HYDROGEOLOGICAL INVESTIGATION
603-643, 645-699 KINGSTON ROAD
PICKERING, ON
L1V 3N7

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1 Introduction

1.1 Project Background

Toronto Inspection Ltd. was retained by Director Industrial Holdings Limited (the Client) to conduct a hydrogeological investigation for the proposed development property encompassing the municipal addresses of 603-643 and 645-699 Kingston Road in Pickering, ON (the Site). It is our understanding that the Client is proposing a mixed-use residential/commercial development for the Site consisting of ten high-rise towers spread across seven podiums and three building complexes. It is also understood that the Site will include three underground parking facilities, one per building complex. Each building complex will have two levels of underground parking, with the exception of Podium 1, which will have one level of underground parking. Since the project is currently at a planning stage for the development, each parking level was assumed to be 3 m high.

This hydrogeological report provides estimates for the short-term (construction) and long-term dewatering rates for the parking facilities based on review of the Site plan and drawings. Dewatering rates could not be provided for the installation of servicing because a Site Servicing Plan was not available for review. Therefore, the requirements for groundwater control during the construction of services at the Site should be evaluated prior to construction and applications for dewatering and/or discharge permits updated, as the case may be. In addition, dewatering rates should be reviewed once the final building (finished floor) elevations and a Site Grading Plan are available to confirm the groundwater control requirements for the development.

The location of the Site is shown in **Figure 1.** The Site Plan (DWG No. A.102), Underground Plans (DWG No. A.201) and Building Sections (DWG No. A.501 & A.502), prepared by Graziani + Corazza Architects Inc. and dated October 19 and 25, 2023, for the proposed development are provided in **Appendix A**.

1.2 Site Description

The Site is located on the southwest corner of the intersection between Whites Road and Kingston Road and is approximately rectangular in shape and 5.4 ha in area. The Site was most recently used for commercial purposes and is occupied by three commercial buildings including a strip mall having several occupants. The area immediately surrounding the Site is primarily occupied for residential, commercial, and transportation uses. The Site is bounded by Kingston Road to the north, Whites Road to the east, the Highway 401 corridor to the south, and an automobile dealership to the west.

1.3 Objectives of the Hydrogeological Investigation

The objectives of this hydrogeological investigation are to identify regulations which may be relevant to the development of the Site from a groundwater and environmental perspective and to develop a conceptual understanding of the Site setting by characterizing the existing geological and hydrogeological conditions at the Site including the groundwater elevations, groundwater flow direction, and hydraulic properties of the soils. Based on the conceptual understanding of the Site and proposed development, an evaluation is made of potential dewatering requirements for the during-construction phase and long-term operation of the Site. An impact assessment of the proposed development on local hydrogeological conditions is also made and recommendations for mitigated provided.

1.4 Scope of Work

1.4.1 Conceptual Understanding

A conceptual understanding of the regional and local geological and hydrogeological system was developed through the review of existing reports and available geological information. This included:

- Mapping and reports by Toronto and Region Conservation Authority (TRCA);
- Geological and hydrogeological Information from the Ontario Geological Survey (OGS);
- Geological and hydrogeological information from technical studies and plans prepared for source water protection initiatives in the CTC Source Protection Region;
- Mapping and data from the Ontario Ministry of Natural Resources and Forestry (MNRF);
- Data from the Ministry of the Environment, Conservation, and Parks (MECP) Water Well Information System (WWIS) and Permit to Take Water (PTTW) database; and
- A report prepared by Toronto Inspection Ltd., entitled *Preliminary Geotechnical Report – 603 to 699 Kingston Road, Pickering, Ontario*, dated April 20, 2020.

1.4.2 Field Investigation

The local scale geological and hydrogeological conditions at the Site were characterized using the observations from 16 boreholes drilled in February and March of 2019. The boreholes ranged in depth from 4.87 meters below ground surface (mbgs) to 20.88 mbgs.

Of the 16 boreholes, 12 were instrumented as monitoring wells to be used in this investigation. All monitoring wells were constructed of 51 mm diameter riser pipe and 51 mm diameter # 10-slot, 10-foot long, screens. Monitoring wells were used to measure static groundwater levels, to conduct in-situ hydraulic conductivity testing, and to collect representative groundwater quality samples. Monitoring wells were installed according to the relevant provisions of Regulation 903 (Reg. 903) by a licenced drilling contractor. Once it is determined that the monitoring wells installed within the Site are no longer required, they should be decommissioned by a licensed well contractor per Reg. 903.

1.4.3 Data Analysis

The data analysis component of this study included the following items:

- Determination of soil stratigraphy and hydrostratigraphy;
- Determination of groundwater elevations and seasonal variability;
- Determination of the hydraulic conductivity of screened soils;
- Evaluation of local groundwater quality;
- Evaluation of potential dewatering requirements during and after construction;
- Evaluation of the potential impacts to surrounding receptors within the anticipated dewatering and construction zones of influence; and
- Identification of options for short-term and long-term mitigation of potential impacts to natural features, sensitive receptors, and vulnerable areas.

2 Relevant Regulations and Policies

Environmental regulations and policies which may be relevant to the development of the Site and this hydrogeological investigation are listed below and discussed briefly:

- Durham Region Official Plan (Office Consolidation May 2020);
- City of Pickering Official Plan (Office Consolidation March 2022);
- Regional Municipality of Durham Sewer Use By-Law No. 55-2013;
- TRCA Policies and Regulations, Ontario Regulation (O. Reg.) 166/06;
- Ontario Water Resources Act, R.S.O. 1990, c. O.40;
- O. Reg. 387/04: Water Taking And Transfer;
- The Clean Water Act, S.O. 2006, c.22; and
- Approved Source Protection Plan – CTC Source Protection Region.

Durham Region Official Plan

The Regional Municipality of Durham (Durham Region) Official Plan identifies development and land-use objectives for Durham Region. Based on a review of Official Plan maps, the Site is located within “Living Areas”. The Site is outside of the Durham Region’s designated “Greenlands System”.

City of Pickering Official Plan

The City of Pickering (2022) Official Plan identifies development and land-use objectives within the City and uses Durham Region’s Official Plan as an overall framework. Based on a review of the City’s Official Plan, the Site is located along the “Kingston Road Corridor” and is therefore subject to the urban design objectives and land development guidelines of the “Kingston Road Corridor Land Development Guidelines”. The Kingston Road Land Development Guidelines should be reviewed during the preparation of land development proposals for the Site.

Regional Municipality of Durham Sewer Use By-Law No. 55-2013

Durham Region’s sewer use by-law controls discharges to their sanitary and storm sewers including the establishment of sewer discharge criteria. If any private water on the Site will require discharge to the sewer system during or following construction, written approval from Durham Region will be required as authorization, and mutual agreement to the terms and limitations of the discharge approval.

TRCA Policies and Regulations (O. Reg. 166/06)

Under Section 28 of the Conservation Authorities Act, the 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 TRCA, through its regulatory mandate, is responsible for issuing permits under *O. Reg. 166/06 Toronto and Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* for development proposals or site alteration works within regulated areas.

TRCA (2022) mapping indicates that the Site is not within a TRCA regulated area, as such a permit under O.Reg. 166/06 is not expected to be required.

Ontario Water Resource Act (1990)

Under Section 34 of the Ontario Water Resources Act, 1990 (OWRA), a PTTW is required from the MECP for any water taking that is greater than 50,000 L/day. For water takings related to construction site dewatering water takings of more than 50,000 L/day but less than 400,000 L/day may be registered on the Environmental Activity and Sector Registry (EASR) under *O. Reg. 63/16: Registrations Under Part 11.2 of the Act – Water Takings.* Water takings during construction that will exceed more than 400,000 L/day will require a PTTW issued by the MECP. Any water takings in the long-term that will exceed 50,000 L/day will also require a PTTW issued by the MECP.

O. Reg. 387/04 Water Taking and Transfer Regulation

O. Reg. 387/04 outlines prohibited water taking and transfer activities, identifies activities that are exempt from the PTTW/EASR requirements, and explains the data collection and reporting requirements for PTTW and EASR holders. Any water taking activity that is regulated by the OWRA will need to be undertaken in accordance with O. Reg. 387/04.

The Clean Water Act (2006)

The MECP mandates the protection of existing and future sources of drinking water under the Clean Water Act, 2006 (CWA). Initiatives undertaken under the CWA include the delineation vulnerable areas for drinking water quality, i.e., Wellhead Protection Areas (WHPAs); Significant Groundwater Recharge Areas (SGRAs); Intake Protection Zones (IPZs); and Highly Vulnerable Aquifers (HVAs); and vulnerable areas for drinking water quantity, i.e., WHPA-Q1, WHPA-Q2 and IPZ-Q.

Based on a review of the MECP (2023a) Source Protection Information Atlas, the Site falls within the Toronto and Region Source Protection Area (TRSPA) within the CTC Source Protection Region. A small portion of the site along the southern property boundary intersects a HVA with a vulnerability score of 6. Activities such as the handling and storage of road salt are considered a low risk threat within the HVA.

Approved Source Protection Plan – CTC Source Protection Region

Source Protection Plans (SPPs) are developed under the CWA and outline policies for the restriction, regulation, and prohibition of land use activities within vulnerable drinking water areas. Local municipalities and regional governments are required under the CWA to implement SPPs through integration into planning policy with support from local conservation authorities.

The *Approved Source Protection Plan: CTC Source Protection Region* (CTC Source Protection Committee, 2022) outlines land use policies to be implemented within the Toronto Source Protection Area. Policies SAL-10, SAL-11 and SAL-12 of the SPP encourage the use of best management practices for the application of road salt in HVAs, particularly in developments with new roads or parking lots.

3 Regional Geological and Hydrogeological Understanding

3.1 Topography and Drainage

The Site is located at the eastern extent of the Petticoat Creek watershed which is under the jurisdiction of the TRCA. This watershed is approximately 49 km in length and drains an approximate area of 27 km^2. The headwaters of the Petticoat Creek watershed originate south of the Oak Ridges Moraine and empty to Lake Ontario from the mouth of Petticoat Creek in the Petticoat Creek Conservation Area, which is west of the Site. The nearest water feature to the Site is a tributary to Petticoat Creek approximately 200 m to the west. The Petticoat Creek watershed is highly urbanized in its southern reaches where the Site is located.

The regional topography slopes southward towards Lake Ontario. As the Site is currently developed, the local Site topography is relatively flat. There is slight grading from the outer boundaries of the Site towards the centre and to the south. The average ground elevation across the Site is approximately 105 meters above sea level (masl).

A topographic map of the Site and the surrounding area is presented in **Figure 2**.

3.2 Physiography

The Site is situated within the Iroquois Plain physiographic region. The Iroquois Plain is the low land that borders Lake Ontario, and Nwas inundated by the historic Iroquois Lake in the late Pleistocene following the last glacial retreat. Iroquois Lake was a proglacial lake that existed 13,000 years ago and was a body of water slightly larger than present-day Lake Ontario. The Iroquois Plain stretches from the Niagara River to the Trent River, a distance of 300 km. Shoreline cliffs, sand bars, and beaches extend about 3 km inland and mark the inland extent of Iroquois Lake. Typically, the Iroquois Plain is characterized by layers of fine silty sand that were characteristic of the former lake bed and shoreline beaches of Iroquois Lake (Chapman and Putnam, 1984).

A physiographic map of the Site and the surrounding area is presented in **Figure 3**.

3.3 Regional Geology and Hydrogeology

The current understanding of the geological and hydrogeological environment was based on scientific work conducted by and information available from York, Peel, Durham, Toronto and The Conservation Authorities Moraine Coalition (YPDT-CAMC). A copy of a YPDT-CAMC regional hydrostratigraphic cross-section, as shown in TRCA (2012), is provided in **Figure 4**.

3.3.1 Hydrostratigraphy

Based on regional hydrogeological mapping presented by YPDT-CAMC (2006), the following units overlie the bedrock (from youngest to oldest):

A. Recent Deposits
B. Halton Till (Aquitard)
C. Oak Ridges Moraine (Aquifer)
D. Newmarket Till (Aquitard)
E. Thorncliffe Formation (Aquifer)
F. Sunnybrook Drift (Aquitard)
G. Scarborough Formation (Aquifer)

The following provides a description of the underlying hydrostratigraphic units in the area and their relevance to the Site based on the conceptual understanding of regional hydrostratigraphy offered by review of YPDT-CAMC mapping:

- **Recent Deposits** – The uppermost surficial geologic unit consists of glaciolacustrine deposits consisting of mainly silt and silty clay materials.
- **Halton Till** – The Halton Till was deposited approximately 13,000 years before present (B.P.) during the last glacial advance in the area. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Halton Till is not present in the area.
- **Oak Ridges Moraine** – The Oak Ridges Moraine (ORM) was deposited approximately 12,000 to 13,000 years B.P. Regionally, the ORM is approximately 160 km long and 5 to 20 km wide. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the ORM is not present in the area.
- **Newmarket Till** – The Newmarket Till was deposited by the Laurentide ice sheet approximately 18,000 to 20,000 years B.P. It consists of mainly sandy silt to silty sand. The Newmarket Till can reach up to 60 m in thickness. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Newmarket Till is present in the area.
- **Thorncliffe Formation** – The Thorncliffe Formation was deposited approximately 45,000 years B.P. and consists of glaciofluvial deposits containing silt, sand, and clay. Regionally, it acts as an aquifer with variable grain size and thickness. Based on the hydrostratigraphic cross-section by the YPDT-CAMC, the Thorncliffe Formation is present in the area.
- **Sunnybrook Drift** – The Sunnybrook Drift was deposited approximately 45,000 years B.P. It is interpreted to be a silt and clay formation with a thickness of 10 m to 20 m regionally. Based on the hydrostratigraphic cross-section presented by the YPDT-CAMC, the Sunnybrook Drift may be present as a thin layer in the area separating the overlying Thorncliffe aquitard from the underlying Scarborough aquifer.
- **Scarborough Formation** – The Scarborough Formation was deposited during the Wisconsin glaciation approximately 70,000 years to 90,000 years B.P. It is interpreted as a fluvial-deltaic system consisting of sand, silt, and clay deposits. Based on the geologic cross-section presented by the YPDT-CAMC, the Scarborough Formation is present in the area.

Underlying the overburden will be bedrock of the Georgian Bay Formation. These rocks are approximately 438 to 505 million years in age from the Upper Ordovician period.

3.3.2 Groundwater Flow

At a regional scale, groundwater flows from the topographic highs associated with the Oak Ridges Moraine, north of the Site, to the topographic lows associated with Lake Ontario to the south.

4 Local Geology and Hydrogeology

The current understanding of the local geological and hydrogeological conditions at the Site is based on the observations from the geotechnical investigation conducted by Toronto Inspection Ltd. and the studies undertaken as part of this hydrogeological investigation.

4.1 Overburden

A total of 16 boreholes were drilled across the Site to depths ranging from 4.87 mbgs to 20.88 mbgs in February and March of 2019. In summary, the soil characterizations in the borehole logs indicate the overburden at the Site consists of a layer of fill underlain predominantly by a thick and laterally extensive deposit of sandy silt. Additionally, an isolated sand and gravel deposit with a thickness of approximately 12.9 m was encountered at BH-10. Sand layers of 1.5 m to 4.6 m in thickness were found within the sandy silt at BH-11 and BH12 east of BH-10. A detailed description of soil stratigraphy is provided in the borehole logs from Toronto Inspection Ltd.'s geotechnical investigation, which are provided in **Appendix B**.

4.2 Quaternary Geology

Mapping from the OGS (2000) indicates that the regional quaternary geology across the Site is composed of undifferentiated, predominantly sandy silt to silt textured tills. This description is consistent with observations made at the Site.

The quaternary geology of the Site and the surrounding area is presented in **Figure 5**.

4.3 Bedrock Geology

Bedrock was not encountered at the maximum terminal depth (20.88 mbgs) of the borehole investigation for this study. In an attempt to determine the true depth of bedrock in the area, a search was conducted for borehole records and well records from the surrounding area which extended beyond the depth of investigation for this study. The results were inconclusive in that only one record identified the potential for bedrock at a depth of approximately 29.6 mbgs (Well ID 4601908). Mapping from the OGS (2011) indicates that shale bedrock of the Georgian Bay Formation underlies the overburden soils in this area. The top of bedrock elevation is expected to be at approximately 50 masl based on the regional hydrostratigraphic cross-section presented by the YPDT-CAMC.

The bedrock geology of the Site and the surrounding area is presented in **Figure 6**.

4.4 Groundwater Conditions

4.4.1 On-Site Monitoring Well Network

A monitoring network consisting of 12 monitoring wells was established spanning the entirety of the Site and all wells were completed within the sandy silt unit. Monitoring well locations are illustrated together with static groundwater elevations from a monitoring event on May 7, 2019, in plan view in **Figure 7** and in a northeast-southwest oriented geological cross-section in **Figure 8**.

All monitoring wells were drilled with solid stem augers with the exception of BH-7 which was drilled using hollow stem augers. A summary of the monitoring well construction details is provided in **Table 4-1** below.

Table 4-1 Summary of Monitoring Well Details

Well ID	Ground Elevation (masl)	Depth to bottom of well (mbgs)	Well Diameter (m)	Screen Length (m)	Screened Unit
BH-1	105.35	9.20	0.051	3.048	Sandy Silt
BH-5	104.76	9.20	0.051	3.048	Sandy Silt
BH-6 S (MW-6)	104.97	4.60	0.051	3.048	Fill/ Sandy Silt
BH-6 D	104.97	9.20	0.051	3.048	Sandy Silt
BH-7	105.73	19.80	0.051	3.048	Sandy Silt
BH-9	104.89	9.20	0.051	3.048	Sandy Silt
BH-12 (MW-12)	105.01	5.18	0.051	3.048	Sandy Silt
BH-13	105.01	6.10	0.051	3.048	Sandy Silt
BH-14	105.32	4.60	0.051	3.048	Sandy Silt
BH-15S (MW-15)	105.42	6.10	0.051	3.048	Sandy Silt
BH-15 D	105.42	9.20	0.051	3.048	Sandy Silt
BH-16	105.00	19.80	0.051	3.048	Sandy Silt

4.4.2 Groundwater Levels

Static groundwater elevations were recorded in a long-term monitoring program spanning the period of March to June of 2019; manual measurements were taken approximately once every two weeks. Additionally, manual measurements were supplemented with continuous hourly recordings at two monitoring locations, BH-5 and BH-7, using pre-programmed dataloggers. The records from the monitoring program are presented in **Table 4-2** in meters below ground surface and in **Table 4-3** in meters above sea level. Groundwater depths are presented relative to the existing ground surface. A long-term groundwater level monitoring hydrograph is presented in **Figure 9** to illustrate the seasonal variability in groundwater levels at the Site.

Groundwater elevations within the long-term monitoring period ranged in elevation from a low of 96.53 masl (8.89 mbgs) at BH-15S (MW-15) in northeast corner of the Site in late March, to a high of 103.57 masl (1.4 mbgs) at BH-6S (MW-6) in the southwest corner of the Site in late March. The variability in water levels over the long-term monitoring period was on average, approximately 0.39 m across the Site excluding wells that demonstrated uncharacteristic variability, which were located in the northeast corner of the Site. The range in groundwater elevations at each well over the monitoring period is presented in **Table 4-2** and in **Table 4-3**.

Groundwater levels from shallow wells, i.e., wells 6.1 m deep or less (BH-6S, BH-12, BH-13, BH-14, BH-15S), were taken as representative of the water table. The groundwater table is expected to fluctuate with the change of seasons in response to periods of groundwater recharge resulting from frequent storm events and periods of snowmelt. In this regard, water levels at the Site are anticipated to be highest in the spring; based on the long-term monitoring results the shallow groundwater levels were in general slightly higher in April to May.

Table 4-2 Water Level Depths – mbgs

ID	15-Mar-19	29-Mar-19	24-Apr-19	07-May-19	15-May-19	31-May-19	06-Jun-19	Variability (m)
BH-1	3.11	NM	3.15	NM	3.11	2.79	2.78	0.37
BH-5	3.97	3.59	3.50	3.52	3.97	3.55	3.50	0.47
BH-6 S (MW-6)	2.09	1.40	1.41	1.51	2.09	1.64	1.79	0.69
BH-6D	NM	3.01	2.86	2.86	NM	2.90	2.92	0.15
BH-7	4	3.92	3.78	3.67	4.00	3.78	3.75	0.25
BH-9	3.12	3.06	3.10	3.06	3.12	2.99	2.97	0.15
BH-12 (MW-12)	NM	4.15	4.07	4.03	NM	3.78	3.72	0.43
BH-13	2.67	2.30	2.18	2.24	2.67	2.20	2.20	0.49
BH-14	4.52	4.54	4.29	4.10	4.52	4.00	4.00	0.54
BH-15S (MW-15)	dry	8.89	8.62	8.43	dry	3.17	2.92	2.56
BH-15 D	dry	dry	5.48	4.71	dry	8.05	7.94	0.95
BH-16	NM	8.25	4.38	4.42	NM	4.28	4.24	4.01

Notes:
1. NM denotes not monitored due to obstruction.
2. Water depths relative to existing ground surface.

Table 4-3 Water Level Measurements – masl

ID	15-Mar-19	29-Mar-19	24-Apr-19	07-May-19	15-May-19	31-May-19	06-Jun-19	Variability (m)
BH-1	102.24	NM	102.20	NM	102.24	102.56	102.57	0.37
BH-5	100.79	101.17	101.26	101.24	100.79	101.21	101.26	0.47
BH-6S (MW-6)	102.88	103.57	103.56	103.46	102.88	103.33	103.18	0.69
BH-6D	NM	101.96	102.11	102.11	NM	102.07	102.05	0.15
BH-7	101.73	101.81	101.95	102.06	101.73	101.95	101.98	0.25
BH-9	101.77	101.83	101.79	101.83	101.77	101.90	101.92	0.15
BH-12 (MW-12)	NM	100.86	100.94	100.98	NM	101.23	101.29	0.43
BH-13	102.22	102.59	102.71	102.65	102.22	102.69	102.69	0.49
BH-14	100.80	100.78	101.03	101.22	100.80	101.32	101.32	0.54
BH-15S (MW-15)	dry	96.53	96.80	96.99	dry	102.25	102.50	2.56
BH-15 D	dry	dry	99.94	100.71	dry	97.37	97.48	0.95
BH-16	NM	96.75	100.62	100.58	NM	100.72	100.76	4.01

Notes:
1. NM denotes not monitored due to obstruction.

4.4.3 Hydraulic Conductivity

Single well hydraulic response testing in the form of rising-head tests was conducted in March of 2019 at select monitoring wells to measure the in-situ hydraulic conductivity (K) of the screened overburden materials. Prior to testing, each well was developed in order to mitigate potential influences from impacts to the native, near-well materials disturbed by drilling.

During the rising head test, a pseudo-instantaneous drop in the water level was achieved by extracting water from the well using a manual inertial pump. The water level recovery was measured by a datalogger taking readings at pre-programmed intervals and left in place to record recovery. For the purposes of the test, recovery was considered to be complete at or above approximately 85% of the pre-test water column.

The hydraulic conductivity was estimated using the Hvorslev (1951) method with the recovery data recorded by the dataloggers. Where available, hydraulic conductivity was also calculated using data from grainsize analyses using the Hazen (1911) method. The corresponding analyses are presented in **Appendix C**.

A summary of hydraulic conductivities obtained from the rising head tests and grainsize analyses is presented in **Table 4-4**.

Table 4-4 Summary of Hydraulic Conductivity Tests

Well ID	Screen Interval (masl) / Sample Depth (masl)	Material Tested	Hvorslev Method K (m/s)	Hazen Method K (m/s)
BH-1	96.15 – 99.20	Sandy Silt	5.5×10^{-8}	-
	96.25			1.4×10^{-7}
BH-5	96.15 – 99.20	Sandy Silt	8.7×10^{-8} – 1.0×10^{-7}	-
BH-6 S /(MW-6)	100.85 – 103.90	Sandy Silt	2.7×10^{-8} – 7.3×10^{-8}	-
BH-7	85.55 – 88.60	Sandy Silt	1.8×10^{-7}	-
BH-9	96.15 – 99.20	Sandy Silt	1.0×10^{-7} – 1.4×10^{-7}	-
BH-10	96.88	Sand and Gravel	-	7.7×10^{-5}
BH-13	99.25 – 102.30	Sandy Silt	2.3×10^{-8} – 3.6×10^{-8}	-
BH-16	85.55 – 88.60	Sandy Silt	1.6×10^{-8}	-

Notes:
1. – indicates not applicable

The hydraulic conductivity of the sandy silt ranged between 1.6×10^{-8} m/s and 1.8×10^{-7} m/s with a geometric mean of 6.0×10^{-8} m/s. The range in reported in-situ hydraulic conductivity values falls within the literature range for glacial till and silt deposits (Freeze and Cherry, 1979). The observed variability in values reported is expected to be a result of the heterogeneous nature of the materials tested.

The sand and gravel deposit, with an estimated hydraulic conductivity of 7.7×10^{-5} m/s from grainsize analysis, represents the most conductive unit at the Site. It should be noted that measures of hydraulic conductivity obtained using the Hazen (1911) method are determined using a grab sample and are therefore considered representative only of the micro-scale area where the sample was collected. As a result, the estimated hydraulic conductivity may not be

representative of the larger unit itself on a macro scale and typically provides overly conservative estimates of hydraulic conductivity.

For the purposes of the dewatering estimates (**Section 5**), the sand and gravel unit at BH-10 and the sand units at BH-11 and BH-12 are assumed to act with the over and underlying sandy silt as one hydraulic unit with a hydraulic conductivity equivalent to a the geometric mean of all estimated values 1.3 x 10^{-6} m/s.

4.4.4 Groundwater Flow

Based on the groundwater elevations and trends observed over the long-term monitoring period, the local groundwater flow direction in the shallow water table system is a subdued reflection of the local topographic relief in that the groundwater flows towards the inside of the Site from the perimeter and to the south towards Lake Ontario.

4.4.5 Groundwater Quality

Unfiltered groundwater samples were collected from BH-7 on March 12, 2019. The collected samples were sent to SGS Environmental Services in Lakefield, ON. The samples were analyzed for the parameters and corresponding sewer discharge criteria of the *Regional Municipality of Durham Sewer Use By-Law No. 55-2013* (By-Law 55-2013).

Based on the laboratory analytical results, the results for all parameters, with the exception of Total Suspended Solids (TSS), were within the criteria outlined in *Table 2 – Limits for Storm Sewer Discharge* of By-Law 55-2013. Additionally, all parameters, including TSS, were found to have met the criteria for *Table 1 – Limits for Sanitary Sewer Discharge* of By-Law 55-2013. Use of the municipal sewers for disposal of groundwater is contingent on approval from Durham Region and the quality of the discharge relative to the criteria of the receiving sewer, among others, is satisfied.

The laboratory analytical results and Certificate of Analysis are included in **Appendix D** and a tabulated summary is provided in **Table 4-5** below.

