Job #: C275443
Report Date: 2022/07/13

MTE Consultants Inc
Client Project #: 50347-100
Sampler Initials: KDH

PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU710		
Sampling Date					2022/03/22 14:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW104-22 Lab-Dup**	**RDL**	**QC Batch**
Inorganics							
Total Kjeldahl Nitrogen (TKN)	mg/L	100	1	-	**1.1**	0.10	7901641
Miscellaneous Parameters							
Nonylphenol Ethoxylate (Total)	mg/L	0.2	-	-	<0.025	0.025	7910361
PCBs							
Total PCB	ug/L	1	0.4	0.4	<0.05	0.05	7905141
Surrogate Recovery (%)							
Decachlorobiphenyl	%	-	-	-	93		7905141

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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Bureau Veritas Job #: C275443
Report Date: 2022/07/13

MTE Consultants Inc
Client Project #: 50347-100
Sampler Initials: KDH

PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU711		
Sampling Date					2022/03/22 16:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW109-22**	**RDL**	**QC Batch**
Calculated Parameters							
Total Animal/Vegetable Oil and Grease	mg/L	150	-	-	0.70	0.50	7896205
Inorganics							
Total Carbonaceous BOD	mg/L	300	15	-	<2	2	7903215
Fluoride (F-)	mg/L	10	-	-	0.95	0.10	7900340
Total Kjeldahl Nitrogen (TKN)	mg/L	100	1	-	**5.3**	0.20	7901360
pH	pH	5.5:10.0	6.0:9.0	6:9	7.96		7900342
Phenols-4AAP	mg/L	1	0.008	0.008	<0.0010	0.0010	7899402
Total Suspended Solids	mg/L	350	15	15	**210**	10	7900001
Dissolved Sulphate (SO4)	mg/L	1500	-	-	250	1.0	7899457
Total Cyanide (CN)	mg/L	2	0.02	0.02	0.015	0.0050	7901118
Petroleum Hydrocarbons							
Total Oil & Grease	mg/L	-	-	-	0.70	0.50	7905655
Total Oil & Grease Mineral/Synthetic	mg/L	15	-	-	<0.50	0.50	7905657
Miscellaneous Parameters							
Nonylphenol Ethoxylate (Total)	mg/L	0.2	-	-	<0.025	0.025	7910361
Nonylphenol (Total)	mg/L	0.02	-	-	<0.001	0.001	7910313
Metals							
Mercury (Hg)	mg/L	0.01	0.0004	0.0004	<0.00010	0.00010	7900884
Total Aluminum (Al)	ug/L	50000	-	1000	**4000**	4.9	7906986
Total Antimony (Sb)	ug/L	5000	-	-	<0.50	0.50	7906986
Total Arsenic (As)	ug/L	1000	20	20	2.4	1.0	7906986
Total Cadmium (Cd)	ug/L	700	8	8	<0.090	0.090	7906986
Total Chromium (Cr)	ug/L	5000	80	80	8.6	5.0	7906986
Total Cobalt (Co)	ug/L	5000	-	-	3.3	0.50	7906986
Total Copper (Cu)	ug/L	3000	50	40	14	0.90	7906986
Total Lead (Pb)	ug/L	3000	120	120	1.7	0.50	7906986
Total Manganese (Mn)	ug/L	5000	50	2000	**330**	2.0	7906986
Total Molybdenum (Mo)	ug/L	5000	-	-	2.9	0.50	7906986
Total Nickel (Ni)	ug/L	3000	80	80	7.0	1.0	7906986
Total Phosphorus (P)	ug/L	10000	-	400	**620**	100	7906986

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU711		
Sampling Date					2022/03/22 16:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW109-22**	**RDL**	**QC Batch**
Total Selenium (Se)	ug/L	1000	20	20	<2.0	2.0	7906986
Total Silver (Ag)	ug/L	5000	120	120	0.95	0.090	7906986
Total Tin (Sn)	ug/L	5000	-	-	1.5	1.0	7906986
Total Titanium (Ti)	ug/L	5000	-	-	43	5.0	7906986
Total Zinc (Zn)	ug/L	3000	40	200	39	5.0	7906986
Semivolatile Organics							
Bis(2-ethylhexyl)phthalate	ug/L	12	8.8	-	<2.0	2.0	7908870
Di-N-butyl phthalate	ug/L	80	15	-	<2.0	2.0	7908870
Volatile Organics							
Benzene	ug/L	10	2	2	<0.40	0.40	7898454
Chloroform	ug/L	40	2	-	<0.40	0.40	7898454
1,2-Dichlorobenzene	ug/L	50	5.6	5.6	<0.80	0.80	7898454
1,4-Dichlorobenzene	ug/L	80	6.8	6.8	<0.80	0.80	7898454
cis-1,2-Dichloroethylene	ug/L	4000	5.6	-	<1.0	1.0	7898454
trans-1,3-Dichloropropene	ug/L	140	5.6	-	<0.80	0.80	7898454
Ethylbenzene	ug/L	160	2	2	<0.40	0.40	7898454
Methylene Chloride(Dichloromethane)	ug/L	2000	5.2	5.2	<4.0	4.0	7898454
Methyl Ethyl Ketone (2-Butanone)	ug/L	8000	-	-	<20	20	7898454
Styrene	ug/L	200	-	-	<0.80	0.80	7898454
1,1,2,2-Tetrachloroethane	ug/L	1400	17	17	<0.80	0.80	7898454
Tetrachloroethylene	ug/L	1000	4.4	4.4	<0.40	0.40	7898454
Toluene	ug/L	270	2	2	<0.40	0.40	7898454
Trichloroethylene	ug/L	400	8	7.6	<0.40	0.40	7898454
p+m-Xylene	ug/L	-	-	-	<0.40	0.40	7898454
o-Xylene	ug/L	-	-	-	<0.40	0.40	7898454
Total Xylenes	ug/L	1400	4.4	4.4	<0.40	0.40	7898454
PCBs							
Total PCB	ug/L	1	0.4	0.4	<0.05	0.05	7905141
Microbiological							
Escherichia coli	CFU/100mL	-	200	200	<10	10	7897948

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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PEEL SANITARY & STORM SEWER (53-2010)

Bureau Veritas ID					SDU711		
Sampling Date					2022/03/22 16:30		
COC Number					869351-01-01		
	UNITS	**Criteria**	**Criteria B**	**Criteria-2**	**MW109-22**	**RDL**	**QC Batch**
Surrogate Recovery (%)							
2,4,6-Tribromophenol	%	-	-	-	99		7908870
2-Fluorobiphenyl	%	-	-	-	71		7908870
2-Fluorophenol	%	-	-	-	44		7908870
D14-Terphenyl	%	-	-	-	99		7908870
D5-Nitrobenzene	%	-	-	-	81		7908870
D5-Phenol	%	-	-	-	28		7908870
Decachlorobiphenyl	%	-	-	-	84		7905141
4-Bromofluorobenzene	%	-	-	-	93		7898454
D4-1,2-Dichloroethane	%	-	-	-	106		7898454
D8-Toluene	%	-	-	-	93		7898454

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria,Criteria B: Peel Region Combined 2010 sewer by law Sanitary and Storm respectively
Criteria-2: City of Mississauga Storm Sewer Use By-Law 0046-2022

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TEST SUMMARY

Bureau Veritas ID: SDU710
Sample ID: MW104-22
Matrix: Water

Collected: 2022/03/22
Shipped:
Received: 2022/03/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
ABN Compounds in Water by GC/MS	GC/MS	7908870	2022/03/29	2022/03/29	Anh Lieu
Carbonaceous BOD	DO	7903215	2022/03/25	2022/03/30	Nusrat Naz
Total Cyanide	SKAL/CN	7901118	2022/03/24	2022/03/24	Aditiben Patel
Fluoride	ISE	7900340	2022/03/23	2022/03/25	Surinder Rai
Mercury in Water by CVAA	CV/AA	7900884	2022/03/24	2022/03/24	Indira HarryPaul
Total Metals Analysis by ICPMS	ICP/MS	7906986	N/A	2022/03/29	Arefa Dabhad
E.coli, (CFU/100mL)	PL	7897948	N/A	2022/03/22	Sonja Elavinamannil
Total Nonylphenol in Liquids by HPLC	LC/FLU	7910313	2022/03/29	2022/03/30	Furneesh Kumar
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7910361	2022/03/29	2022/03/30	Furneesh Kumar
Animal and Vegetable Oil and Grease	BAL	7896205	N/A	2022/03/28	Automated Statchk
Total Oil and Grease	BAL	7905655	2022/03/26	2022/03/26	Atinder Singh
Polychlorinated Biphenyl in Water	GC/ECD	7905141	2022/03/25	2022/03/27	Joy Zhang
pH	AT	7900342	2022/03/23	2022/03/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	7899402	N/A	2022/03/23	Shivani Shivani
Sulphate by Automated Colourimetry	KONE	7900519	N/A	2022/03/24	Avneet Kour Sudan
Total Kjeldahl Nitrogen in Water	SKAL	7901641	2022/03/24	2022/03/25	Massarat Jan
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	7905657	2022/03/26	2022/03/26	Atinder Singh
Total Suspended Solids	BAL	7900001	2022/03/24	2022/03/28	Shaneil Hall
Volatile Organic Compounds in Water	GC/MS	7898454	N/A	2022/03/24	Manpreet Sarao

Bureau Veritas ID: SDU710 Dup
Sample ID: MW104-22
Matrix: Water

Collected: 2022/03/22
Shipped:
Received: 2022/03/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7910361	2022/03/29	2022/03/30	Furneesh Kumar
Polychlorinated Biphenyl in Water	GC/ECD	7905141	2022/03/25	2022/03/27	Joy Zhang
Total Kjeldahl Nitrogen in Water	SKAL	7901641	2022/03/24	2022/03/25	Massarat Jan

Bureau Veritas ID: SDU711
Sample ID: MW109-22
Matrix: Water

Collected: 2022/03/22
Shipped:
Received: 2022/03/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
ABN Compounds in Water by GC/MS	GC/MS	7908870	2022/03/29	2022/03/30	Anh Lieu
Carbonaceous BOD	DO	7903215	2022/03/25	2022/03/30	Nusrat Naz
Total Cyanide	SKAL/CN	7901118	2022/03/24	2022/03/24	Aditiben Patel
Fluoride	ISE	7900340	2022/03/23	2022/03/25	Surinder Rai
Mercury in Water by CVAA	CV/AA	7900884	2022/03/24	2022/03/24	Indira HarryPaul
Total Metals Analysis by ICPMS	ICP/MS	7906986	N/A	2022/03/29	Arefa Dabhad
E.coli, (CFU/100mL)	PL	7897948	N/A	2022/03/22	Sonja Elavinamannil
Total Nonylphenol in Liquids by HPLC	LC/FLU	7910313	2022/03/29	2022/03/30	Furneesh Kumar
Nonylphenol Ethoxylates in Liquids: HPLC	LC/FLU	7910361	2022/03/29	2022/03/30	Furneesh Kumar
Animal and Vegetable Oil and Grease	BAL	7896205	N/A	2022/03/28	Automated Statchk
Total Oil and Grease	BAL	7905655	2022/03/26	2022/03/26	Atinder Singh

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Bureau Veritas Job #: C275443
Report Date: 2022/07/13

MTE Consultants Inc
Client Project #: 50347-100
Sampler Initials: KDH

TEST SUMMARY

Bureau Veritas ID: SDU711
Sample ID: MW109-22
Matrix: Water

Collected: 2022/03/22
Shipped:
Received: 2022/03/22

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Water	GC/ECD	7905141	2022/03/25	2022/03/27	Joy Zhang
pH	AT	7900342	2022/03/23	2022/03/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	7899402	N/A	2022/03/23	Shivani Shivani
Sulphate by Automated Colourimetry	KONE	7899457	N/A	2022/03/24	Avneet Kour Sudan
Total Kjeldahl Nitrogen in Water	SKAL	7901360	2022/03/24	2022/03/28	Rajni Tyagi
Mineral/Synthetic O & G (TPH Heavy Oil)	BAL	7905657	2022/03/26	2022/03/26	Atinder Singh
Total Suspended Solids	BAL	7900001	2022/03/24	2022/03/28	Shaneil Hall
Volatile Organic Compounds in Water	GC/MS	7898454	N/A	2022/03/24	Manpreet Sarao

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.0°C
Package 2	6.0°C

Revised Report [2022/07/13]: Criteria updated as per client request.
Revised Report [2022/04/04]: Criteria updated as per client request.

Sample SDU710 [MW104-22] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Sample SDU711 [MW109-22] : VOC Analysis: Due to the sample matrix, sample required dilution. Detection limits were adjusted accordingly.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7898454	4-Bromofluorobenzene	2022/03/24	103	70 - 130	102	70 - 130	100	%				
7898454	D4-1,2-Dichloroethane	2022/03/24	99	70 - 130	98	70 - 130	103	%				
7898454	D8-Toluene	2022/03/24	98	70 - 130	98	70 - 130	93	%				
7905141	Decachlorobiphenyl	2022/03/27	92	60 - 130	87	60 - 130	90	%				
7908870	2,4,6-Tribromophenol	2022/03/29	84	10 - 130	93	10 - 130	86	%				
7908870	2-Fluorobiphenyl	2022/03/29	50	30 - 130	66	30 - 130	73	%				
7908870	2-Fluorophenol	2022/03/29	28	10 - 130	42	10 - 130	40	%				
7908870	D14-Terphenyl	2022/03/29	90	30 - 130	101	30 - 130	99	%				
7908870	D5-Nitrobenzene	2022/03/29	51	30 - 130	77	30 - 130	85	%				
7908870	D5-Phenol	2022/03/29	18	10 - 130	27	10 - 130	26	%				
7898454	1,1,2,2-Tetrachloroethane	2022/03/24	95	70 - 130	94	70 - 130	<0.40	ug/L	NC	30		
7898454	1,2-Dichlorobenzene	2022/03/24	94	70 - 130	94	70 - 130	<0.40	ug/L	NC	30		
7898454	1,4-Dichlorobenzene	2022/03/24	107	70 - 130	108	70 - 130	<0.40	ug/L	NC	30		
7898454	Benzene	2022/03/24	91	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
7898454	Chloroform	2022/03/24	96	70 - 130	96	70 - 130	<0.20	ug/L				
7898454	cis-1,2-Dichloroethylene	2022/03/24	92	70 - 130	93	70 - 130	<0.50	ug/L	NC	30		
7898454	Ethylbenzene	2022/03/24	88	70 - 130	88	70 - 130	<0.20	ug/L	1.1	30		
7898454	Methyl Ethyl Ketone (2-Butanone)	2022/03/24	98	60 - 140	99	60 - 140	<10	ug/L	NC	30		
7898454	Methylene Chloride(Dichloromethane)	2022/03/24	110	70 - 130	109	70 - 130	<2.0	ug/L	NC	30		
7898454	o-Xylene	2022/03/24	89	70 - 130	89	70 - 130	<0.20	ug/L	0.79	30		
7898454	p+m-Xylene	2022/03/24	94	70 - 130	90	70 - 130	<0.20	ug/L	0.45	30		
7898454	Styrene	2022/03/24	99	70 - 130	101	70 - 130	<0.40	ug/L	NC	30		
7898454	Tetrachloroethylene	2022/03/24	91	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
7898454	Toluene	2022/03/24	88	70 - 130	88	70 - 130	<0.20	ug/L	NC	30		
7898454	Total Xylenes	2022/03/24					<0.20	ug/L				
7898454	trans-1,3-Dichloropropene	2022/03/24	96	70 - 130	103	70 - 130	<0.40	ug/L	NC	30		
7898454	Trichloroethylene	2022/03/24	104	70 - 130	105	70 - 130	<0.20	ug/L	NC	30		
7899402	Phenols-4AAP	2022/03/23	99	80 - 120	99	80 - 120	<0.0010	mg/L	9.5	20		
7899457	Dissolved Sulphate (SO4)	2022/03/24	NC	75 - 125	100	80 - 120	<1.0	mg/L	0.038	20		
7900001	Total Suspended Solids	2022/03/28					<10	mg/L	NC	25	95	85 - 115
7900340	Fluoride (F-)	2022/03/25	100	80 - 120	100	80 - 120	<0.10	mg/L	NC	20		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7900342	pH	2022/03/25			102	98 - 103			0.74	N/A		
7900519	Dissolved Sulphate (SO4)	2022/03/24	NC	75 - 125	100	80 - 120	<1.0	mg/L	1.5	20		
7900884	Mercury (Hg)	2022/03/24	92	75 - 125	93	80 - 120	<0.00010	mg/L	NC	20		
7901118	Total Cyanide (CN)	2022/03/24	97	80 - 120	96	80 - 120	<0.0050	mg/L	NC	20		
7901360	Total Kjeldahl Nitrogen (TKN)	2022/03/25	112	80 - 120	99	80 - 120	<0.10	mg/L	NC	20	102	80 - 120
7901641	Total Kjeldahl Nitrogen (TKN)	2022/03/25	118	80 - 120	106	80 - 120	<0.10	mg/L	8.9	20	102	80 - 120
7903215	Total Carbonaceous BOD	2022/03/30					<2	mg/L	NC	30	101	85 - 115
7905141	Total PCB	2022/03/27	106	60 - 130	100	60 - 130	<0.05	ug/L	NC	40		
7905655	Total Oil & Grease	2022/03/26			100	85 - 115	<0.50	mg/L	2.8	25		
7905657	Total Oil & Grease Mineral/Synthetic	2022/03/26			94	85 - 115	<0.50	mg/L	1.6	25		
7906986	Total Aluminum (Al)	2022/03/29	NC	80 - 120	101	80 - 120	<4.9	ug/L	0.46	20		
7906986	Total Antimony (Sb)	2022/03/29	106	80 - 120	98	80 - 120	<0.50	ug/L	NC	20		
7906986	Total Arsenic (As)	2022/03/29	98	80 - 120	97	80 - 120	<1.0	ug/L	5.1	20		
7906986	Total Cadmium (Cd)	2022/03/29	96	80 - 120	95	80 - 120	<0.090	ug/L	NC	20		
7906986	Total Chromium (Cr)	2022/03/29	92	80 - 120	92	80 - 120	<5.0	ug/L	4.6	20		
7906986	Total Cobalt (Co)	2022/03/29	97	80 - 120	96	80 - 120	<0.50	ug/L	1.3	20		
7906986	Total Copper (Cu)	2022/03/29	97	80 - 120	94	80 - 120	<0.90	ug/L	2.3	20		
7906986	Total Lead (Pb)	2022/03/29	92	80 - 120	95	80 - 120	<0.50	ug/L	NC	20		
7906986	Total Manganese (Mn)	2022/03/29	NC	80 - 120	96	80 - 120	<2.0	ug/L	2.3	20		
7906986	Total Molybdenum (Mo)	2022/03/29	101	80 - 120	92	80 - 120	<0.50	ug/L	1.1	20		
7906986	Total Nickel (Ni)	2022/03/29	94	80 - 120	96	80 - 120	<1.0	ug/L	1.9	20		
7906986	Total Phosphorus (P)	2022/03/29	101	80 - 120	107	80 - 120	<100	ug/L	3.3	20		
7906986	Total Selenium (Se)	2022/03/29	100	80 - 120	104	80 - 120	<2.0	ug/L	NC	20		
7906986	Total Silver (Ag)	2022/03/29	93	80 - 120	93	80 - 120	<0.090	ug/L	NC	20		
7906986	Total Tin (Sn)	2022/03/29	102	80 - 120	94	80 - 120	<1.0	ug/L	NC	20		
7906986	Total Titanium (Ti)	2022/03/29	99	80 - 120	96	80 - 120	<5.0	ug/L	2.5	20		
7906986	Total Zinc (Zn)	2022/03/29	NC	80 - 120	99	80 - 120	<5.0	ug/L	2.8	20		
7908870	Bis(2-ethylhexyl)phthalate	2022/03/30	112	30 - 130	113	30 - 130	<2.0	ug/L	NC	40		
7908870	Di-N-butyl phthalate	2022/03/30	102	30 - 130	109	30 - 130	<2.0	ug/L	NC	40		
7910313	Nonylphenol (Total)	2022/03/30	31 (1)	50 - 130	105	50 - 130	<0.001	mg/L	NC	40		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7910361	Nonylphenol Ethoxylate (Total)	2022/03/30	76	50 - 130	81	50 - 130	<0.025	mg/L	NC	40		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) The recovery was below the lower control limit. This may represent a low bias in some results for this specific analyte.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastassia Hamanov, Scientific Specialist