Table 4-5 Groundwater Quality Results

Analysis	Units	Durham Sanitary By-law Limit	Durham Storm By-law Limit	RL	BH-7
General Chemistry					
Total BOD	mg/L	300	15	2	< 4
Total Kjeldahl Nitrogen (TKN)	mg/L	100	-	0.5	0.6
pH	pH	6.0-11.5	6.0-9.5	0.05	8.15
Phenols-4AAP	mg/L	1	0.008	0.002	< 0.002
Total Suspended Solids (TSS)	mg/L	350	15	2	48
Total Phosphorus (P)	mg/L	10	0.4	0.003	0.055
Sulphate	mg/L	1500	-	2	15
Oil and Grease					
Total Animal / Vegetable Oil and Grease	mg/L	150	-	4	< 4
Total Oil & Grease Mineral / Synthetic	mg/L	15	-	4	< 4

Table 4-5 Groundwater Quality Results

Analysis	Units	Durham Sanitary By-law Limit	Durham Storm By-law Limit	RL	BH-7
Nonylphenol and Ethoxylates					
Nonylphenol Ethoxylate (Total)	mg/L	0.2	0.01	0.01	< 0.01
Nonylphenol (Total)	mg/L	0.02	0.001	0.001	< 0.001
Metals and Inorganics					
Total Aluminum (Al)	mg/L	50	-	0.001	0.335
Total Antimony (Sb)	mg/L	5	-	0.0009	< 0.0009
Total Arsenic (As)	mg/L	1	0.02	0.0002	0.00021
Total Cadmium (Cd)	mg/L	0.7	0.008	0.000003	0.00001
Total Chromium (Cr)	mg/L	2	0.08	0.00008	0.00209
Total Cobalt (Co)	mg/L	5	-	0.000004	0.000312
Total Copper (Cu)	mg/L	3	0.05	0.0002	0.0061
Total Cyanide (CN)	mg/L	2	0.02	0.01	< 0.01
Total Fluoride (F-)	mg/L	10	-	0.06	0.39
Total Lead (Pb)	mg/L	1	0.12	0.00001	0.00056
Total Manganese (Mn)	mg/L	5	0.15	0.00001	0.0391
Total Mercury (Hg)	mg/L	0.01	0.0004	0.00001	< 0.00001
Total Molybdenum (Mo)	mg/L	5	-	0.00004	0.0261
Total Nickel (Ni)	mg/L	2	0.08	0.0001	0.0009
Total Selenium (Se)	mg/L	1	0.02	0.00004	0.00005
Total Silver (Ag)	mg/L	5	0.12	0.00005	< 0.00005
Total Tin (Sn)	mg/L	5	-	0.00006	0.00056
Total Titanium (Ti)	mg/L	5	-	0.00005	0.0121
Total Zinc (Zn)	mg/L	2	0.04	0.002	0.003
Semivolatile Organics					
Di-N-butyl phthalate	mg/L	0.08	0.015	0.002	< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.012	0.0088	0.002	< 0.002
Volatile Organics					
Chloroform	mg/L	0.04	0.002	0.0005	< 0.0005
1,2-Dichlorobenzene	mg/L	0.05	0.0056	0.0005	< 0.0005
1,4-Dichlorobenzene	mg/L	0.08	0.0068	0.0005	< 0.0005
cis-1,2-Dichloroethylene	mg/L	4	0.0056	0.0005	< 0.0005
trans-1,3-Dichloropropene	mg/L	0.14	0.0056	0.0005	< 0.0005
Methylene Chloride	mg/L	2	0.0052	0.0005	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	1.4	0.017	0.0005	< 0.0005
Tetrachloroethylene	mg/L	1	0.0044	0.0005	< 0.0005
Trichloroethylene	mg/L	0.4	0.0076	0.0005	< 0.0005
Methyl Ethyl Ketone	mg/L	8	-	0.02	0.18

Table 4-5 Groundwater Quality Results

Analysis	Units	Durham Sanitary By-law Limit	Durham Storm By-law Limit	RL	BH-7
Styrene	mg/L	0.2	-	0.0005	< 0.0005
Volatile Organics - BTEX					
Benzene	mg/L	0.01	0.002	0.0005	< 0.0005
Ethylbenzene	mg/L	0.16	0.002	0.0005	< 0.0005
Toluene	mg/L	0.016	0.002	0.0005	< 0.0005
Total Xylenes	mg/L	1.4	0.0044	0.0005	< 0.0005
PCBs					
Total PCB	mg/L	0.001	0.0004	0.0001	< 0.0001
Microbiological					
Escherichia coli (E.Coli)	CFU/100mL	-	200	-	< 2

Notes: Yellow highlighted cells indicate an exceedance of Table 2 criteria.

5 Calculation of Dewatering Rates and Estimation of Zone of Influence

Dewatering rates were estimated based on Toronto Inspection Ltd.'s interpretation of the hydrogeological conditions of the Site and the proposed development details outlined in the plans and sections which as included in **Appendix A**. At the time of preparation of this report, the proposed top-of-slab elevations for the underground parking levels in each parking facility were not known. For the purposes of the dewatering assessment, each storey of underground parking facility was assumed to have a height of 3 m. If these assumptions are proven to be inaccurate, the dewatering requirements for the proposed parking facilities in conjunction with potential groundwater control requirements for Site services should be re-evaluated prior to the submission of applications for dewatering and/or discharge permits.

Dewatering estimates are based on groundwater elevations observed during monitoring events and the hydraulic properties of the soils determined by in-situ hydraulic conductivity tests and grainsize analyses. This section does not provide a design of dewatering operations, instead, it provides an estimate of the expected dewatering rate required to obtain the desired drawdown. The most effective dewatering measures for the prevalent ground conditions and the design of the dewatering operations are the sole responsibility of the dewatering contractor on-Site.

5.1 Aquifer Characteristics

The underlying geology of the Site was determined to consist primarily of sandy silt with intermittent layers of sand in the east of the Site. A significant sand and gravel deposit with an approximate thickness of 12.9 m was encountered at BH-10. The sand layers and sand and gravel deposits should be expected to contribute increased flows in comparison to the poorly graded sandy silts which have higher proportions of fine-grained material. However, as it is anticipated that these units are not laterally extensive, they are expected to drain relatively quickly in comparison to the sandy silt materials.

Considering the distribution of proposed parking facilities at the Site, the groundwater elevation considered in the dewatering analysis of each facility corresponds to the maximum groundwater level from the nearest shallow monitoring well, plus 1 m as it is expected that the water levels may fluctuate seasonally year to year. The maximum groundwater elevations are therefore 103.71 masl for the parking structure beneath Podium 7 & the proposed park (102.71 masl from BH-13 on April 24, 2019, plus 1 m); 103.50 masl for the structure beneath Podiums 2-6 (102.50 masl from BH-15s on June 6, 2019 plus 1m); and 104.57 masl for the structure beneath Podium 1 (103.57 masl from BH-6S on March 29, 2019 plus 1m).

Based on the site-specific estimates of hydraulic conductivity (**Section 4.4.3**) and anticipated depth of excavation required for the parking facility, the hydraulic conductivity of the sandy silt considered in the estimation of dewatering rates for facilities in this material was 6.0×10^{-8} m/s, the geometric mean of estimates for the sandy silt. The dewatering rates for parking facilities in the east of the Site that are anticipated to contact the sand layers , and sand and gravel unit (Podiums 2 – 6) were estimated using a hydraulic conductivity of 1.3×10^{-6} m/s, the geometric mean incorporating hydraulic conductivity estimates for these units.

5.2 Required Drawdown

Dewatering will be required to draw the water level down to below the depth of excavation required for the parking and building foundations or in the case of relatively impermeable material, to control groundwater seepage in the excavation.

For the purposes of the dewatering calculations, the rate of dewatering was calculated separately for each individual parking facility. The excavation dimensions were scaled from the underground parking plans (Graziani + Corazza Architects Inc., 2023); an equivalent area approach was used for Podiums 2-6 and Podium 1 as these structures are irregularly shaped.

The finished floor elevation of each building was assumed equal to the average grade for the ground floor, shown on the architectural sections by Graziani + Corazza Architects Inc. (2023). The lowest average grade for each underground parking facility was used for calculation. Underground parking structures were assumed to be 3 m and 6 m tall for 1-level and 2-levels respectively. The base of each excavation was taken as 1 m below the height of the underground parking structure.

The dewatering requirements for the Site are summarized in **Table 5-1** below.

Table 5-1 Summary of Dewatering Requirements

Underground Parking Facility	Ground Surface (masl)	Excavation Depth / Base (mbgs/masl)	Excavation Width (m)	Excavation Length (m)	Maximum Groundwater Elevation (masl)	Drawdown Water Level (masl)	Maximum Required Drawdown (m)
Podium 7 & Park	105.60	7 / 98.60	50	150	103.71	97.60	6.11
Podium 2 – 6	105.55	7 / 98.55	105	190	103.50	97.55	5.95
Podium 1	104.95	4 / 100.95	36	180	104.57	99.95	4.62

5.3 Zone of Influence

5.3.1 Unconfined Aquifers

Based on the drawdown requirements, the dimensions of the excavations, and the underlying soil conditions, it is anticipated that the dominant mode of groundwater flow to the excavations will be planar to all sides with corners not being a significant contribution. An estimate of the Distance of Influence (DOI) for dewatering excavations in unconfined aquifers can be calculated using the following equation (Powrie and Preene, 1994, as provided in Cashman and Preene, 2013):

$$L_0 = \sqrt{\frac{12HK}{S_y}}t$$

where,

- L_0 = Distance of influence to line source of recharge (m)
- H = Distance from initial static water level to assumed bottom of saturated aquifer contributing flows (m)
- S_y = Specific yield of the aquifer formation (0.2 for a silt per Morris and Johnson, 1967)
- t = Time, in seconds, required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)
- K = Hydraulic Conductivity of aquifer formation (m/s)

A summary of the ROI of dewatering estimated for each parking facility is presented in **Table 5-2** below.

Table 5-2 Summary of Zone of Influence Estimates

Underground Parking Facility	H (m)	S_y [-]	K (m/s)	t (s)	L_{01} (m)
Podium 7 & Park	15	0.20	6.0×10^{-8}	1,209,600	9
Podium 2 – 6	15	0.20	1.3×10^{-6}	1,209,600	38
Podium 1	14	0.20	6.0×10^{-8}	1,209,600	8

5.4 Dewatering Rate Calculations

5.4.1 Short-term Dewatering

Groundwater Control

The calculation of anticipated dewatering rates, to control groundwater inflows to the excavation during construction is based on methods of analytical assessment using the theoretical solutions detailed in *Construction Dewatering and Groundwater Control: New Methods and Applications, Third Edition* (Powers et. al., 2007). The analytical equations have the following assumptions:

- ideal aquifer conditions, i.e., homogeneous, isotropic, uniform thickness and infinite areal extent;
- fully penetrating pumping well(s);
- exclusively horizontal flow to the pumping well(s); and
- a constant pumping rate with the flow to the pumping well(s) corresponding to steady-state conditions.

The analytical assessment assumes steady state flow into an open excavation; however, it should be recognized that a transient condition will exist at the start of dewatering and that during this time, flows may be higher but will dissipate over time to steady state conditions as aquifer storage is depleted.

The following equation for groundwater flow in unconfined aquifers to a rectangular excavation with planar flow to all sides was used:

$$Q = 2\left[\frac{aK(H^2 - h^2)}{2L_0}\right] + 2\left[\frac{bK(H^2 - h^2)}{2L_0}\right]$$

where,

Q	=	Anticipated pumping rate (m^3/day)
K	=	Hydraulic conductivity (m/day)
H	=	Distance from the static water level to the bottom of the saturated aquifer (m)
h	=	Depth of water in the well while pumping (m)
L_0	=	Distance of Influence (m) from excavation, beyond which there is negligible drawdown.
a	=	Length of excavation (m)
b	=	Width of excavation (m)

To account for uncertainties and natural variability in the range of hydraulic conductivity and water levels, the calculated groundwater inflow rates were multiplied by a factor of safety of 2. Incorporating the factor of safety in the dewatering calculations also provides flexibility to the

dewatering contractor in meeting project schedules and helps to account for the initial pumping period under transient conditions when dewatering volumes are expected to be higher.

5.4.2 Long Term Dewatering

Since the building foundations are expected to extend below the seasonal high water table, it is anticipated that a method of groundwater control may be required to manage groundwater seepage around the foundation floor and walls over the long-term. If foundation drains are used as the management method, it is expected that over the long-term, one-third the rate of short-term dewatering may be required.

5.4.3 Allowance for Precipitation

While the excavation remains open, it may be necessary to dewater stormwater inputs from direct precipitation to the excavation. Incorporating additional discharge requirements for this provides an estimate of a worst-case dewatering scenario for the purpose of dewatering discharge permits and/or approvals. As such, a storm with a 24-hour depth of accumulation of 11 mm was considered. A rainfall depth of 11 mm represents over the 95th percentile of daily rainfall at the Oshawa Climate Station (Environment and Climate Change Canada, 2023), located approximately 22 km northeast of the Site at an elevation of 140 masl. Data for the Oshawa Climate Station were obtained from.

5.4.4 Summary

A summary of the dewatering rates estimated for each parking facility is presented in **Table 5-3** below. The dewatering analysis sheets can be found in **Appendix E**.

Table 5-3 Dewatering Rate Summary

Underground Parking Facility	H	h	K	Distance of Influence L_0	Short-Term Pumping Rate Q			Long-Term Pumping Rate Q
	m	m	m/day	m	m^3/day	L/day	L/s	L/day
Podium 7 & Park	15	9	5.2×10^{-3}	9				
				Groundwater	33.9	33,900	0.39	11,300
				Precipitation	82.5	82,500	0.95	-
				Sub-Total	116.4	116,400	1.35	11,300
Podium 2 – 6	15	9	1.1×10^{-1}	38				
				Groundwater	248.5	248,500	2.88	82,800
				Precipitation	219.4	219,400	2.54	-
				Sub-Total	467.9	467,900	5.42	82,800
Podium 1	14	9	5.2×10^{-3}	8				
				Groundwater	29.3	29,300	0.34	9,800
				Precipitation	71.3	71,300	0.83	-
				Sub-Total	100.6	100,600	1.16	9,800
				Groundwater	311.7	311,700	3.61	103,900
				Precipitation	373.2	373,200	4.32	-
				Total	684.9	684,900	7.93	103,900

Notes: 1. Rates shown rounded to the nearest 100 L/day. 2. Groundwater rates include a safety factor of 2.

As was mentioned previously, this dewatering analysis has been prepared for permitting requirements only. As such, the dewatering rates are not meant to be solely relied upon in the determination of the approach used in the design of the dewatering system. The dewatering contractor is ultimately responsible for ensuring project timelines with respect to dewatering are met and that the open excavations are safe from a groundwater seepage perspective.

5.5 Options for Dewatering Discharge and Permitting

5.5.1 Dewatering Permit Requirements

Assuming construction of all three underground parking facilities at the same time, the estimated maximum cumulative groundwater dewatering rate required during construction to achieve the desired conditions within the excavations is 311,700 L/day. Additionally, it is recommended to account for incident precipitation when applying for potential dewatering and discharge approvals to ensure there is contingency available for maintaining a dry excavation during periods of rain. An accumulation of 11 mm over 24 hours within each excavation was considered in this investigation, which requires accounting for an additional 373,200 L/day above the estimated groundwater dewatering rates. Considering both groundwater and stormwater control requirements, the cumulative rate of dewatering is then 684,900 L/day. If however, construction is staged with each underground parking facility constructed separately, maximum dewatering rates for both groundwater and stormwater would vary between 100,600 L/day and 467,900 L/day. Cumulative water takings for construction dewatering in excess of 50,000 L/day but less than 400,000 L/day that include groundwater and storm water require an EASR to proceed. Groundwater takings greater than 400,000 L/day require a PTTW issued by the MECP. Consideration of the approach to construction phasing is warranted to determine the water taking permit requirements and maximum dewatering rate that may need to be requested.

Since the foundations for all parking facilities will extend below the water table, it is anticipated that a method of groundwater control will be required over the long-term to manage hydrostatic pressure and groundwater seepage around the foundation floor and walls. If foundation drains and sumps are proposed for long-term groundwater control, a dewatering rate of 103,900 L/day is expected. Long-term dewatering over 50,000 L/day requires a PTTW to proceed.

5.5.2 Disposal Options for Discharge Water

At this time, the groundwater quality, as it relates to By-Law 55-2013, does not meet the discharge criteria in the *Table 2 – Limits for Storm Sewer Discharge*; however, it does meet the *Table 1 – Limits for Sanitary Sewer Discharge.* With approval from Durham Region, excess groundwater can be directed to the municipal sanitary sewers without requiring additional treatment. Disposal options for excess groundwater should be considered prior to construction as a discharge agreement will be required from Durham Region to authorize the discharge of dewatering effluent to municipal sewers. Consultation with Durham Region is recommended to determine the requirements for dewatering discharge agreements on this project.

If dewatering discharge during construction is directed to a Durham Region municipal sewer, By-Law 55-2013 provides that dewatering operations must comply with the *Construction Specifications for Control of Water from Dewatering Operations, OPSS 518, November 2006.* If disposal to a Durham Region municipal sewer is proposed during construction, the treatment of dewatering discharge is the responsibility of the dewatering contractor on-Site. It is incumbent upon them to ensure that the dewatering discharge effluent meets the discharge criteria in By-

Law 55-2013 for the receiving sewer and is in accordance with any and all terms and/or conditions of their discharge approval.

If a Private Water Drainage System (PWDS) is required for managing groundwater seepage over the long-term, approval for the connection to municipal sewers will be required from Durham Region. Alternatively, waterproofing of the foundation can be undertaken as an alternative to a PWDS. The option of waterproofing versus installing a PWDS and connecting to a municipal sewer should be considered prior to construction as approval for the connection from Durham Region will be required and may include separate agreements for each building complex. Further consultation with Durham Region is recommended if the discharge of groundwater to a municipal sewer is proposed over the long-term.

6 Potential Receptors

As part of this investigation, the potential receptors of impacts from the anticipated dewatering, and construction were identified through the following:

- A query of the MECP (2023b) Water Well Information System (WWIS) for records of private water supply within a 500 m radius of the Site;
- A query of the MECP (2022) PTTW database to identify permitted water takers within a 500 m radius of the Site; and
- A review of the MNRF (2023) Natural Heritage Areas mapping for potential ecological receptors within a 500 m radius of the Site.
- A review of MECP (2023a) Source Protection Information Atlas for vulnerable source water protection areas.

6.1 MECP Water Well Record Search

A search of the MECP WWIS was conducted within 500 m of the Site. The search returned 64 water well records. **Figure 11** shows the location of MECP water well records within the 500 m buffer. Well usage details for the records are summarized in **Table 6-1**. **Appendix G** provides a summary of the water well record data.

Table 6-1 MECP Well Records within 500 m Radius

Primary Well Use	Number of Wells within 500 m Buffer of Study Area	Percentage of Total
Water Supply –Domestic	2	32%
Test/Observation/Monitoring Well	31	48%
Dewatering - Commercial	3	5%
Abandoned	13	20%
Unknown	15	23
Total	**64**	**100%**

The primary well usage within 500 m of the Site is for test/ observation/ monitoring well purposes, with the total number of 31 well records (48%). Of the remaining well records, 2 (3%) were for domestic water supply, 3 (5%) were for commercial dewatering, 13 (20%) were for abandoned wells, 15 (23%) were of unknown use.

6.2 Permitted Water Users

A search for permitted water takers within a 500 m radius of the Site was completed using the MECP PTTW database. No active PTTWs were returned.

6.3 Ecological Receptors

Based on a review of MNRF (2023) Natural Heritage Areas mapping, the Site is located 220 m east of a tributary of Petticoat Creek and the woodlands within the creek valley. The creek and its woodlands are shown on **Figure 1**.

7 Potential Impacts and Proposed Mitigation

7.1 Identification and Mitigation of Short-Term Impacts

7.1.1 Potential Short-Term Impacts to the Groundwater System

Dewatering activities may cause the local water level to drop temporarily. Short-term impacts to the groundwater system will be limited to the temporary drawdown resulting from construction dewatering. Following construction dewatering, the water table is expected to recover to pre-construction conditions. Surficial soils at the Site are of low permeability, which will limit the potential for contaminant migration through the subsurface. Based on the above unacceptable short-term impacts to the groundwater system are not expected.

7.1.2 Potential Short-Term Impacts to the Surface Water System

Dewatering can result in a decline in the groundwater level in shallow unconfined aquifers and change how the groundwater and surface water systems interact. There are no surface water features within the anticipated 38 m zone of influence of for construction dewatering and as such, dewatering activities are unlikely to have an impact on surrounding surface water features.

7.1.3 Potential Short-Term Impacts to Other Groundwater Users

Dewatering can result in a decline in the groundwater level in shallow unconfined aquifers, reducing the available groundwater for nearby groundwater takers. The distance of influence (L_0) for the construction dewatering is estimated to be at most 38 m. Based on the results of the MECP WWIS and PTTWs review, there are no active groundwater takers within this anticipated zone of influence, the nearest water supply wells are 180 m and 425 m away and no active PTTWs were identified. Further considering the availability of municipal servicing in the area, where water supply wells to exist impacts could be mitigated by the municipal supply. Given the above, no short-term impacts to other groundwater users are anticipated.

7.1.4 Potential Short-Term Impacts to Land Stability

Dewatering activities remove groundwater from the soil thereby increasing the effective stress of those soils whose pore spaces were once occupied by water. The increase in effective stress can naturally lead to settlement in subsurface materials which can manifest at the ground surface as and damage local infrastructure. Ground settlement related to construction dewatering should be reviewed by a geotechnical engineer prior to construction to evaluate and mitigate potential risks.

7.1.5 Mitigation of Short-Term Impacts

A Spill Prevention and Response Plan, as well as an Erosion and Sediment Control (ESC) Plan, should be implemented during construction to limit the possibility of downward percolation of spilled contaminants to the groundwater table and the release of sediments and other spilled contaminants off-Site. Where well designed and implemented environmental management plans are in place, impacts to receptors can be minimized.

7.2 Identification and Mitigation of Long-Term Impacts

7.2.1 Potential Long-Term Impacts to the Groundwater System

A small portion of the Site along the southern property boundary intersects an HVA where the storage, application and use of road salt is a low threat to drinking water quality.

When there exists a possibility that groundwater may be diverted and follow the path of new utilities or services, groundwater barriers may be used to prevent groundwater migration within utility or service networks.

7.2.2 Potential Long-Term Impacts to the Surface Water System

The Site is not located within an IPZ nor near to any water bodies or watercourses and therefore no unacceptable long-term impacts to the surface water system are expected.

7.2.3 Potential Long-Term Impacts to Other Groundwater Users

Long-term dewatering can result in a decline in the groundwater level in shallow unconfined aquifers, reducing the available groundwater for nearby groundwater takers. However, based on the results of the MECP WWIS and PTTWs review, there are few if any active groundwater takers within 500 m of the Site. As a result, no long-term impacts to other groundwater users are expected.

7.2.4 Mitigation of Long-Term Impacts

Considering the size of the Site, and its proximity to an HVA where the application of road salt is a low drinking water quality threat, best practices for salt use are recommended over the long-term.

8 Summary

A summary of the hydrogeological investigation is provided below:

- The Site is located within the Toronto and Region Source Protection Area and CTC Source Protection Region. A portion of the Site along the southern property boundary intersects an HVA.
- The Site is located within the Petticoat Creek Watershed under the jurisdiction of the TRCA and it is not located within TRCA regulated areas. The nearest surface water feature to the Site is a tributary to Petticoat Creek at approximately 220 m to the west.
- The ground topography at the Site is relatively flat, the average ground surface elevation is 105 masl.
- The Site is situated in the Iroquois Plain physiographic region.
- The subsurface geology consists of fill underlain by a layer of sandy silt to a depth of 22.88 mbgs. Intermixed within the sandy silt unit are thin layers of sand, with a sand and gravel deposit approximately 12.9 m thick observed along the south-central area of the Site's southern development boundary.
- Groundwater levels measured from March to June of 2019, and ranged from 96.53 masl in the northeast corner of the Site in late March, to a high of 103.57 masl in the southwest corner of the Site in late March.
- In-situ hydraulic conductivity (slug) tests were conducted at monitoring wells. The estimated hydraulic conductivity of the sandy silt deposits was estimated to range between 1.6×10^{-8} m/s and 1.8×10^{-7} m/s. The hydraulic conductivity of the sand and gravel unit was estimated at 7.7×10^{-5} m/s.
- A non-filtered groundwater quality sample was collected from BH-7 and analyzed for sewer discharge criteria in By-Law 55-2013. All parameters met the Table 1 – Limits for Sanitary Sewer Discharge of By-Law 55-2013. All parameters, with the exception of TSS, were met the discharge criteria of the Table 2 – Limits for Storm Sewer Discharge of By-Law 55-2013.
- The maximum dewatering rate estimated for construction of all underground parking structures is 684,900 L/day, which considers dewatering for groundwater control and removal of stormwater from direct precipitation into excavations assuming 11 mm of rainfall over 24 hours. Maximum estimated dewatering rates for individual parking structures range from 100,600 L/day to 467,900 L/day. An EASR is required for construction dewatering above 50,000 L/day but below 400,000 L/day which consists of groundwater and stormwater takings. A PTTW is required for groundwater takings above 400,000 L/day. Consideration of the construction phasing approach is recommended to determine permitting requirements and the maximum dewatering rate that should be requested.
- As the foundations for all parking facilities will extend below the seasonal high groundwater table, it is anticipated that a method of long-term groundwater control will be required. If a foundation drain is proposed, the maximum dewatering rate over the long-term is anticipated to be 103,900 L/day. Long-term dewatering above 50,000 L/day requires a PTTW to proceed.

- If excess groundwater/stormwater encountered during construction or collected in a dedicated foundation drainage system over the long-term is proposed to be discharged to a municipal sewer, approval from Durham Region will be required. Consultation with Durham Region is recommended to determine the requirements for the discharge approvals during construction and permanent sewer connections for groundwater discharge over the long-term.
- Dewatering activities remove groundwater from the soil thereby increasing the effective stress which could lead to soil settlement. The potential risks associated with dewatering settlement should be reviewed by a geotechnical engineer prior to construction.
- It is recommended that a Spill Prevention and Response Plan as well as an ESC Plan be implemented during construction to limit potential impacts to the groundwater system and the off-Site release of sediment and construction debris.
- Considering the size of the Site, and its proximity to an HVA where the storage, application and handling of road salt is considered a low threat to drinking water quality, best management practices for salt use are recommended over the long-term.

9 References

Cashman, P.M. and Preene, M. 2013. Groundwater Lowering In Construction: A Practical Guide to Dewatering, 2nd Edition. CRC Press, New York, New York.

Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario, Third Edition. Ontario Geological Survey, Ontario Ministry of Natural Resources.

City of Pickering. 2022. City of Pickering Official Plan. Consolidated March 2022.

CTC Source Protection Committee. 2022. Approved Source Protection Plan: CTC Source Protection Region. Amendment (Version 5.0). Approved February 23, 2022.

Environment and Climate Change Canada. 2023. Historical Climate Data, Historical Data, Daily Data. Climate Station: Oshawa ID: 6155875, Year: 2021 and 2022. https://climate.weather.gc.ca/index_e.html. Accessed July 2023.

Freeze, R.A., and Cherry, J.A. 1979. Groundwater. Prentice Hall Inc., New Jersey.

Graziani & Corazza Architects Inc. 2023. Architectural Drawing Set for 603-643 & 645-699 Kingston Road. 10 pages. October 25, 2023.

Hazen, A. 1911. Discussion-dams of sand foundations: Transactions, American Society of Civil Engineers, v. 73, p 199-203.

Hvorslev, M.J. 1951. Time Lag and Soil Permeability In Groundwater Observations. Bulletin No. 36 Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg Mississippi. April 1951.