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Master of Biochemistry, Team Lead

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Page 1 of 1

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#6868 MTE Consultants Inc	Company Name:		Quotation #:	B90004	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Alison Schincariol	P.O. #:			869351
Address:	520 Bingemans Centre Dr Kitchener ON N2B 3X9	Address:		Project:	50347-100	COC #:	Project Manager:
Tel:	(519) 743-6500 Fax: (519) 743-6513	Tel:	Fax:	Project Name:		C#869351-01-01	Ronklin Gracian
Email:	accounting@mte85.com	Email:	ASchincariol@mte85.com	Site #:			
				Sampled By:	KH/ZT		

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
☐ Table 1 ☐ Res/Park ☐ Medium/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ For RSC
☐ Table ___

Other Regulations
☐ CCME ☐ Sanitary Sewer Bylaw
☐ Reg 558. ☐ Storm Sewer Bylaw
☐ MISA Municipality ___
☐ PWQO ☐ Reg 406 Table ___
☐ Other ___

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ *(call lab for #)*

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / (Hg) / Cr VI	Peel Sanitary & Storm Sewer (53-2010)	# of Bottles	Comments
1		MW104-22	Mar 22	14:30	GW	+	+	18	
2		MW109-22	"	16:30	GW		+	18	- did not filter for mercury - overfilled oil & grease bottle
3									report for both sanitary
4									& storm
5									
6									
7									
8									
9									
10									

22-Mar-22 18:00
Ronklin Gracian
C275443
ATM ENV-1563

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only: Time Sensitive	Temperature (°C) on Recei	Custody Seal Present	Yes	No
Kay Harvey	22/03/22	17:30	DIPIKA SINGH	2022/03/22	18:00			8/8/8	Intact		

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

4/7/7

Exceedance Summary Table – Peel Region Combined 2010

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
No Exceedances						

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

Exceedance Summary Table – Mississauga Storm Sewer

Result Exceedances

Sample ID	Bureau Veritas ID	Parameter	Criteria	Result	DL	UNITS
MW104-22	SDU710-05	Total Suspended Solids	15	16	10	mg/L
MW109-22	SDU711-08	Total Aluminum (Al)	1000	4000	4.9	ug/L
MW109-22	SDU711-08	Total Phosphorus (P)	400	620	100	ug/L
MW109-22	SDU711-05	Total Suspended Solids	15	210	10	mg/L

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.

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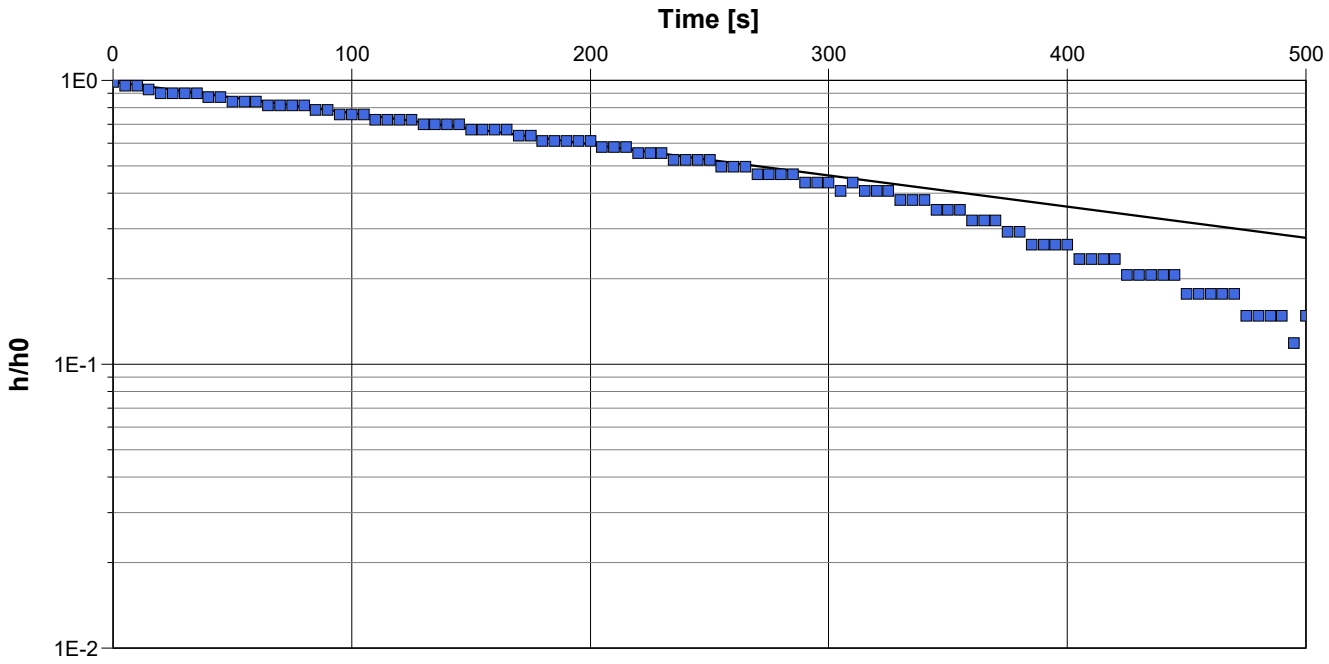
Appendix D

AquiferTest© Data Sheets

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 101-22 RH1	Test Well: MW 101-22
Test Conducted by: KDH		Test Date: 3/23/2022
Analysis Performed by: UMA	MW 101-22 RH1	Analysis Date: 5/25/2022
Aquifer Thickness: 0.65 m		

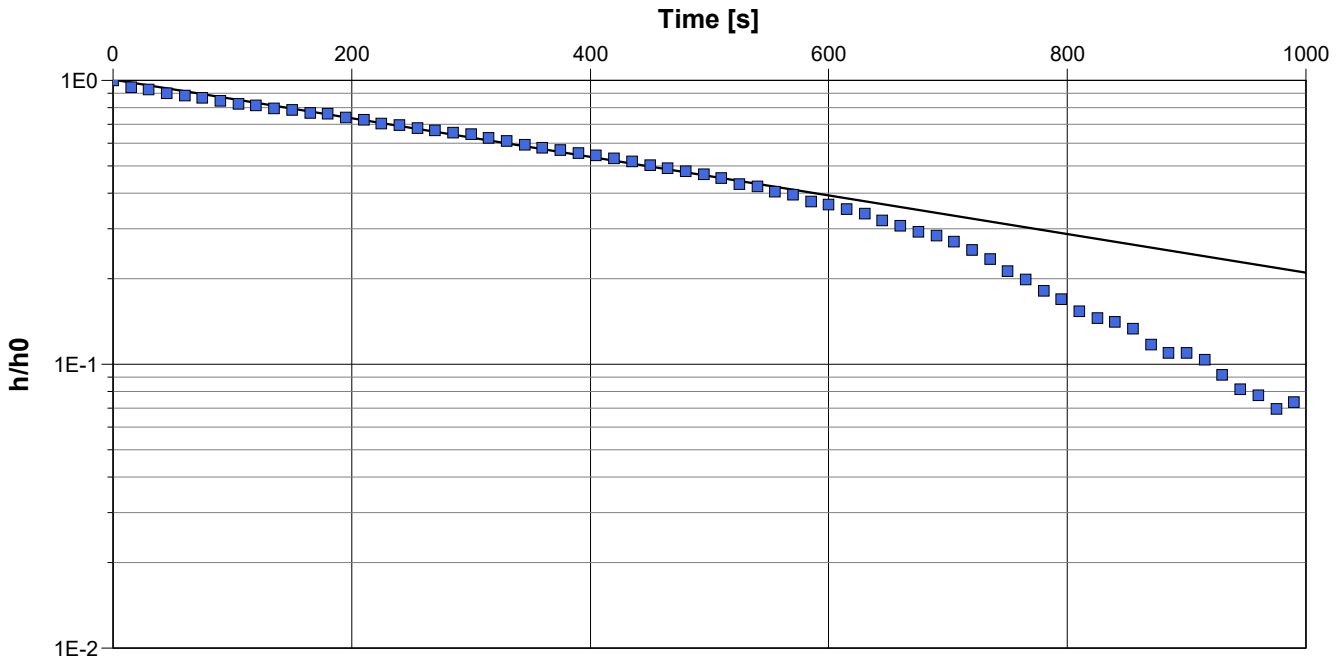


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 101-22	9.81×10^{-7}	

MTE	**Slug Test Analysis Report**
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 101-22 RH2	Test Well: MW 101-22
Test Conducted by: KDH		Test Date: 3/23/2022
Analysis Performed by: UMA	MW 101-22 RH2	Analysis Date: 5/25/2022
Aquifer Thickness: 0.65 m		

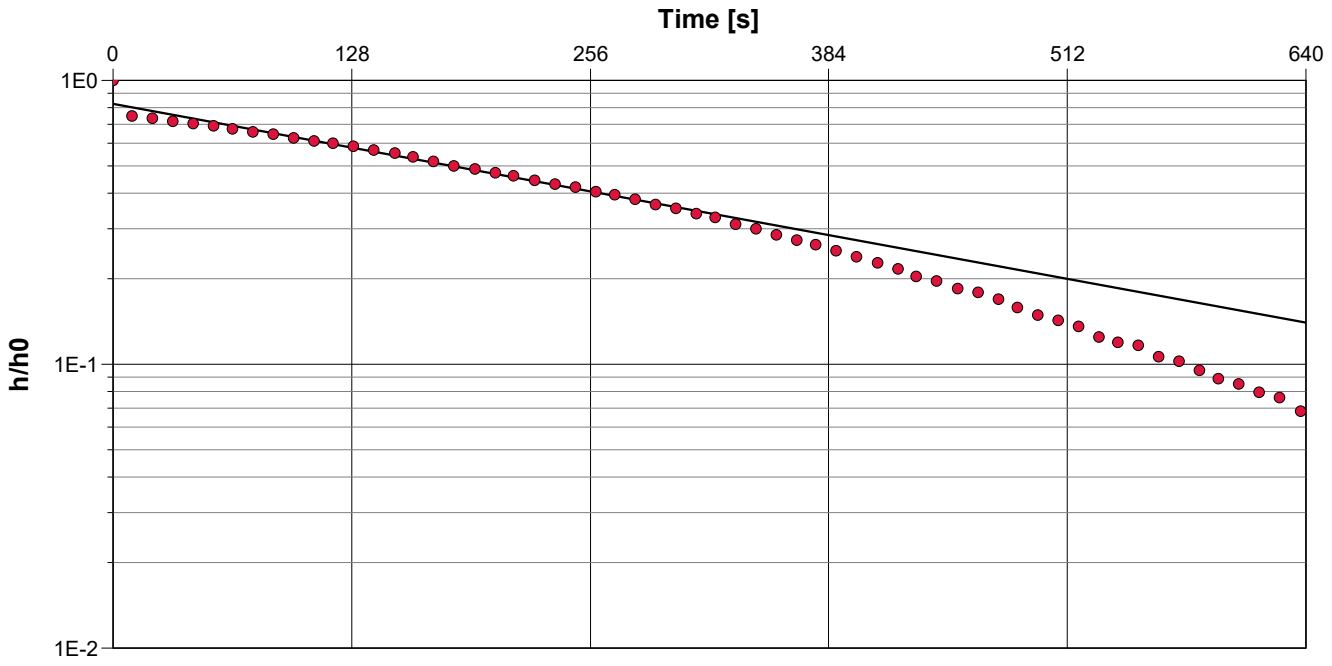


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 101-22	6.11×10^{-7}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 108-22 RH2	Test Well: MW 108-22
Test Conducted by: KDH		Test Date: 3/23/2022
Analysis Performed by: UMA	MW 108-22 RH2	Analysis Date: 5/25/2022
Aquifer Thickness: 1.10 m		

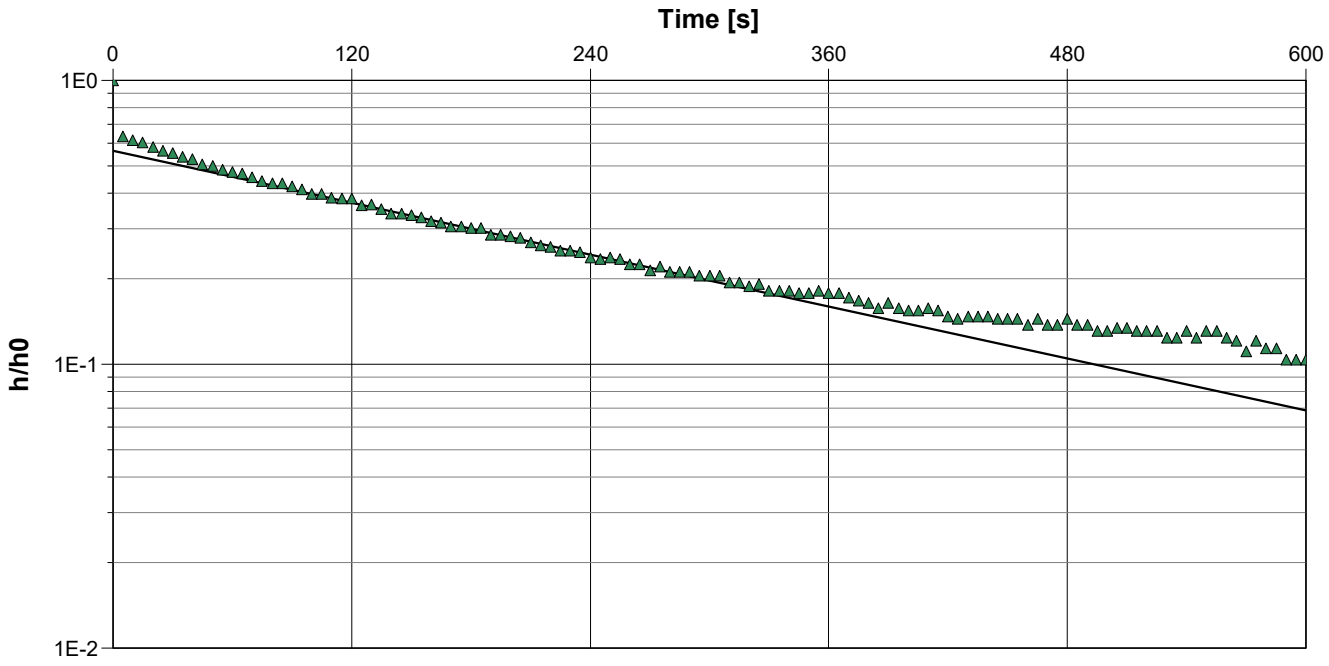


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 108-22	1.28×10^{-6}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 FH1	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 FH1	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