Ministry of the Environment, Conservation, and Parks (MECP). 2022. Permit to Take Water Database. 1960 to 2022. Last Updated April 29, 2022. https://data.ontario.ca/dataset/permit-to-take-water Accessed July 2023.

Ministry of the Environment, Conservation, and Parks (MECP). 2023a. Source Protection Information Atlas. http://geohub.lio.gov.on.ca/datasets/source-protection-information-atlas Last Updated June 29, 2023. Accessed July, 2022.

Ministry of the Environment, Conservation, and Parks (MECP). 2023b. Water Well Information System. January 1, 1899 to June 30, 2022. Last Updated March 31, 2023.https://data.ontario.ca/dataset/well-records Accessed July 2023.

Ministry of Natural Resources and Forestry (MNRF). 2023. Natural Heritage Areas Mapping Portal. https://geohub.lio.gov.on.ca/datasets/make-a-map-natural-heritage-areas. Accessed July 2023.

Ontario Geological Survey (OGS). 2000. Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised.

Ontario Geological Survey (OGS). 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release---Data 126-Revision 1.

Powers, J.P; A.B. Corwin; P.C. Schmall; W.E. Kaeck. 2007. Construction Dewatering and Groundwater Control: New Methods and Applications – Third Edition. New York, New York: John Wiley & Sons.

Powrie, W., and Preene, M. 1994. Performance of ejectors in construction dewatering systems. Proceedings of the Institution of Civil Engineers, Geotechnical Engineering No. 107: 143–154.

Regional Municipality of Durham (Durham Region). 2020. Durham Regional Official Plan. Consolidated May 26, 2020.

Toronto and Region Conservation Authority (TRCA). 2012. Petticoat Creek Watershed Action Plan.

Toronto and Region Conservation Authority (TRCA). 2022 TRCA Annual Regulation Mapping Update. https://trca.ca/regulation-mapping-update/. Accessed July 2023.

York, Peel, Durham, Toronto and The Conservation Authorities Moraine Coalition (YPDT-CAMC). 2006. Groundwater Modelling of the Oak Ridges Moraine Area. CAMC-YPDT Technical Report # 01-06. Prepared by Earthfx Inc.

10 General Statement of Limitations

The comments presented in this report are based on the soil and groundwater samples gathered from the borehole/monitoring well locations indicated on the plan of this report. There is no warranty expressed or implied or representations made by Toronto Inspection Ltd. that this program has discovered all potential environmental risks or liabilities associated with the subject site.

Although we consider this report to be representative of the subsurface conditions at the subject property in the areas investigated, any interpretation of factual data or unexpected soil conditions which exhibit noticeable discolouration, odour, etc. in areas not investigated in this report, should be discussed in consultation with us prior to any initiation of activity. Our responsibility is limited to an accurate assessment of the soil condition prevailing at the locations investigated at the time of the study.

To the fullest extent permitted by law, the clients maximum aggregate recovery against Toronto Inspection Ltd., its directors, employees, sub-contractors and representatives, for any and all claims by Director Industrial Holdings Limited for all causes including, but not limited to, claims of breach of contract, breach of warranty and/or negligence, shall be the amount of fees paid to Toronto Inspection Ltd. for its professional engineering services rendered with respect to the particular site which is the subject of the claim by the client.

Any use and/or interpretation of the data presented in this report, and any decisions made on it by the third party are responsibility of the third party. Toronto Inspection Ltd. accepts no responsibility for loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

Any legal actions arising directly or indirectly from this work and/or Toronto Inspection Ltd.'s performance of the services shall be filed no longer than two years from the date of Toronto Inspection Ltd.'s substantial completion of the services. Toronto Inspection Ltd. shall not be responsible to the client for lost revenues, loss of profits, cost of content, claims of customers, or other special indirect, consequential, or punitive damages.

Yours truly,

Toronto Inspection Ltd.

PROFESSIONAL GEOSCIENTIST
RASHEEDA D. BYER-COWARD
PRACTISING MEMBER
1933
ONTARIO

Sanjay Goel, B.E.S.
Environmental Scientist
Vice-President

Rasheeda Byer-Coward, M.Sc., P.Geo.
Hydrogeologist

ig/dz/rbc

Legend

- Highway
- Arterial Road
- Local Road
- Railway
- Watercourse
- Wooded Area
- Site Location

0 50 100 200 300 400 m

1:10,000

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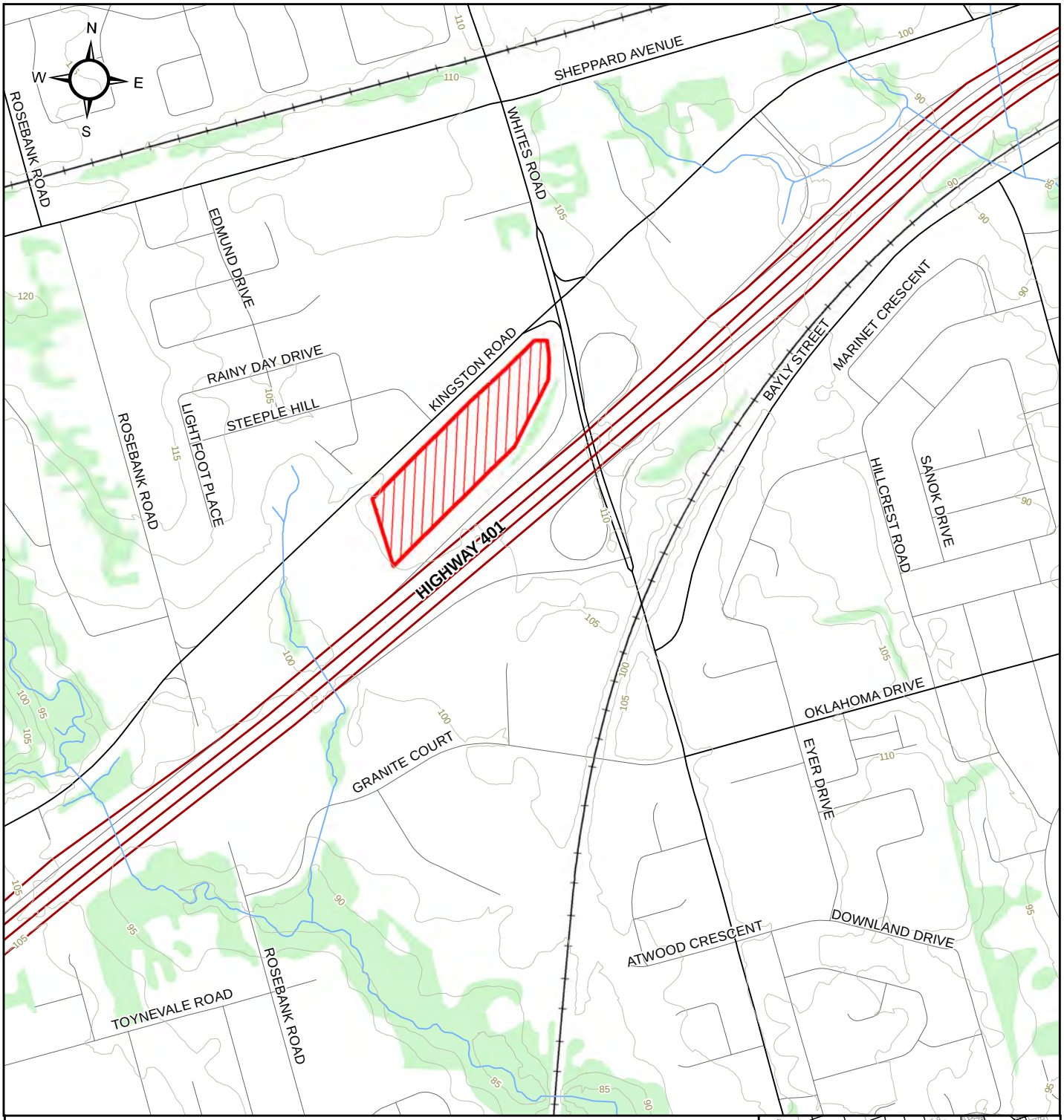
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:	Site Location
LOCATION:	603-643, 645 and 699 Kingston Road, Pickering, Ontario
PROJECT NO.	4986-19-HD
DATE:	November 2023
FIGURE NO.	1



Legend

- 5m Contour
- Highway
- Arterial Road
- Local Road
- Railway
- Watercourse
- Wooded Area
- Site Location

0 50 100 200 300 400 m

1:10,000

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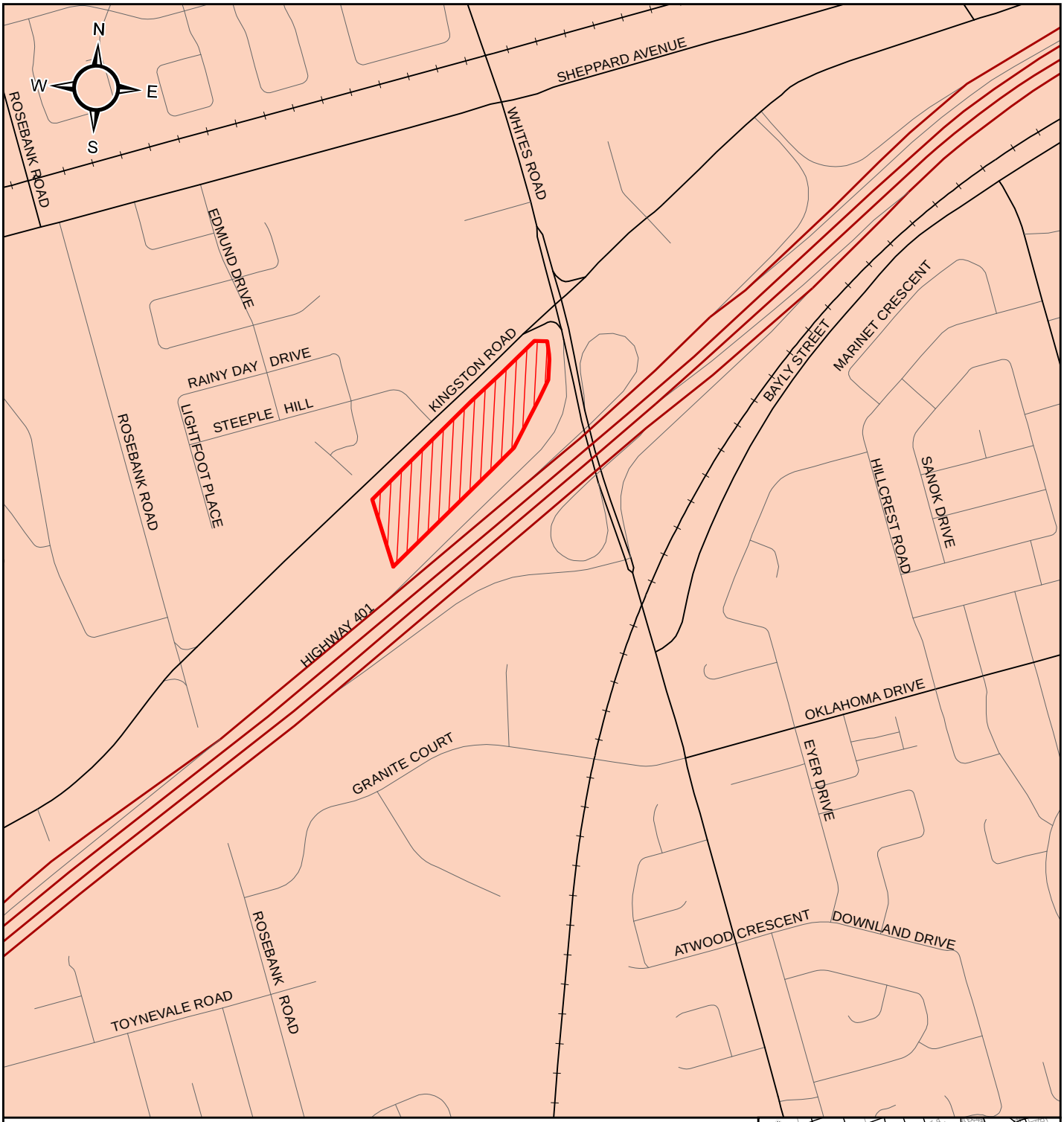
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Topography

LOCATION: 603-643, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	2



Legend

- Railway
- Highway
- Arterial Road
- Local Road
- Site Location

Physiography

- Iroquois Plain

0 50 100 200 300 400 m

1:10,000

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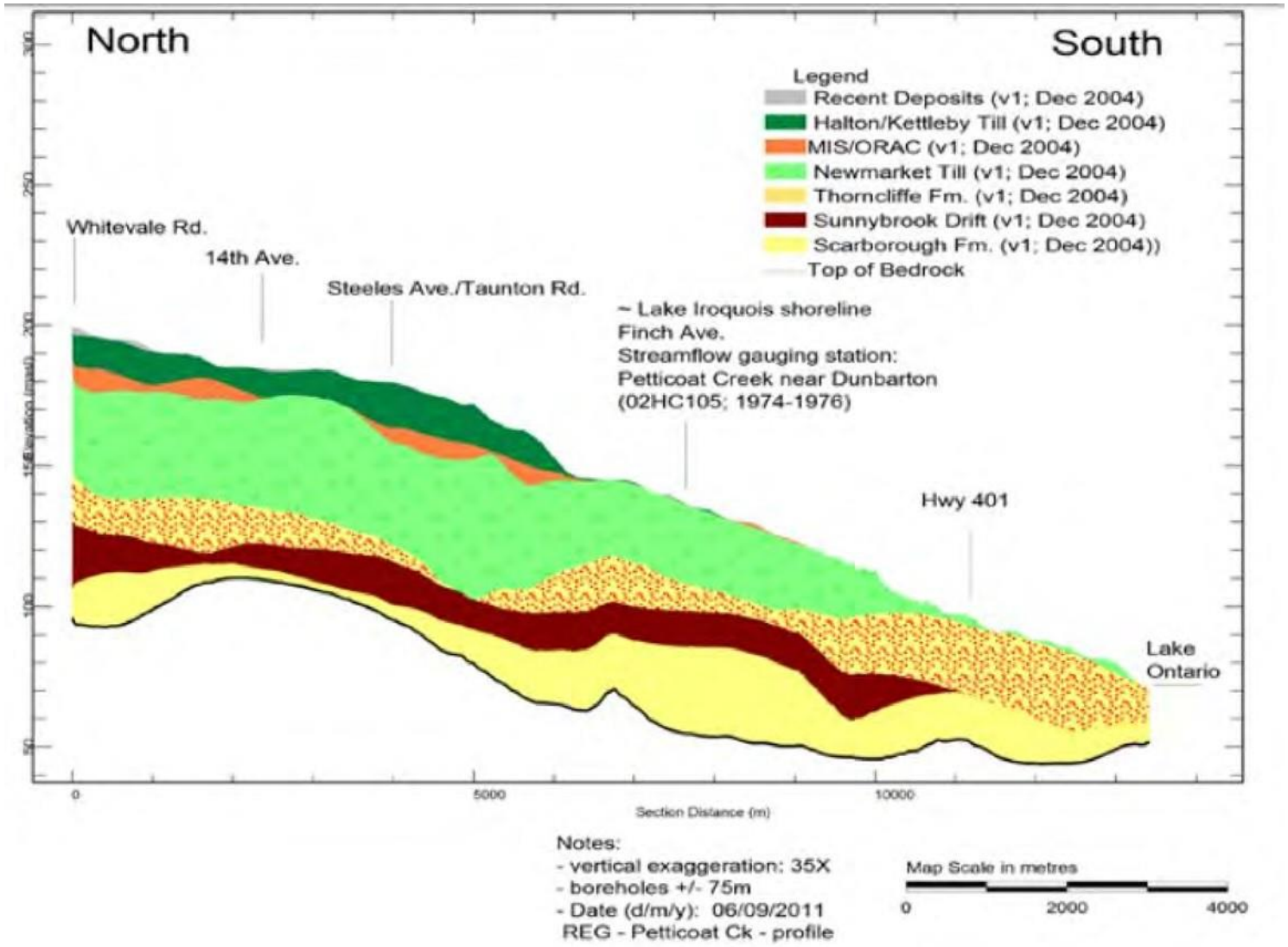
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Physiography

LOCATION: 603-643, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	3



LEGEND

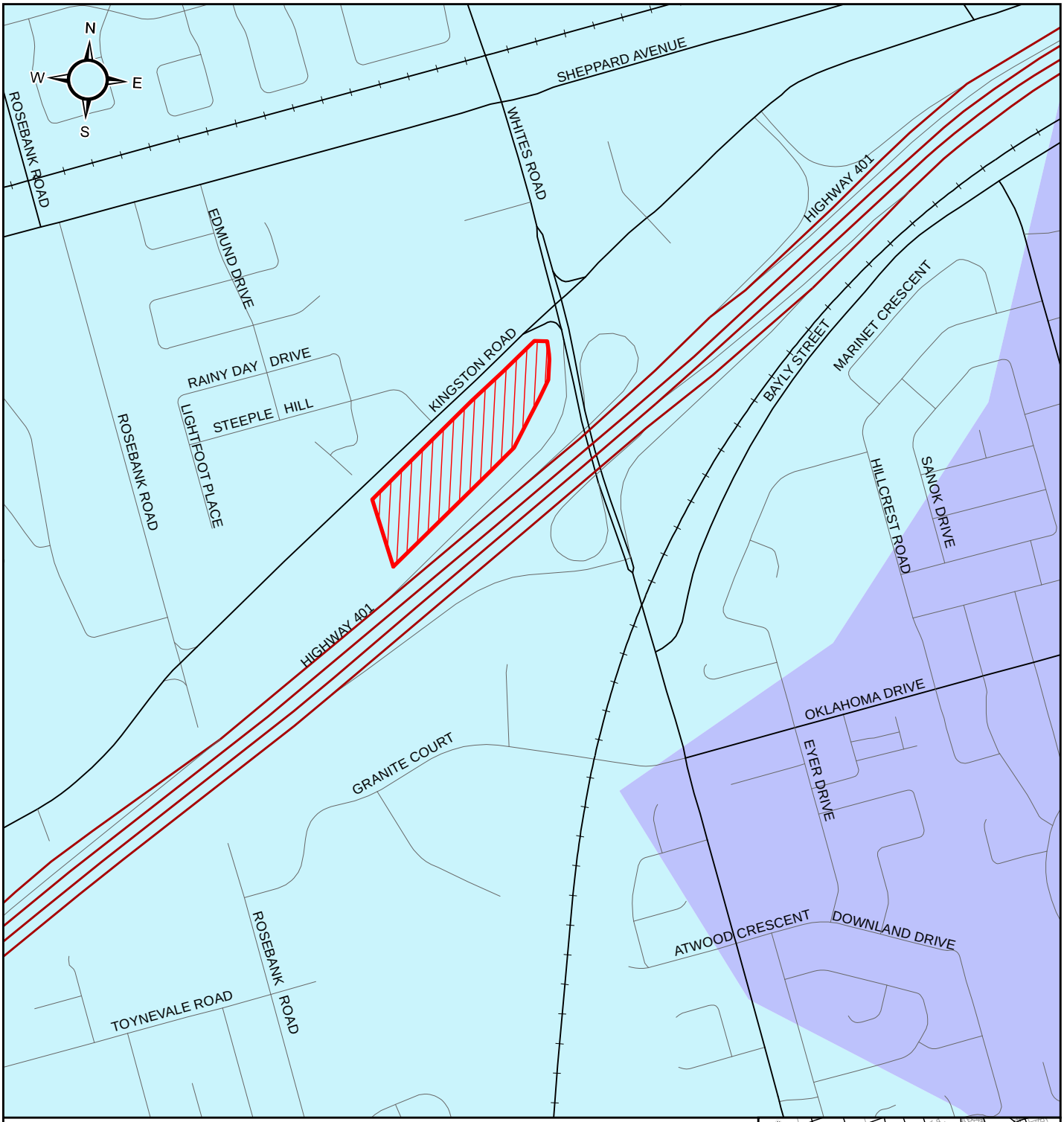
REFERENCE:
Petticoat Creek Watershed Action Plan, TRCA, August 2012.

TorontoInspection
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:
Regional Hydrostratigraphic Cross-Section

LOCATION:
603-643, 645-699 Kingston Road,
Pickering, Ontario

PROJECT NO.:	DATE:	FIGURE NO.:
4986-19-HD	November 2023	4



Legend

- Railway
- Highway
- Arterial Road
- Local Road
- Site Location

Quaternary Geology

- Glaciolacustrine deposits
- Till

0 50 100 200 300 400 m

1:10,000

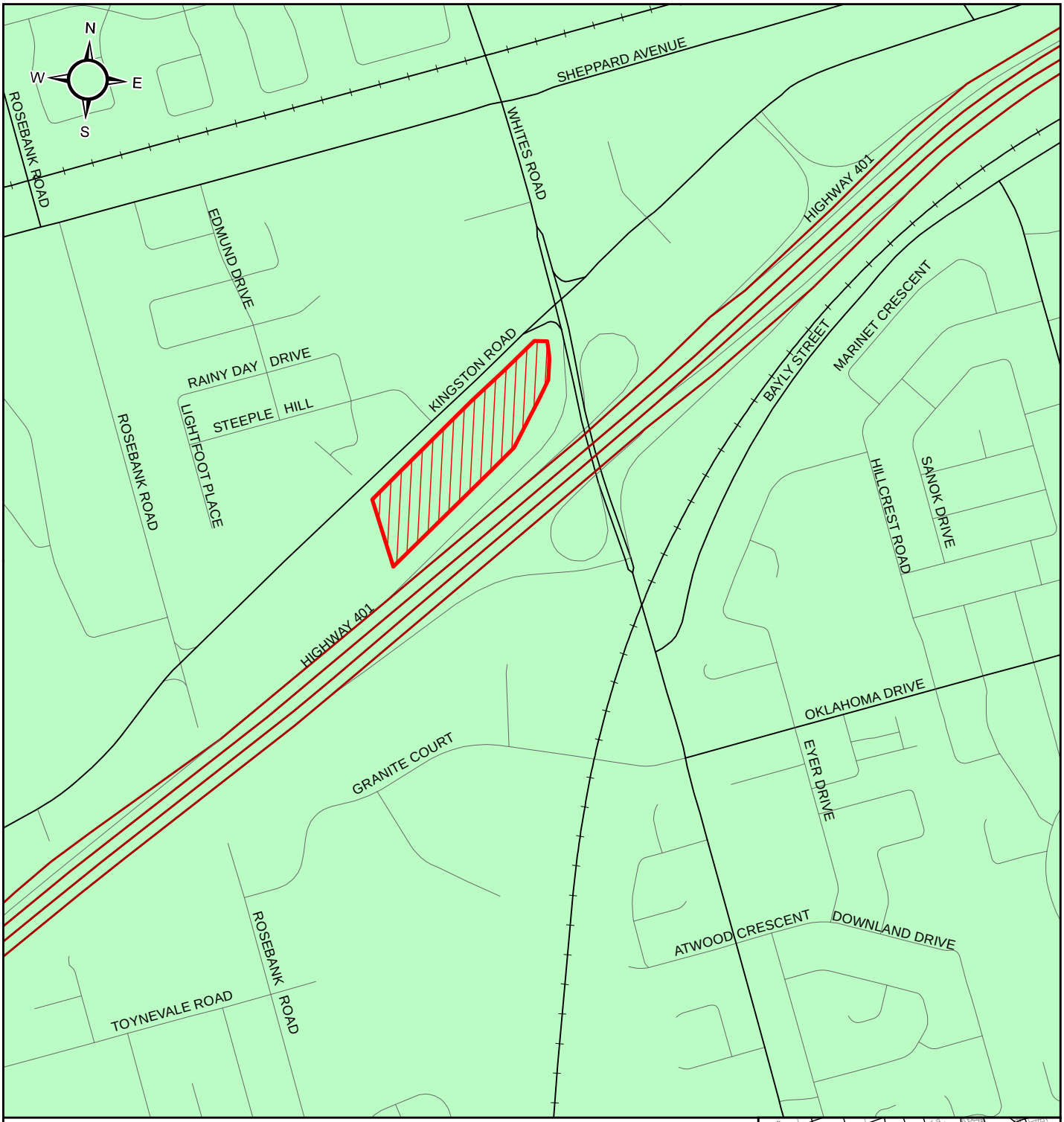
TorontoInspection
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Quaternary Geology

LOCATION: 603-699, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	5

REFERENCE



Legend

- Railway
- Highway
- Arterial Road
- Local Road
- Site Location

Bedrock Geology

Georgian bay Fm.; Blue Mountain Fm.; Billings Fm.; Collingwood Mb.; Eastview Mb.

0 50 100 200 300 400 m

1:10,000

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Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Bedrock Geology

LOCATION: 603-643, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	6

REFERENCE

Legend

- Borehole Location
- Monitoring Well Location
- Cross-Section A-A'
- 103.46 Water Level (May 7, 2019)
- Highway
- Arterial Road
- Local Road
- Site Location

0 12.5 25 50 75 100 m

1:3,000

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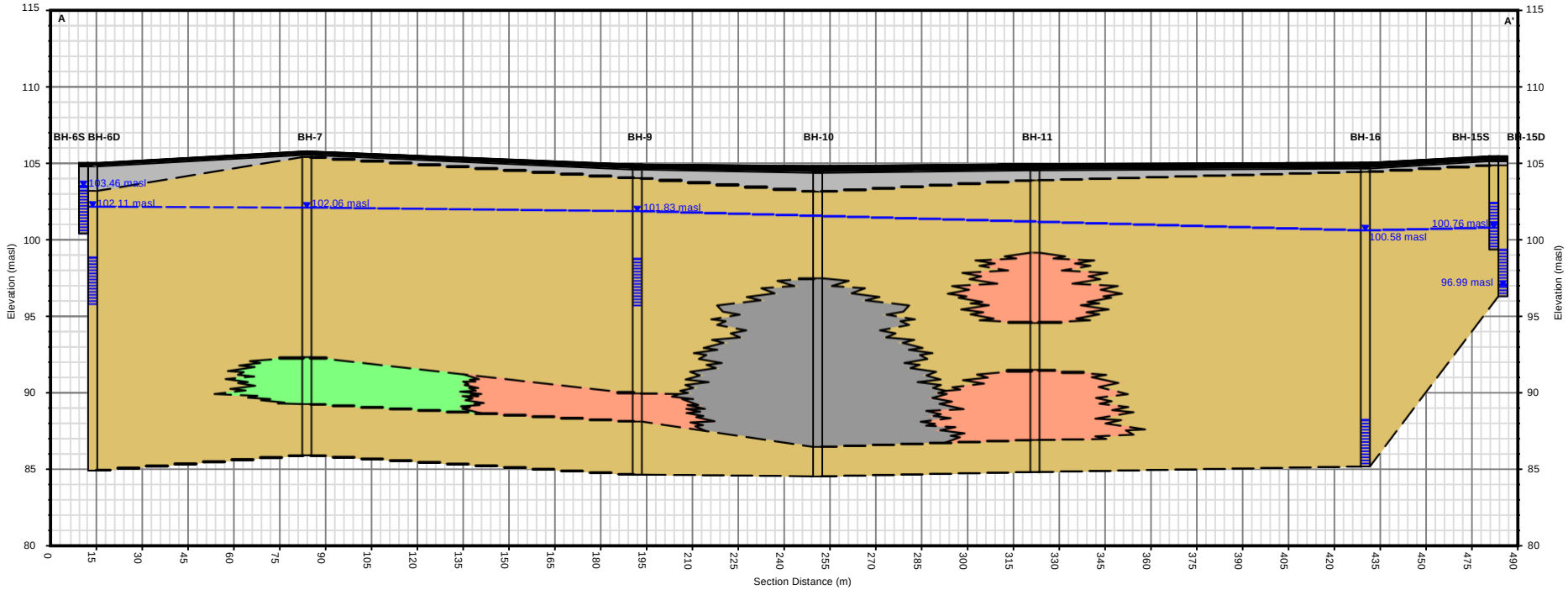
110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Borehole and Monitoring Well Locations

LOCATION: 603-643, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	7



LEGEND

Simplified Stratigraphy

- Asphalt/Granular Base
- Fill
- Sandy Silt Till
- Silty Sand
- Sand
- Sand and Gravel

* For detailed description, see borehole records

Water Level (May 07, 2019)

Monitoring Well Screen

Inferred Water Table

Inferred Geological Boundary

Drawing Notes

All locations are approximate
Vertical Exaggeration: 10x
Drawn By: I.G. 05/28/2019
Reviewed By: T.L. 05/28/2019

Toronto Inspection
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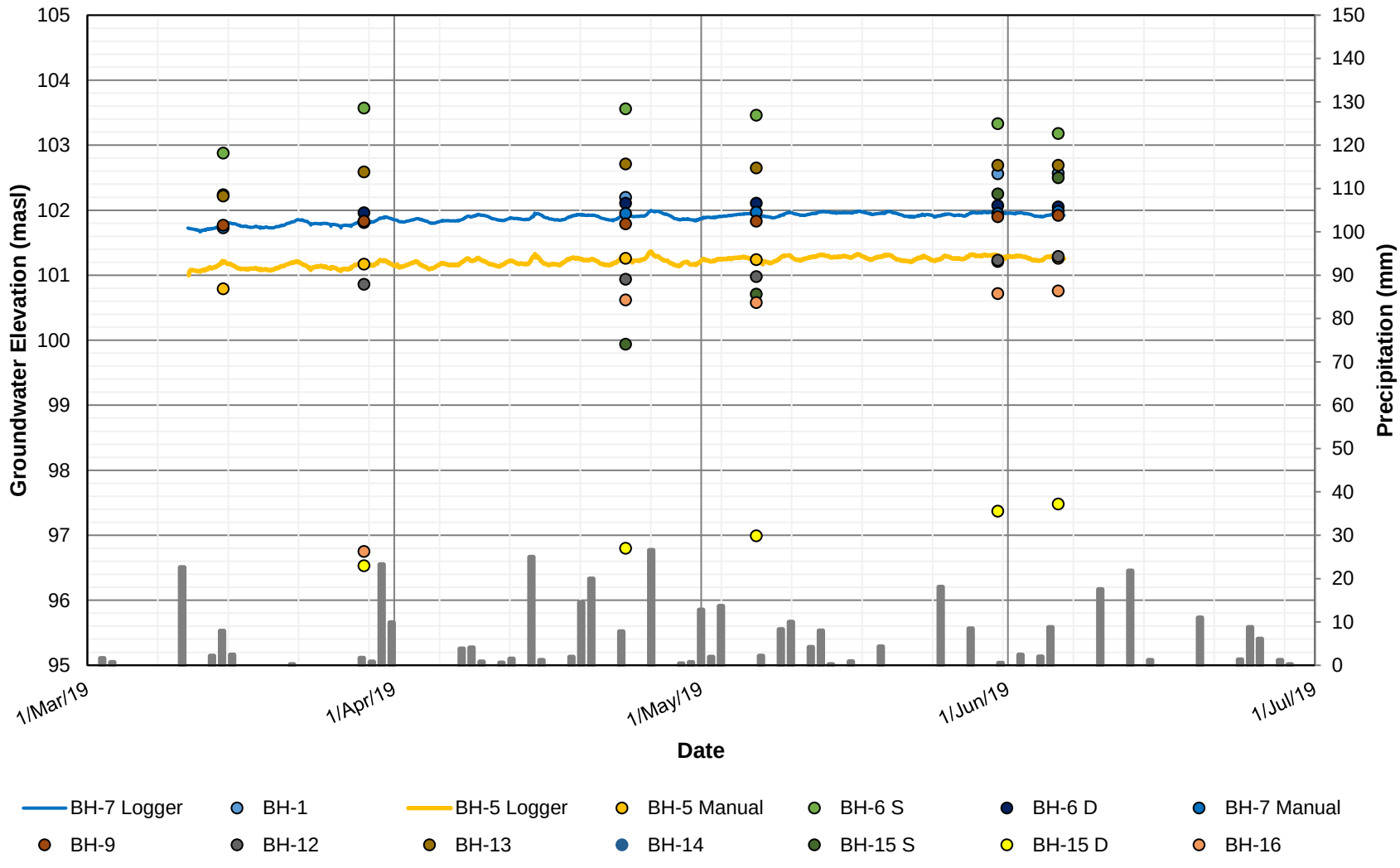
110 Konrad Crescent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: Local Geological Cross-Section A - A'

LOCATION: 603-643, 645-699 Kingston Road, Pickering, Ontario

PROJECT NO.:	DATE:	FIGURE NO.:
4986-19-HD	November 2023	8



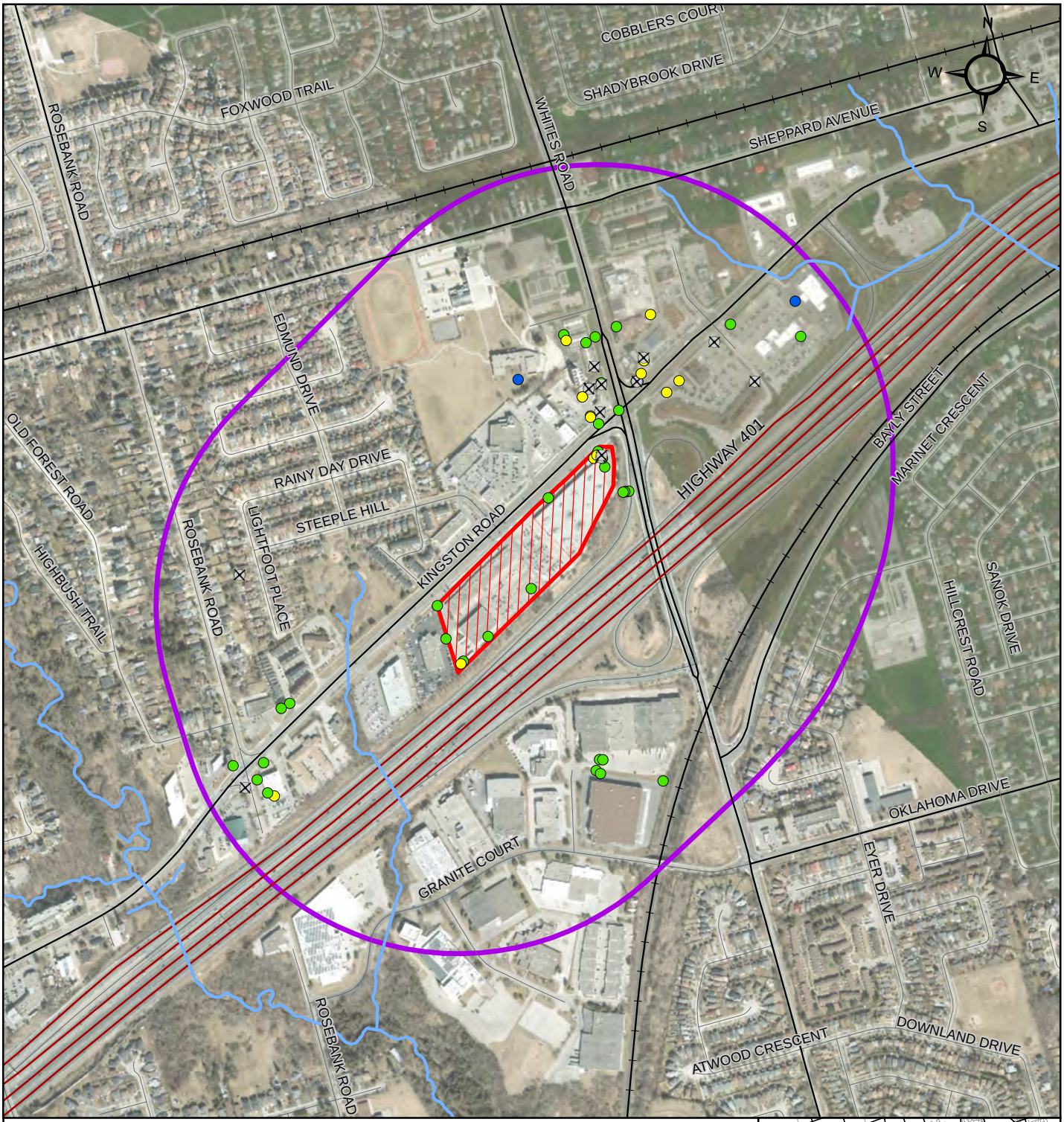
Notes:
Precipitation data obtained from Environment and Climate Change Canada for the Oshawa Climate Station, which is located 22 km northeast of the Site.

GROUNDWATER LEVEL HYDROGRAPH

603-043, 645-699 Kingston Road, Pickering ON

Director Industrial Holdings Limited

Figure No.: 9	
Project No: 4986-19-HD	
Date: November 2023	



Legend

- Monitoring Well
- Dewatering, Commerical
- Water Supply, Domestic
- Abandoned Well
- Uknown
- Highway
- Arterial Road
- Local Road
- Railway
- Watercourse
- 500m Buffer of Site Location
- Site Location

0 50 100 200 300 400 m

1:10,000

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110 Konrad Crescent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: MECP Water Wells and Permits to Take Water

LOCATION: 603-643, 645 and 699 Kingston Road, Pickering, Ontario

PROJECT NO.	DATE:	FIGURE NO.
4986-19-HD	November 2023	10

APPENDIX A

Site Plan and Drawings

01.	APR.2020	ISSUED FOR REZONING E.C.
02.	OCT.19.2023	REISSUED FOR REZONING E.C.

issued for revisions

GRAZIANI + CORAZZA ARCHITECTS
8400 JANE STREET, BUILDING D-SUITE 300 CONCORD, ONTARIO L4K 4L8
T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited

PICKERING ONTARIO

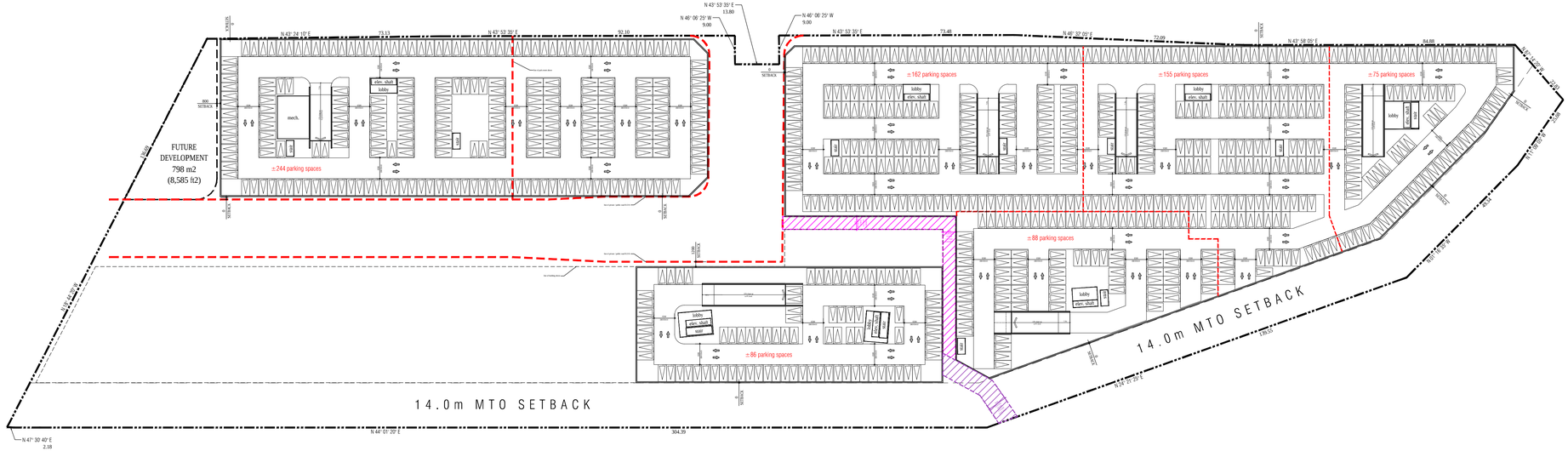
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

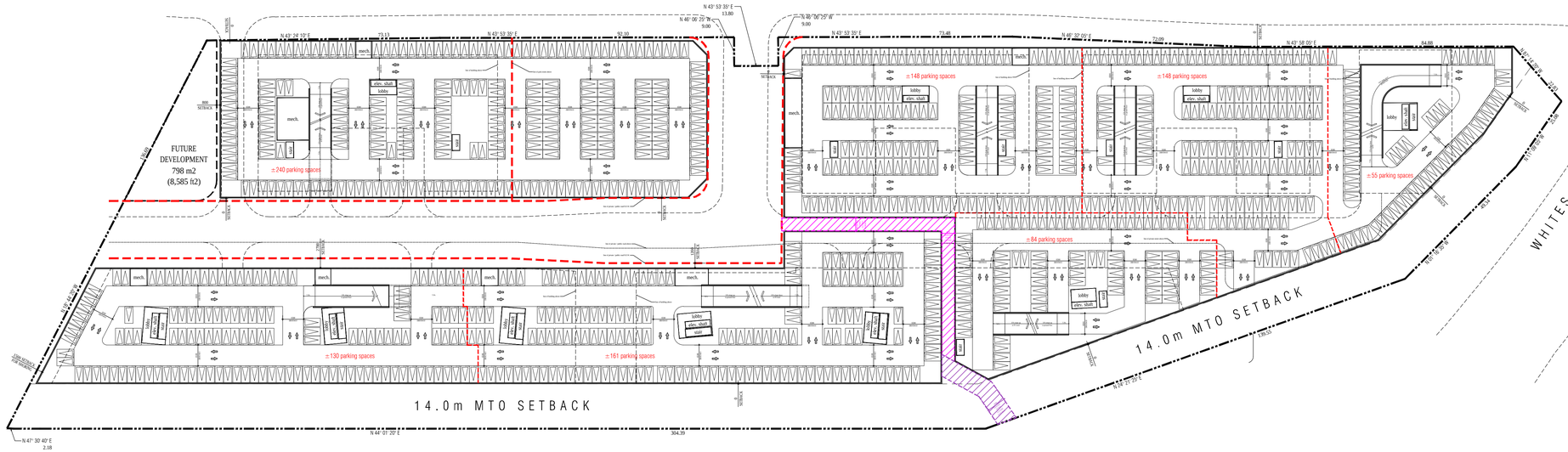
SITE PLAN

1:750

A.102

TITLEBLOCK SIZE: 610 x 950





01.	APR.2020 ISSUED FOR REZONING	E.C.
02.	OCT.19.2023 REISSUED FOR REZONING	E.C.

P2 UNDERGROUND PLAN 1 / A.201
1:750

issued for revisions

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T.905.795.2601 F.905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 Kingston Road

Director Industrial Holdings Limited
PICKERING ONTARIO

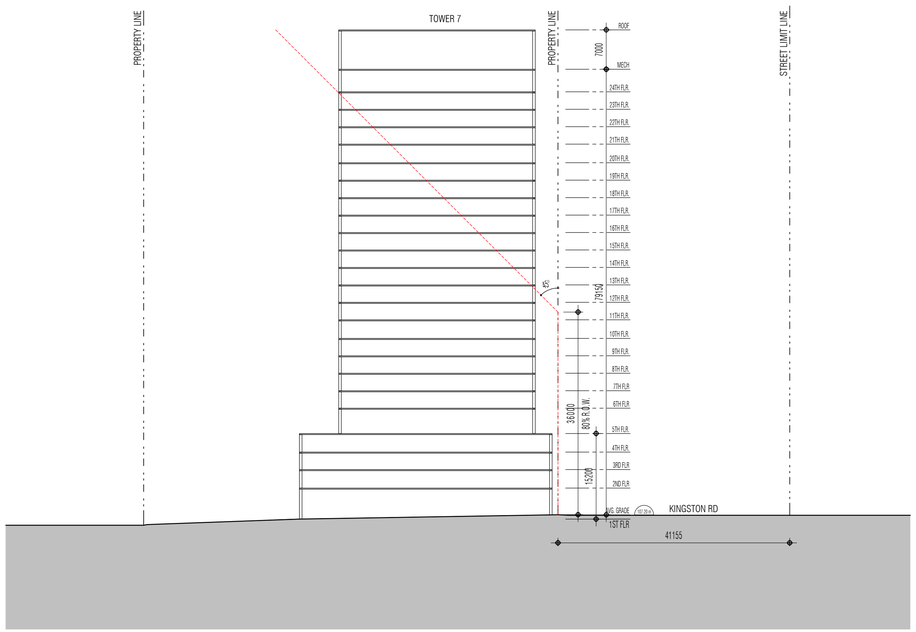
PROJECT ARCHITECT:	E.CORAZZA
ASSISTANT DESIGNER:	L.WONG
DRAWN BY:	L.WONG/O.HADI/W.CHIU
CHECKED BY:	D.BIASE
PLOT DATE:	OCT.25.2023
JOB #	1682.19

UNDERGROUND PLAN

1:750 A.201

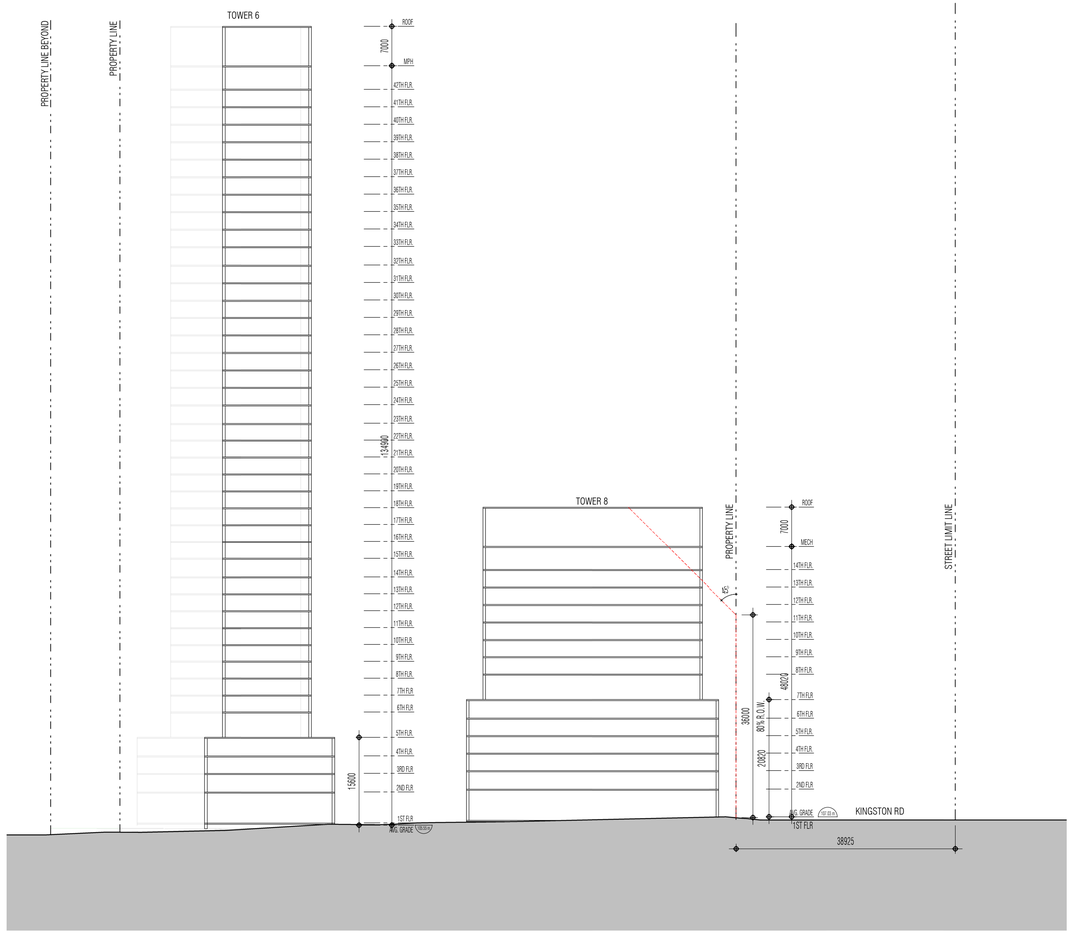
P1 UNDERGROUND PLAN 2 / A.201
1:750

TITLEBLOCK SIZE: 610 x 950



Section A - A
SCALE - 1 : 500

1
A.501



Section B - B
SCALE - 1 : 500

2
A.501

Issuances

01. APR.2020	ISSUED FOR REZONING	E.C.
02. OCT.25.2023	REISSUED FOR REZONING	E.C.

Issued for revisions

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PHONE 905.795.2601 FAX. 905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 KINGSTON ROAD

Director Industrial Holdings Limited

PICKERING ONTARIO

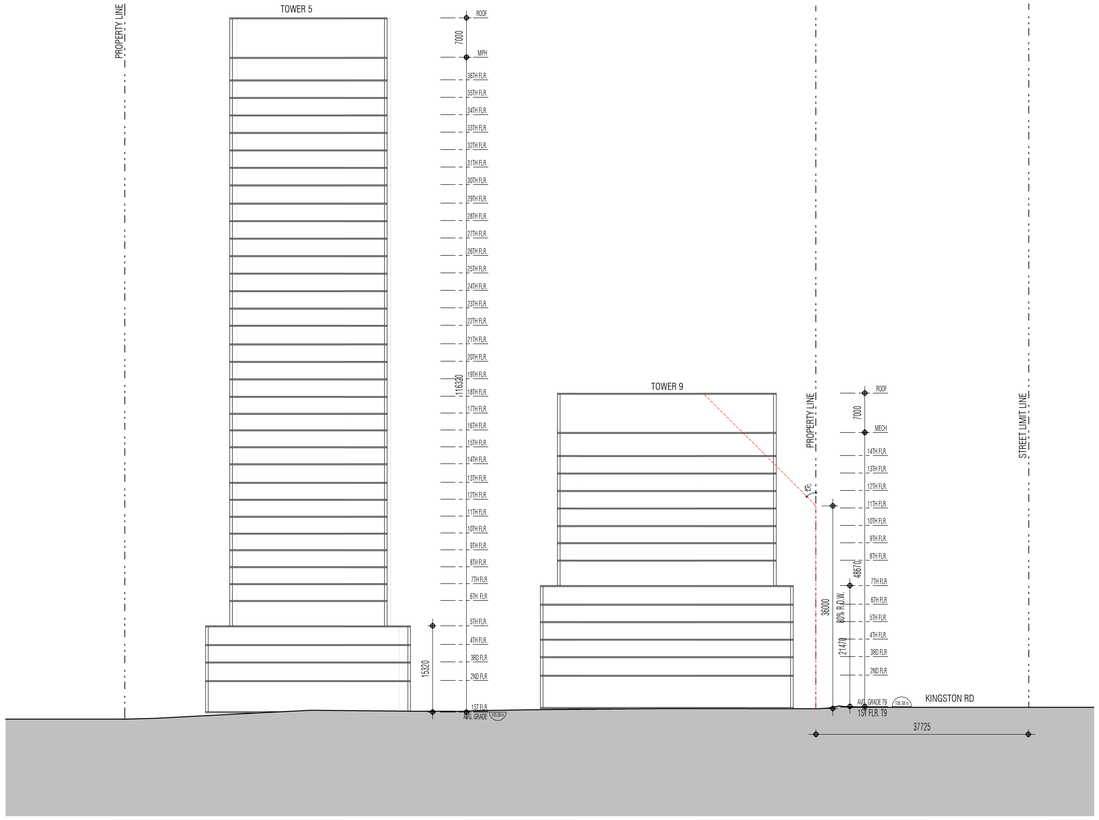
Project Architect :	E.CORAZZA
Assistant Designer :	L.WONG
Drawn By :	L.WONG/O.HADI
Checked By :	D.BIASE
Plot Date :	OCT.25.2023
Job #	1682.19

BUILDING SECTIONS

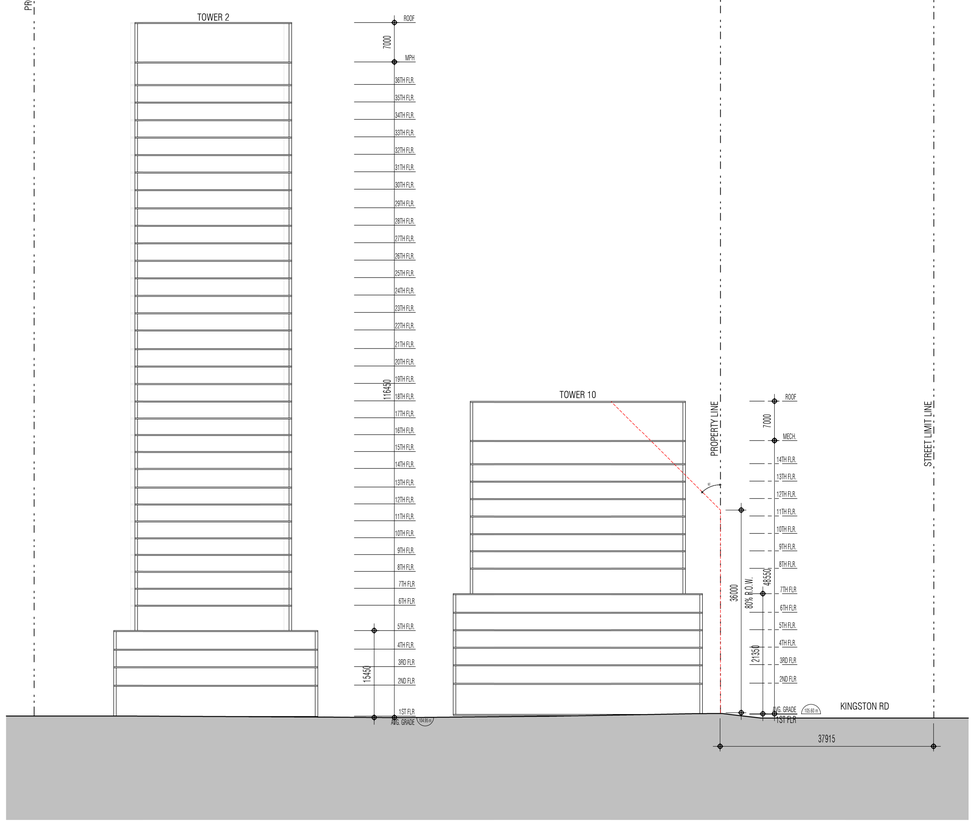
1 : 500 A.501

Issuances

01. APR.2020	ISSUED FOR REZONING	E.C.
02. OCT.25.2023	REISSUED FOR REZONING	E.C.



Section C - C
SCALE - 1 : 500
1 / A.502



Section D - D
SCALE - 1 : 500
2 / A.502

Issued for revisions

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PHONE 905.795.2601 FAX. 905.795.2844 WWW.GC-ARCHITECTS.COM