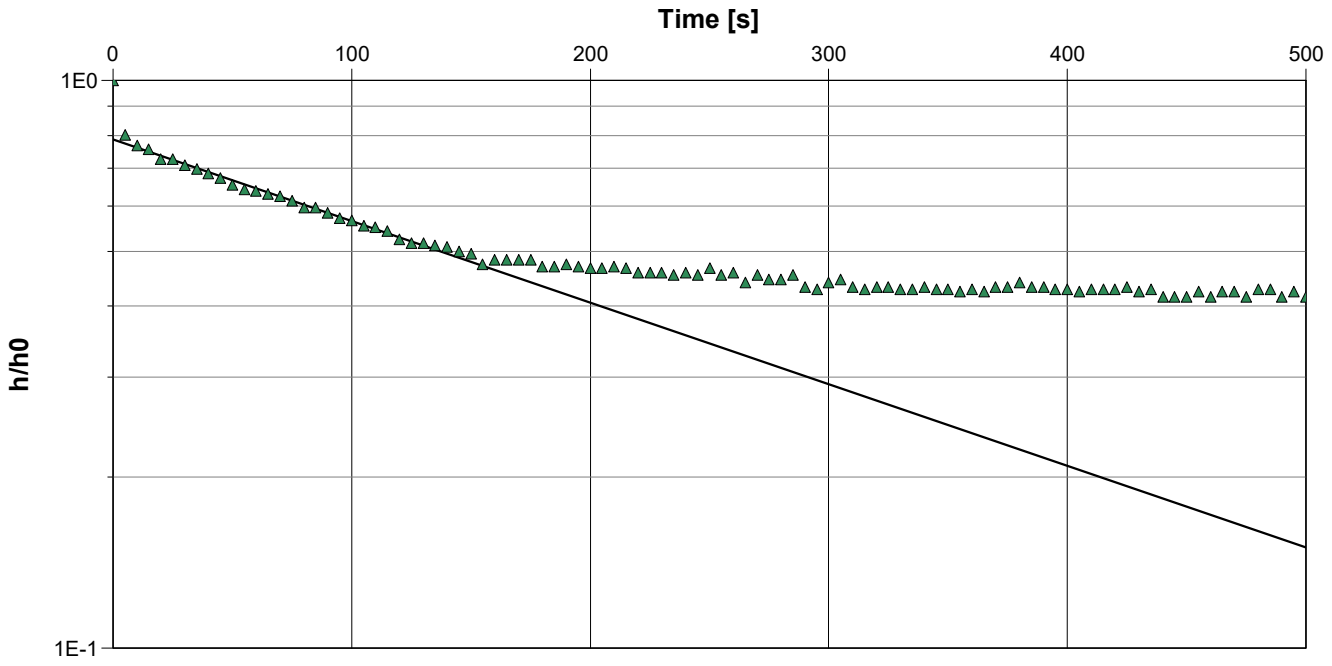


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	3.03×10^{-6}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 RH1	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 RH1	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

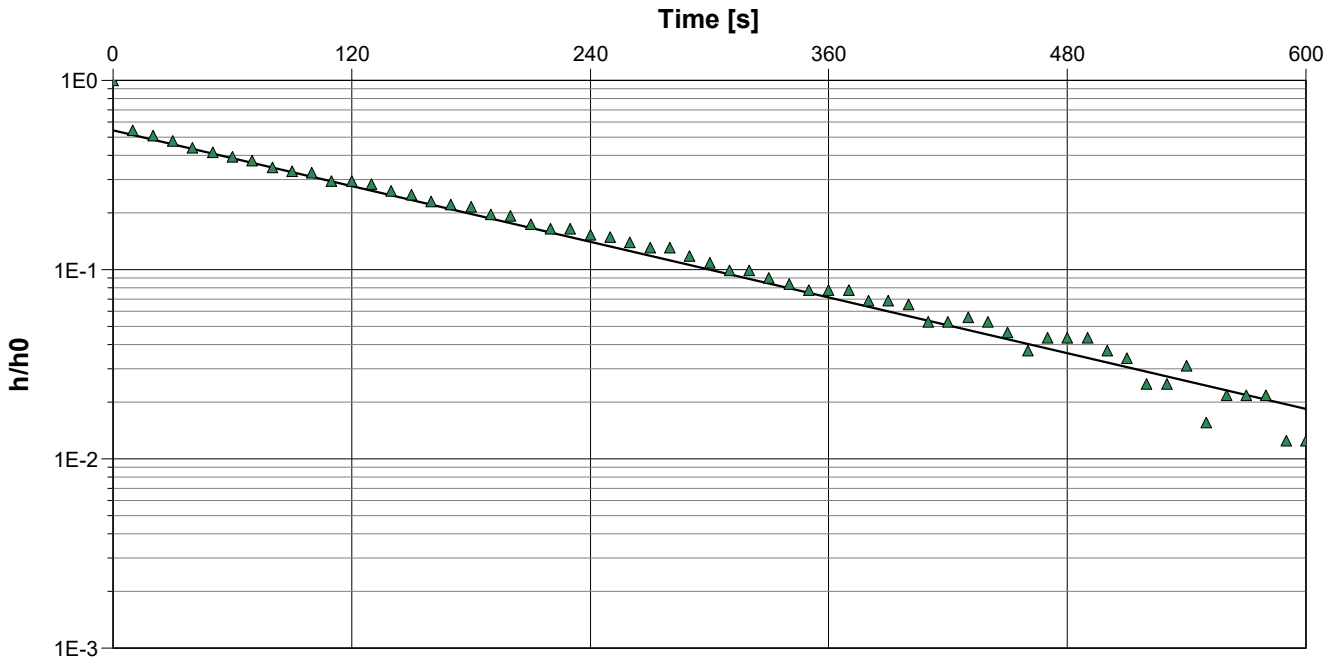


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	2.85×10^{-6}	

MTE	**Slug Test Analysis Report**
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 FH2	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 FH2	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

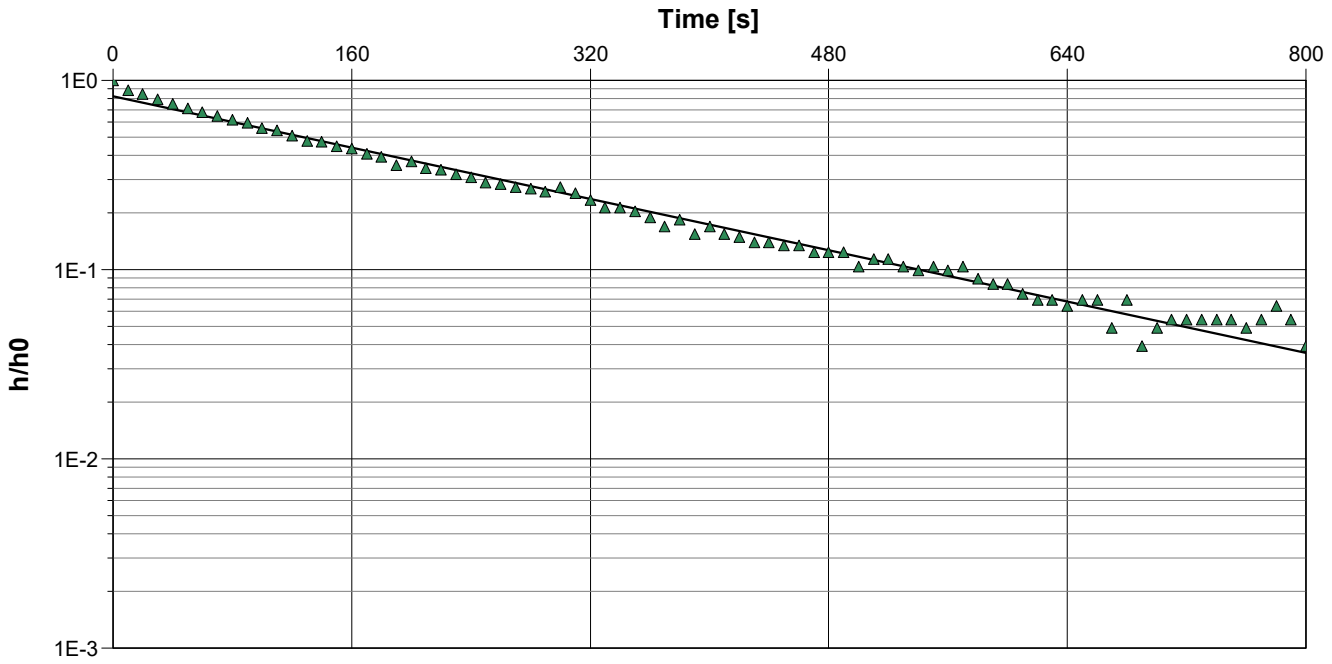


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	4.88×10^{-6}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 RH2	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 RH2	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