PROPOSED MIXED USE DEVELOPMENT

603 - 643 & 645 - 699 KINGSTON ROAD

Director Industrial Holdings Limited

PICKERING ONTARIO

Project Architect :	E.CORAZZA
Assistant Designer :	L.WONG
Drawn By :	L.WONG/O.HADI
Checked By :	D.BIASE
Plot Date :	OCT.25.2023
Job #	1682.19

BUILDING SECTIONS

1 : 500 A.502

APPENDIX B

Borehole Logs

Project No. 4986-19-GC

Log of Borehole BH-1

Dwg No. 2

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

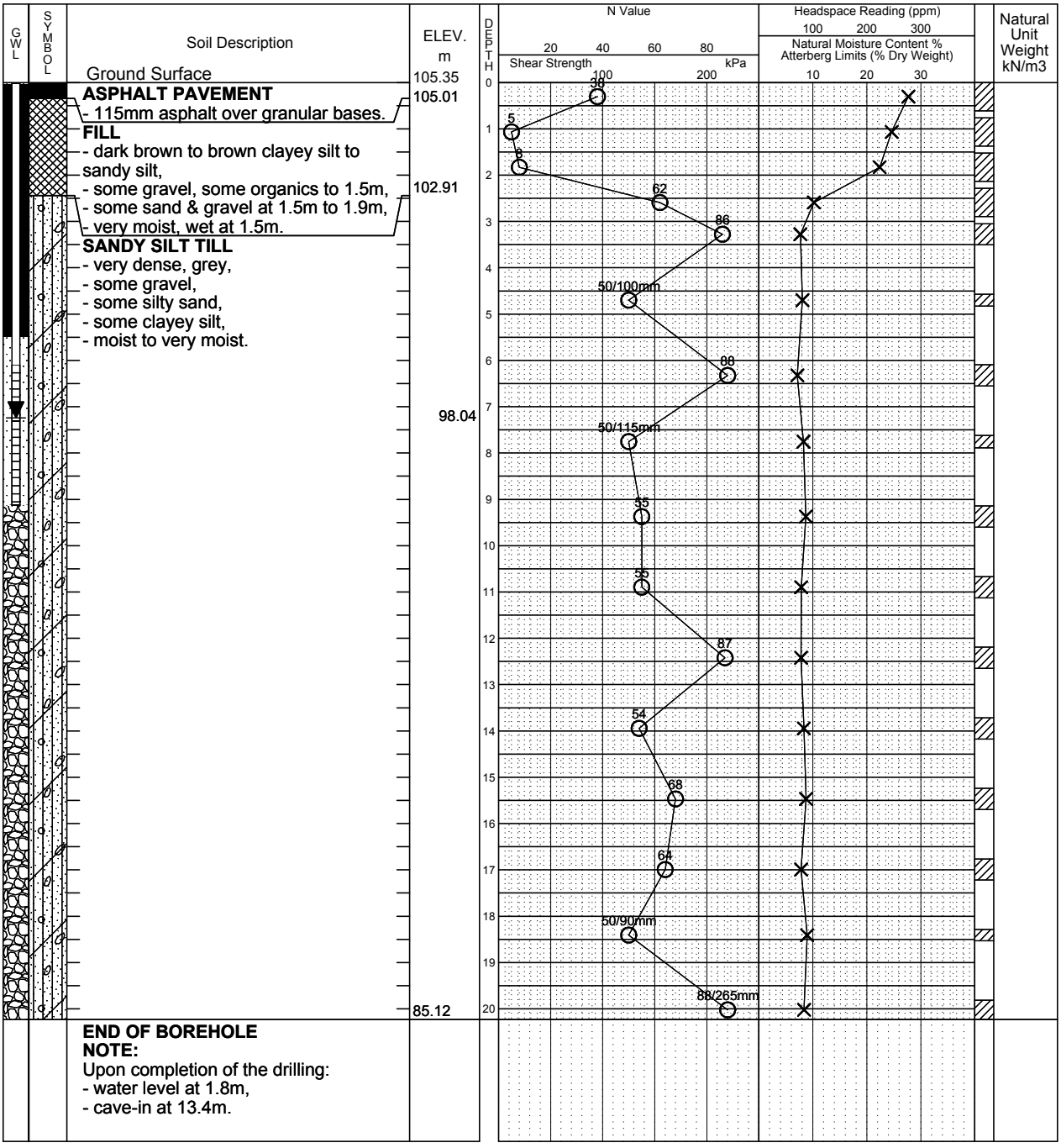
Date Drilled: 2/11/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit |—|
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	3.11m	
March 11, 2019	7.31m	
March 26, 2019	Blocked	

Project No. 4986-19-GC

Log of Borehole BH-2

Dwg No. 3

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

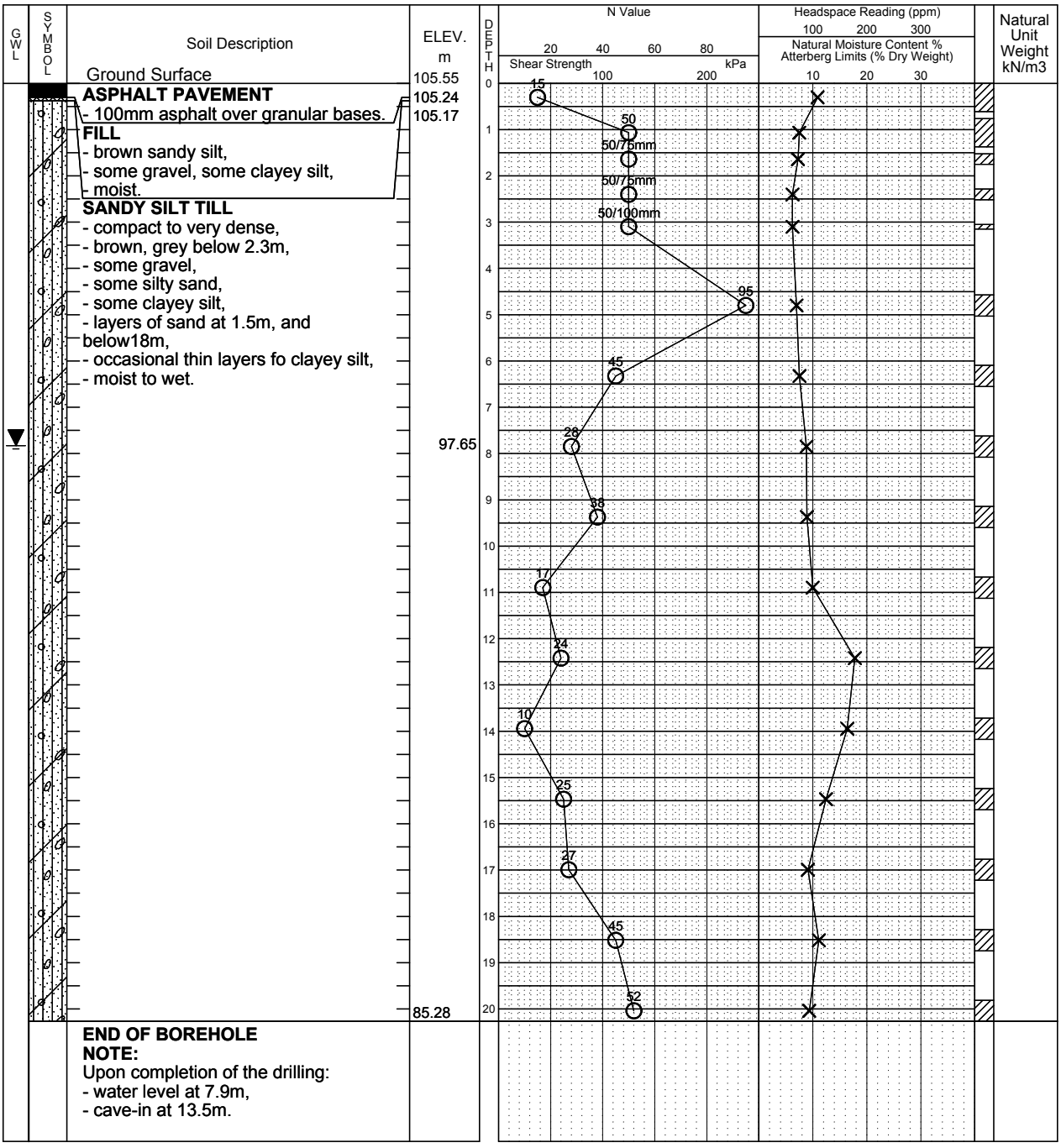
Date Drilled: 2/8/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-3

Dwg No. 4

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

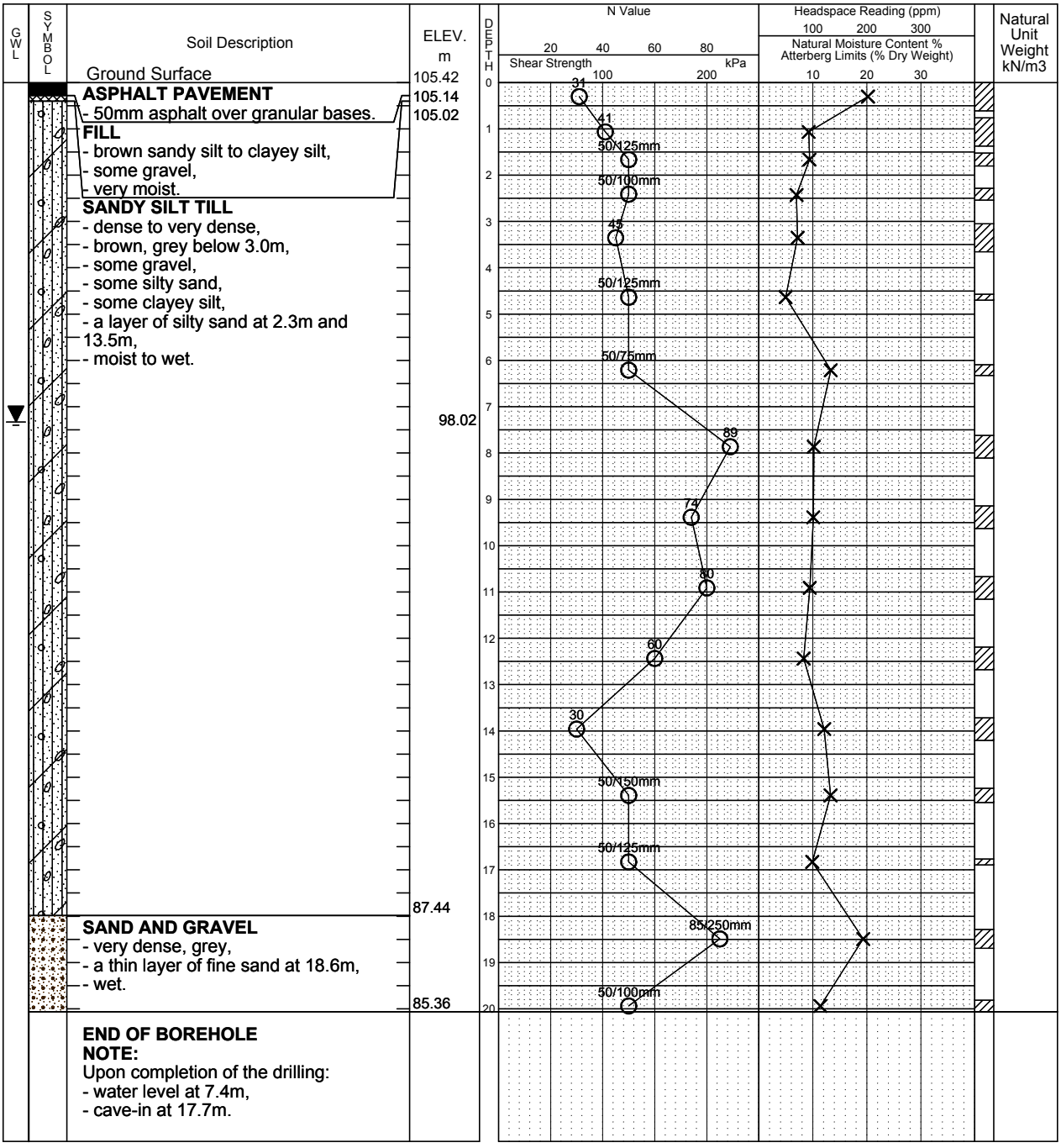
Date Drilled: 2/12/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-4

Dwg No. 5

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/15/19

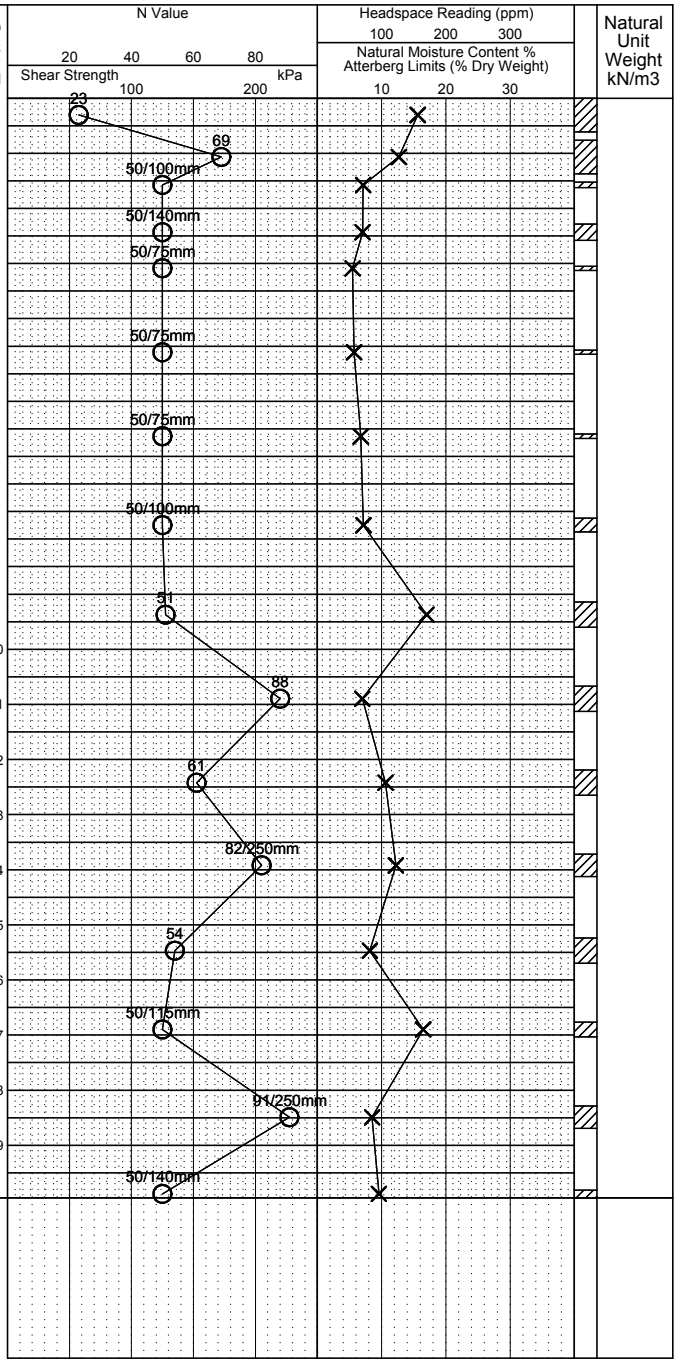
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	105.77	0
		ASPHALT PAVEMENT - 100mm asphalt over granular bases.	105.41 104.85	
		FILL - dark brown sandy silt, - some gravel, some clayey silt, - some organics, - moist.		1
▼		**SANDY SILT TILL** - very dense, - brown, grey below 3.0m, - some gravel, - some clayey silt, - moist.	100.57	2 3 4 5
		SAND - very dense, grey, - medium grained, - some gravel, - some silty sand to sandy silt at 10.8m, - very moist to wet.	96.93 94.87	6 7 8 9 10 11
		SANDY SILT TILL - very dense, grey, - some gravel, - trace clayey silt, - moist.	93.58	12
		SAND - very dense, grey, - fine to coarse grained, - some gravel, - some silty sand, - thin layers of sandy silt at 15.3m, 18.3m, 19.8m, - wet, moist to very moist pockets.		13 14 15 16 17 18 19
			85.82	
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - water level at 5.2m, - cave-in at 8.0m.		



Natural Unit Weight kN/m3

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-5

Dwg No. 6

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

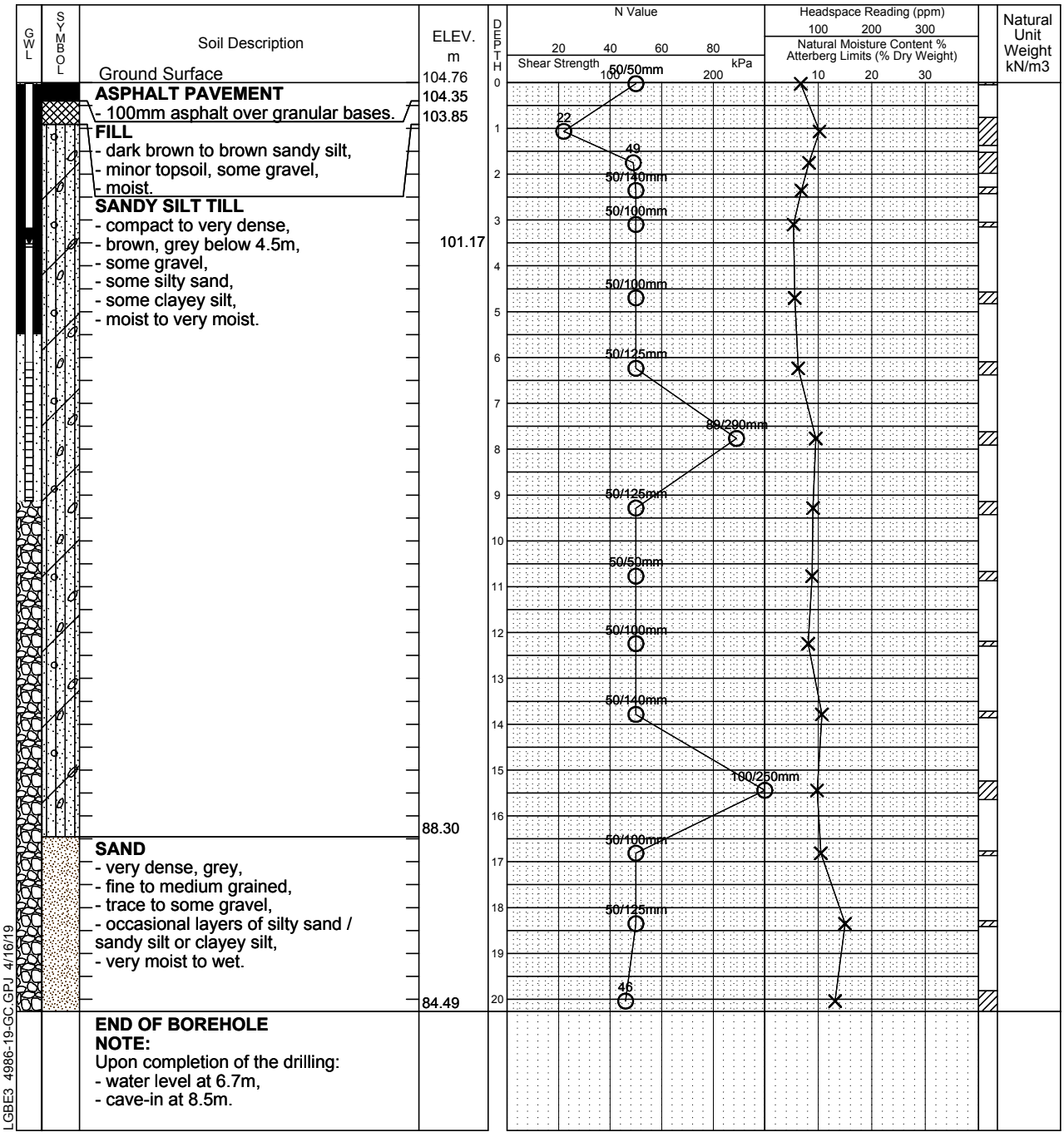
Date Drilled: 2/13/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit ⊢⊣
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	3.62m	
March 11, 2019	4.37m	
March 26, 2019	3.59m	

Project No. 4986-19-GC

Log of Borehole MW-6

Dwg No. 18

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/4/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit ⊢⊣
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (kPa)	Headspace Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m3
		Ground Surface	104.97	0	20 40 60 80 / Shear Strength 100 200 kPa	100 200 300 / 10 20 30	
		NO SAMPLING		1			
			103.57	2			
				3			
				4			
			100.40				
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - no free water.					

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	2.08m	
March 11, 2019	2.07m	
March 26, 2019	1.40m	

Project No. 4986-19-GC

Log of Borehole BH-6

Dwg No. 7

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/4/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength kPa	Headspace Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m3
		Ground Surface	104.97	0			
		ASPHALT PAVEMENT - 90mm asphalt over granular bases.	104.73				
		FILL - dark brwon to brown sandy silt to clayey silt, - some organics, wood pieces at 0.8m, - trace gravel, - very moist.	103.14				
		SANDY SILT TILL - compact to very dense, - brown, grey below 7.8m, - some gravel, - some sandy silt, - some clayey silt, - a layer of slity sand at 18m, - occasional thin layers fo clayey silt, - moist to very moist, wet pockets.	101.96				
			84.93	20			
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - water level at 7.0m, - cave-in at 9.7m.					

N Value: 20 40 60 80 — Shear Strength kPa: 100 200

Headspace Reading (ppm): 100 200 300

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 10 20 30

50/125mm
8
5
28
21
50/125mm
50/100mm
40
49
50/125mm
86/275mm
50/140mm
50/100mm
50/125mm
50/125mm
50/75mm

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 26, 2019	3.01m	

Project No. 4986-19-GC

Log of Borehole BH-7

Dwg No. 8

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/5/19

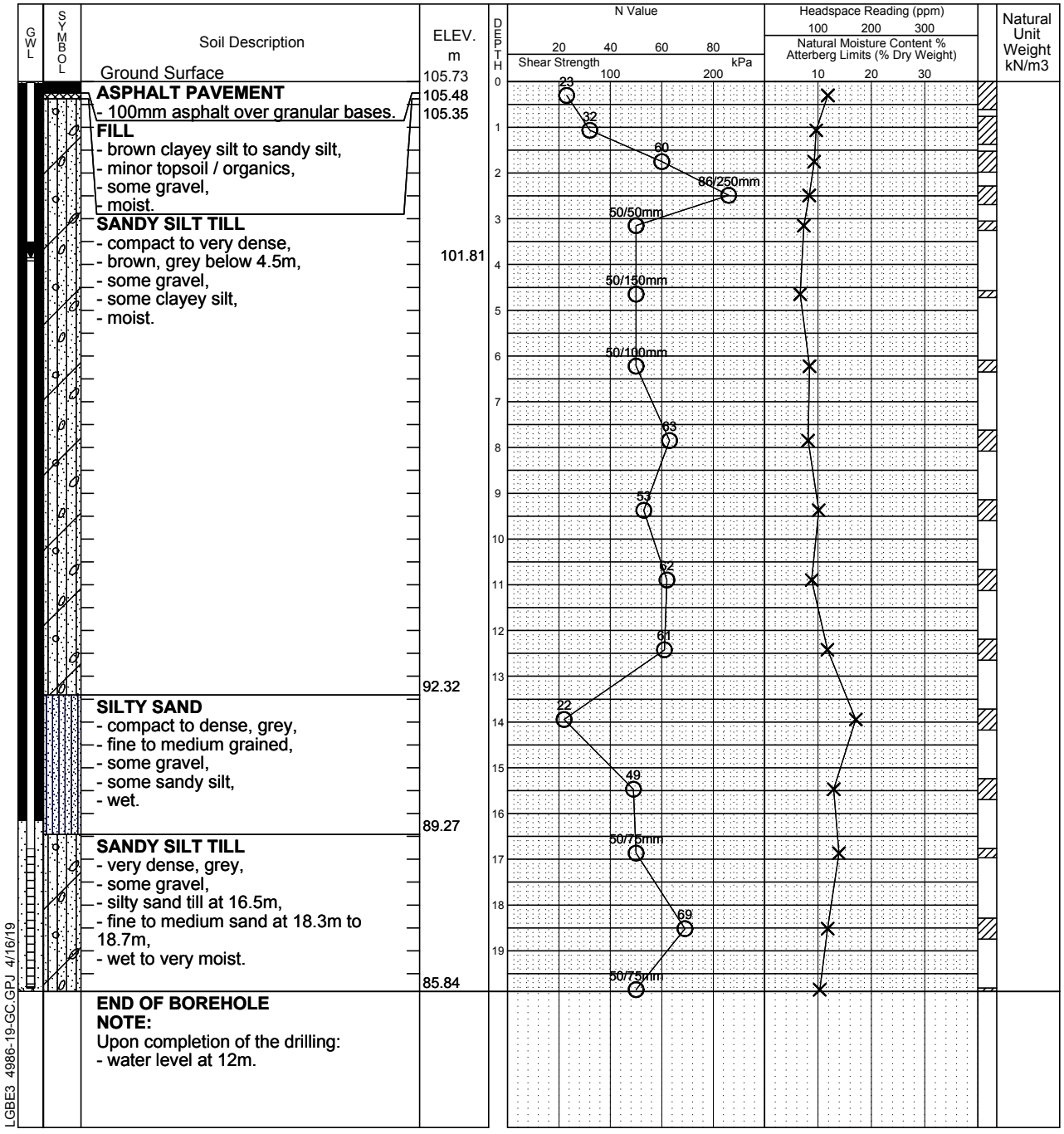
Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer

Soil Description	ELEV. m
Ground Surface	105.73
ASPHALT PAVEMENT - 100mm asphalt over granular bases.	105.48
FILL - brown clayey silt to sandy silt, - minor topsoil / organics, - some gravel, - moist.	105.35
SANDY SILT TILL - compact to very dense, - brown, grey below 4.5m, - some gravel, - some clayey silt, - moist.	101.81
SILTY SAND - compact to dense, grey, - fine to medium grained, - some gravel, - some sandy silt, - wet.	92.32
SANDY SILT TILL - very dense, grey, - some gravel, - silty sand till at 16.5m, - fine to medium sand at 18.3m to 18.7m, - wet to very moist.	89.27
END OF BOREHOLE **NOTE:** Upon completion of the drilling: - water level at 12m.	85.84



Natural Unit Weight kN/m3

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	3.98m	
March 11, 2019	4.00m	
March 26, 2019	3.92m	

Project No. 4986-19-GC

Log of Borehole BH-8

Dwg No. 9

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/7/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	105.19	0
		ASPHALT PAVEMENT - 100mm asphalt over granular bases.	104.83 104.78	
		FILL - brown sandy silt, - some gravel, some clayey silt, - moist.		1 2
		SANDY SILT TILL - dense to very dense, - brown, grey below 2.3m, - some gravel, - some clayey silt, - a thin layer of sand at 7.8m, - moist.		3 4 5 6 7 8 9 10 11 12
			91.78	13
		SAND - very dense, grey, - fine to medium grained, - some silty sand, - wet.	90.25	14 15
		SANDY SILT TILL - very dense, grey, - some gravel, - some clayey silt, - moist.		16 17 18 19
			85.12	20
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - cave-in at 7.8m.		

N Value: 20 40 60 80
Shear Strength: 100 200 kPa

50/100mm
56
58
46
66
50/115mm
72
61
80/275mm
54
81/290mm
50/140mm
50/50mm
50/115mm
50/100mm

Headspace Reading (ppm): 100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight): 10 20 30

Natural Unit Weight kN/m3

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-9

Dwg No. 10

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

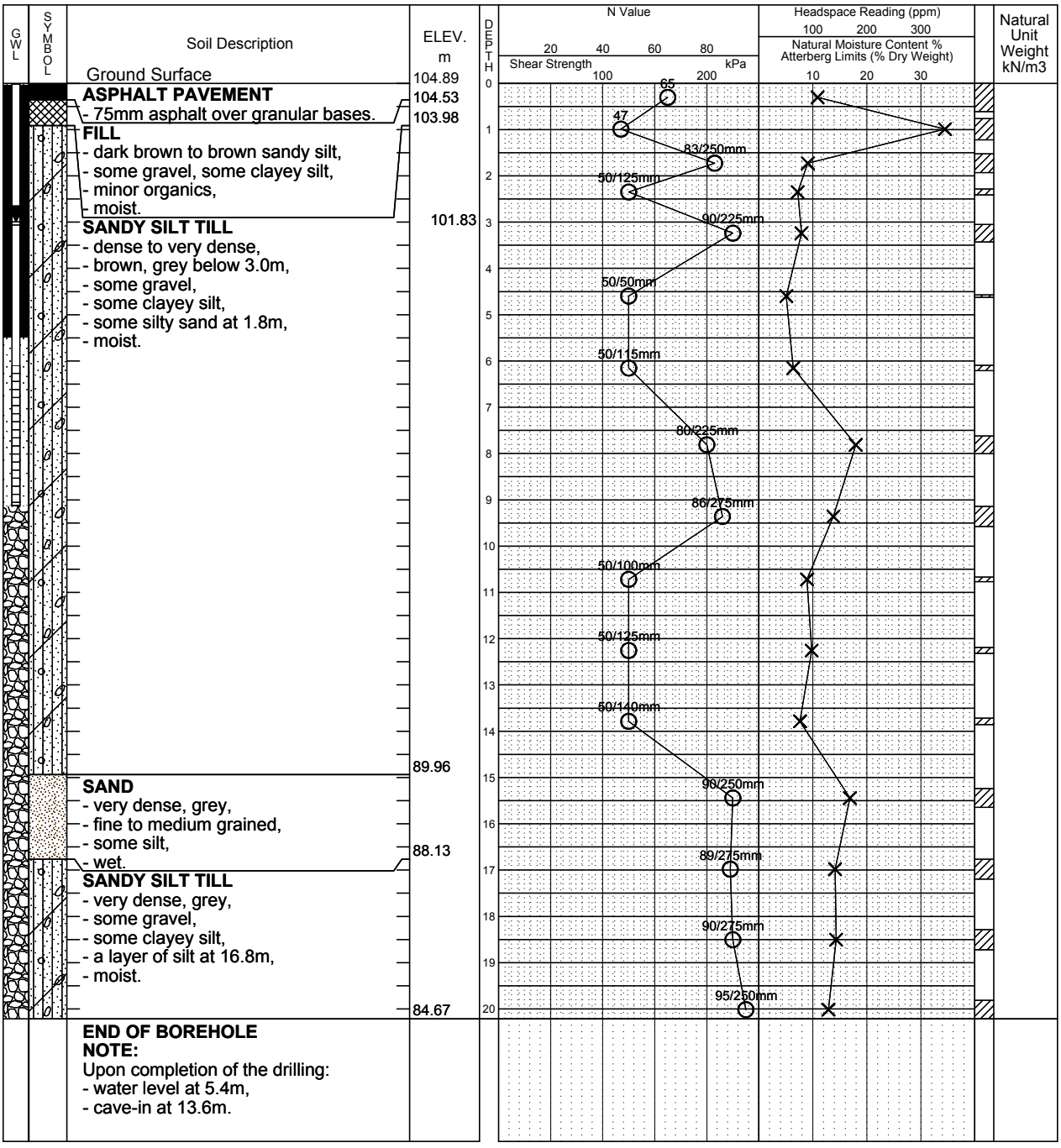
Date Drilled: 2/8/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	2.98m	
March 11, 2019	3.05m	
March 26, 2019	3.06m	

Project No. 4986-19-GC

Log of Borehole BH-10

Dwg No. 11

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

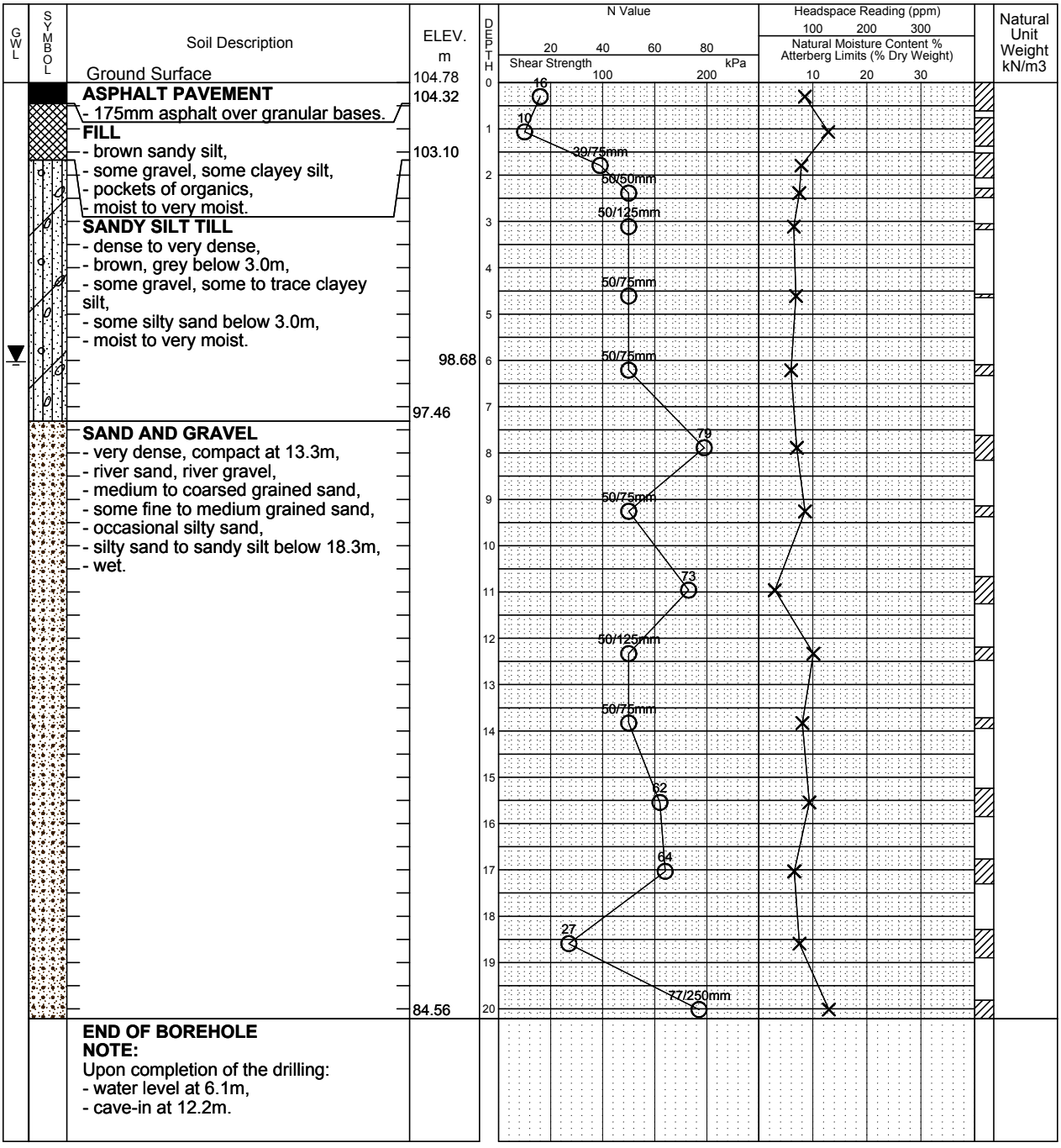
Date Drilled: 3/19/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-11

Dwg No. 12

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 2/14/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit |—|
Unconfined Compression ⊗
% Strain at Failure
Penetrometer ▲

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH
		Ground Surface	104.91	0
		ASPHALT PAVEMENT - 100mm asphalt over granular bases.	104.48	
		FILL - dark brown to brown sandy silt, - some organics, - trace gravel, trace clayey silt, - moist.	103.84	1
▼		**SANDY SILT TILL** - compact to very dense, - brown, grey below 2.3m, - some gravel, - some clayey silt, - moist.	100.81	4
			99.12	6
		SAND - very dense, grey, - medium grained, - some gravel, - very moist to wet.	94.55	10
		SANDY SILT TILL - very dense, grey, - some gravel, - some clayey silt, - moist.	91.50	12
		SAND - very dense, grey, - fine to coarse grained, - some silt, - some gravel, - river sand with gravel at 16.8m, - very moist to wet.	86.93	18
		SANDY SILT TILL - very dense, gery, - some gravel, some clayey silt, - some silty sand at 18.3m, - very wet to moist.	84.84	20
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - water level at 4.1m, - cave-in at 7.0m.		

N Value
20 40 60 80
Shear Strength 100 200 kPa

Headspace Reading (ppm)
100 200 300
Natural Moisture Content % Atterberg Limits (% Dry Weight)
10 20 30

31
16
48
55
99/275mm
50/125mm
57
64
94/275mm
50/125mm
96/225mm
50/100mm
50/90mm
50/115mm
50/90mm
50/100mm

Natural Unit Weight kN/m3

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole BH-12

Dwg No. 13

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

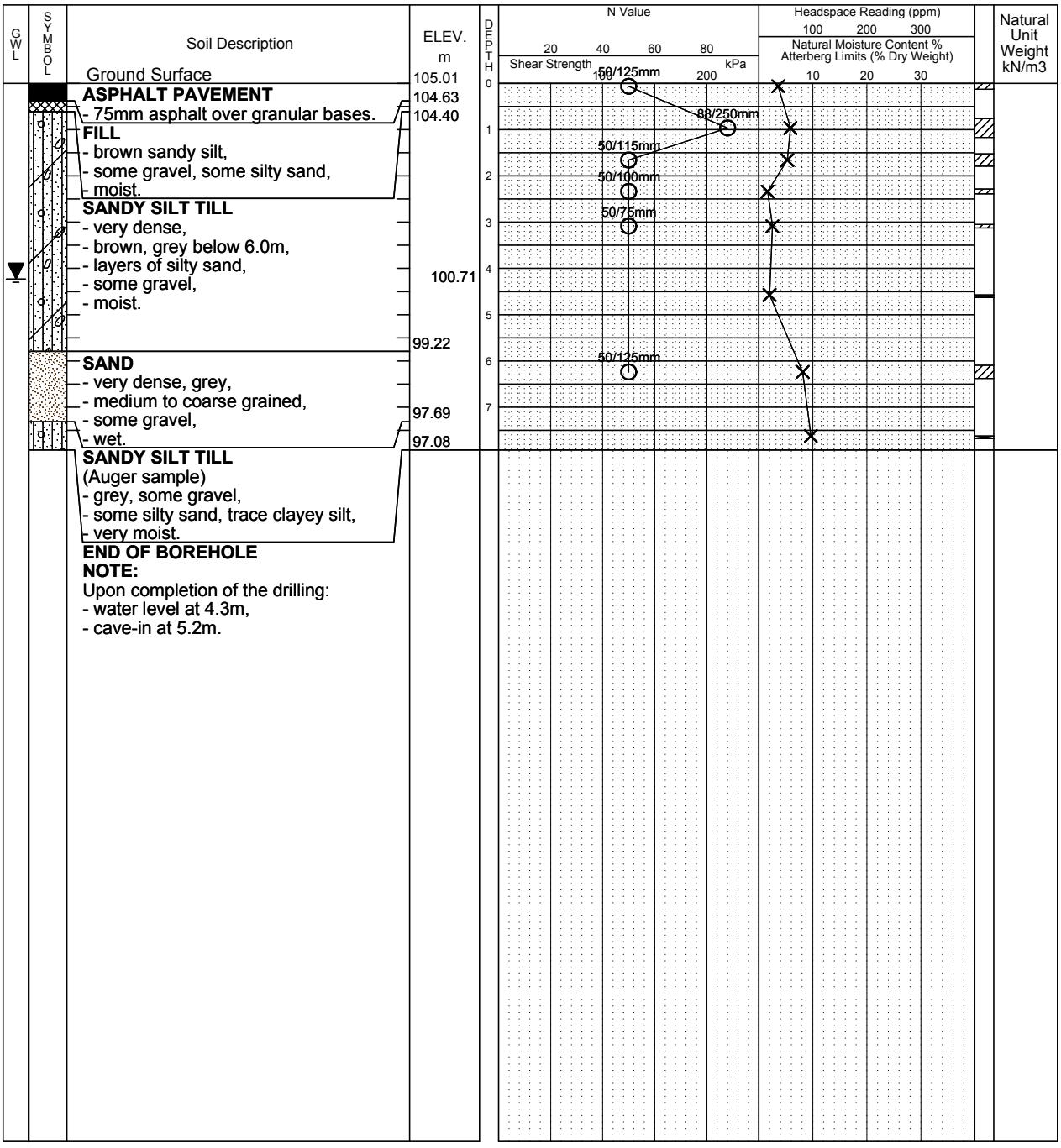
Date Drilled: 2/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4986-19-GC

Log of Borehole MW-12

Dwg No. 19

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 3/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit ⊢—⊣
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength kPa	Headspace Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m3
		Ground Surface	105.01	0	20 40 60 80 / 100 200	100 200 300 / 10 20 30	
		NO SAMPLING		1			
				2			
				3			
			101.01	4			
			100.44				
		SAND - very dense, grey, - medium to coarse grained, - some gravel, - wet.	99.83	5	51		
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - water level at 4.0m.					

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 25, 2019	4.16m	
March 26, 2019	4.15m	

Project No. 4986-19-GC

Log of Borehole BH-13

Dwg No. 14

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

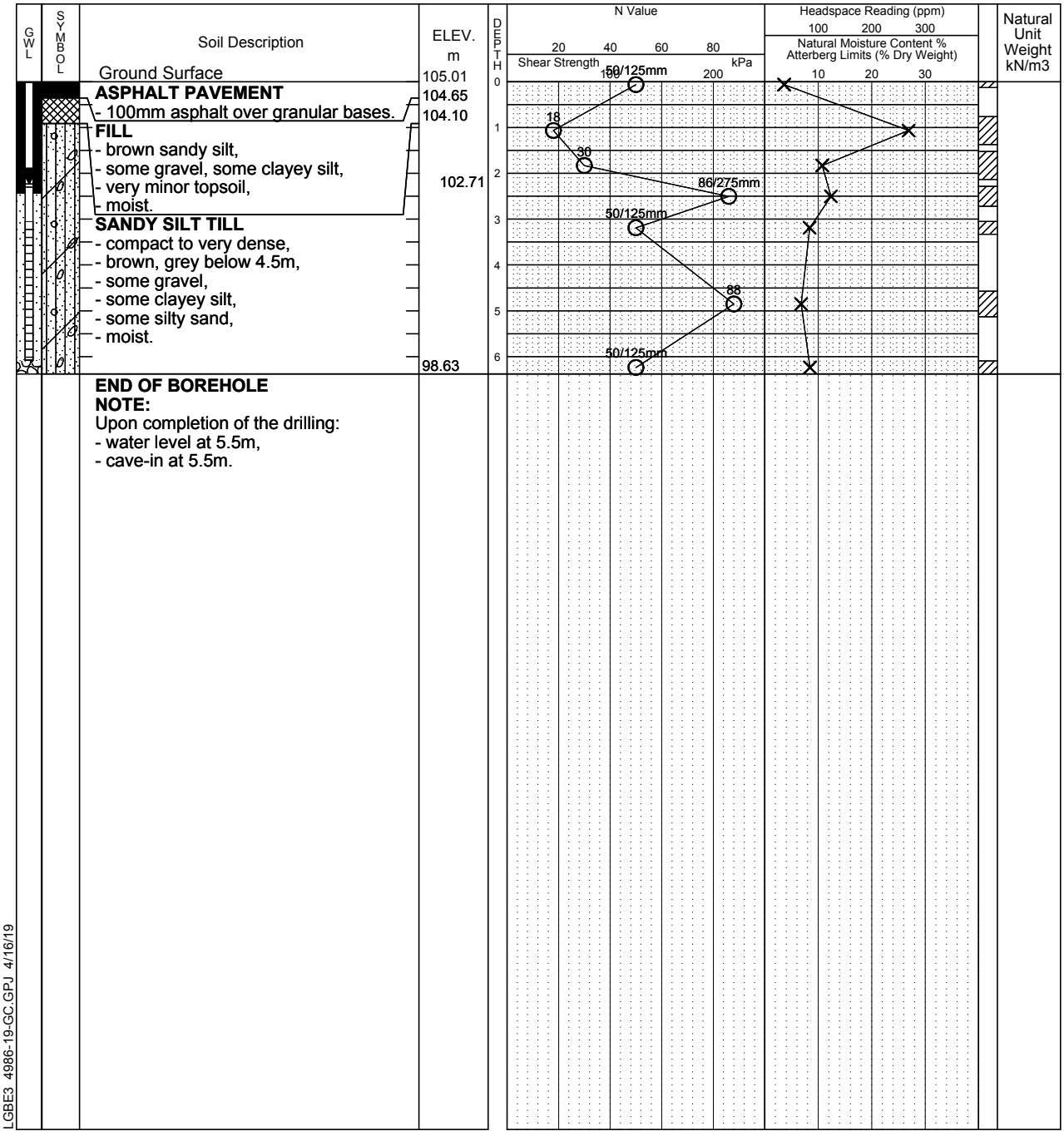
Date Drilled: 2/4/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	2.58m	
March 11, 2019	2.53m	
March 26, 2019	2.30m	

Project No. 4986-19-GC

Log of Borehole BH-14

Dwg No. 15

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

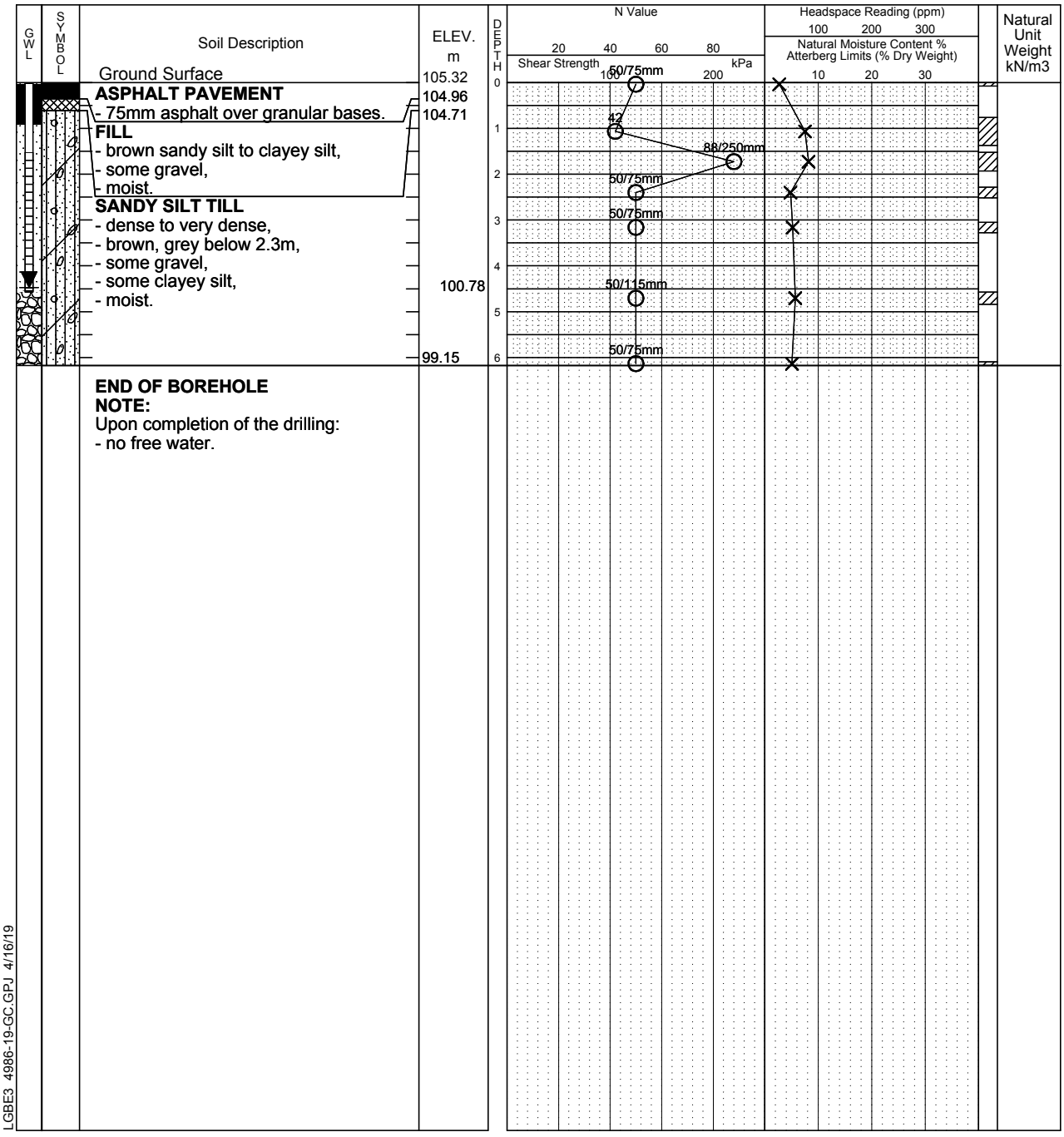
Date Drilled: 2/19/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression
% Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	4.31m	
March 11, 2019	4.59m	
March 26, 2019	4.54m	

Project No. 4986-19-GC

Log of Borehole MW-15

Dwg No. 20

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

Date Drilled: 3/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer

GWL	SYMBOL	Soil Description	ELEV. m	DEPTH	N Value / Shear Strength (kPa)	Headspace Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	Natural Unit Weight kN/m3
		Ground Surface	105.42	0	20 40 60 80 / Shear Strength 100 200 kPa	100 200 300 / 10 20 30	
		NO SAMPLING		1			
				2			
				3			
				4			
				5			
			99.33	6			
		END OF BOREHOLE **NOTE:** Upon completion of the drilling: - cave-in at 5.8m.					

LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 25, 2019	Dry	
March 26, 2019	Dry	

Project No. 4986-19-GC

Log of Borehole BH-15

Dwg No. 16

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

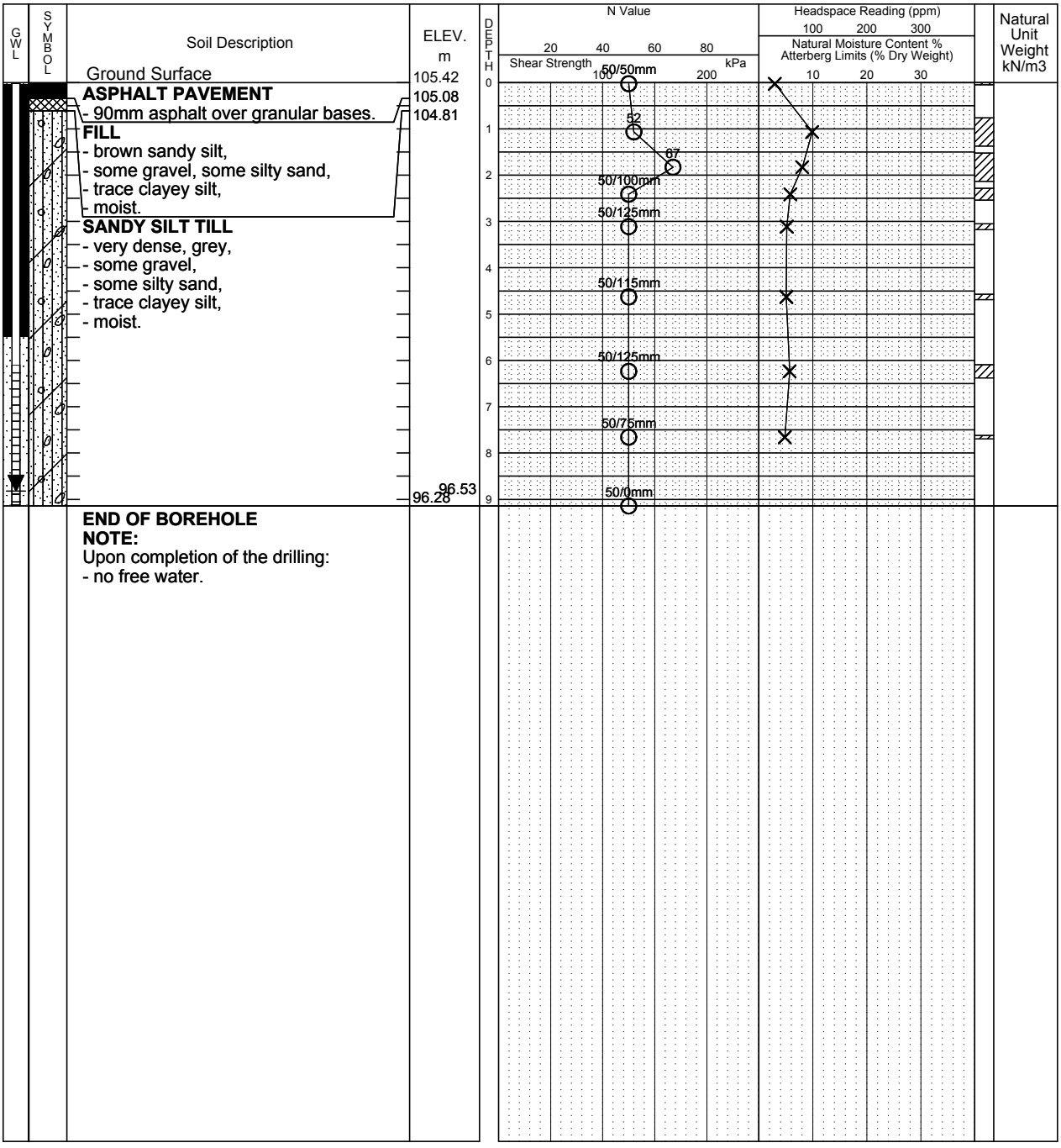
Date Drilled: 2/20/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample
SPT (N) Value
Dynamic Cone Test
Shelby Tube
Field Vane Test (S)

Headspace Reading (ppm)
Natural Moisture
Plastic and Liquid Limit
Unconfined Compression % Strain at Failure
Penetrometer



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
March 7, 2019	Dry	
March 11, 2019	Dry	
March 25, 2019	8.48m	
March 26, 2019	8.89m	