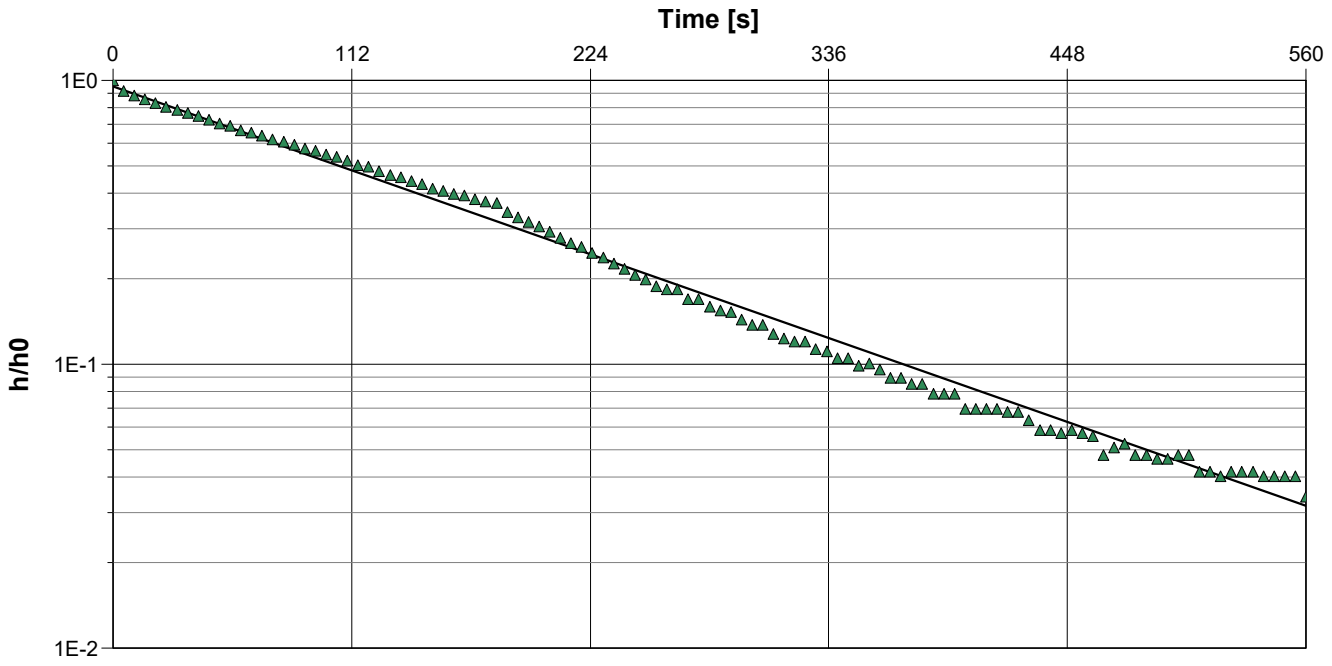


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	3.36×10^{-6}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 FH3	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 FH3	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

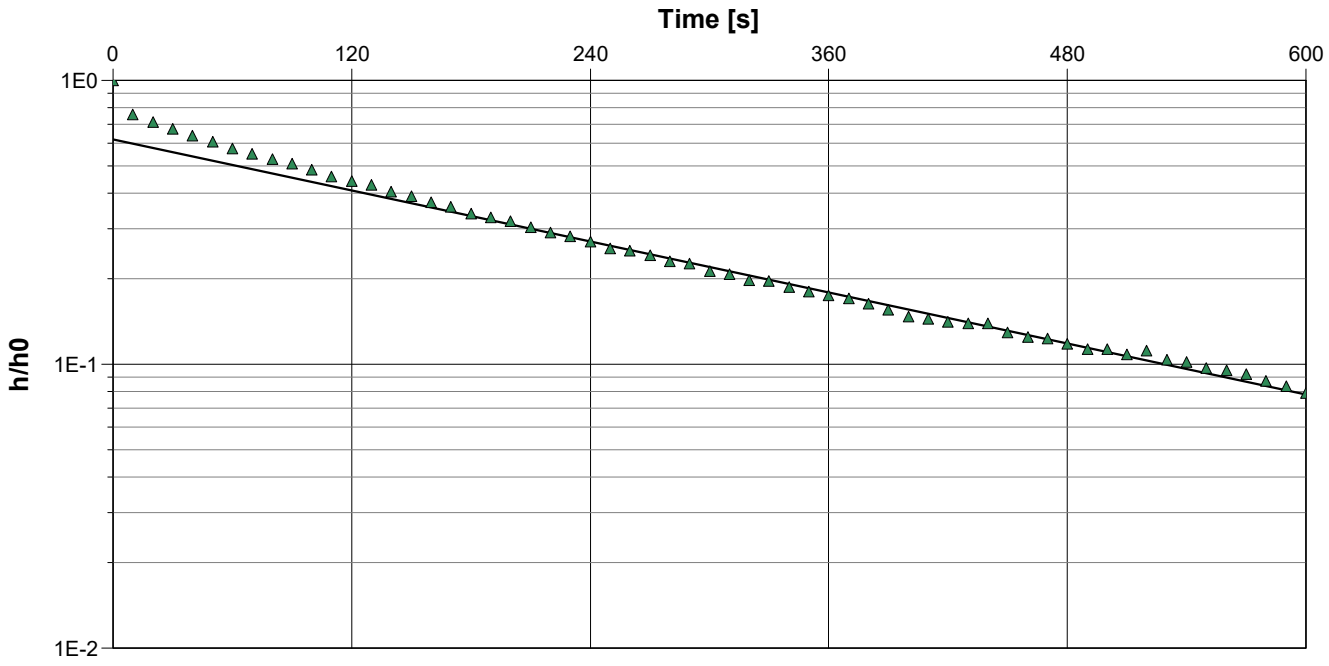


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	5.24×10^{-6}	

	Slug Test Analysis Report
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 RH3	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 RH3	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

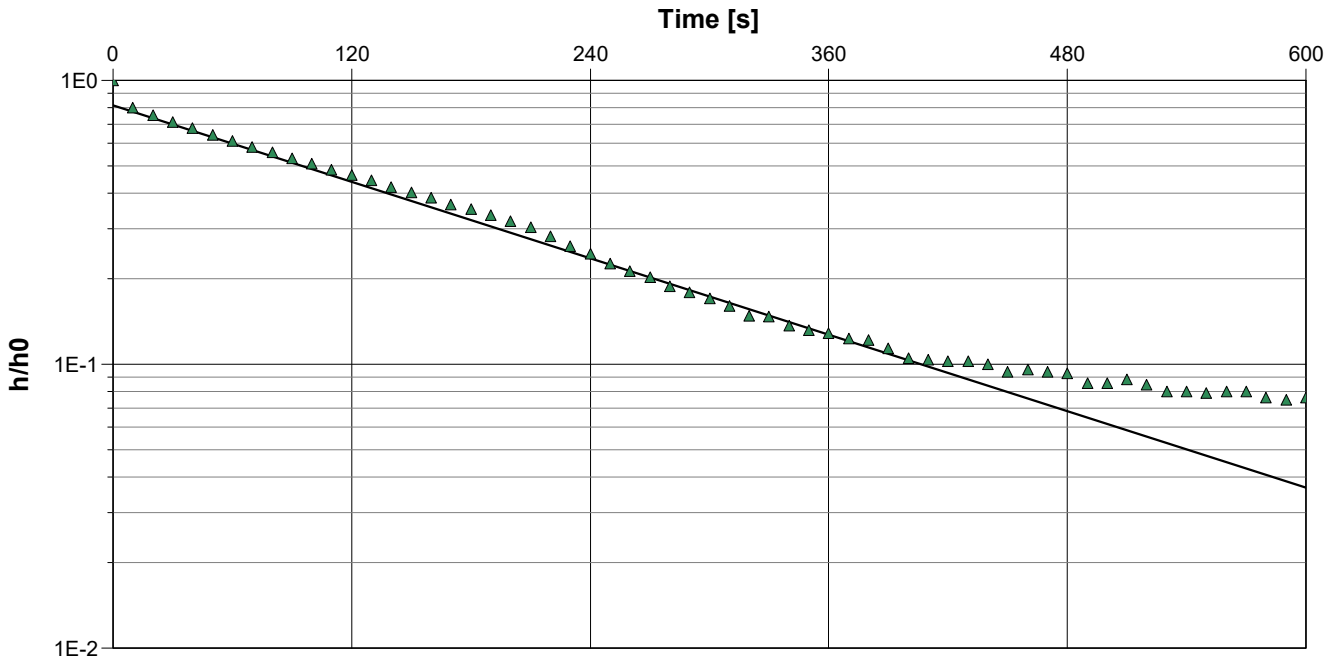


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	2.98×10^{-6}	

MTE	**Slug Test Analysis Report**
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 FH4	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 FH4	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		

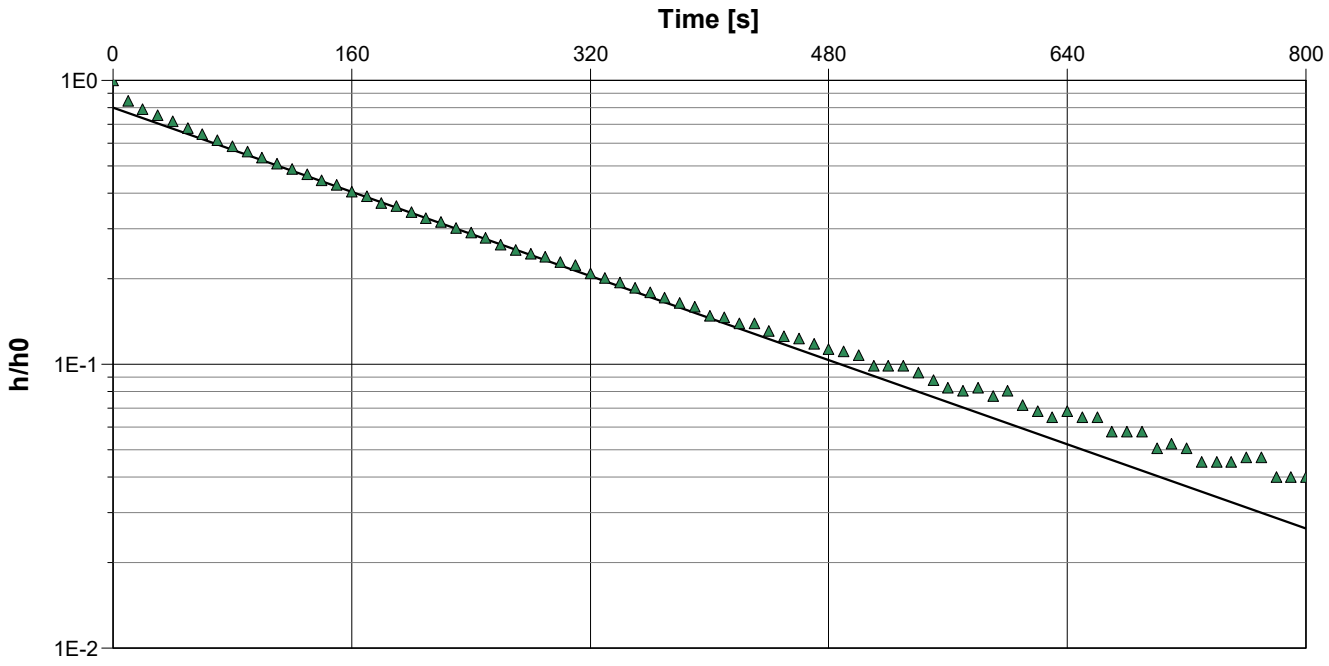


Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	4.46×10^{-6}	

MTE	**Slug Test Analysis Report**
	Project: 3115 Hurontario Street, Mississauga, ON
	Number: 50347-100
	Client: Clearbrook Developments Ltd.

Location: Mississauga, ON	Slug Test: MW 107-22 RH4	Test Well: MW 107-22
Test Conducted by: KDH		Test Date: 3/22/2022
Analysis Performed by: UMA	MW 107-22 RH4	Analysis Date: 5/25/2022
Aquifer Thickness: 8.27 m		



Calculation using Bouwer & Rice

Observation Well	Hydraulic Conductivity [m/s]	
MW 107-22	3.68×10^{-6}	

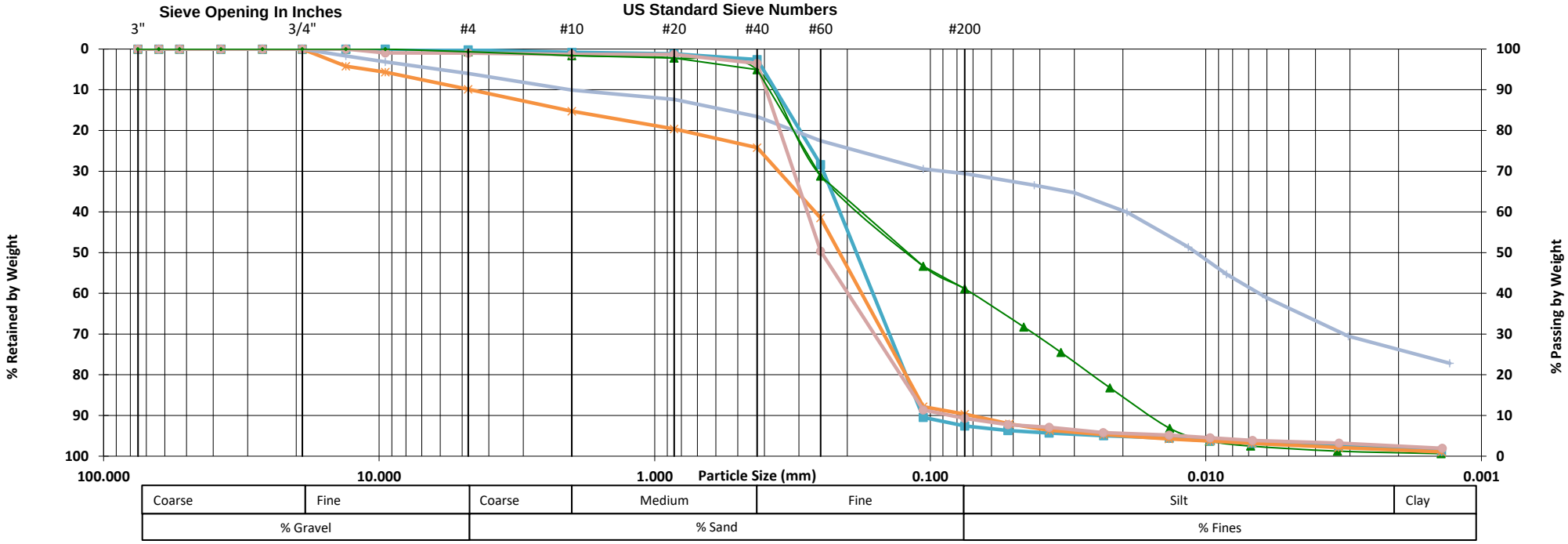
Appendix E

Particle Size Distribution Analysis

Particle Size Distribution Analysis Test Results

Project Name:	**3115 Hurontario Street Development**	**Date Sampled:**	**Feb. 14-18, 2022**	**MTE File No.:**	**50347-100**
Client:	**Clearbrook Developments Ltd.**	**Date Tested:**	**Mar. 3-10, 2022**	**Table No:**	**101**
Project Location:	**3115 Hurontario Street, Mississauga, ON**				

Unified Soil Classification



Symbol	Borehole ID	Sample #	Sample Depth	Description
▲	MW101-22	SS-4	2.3-2.9 mbgs	SAND and SILT, trace Gravel
■	MW102-22	SS-4	2.3-2.9 mbgs	SAND, trace Silt and Clay
✳	MW104-22	SS-5	3.0-3.7 mbgs	SAND, trace Gravel, Silt, and Clay
+	MW107-22	SS-5	3.0-3.7 mbgs	Clayey Sandy SILT, trace Gravel
●	MW109-22	SS-4	2.3-2.9 mbgs	SAND, trace Silt, Clay, and Gravel

CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

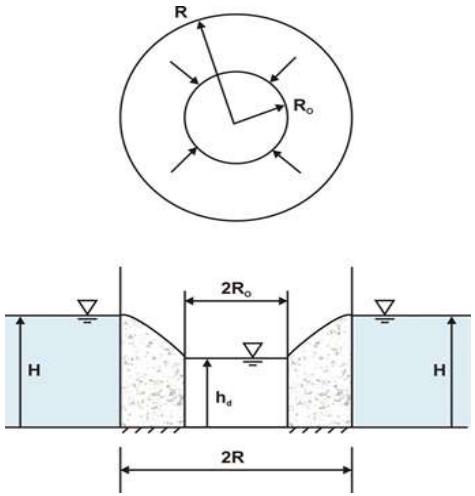
NOTES:

Appendix F

Dewatering Calculations

Project No. 50347-100
Dewatering Assessment-Bedrock (7 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	3.70E-06
Aquifer Head	H	m	12.13
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.05
Initial Dewatering Duration	t_1	days	7.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



Nevillle, 2013

Initial Dewatering to Reach Target Water Table Elevation

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
7	4.49E-05	0.05	27	10080	0.007	62	180	179,660	**269,490**

Steady-State Dewatering to Maintain Depressed Water Table

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
365.0	4.49E-05	0.05	27	525600	0.007	280	64	63,587	**95,381**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d{}^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

[1] Equation 6.11 (Powers, 2011)
C = 135^{-1} (Table 4-3, Powers 2007)

[2] Equation 6.3 (Powers, 2007)

[3] Equation 6.8 (Powers, 2007)

Assumptions:

Unconfined aquifer extends horizontally in all directions without encountering recharge or other boundaries

Uniform saturated thickness

Isotropic (horizontal and vertical hydraulic conductivity are equal and do not vary)

Well is frictionless, small diameter, and fully penetrates aquifer

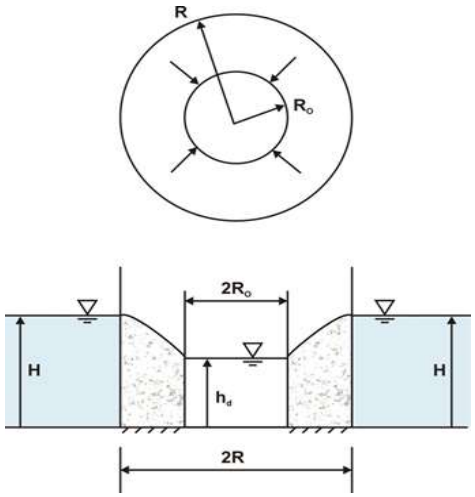
References:

Neville, Christopher J. Analytical solutions for the preliminatry estimation of long-term rates of groundwater inflow into excavations. 2007.

Powers, J. Patrick; Corwin, Arthur; Schmall, Paul; Kaeck, Walter. Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition. 2007.