Project No. 4986-19-GC

Log of Borehole BH-16

Dwg No. 17

Project: Geotechnical investigation

Sheet No. 1 of 1

Location: 603-699 Kingston Road, Pickering, Ontario

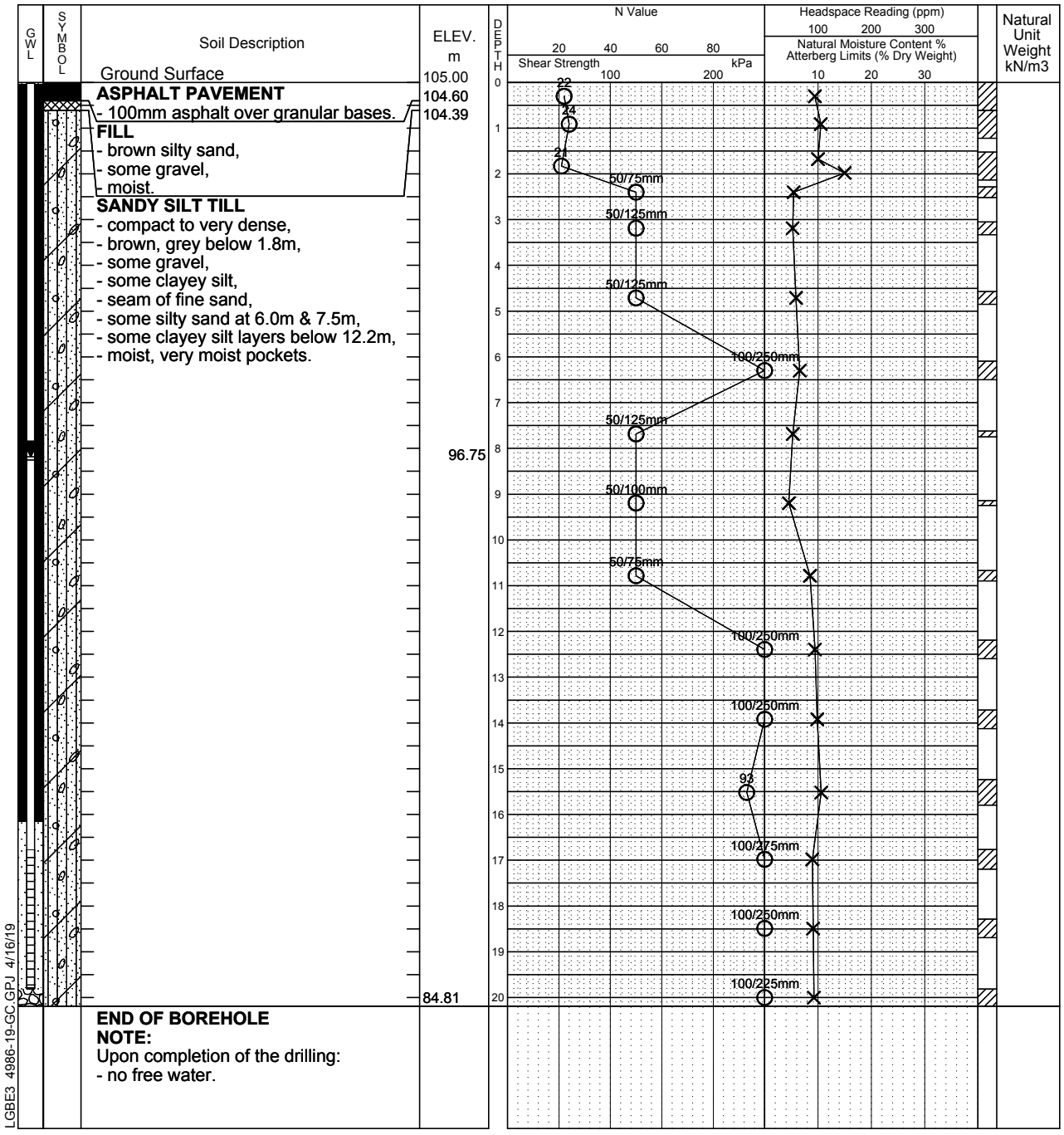
Date Drilled: 3/21/19

Drill Type: Truck Mount Drill Rig

Datum: Geodetic

Auger Sample ☒
SPT (N) Value ○ ▨
Dynamic Cone Test —
Shelby Tube ■
Field Vane Test ✚ S

Headspace Reading (ppm) •
Natural Moisture ×
Plastic and Liquid Limit ⊢—⊣
Unconfined Compression % Strain at Failure ⊗
Penetrometer ▲



LGBE3 4986-19-GC.GPJ 4/16/19

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

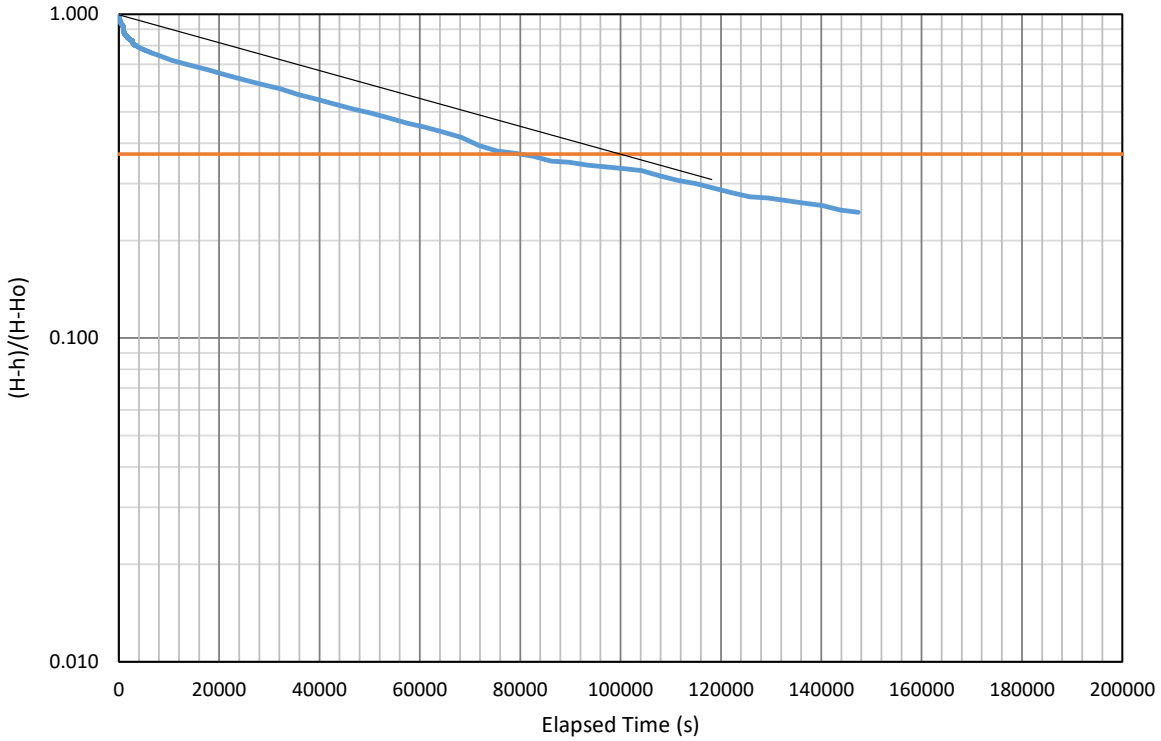
Time	Water Level (m)	Depth to Cave (m)
March 25, 2019	6.95m	
March 26, 2019	8.25m	

APPENDIX C

Hydraulic Conductivity Analysis

In-Situ Hydraulic Conductivity Analyses: BH-1

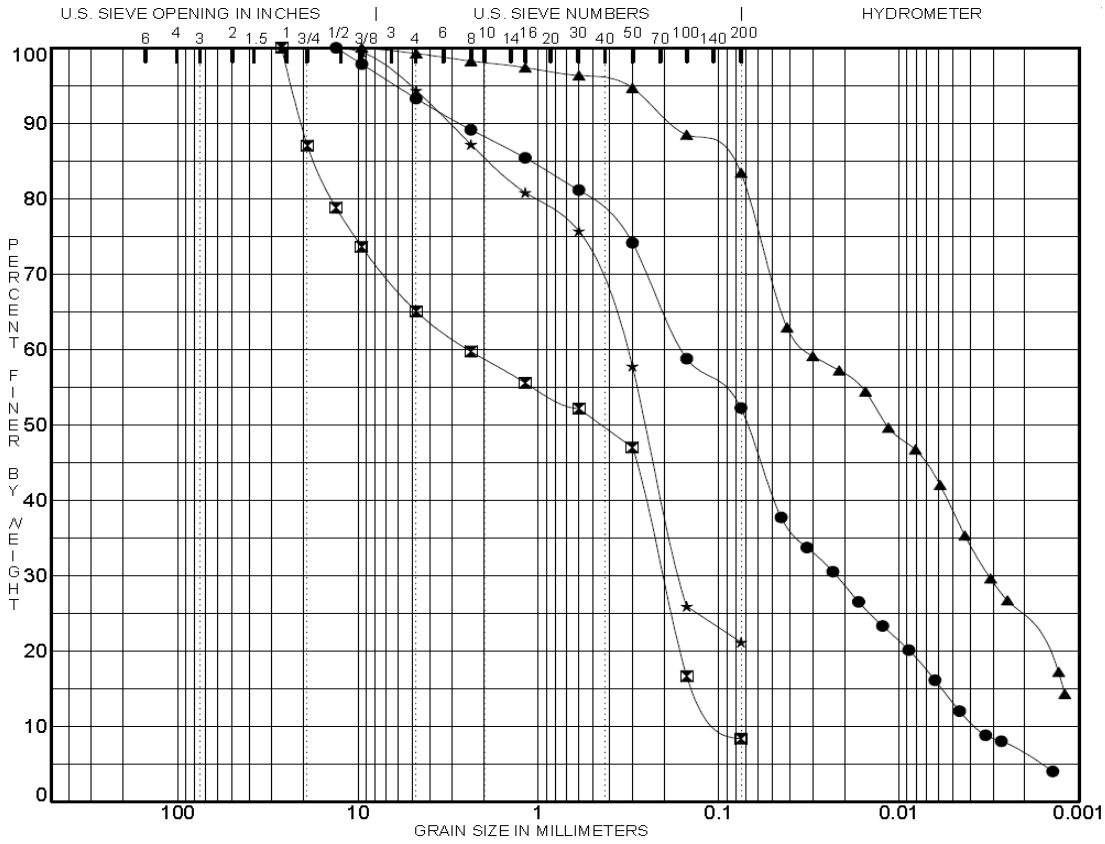
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-1
Test Date:	March 12, 2019
Test Conducted By:	WG



Well Depth (mbgs):	9.2	**Screened Unit:**	Sandy Silt Till
Initial Water Level (mbgs):	7.13	**Screen Length (L_e):**	3.048
Available Drawdown (H):	2.07	**Head at Time = 0 (H_o):**	1.70
Borehole Radius (R_b):	0.0508	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	87%
Early K (m/s)	NA	**Early To (s):**	NA
Mid K (m/s)	5.5E-08	**Mid To (s):**	8000
Late K (m/s)	NA	**Late To (s):**	NA

Hydraulic Conductivity Grainsize Analyses: BH-1 **Appendix C**

Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-1
Test Date:	March 27, 2019
Test Conducted By:	TIL

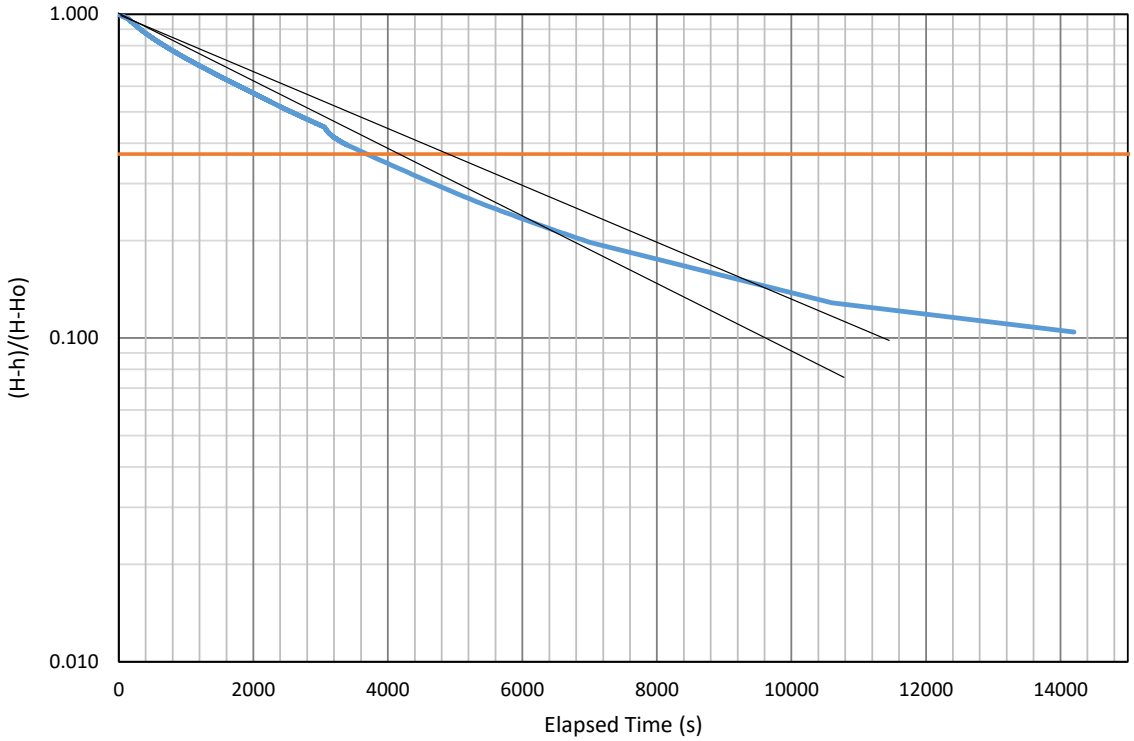


Legend: ● BH-1

Sampled Unit:	Sandy Silt Till	**Sampled Depth (mbgs):**	9.1
% Gravel	6.7	**D100:**	13.200
% Sand	41.0	**D60**	0.1600
% Silt	39.1	**D30:**	0.0220
% Clay	13.1	**D10:**	0.0037
K (m/s)	1.4E-07	**Temperature (°C):**	7

In-Situ Hydraulic Conductivity Analyses: BH-5 **Appendix C**

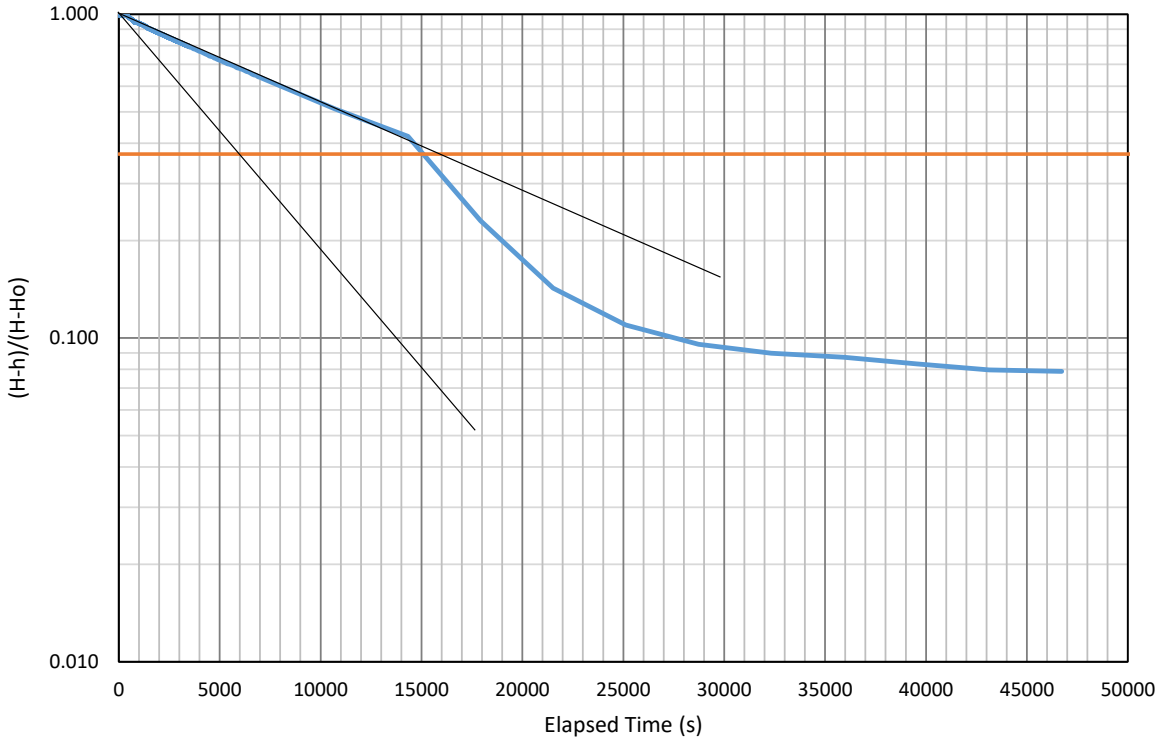
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-5
Test Date:	March 8, 2019
Test Conducted By:	WG



Well Depth:	9.20	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	3.97	**Screen Length (L_e):**	3.048
Available Drawdown (H):	5.23	**Head at Time = 0 (H_o):**	5.61
Borehole Radius (R_b):	0.0508	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	93%
Early K (m/s)	1.0E-07	**Early To (s):**	4200
Mid K (m/s)	8.7E-08	**Mid To (s):**	5000
Late K (m/s)	NA	**Late To (s):**	NA

In-Situ Hydraulic Conductivity Analyses: MW-6 **Appendix C**

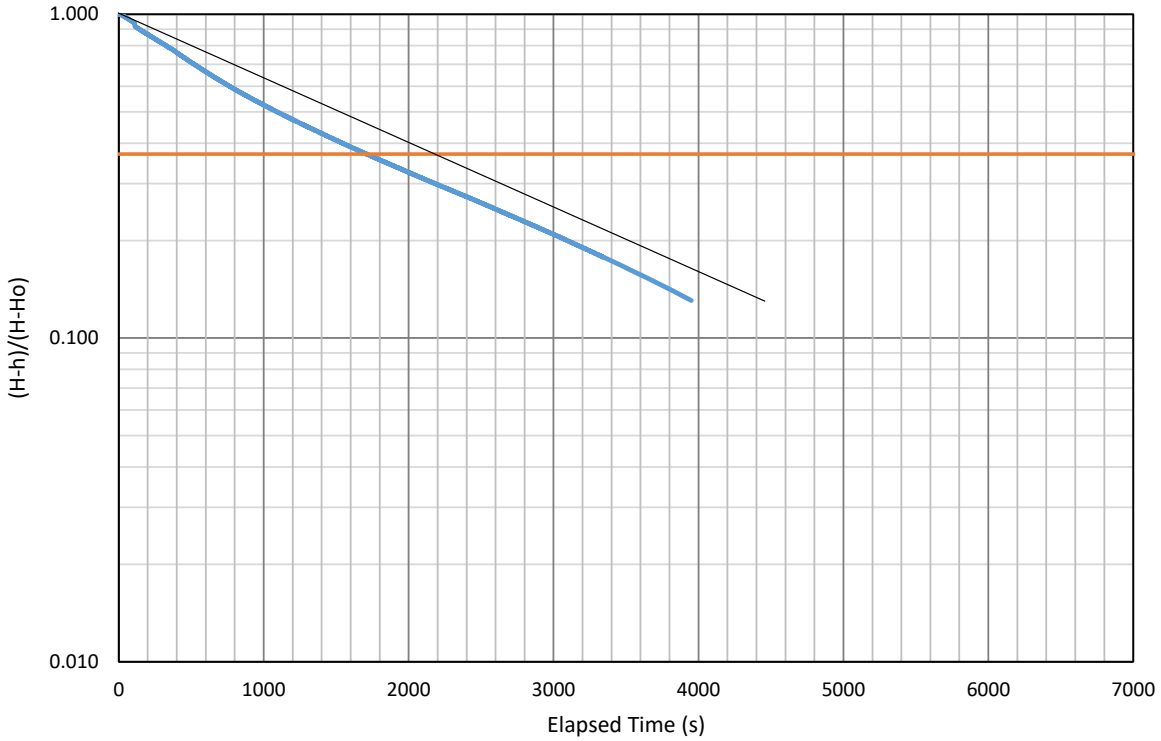
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	MW-6
Test Date:	March 8, 2019
Test Conducted By:	WG



Well Depth:	4.60	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	2.07	**Screen Length (L_e):**	3.048
Available Drawdown (H):	2.53	**Head at Time = 0 (H_o):**	1.95
Borehole Radius (R_b):	0.0508	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	100%
Early K (m/s)	2.7E-08	**Early To (s):**	16000
Mid K (m/s)	7.3E-08	**Mid To (s):**	6000
Late K (m/s)	NA	**Late To (s):**	NA

In-Situ Hydraulic Conductivity Analyses: BH-7 **Appendix C**

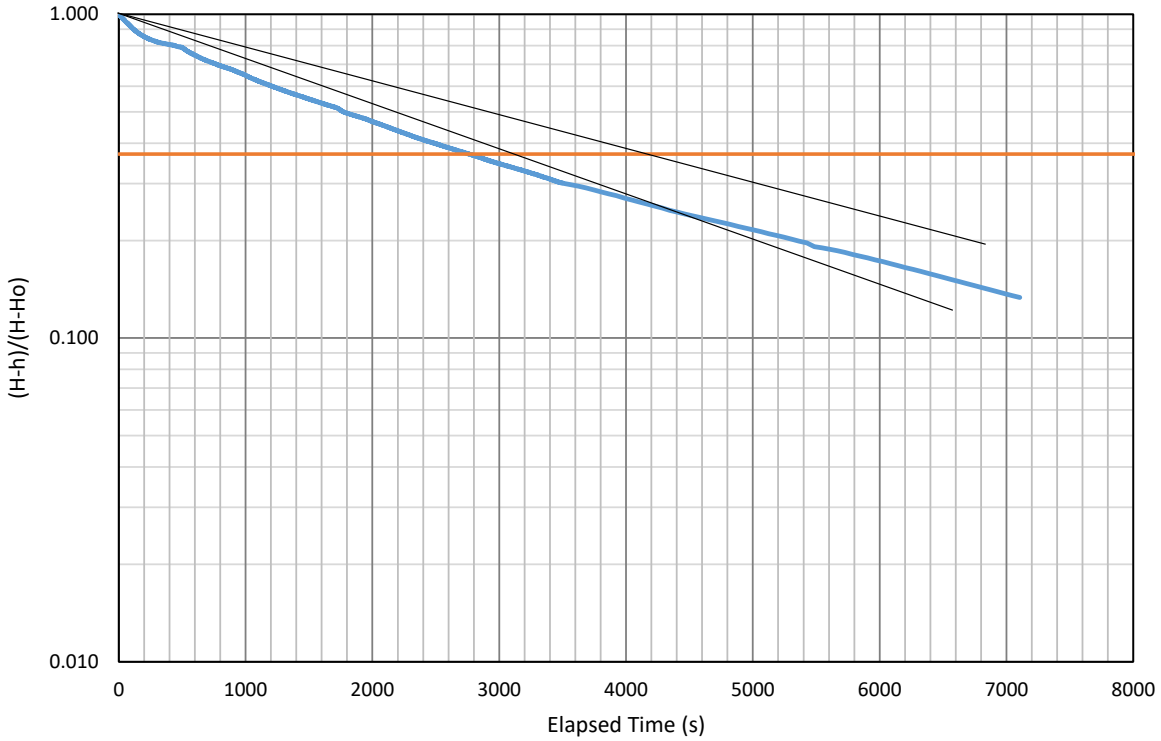
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-7
Test Date:	March 8, 2019
Test Conducted By:	WG



Well Depth:	19.80	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	4.00	**Screen Length (L_e):**	3.048
Available Drawdown (H):	15.80	**Head at Time = 0 (H_o):**	15.69
Borehole Radius (R_b):	0.0795	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	100%
Early K (m/s)	NA	**Early To (s):**	NA
Mid K (m/s)	1.8E-07	**Mid To (s):**	2200
Late K (m/s)	NA	**Late To (s):**	NA

In-Situ Hydraulic Conductivity Analyses: BH-9 **Appendix C**

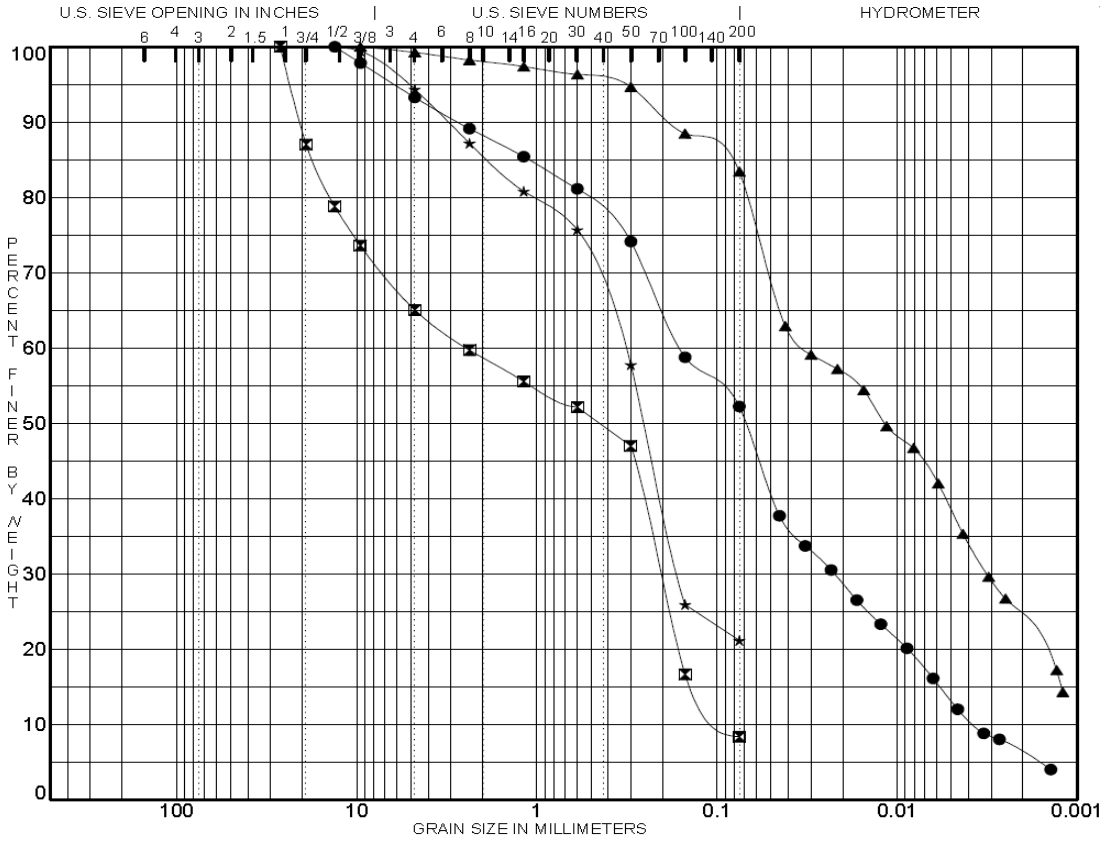
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-9
Test Date:	March 8, 2019
Test Conducted By:	WG



Well Depth:	9.20	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	3.05	**Screen Length (L_e):**	3.048
Available Drawdown (H):	6.15	**Head at Time = 0 (H_o):**	4.56
Borehole Radius (R_b):	0.0508	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	100%
Early K (m/s)	NA	**Early To (s):**	NA
Mid K (m/s)	1.4E-07	**Mid To (s):**	3200
Late K (m/s)	1.0E-07	**Late To (s):**	4200

In-Situ Hydraulic Conductivity Analyses: BH-10 **Appendix C**

Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-10
Test Date:	March 27, 2019
Test Conducted By:	TIL