Project No. 50347-100
Dewatering Assessment-Bedrock (14 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	3.70E-06
Aquifer Head	H	m	12.13
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.05
Initial Dewatering Duration	t_1	days	14.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



Nevillle, 2013

Initial Dewatering to Reach Target Water Table Elevation

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
14	4.49E-05	0.05	27	20160	0.007	77	143	143,281	**214,922**

Steady-State Dewatering to Maintain Depressed Water Table

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
365.0	4.49E-05	0.05	27	525600	0.007	280	64	63,587	**95,381**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d{}^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

[1] Equation 6.11 (Powers, 2011)
C = 135^{-1} (Table 4-3, Powers 2007)

[2] Equation 6.3 (Powers, 2007)

[3] Equation 6.8 (Powers, 2007)

Assumptions:

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Well is frictionless, small diameter, and fully penetrates aquifer

References:

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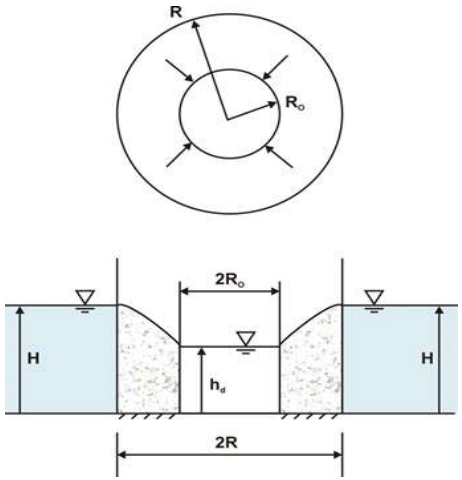
Powers, J. Patrick; Corwin, Arthur; Schmall, Paul; Kaeck, Walter. Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition. 2007.

Project No. 50347-100
Dewatering Assessment-Bedrock (30 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	3.70E-06
Aquifer Head	H	m	12.13
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.05
Initial Dewatering Duration	t_1	days	30.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



Nevillle, 2013

Initial Dewatering to Reach Target Water Table Elevation

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
30	4.49E-05	0.05	27	43200	0.007	100	114	114,327	**171,491**

Steady-State Dewatering to Maintain Depressed Water Table

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
365.0	4.49E-05	0.05	27	525600	0.007	280	64	63,587	**95,381**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

[1] Equation 6.11 (Powers, 2011)
C = 135^{-1} (Table 4-3, Powers 2007)

[2] Equation 6.3 (Powers, 2007)

[3] Equation 6.8 (Powers, 2007)

Assumptions:

Unconfined aquifer extends horizontally in all directions without encountering recharge or other boundaries
Uniform saturated thickness
Isotropic (horizontal and vertical hydraulic conductivity are equal and do not vary)
Well is frictionless, small diameter, and fully penetrates aquifer

References:

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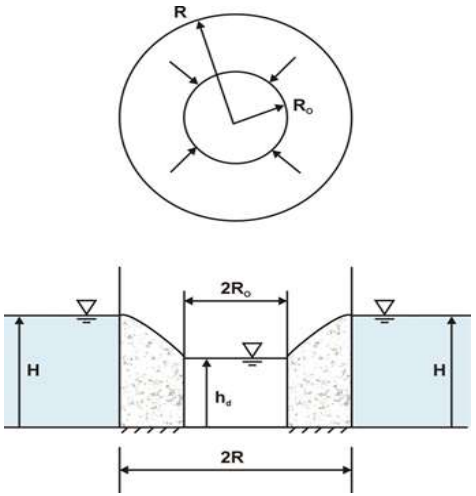
Powers, J. Patrick; Corwin, Arthur; Schmall, Paul; Kaeck, Walter. Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition. 2007.

Project No. 50347-100
Dewatering Assessment-Overburden (7 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	1.80E-06
Aquifer Head	H	m	2.05
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.21
Initial Dewatering Duration	t_1	days	7.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



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Initial Dewatering to Reach Target Water Table Elevation

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
7	3.69E-06	0.21	27	10080	0.007	32	12	12,498	**18,747**

Steady-State Dewatering to Maintain Depressed Water Table

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
365.0	3.69E-06	0.21	27	525600	0.007	63	2	2,479	**3,718**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d{}^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

[1] Equation 6.11 (Powers, 2011)
C = 135^{-1} (Table 4-3, Powers 2007)

[2] Equation 6.3 (Powers, 2007)

[3] Equation 6.8 (Powers, 2007)

Assumptions:

Unconfined aquifer extends horizontally in all directions without encountering recharge or other boundaries

Uniform saturated thickness

Isotropic (horizontal and vertical hydraulic conductivity are equal and do not vary)

Well is frictionless, small diameter, and fully penetrates aquifer

References:

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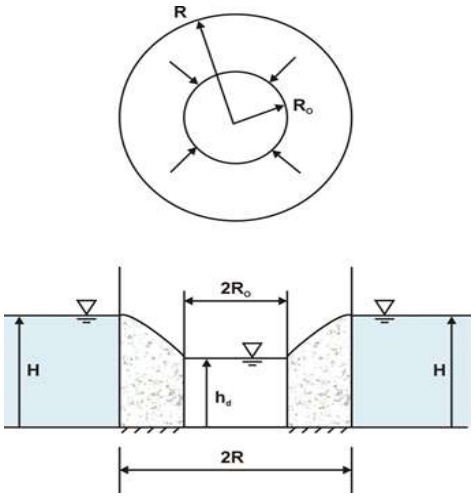
Powers, J. Patrick; Corwin, Arthur; Schmall, Paul; Kaeck, Walter. Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition. 2007.

Project No. 50347-100
Dewatering Assessment-Overburden (14 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	1.80E-06
Aquifer Head	H	m	2.05
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.21
Initial Dewatering Duration	t_1	days	14.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



Nevillle, 2013

Initial Dewatering to Reach Target Water Table Elevation

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
14	3.69E-06	0.21	27	20160	0.007	34	9	9,119	**13,679**

Steady-State Dewatering to Maintain Depressed Water Table

Construction Duration (days)	T Transmissivity (m^2/sec)	S Storage Coefficient (unitless)	r_s [3] Equivelent Radius of Excavation (m)	t Time Pumped (min)	C Emperical Constant (unitless)	R_o [1] Radius of Influence from Well Centre (m)	Q [2] Pumping Rate (m^3/day)	Q Pumping Rate (L/day)	Q Pumping Rate (L/day)
365.0	3.69E-06	0.21	27	525600	0.007	63	2	2,479	**3,718**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d{}^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

[1] Equation 6.11 (Powers, 2011)
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[2] Equation 6.3 (Powers, 2007)

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Assumptions:

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Well is frictionless, small diameter, and fully penetrates aquifer

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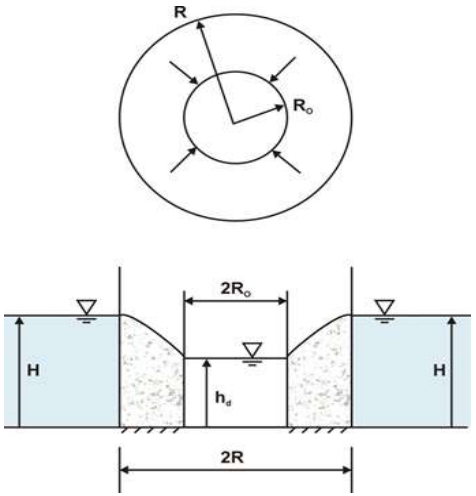
Project No. 50347-100
Dewatering Assessment-Overburden (30 Days)
Completed by: UMA

	Symbol	Units	Value
Hydraulic Conductivity	K	m/sec	1.80E-06
Aquifer Head	H	m	2.05
Excavation Head	h_d	m	0
Area of Excavation	A	m^2	2355
Storage Coefficient	S	unitless	0.21
Initial Dewatering Duration	t_1	days	30.0
Total Construction Duration	t_2	days	365.0
Factor of Safety	FS	unitless	1.5



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Initial Dewatering to Reach Target Water Table Elevation

T	S	r_s [3]	t	C	R_o [1]	Q [2]	Q	Q
Construction Duration (days)	Transmissivity (m^2/sec)	Storage Coefficient (unitless)	Equivelent Radius of Excavation (m)	Time Pumped (min)	Emperical Constant (unitless)	Radius of Influence from Well Centre (m)	Pumping Rate (m^3/day)	Pumping Rate (L/day)	Pumping Rate (L/day)
30	3.69E-06	0.21	27	43200	0.007	38	7	6,528	**9,791**

Steady-State Dewatering to Maintain Depressed Water Table

T	S	r_s [3]	t	C	R_o [1]	Q [2]	Q	Q
Construction Duration (days)	Transmissivity (m^2/sec)	Storage Coefficient (unitless)	Equivelent Radius of Excavation (m)	Time Pumped (min)	Emperical Constant (unitless)	Radius of Influence from Well Centre (m)	Pumping Rate (m^3/day)	Pumping Rate (L/day)	Pumping Rate (L/day)
365.0	3.69E-06	0.21	27	525600	0.007	63	2	2,479	**3,718**

$$R_o = r_s + \sqrt{\frac{Tt}{CS}} \qquad Q = \frac{\pi K(H^2 - h_d{}^2)}{\ln(\frac{R_o}{r_s})} \qquad r_s = \sqrt{\frac{Area}{\pi}}$$

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