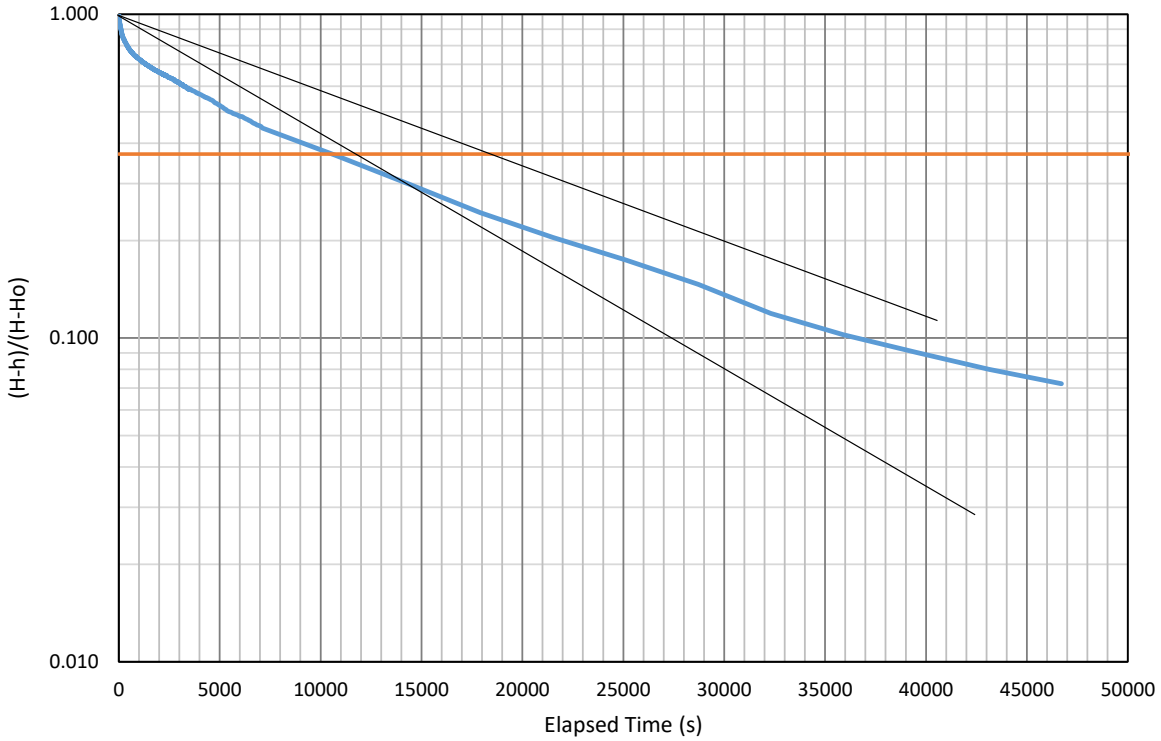


Legend: BH-10

Sampled Unit:	Sand and Gravel	**Sampled Depth (mbgs):**	7.9
% Gravel	35.0	**D100:**	26.5000
% Sand	56.7	**D60**	2.4500
% Silt	8.4	**D30:**	0.2040
% Clay		**D10:**	0.086
K (m/s)	7.7E-05	**Temperature (°C):**	7

In-Situ Hydraulic Conductivity Analyses: BH-13 **Appendix C**

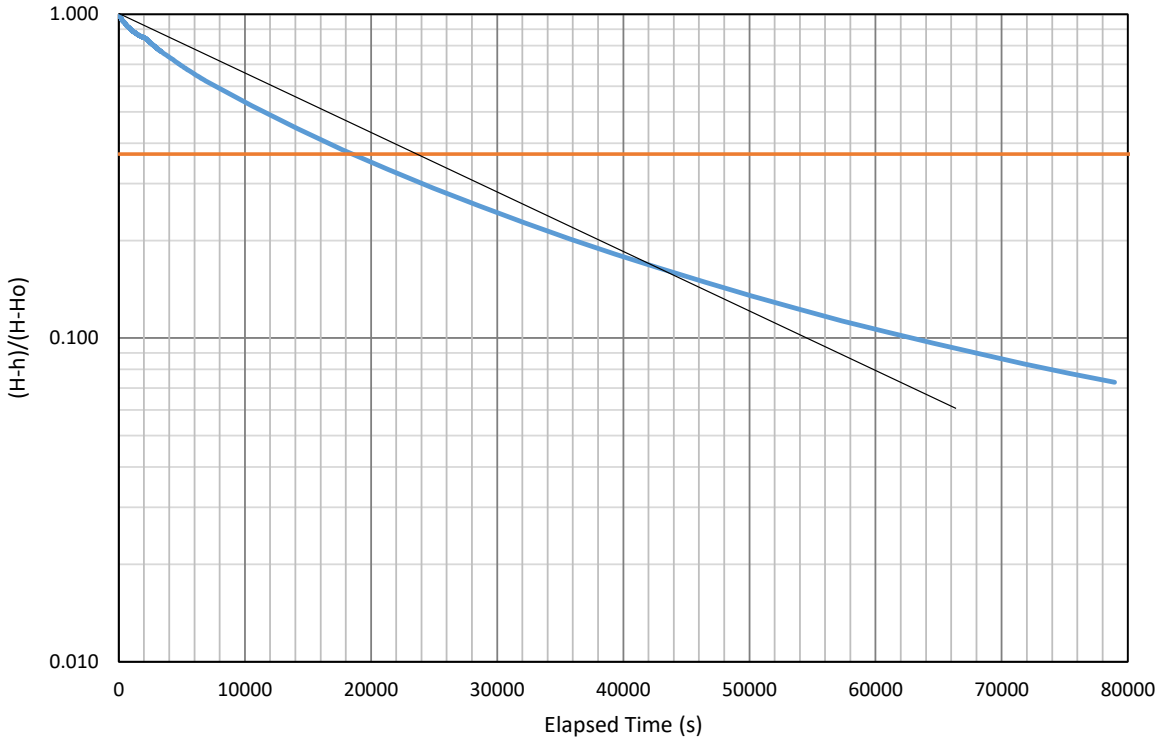
Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-13
Test Date:	March 8, 2019
Test Conducted By:	WG



Well Depth:	6.10	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	2.53	**Screen Length (L_e):**	3.048
Available Drawdown (H):	3.57	**Head at Time = 0 (H_o):**	3.16
Borehole Radius (R_b):	0.0508	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	100%
Early K (m/s)	3.6E-08	**Early To (s):**	12000
Mid K (m/s)	2.3E-08	**Mid To (s):**	19000
Late K (m/s)	NA	**Late To (s):**	NA

In-Situ Hydraulic Conductivity Analyses: BH-16 **Appendix C**

Company:	Toronto Inspection Ltd.
Client:	Sorbara Group of Companies
Project:	4986-19-HD
Location:	603-699 Kingston Rd., Pickering, ON
Test Well:	BH-16
Test Date:	April 4, 2019
Test Conducted By:	WG



Well Depth:	19.80	**Screened Unit:**	Sandy Silt Till
Initial Water Level:	5.13	**Screen Length (L_e):**	3.048
Available Drawdown (H):	14.67	**Head at Time = 0 (H_o):**	13.70
Borehole Radius (R_b):	0.0762	**Monitoring Well Radius (R_c):**	0.026
Solution Method:	Hvorslev (1951)	**Recovery (%):**	93%
Early K (m/s)	NA	**Early To (s):**	NA
Mid K (m/s)	1.6E-08	**Mid To (s):**	24000
Late K (m/s)	NA	**Late To (s):**	NA

APPENDIX D

Laboratory Certificate of Analysis

FINAL REPORT

CA14255-MAR19 R1

4986

Prepared for

Toronto Inspection Ltd.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Toronto Inspection Ltd.	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	110 Konrad Crescent, Unit 16 Markham, ON L3R 9X2. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Tabitha Lee	Telephone	705-652-2000
Telephone	416-996-3214	Facsimile	705-652-6365
Facsimile	905 940 8192	Email	
Email	lab@torontoinspection.com; tabitha@torontoinspection.com	SGS Reference	CA14255-MAR19
Project	4986	Received	03/11/2019
Order Number		Approved	03/18/2019
Samples	Ground Water (2)	Report Number	CA14255-MAR19 R1
		Date Reported	03/18/2019

COMMENTS

RL - SGS Reporting Limit

Nonylphenol Ethoxylates is the sum of nonylphenol monoethoxylate and nonylphenol diethoxylate.

Total PAH is the sum of anthracene, benzo(a)pyrene, benzo(a)anthracene, benzo(e)pyrene, benzo(b,j)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, dibenzo(a,i)pyrene, dibenzo(a,j)acridine, 7H-dibenzo(c,g)carbazole, fluoranthene, indeno(1,2,3-c,d)pyrene, perylene, phenanthrene and pyrene..

Temperature of Sample upon Receipt: 5 degrees C
Cooling Agent Present:Yes
Custody Seal Present:No

Chain of Custody Number:007072

SIGNATORIES

Brad Moore Hon. B.Sc

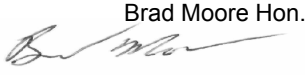


TABLE OF CONTENTS

Client: Toronto Inspection Ltd.
Project: 4986
Project Manager: Tabitha Lee
Samplers: Will Guo

PACKAGE: **SANSEW - General Chemistry** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
General Chemistry					
Biochemical Oxygen Demand (BOD5)	mg/L	2	300	15	< 4 ↑
Total Suspended Solids	mg/L	2	350	15	46
Total Kjeldahl Nitrogen	as N mg/L	0.5	100	1	0.6

PACKAGE: **SANSEW - Metals and Inorganics** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Metals and Inorganics					
Sulphate	mg/L	2	1500		15
Cyanide (total)	mg/L	0.01	2	0.02	< 0.01
Fluoride	mg/L	0.06	10		0.39
Aluminum (total)	mg/L	0.001	50		0.335
Antimony (total)	mg/L	0.0009	5		< 0.0009
Arsenic (total)	mg/L	0.0002	1	0.02	0.0021
Cadmium (total)	mg/L	0.000003	0.7	0.008	0.000010
Chromium (total)	mg/L	0.00008	2	0.08	0.00209
Cobalt (total)	mg/L	0.000004	5		0.000312
Copper (total)	mg/L	0.0002	3	0.05	0.0061
Lead (total)	mg/L	0.00001	1	0.12	0.00056

Client: Toronto Inspection Ltd.

Project: 4986

Project Manager: Tabitha Lee

Samplers: Will Guo

PACKAGE: **SANSEW - Metals and Inorganics**

(WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Metals and Inorganics (continued)					
Manganese (total)	mg/L	0.00001	5	0.15	0.0391
Molybdenum (total)	mg/L	0.00004	5		0.0261
Nickel (total)	mg/L	0.0001	2	0.08	0.0009
Phosphorus (total)	mg/L	0.003	10	0.4	0.055
Selenium (total)	mg/L	0.00004	1	0.02	0.00005
Silver (total)	mg/L	0.00005	5	0.12	< 0.00005
Tin (total)	mg/L	0.00006	5		0.00056
Titanium (total)	mg/L	0.00005	5		0.0121
Zinc (total)	mg/L	0.002	2	0.04	0.003

Client: Toronto Inspection Ltd.
Project: 4986
Project Manager: Tabitha Lee
Samplers: Will Guo

PACKAGE: **SANSEW - Microbiology** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	9
Sample Name	19MW-7 Bacti
Sample Matrix	Ground Water
Sample Date	12/03/2019

Parameter	Units	RL	L1	L2	Result
Microbiology					
E. Coli	cfu/100mL	-		200	< 2↑

PACKAGE: **SANSEW - Nonylphenol and Ethoxylates** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Nonylphenol and Ethoxylates					
Nonylphenol	mg/L	0.001	0.02		< 0.001
Nonylphenol Ethoxylates	mg/L	0.01	0.2		< 0.01
Nonylphenol diethoxylate	mg/L	0.01			< 0.01
Nonylphenol monoethoxylate	mg/L	0.01			< 0.01

PACKAGE: **SANSEW - Oil and Grease** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Oil and Grease					
Oil & Grease (total)	mg/L	2			< 2
Oil & Grease (animal/vegetable)	mg/L	4	150		< 4
Oil & Grease (mineral/synthetic)	mg/L	4	15		< 4

Client: Toronto Inspection Ltd.
Project: 4986
Project Manager: Tabitha Lee
Samplers: Will Guo

PACKAGE: **SANSEW - Other (ORP)** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Other (ORP)					
pH	no unit	0.05	10.5	9	8.15
Mercury (total)	mg/L	0.00001	0.01	0.004	< 0.00001

PACKAGE: **SANSEW - PCBs** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
PCBs					
Polychlorinated Biphenyls (PCBs) - Total	mg/L	0.0001	0.001	0.0004	< 0.0001

PACKAGE: **SANSEW - Phenols** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
Phenols					
4AAP-Phenolics	mg/L	0.002	1	0.008	< 0.002

PACKAGE: **SANSEW - SVOCs** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004
L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result

Client: Toronto Inspection Ltd.

Project: 4986

Project Manager: Tabitha Lee

Samplers: Will Guo

PACKAGE: **SANSEW - SVOCs** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
SVOCs					
di-n-Butyl Phthalate	mg/L	0.002	0.08	0.015	< 0.002
Bis(2-ethylhexyl)phthalate	mg/L	0.002	0.012	0.0088	< 0.002

PACKAGE: **SANSEW - VOCs** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

Parameter	Units	RL	L1	L2	Result
VOCs					
Chloroform	mg/L	0.0005	0.04	0.002	< 0.0005
1,2-Dichlorobenzene	mg/L	0.0005	0.05	0.0056	< 0.0005
1,4-Dichlorobenzene	mg/L	0.0005	0.08	0.0068	< 0.0005
cis-1,2-Dichloroethene	mg/L	0.0005	4	0.0056	< 0.0005
trans-1,3-Dichloropropene	mg/L	0.0005	0.14	0.0056	< 0.0005
Methylene Chloride	mg/L	0.0005	2	0.0052	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	0.0005	1.4	0.017	< 0.0005
Tetrachloroethylene (perchloroethylene)	mg/L	0.0005	1	0.0044	< 0.0005
Trichloroethylene	mg/L	0.0005	0.4	0.008	< 0.0005
Methyl ethyl ketone	mg/L	0.02	8		0.18
Styrene	mg/L	0.0005	0.2		< 0.0005

Client: Toronto Inspection Ltd.

Project: 4986

Project Manager: Tabitha Lee

Samplers: Will Guo

PACKAGE: **SANSEW - VOCs - BTEX** (WATER)

L1 = SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004

L2 = SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004

Sample Number	8
Sample Name	19MW-7
Sample Matrix	Ground Water
Sample Date	08/03/2019

VOCs - BTEX

Parameter	Units	RL	L1	L2	Result
Benzene	mg/L	0.0005	0.01	0.002	< 0.0005
Ethylbenzene	mg/L	0.0005	0.16	0.002	< 0.0005
Toluene	mg/L	0.0005	0.27	0.002	< 0.0005
Xylene (total)	mg/L	0.0005	1.4	0.0044	< 0.0005
m-p-xylene	mg/L	0.0005			< 0.0005
o-xylene	mg/L	0.0005			< 0.0005

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	SANSEW / WATER / - - Durham Table 1 - Sanitary Sewer Discharge - BL_43_2004 L1	SANSEW / WATER / - - Durham Table 2 - Storm Sewer Discharge - BL_43_2004 L2
19MW-7					
Total Suspended Solids	SM 2540D	mg/L	46		15

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 375.4 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphate	DIO0206-MAR19	mg/L	2	<2	9	20	103	80	120	96	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0020-MAR19	mg/L	2	< 2	2	30	89	70	130	NV	70	130

Cyanide by SFA

Method: SM 4500 | Internal ref.: ME-CA-[ENVISFA-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cyanide (total)	SKA0081-MAR19	mg/L	0.01	<0.01	ND	10	93	90	110	90	75	125

QC SUMMARY

Fluoride by Specific Ion Electrode

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0175-MAR19	mg/L	0.06	<0.06	NV	10	102	90	110	100	75	125

Mercury by CVAAS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (total)	EHG0009-MAR19	mg/L	0.00001	< 0.00001	4	20	103	80	120	90	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0055-MAR19	mg/L	0.00005	<0.00005	ND	20	95	90	110	79	70	130
Aluminum (total)	EMS0055-MAR19	mg/L	0.001	<0.001	ND	20	107	90	110	NV	70	130
Arsenic (total)	EMS0055-MAR19	mg/L	0.0002	<0.0002	2	20	97	90	110	NV	70	130
Cadmium (total)	EMS0055-MAR19	mg/L	0.000003	<0.000003	ND	20	96	90	110	78	70	130
Cobalt (total)	EMS0055-MAR19	mg/L	0.000004	<0.000004	ND	20	99	90	110	NV	70	130
Chromium (total)	EMS0055-MAR19	mg/L	0.00008	<0.00008	1	20	100	90	110	105	70	130
Copper (total)	EMS0055-MAR19	mg/L	0.0002	<0.0002	4	20	99	90	110	NV	70	130
Manganese (total)	EMS0055-MAR19	mg/L	0.00001	<0.00001	ND	20	103	90	110	NV	70	130
Molybdenum (total)	EMS0055-MAR19	mg/L	0.00004	<0.00004	0	20	99	90	110	98	70	130
Nickel (total)	EMS0055-MAR19	mg/L	0.0001	<0.0001	2	20	99	90	110	NV	70	130
Lead (total)	EMS0055-MAR19	mg/L	0.00001	<0.00001	ND	20	94	90	110	102	70	130
Antimony (total)	EMS0055-MAR19	mg/L	0.0009	<0.0009	ND	20	101	90	110	107	70	130
Selenium (total)	EMS0055-MAR19	mg/L	0.00004	<0.00004	ND	20	98	90	110	106	70	130
Tin (total)	EMS0055-MAR19	mg/L	0.00006	< 0.0006	ND	20	94	90	110	NV	70	130
Titanium (total)	EMS0055-MAR19	mg/L	0.00005	<0.00005	ND	20	96	90	110	NV	70	130
Zinc (total)	EMS0055-MAR19	mg/L	0.002	<0.002	ND	20	100	90	110	NV	70	130

QC SUMMARY

Metals in aqueous samples - ICP-OES

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	EMS0055-MAR19	mg/L	0.003	<0.003	ND	20	95	90	110	NV	70	130

Microbiology

Method: SM 9222D | Internal ref.: ME-CA-IENVIMIC-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
E. Coli	BAC9170-MAR19	cfu/100mL	-	ACCEPTED	ACCEPTED							

QC SUMMARY

Nonylphenol and Ethoxylates

Method: ASTM D7065-06 | Internal ref.: ME-CA-IENVIGC-LAK-AN-015

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nonylphenol diethoxylate	GCM0186-MAR19	mg/L	0.01	< 0.01			77	55	120			
Nonylphenol Ethoxylates	GCM0186-MAR19	mg/L	0.01	< 0.01								
Nonylphenol monoethoxylate	GCM0186-MAR19	mg/L	0.01	< 0.01			86	55	120			
Nonylphenol	GCM0186-MAR19	mg/L	0.001	< 0.001			83	55	120			

Oil & Grease

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (total)	GCM0185-MAR19	mg/L	2	<2			107	75	125			

QC SUMMARY

Oil & Grease-AV/MS

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Oil & Grease (animal/vegetable)	GCM0185-MAR19	mg/L	4	< 4			NA	70	130			
Oil & Grease (mineral/synthetic)	GCM0185-MAR19	mg/L	4	< 4			NA	70	130			

pH

Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0177-MAR19	no unit	0.05	NA	0		101			NA		

Phenols by SFA

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0078-MAR19	mg/L	0.002	<0.002	ND	10	104	90	110	102	75	125

QC SUMMARY

Polychlorinated Biphenyls

Method: MOE E3400/EPA 8082A | Internal ref.: ME-CA-[ENV]GC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Polychlorinated Biphenyls (PCBs) - Total	GCM0155-MAR19	mg/L	0.0001	<0.0001	ND	30	107	60	140	94	60	140

Semi-Volatile Organics

Method: EPA 3510C/8270D | Internal ref.: ME-CA-[ENV]GC-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Bis(2-ethylhexyl)phthalate	GCM0145-MAR19	mg/L	0.002	< 0.002	NSS	30	106	50	140	NSS	50	140
di-n-Butyl Phthalate	GCM0145-MAR19	mg/L	0.002	< 0.002	NSS	30	103	50	140	NSS	50	140

QC SUMMARY

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0172-MAR19	mg/L	2	< 2	0	10	NV	90	110	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen	SKA0085-MAR19	as N mg/L	0.5	<0.5	9	10	99	90	110	98	75	125

QC SUMMARY

Volatile Organics

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
1,1,2,2-Tetrachloroethane	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	99	60	130	98	50	140
1,2-Dichlorobenzene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	98	60	130	98	50	140
1,4-Dichlorobenzene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	97	60	130	97	50	140
Benzene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	97	60	130	101	50	140
Chloroform	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	98	60	130	99	50	140
cis-1,2-Dichloroethene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	96	60	130	100	50	140
Ethylbenzene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	100	60	130	100	50	140
m-p-xylene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	101	60	130	102	50	140
Methyl ethyl ketone	GCM0146-MAR19	mg/L	0.02	<0.02	ND	30	101	50	140	99	50	140
Methylene Chloride	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	96	60	130	98	50	140
o-xylene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	100	60	130	100	50	140
Styrene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	101	60	130	101	50	140
Tetrachloroethylene (perchloroethylene)	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	95	60	130	96	50	140
Toluene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	98	60	130	98	50	140
trans-1,3-Dichloropropene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	99	60	130	95	50	140
Trichloroethylene	GCM0146-MAR19	mg/L	0.0005	<0.0005	ND	30	96	60	130	96	50	140

QC SUMMARY

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

Samples analysed as received. Solid samples expressed on a dry weight basis. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act" published by the Ministry and dated March 9, 2004 as amended.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: 006101 Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Scott Ross
Received Date (mm/dd/yyyy): 03/12/19 (mm\dd\yy)
Received Time: 15:11 hrs
Received By (signature): S R
Custody Seal Present: ☐ no
Custody Seal Intact: ☐ no
Cooling Agent Present: ☑
Temperature Upon Receipt (°C): 4°C 4°C 4°C 3.3 3.3
LAB LIMS #: CA14255-Mar19

REPORT INFORMATION

Company: Toronto Inspection Ltd.
Contact: Tabitha Lee
Address: 110 Konrad Cres, Unit 16, Markham, Ontario, L3R 9X2
Phone: (905) 940-8509
Email: (905) 940-8192
Email: Lab@torontoinspection.com Tabitha@torontoinspection.com

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact: Sharron Poon
Address:
Phone:
Email: Sharron@torontoinspection.com

PROJECT INFORMATION

Quotation #: 4986
P.O. #:
Project #:
Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION
Specify Due Date:
Rush Confirmation ID:

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

REGULATIONS

Regulation 153/04:
☐ Table 1 ☐ R/P/I
☐ Table 2 ☐ I/C/C
☐ Table 3 ☐ A/O
☐ Table ____
Soil Texture: ☐ Coarse ☐ Medium ☐ Fine

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA

Sewer By-Law:
☑ Sanitary
☑ Storm
Municipality: Durham

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	Metals & Inorganics	PAH ☐ ABN ☐ SVOC(all) ☐	PCB Total ☐ Aroclor ☐	PHC F1-F4 ☐ VOC ☐ BTEX ☐ BTEX/F1 ☐ F2-F4 ☐	VOC ☐ BTEX ☐ THM ☐	Pesticides OC ☐ OP ☐	TCLP M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit. ☐	Water Pkg Gen. ☐ Ext. ☐	Sewer Use: Storm (SC) Durham By-Law	COMMENTS:
1	19MW-7	March 12, 2019	11:30	1	GW	N									✓	
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																

Observations/Comments/Special Instructions

Sampled By (NAME): Will Guo Signature: [signature] Date: 03/12/19 (mm/dd/yy) Pink Copy - Client
Relinquished by (NAME): Will Guo Signature: [signature] Date: 03/13/19 (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.1
Date of Issue: 04 April, 2018

RE: Toronto Inspection-Markham

Wells, Katrina (Lakefield)

Tue 3/12/2019 7:18 PM

Inbox

To:Ross, Scott (Mississauga) <Scott.Ross@sgs.com>; Moore, Brad (Lakefield) <brad.moore@sgs.com>; Vaithilingam, Stephanie (Mississauga) <Stephanie.Vaithilingam@sgs.com>; LR.Envlogin1 (Lakefield) <LR.Envlogin1@sgs.com>; Anderson, Hawley (Lakefield) <Hawley.Anderson@sgs.com>;

Cc:Vukovic, Ivana (Mississauga) <Ivana.Vukovic@sgs.com>;

This ecoli Sample is an addition For CA14255-MAR19. It was sent by purolator on Friday for Saturday receipt but di not make it to the lab until Monday.

Please add to this report, as a new sample line with new date and time please.

Thank you,

Katrina Wells
Environment, Health and Safety
Project Specialist Assistant
SGS – Lakefield
185 Concession St.
Lakefield, ON K0L 2H0
Phone: 705-652-2191
Fax: 705-652-6365
E-mail : katrina.wells@sgs.com

From: Ross, Scott (Mississauga)
Sent: Tuesday, March 12, 2019 3:16 PM
To: Wells, Katrina (Lakefield) <Katrina.Wells@sgs.com>; Moore, Brad (Lakefield) <brad.moore@sgs.com>; Vaithilingam, Stephanie (Mississauga) <Stephanie.Vaithilingam@sgs.com>; LR.Envlogin1 (Lakefield) <LR.Envlogin1@sgs.com>; Anderson, Hawley (Lakefield) <Hawley.Anderson@sgs.com>

APPENDIX E

Dewatering Analysis

Details of Excavation

	Parameter	Value	Units
GS = Ground Surface (masl)	GS	105.60	masl
WL = Assumed Depth of Groundwater (m/masl)	WL	1.89	m
		103.71	masl
a = Length of excavation (m)	a	150	m
b = Width of excavation (m)	b	50	m
D = Depth of Excavation (m/masl)	D	7.00	m
		98.60	masl

Project Details

Location: 603-643, 645 and 699 Kingston Road, Pickering, ON
Project No.: 4986-19-HD
Scenario: Podium 7 & Park
Date: November 17, 2023

Distance of Influence Formula (Cashman, P. and Preene, M., 2013):

$$L_0 = \sqrt{\frac{12HK}{S_y}}\,t$$

Where:

L0 = Distance of influence to line source of recharge (m)
H = Distance from initial static water level to bottom of saturated aquifer (m)
K = Hydraulic conductivity (m/s)
S_y = Specific yield of the aquifer formation [-]
t = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Value	Units	
L0	9	m	
H	15	m	
K	6.0E-08	m/s	
S_y	0.20	[-]	(Morris and Johnson, 1967)
t	1,209,600	s	

Dewatering Rate Formula for Planar Flow to All Sides of Excavation (Powers et al., 2007):

$$Q = 2\left|\frac{aK(H^2 - h^2)}{2L_0}\right| + 2\left|\frac{bK(H^2 - h^2)}{2L_0}\right|$$

Where:

Q = Anticipated unfactored pumping rate (m^3/day)

K = Hydraulic Conductivity (m/day)
H = Distance from initial static water level to bottom of the saturated aquifer (m)
h = Depth of water in the well while pumping (m)
L0 = Distance of influence to line source of recharge (m)
a = Length (m)
b = Width (m)

Parameter	Value	Units
Q	16.97	m^3/day
	0.196	L/s
K	5.2E-03	m/day
H	15	m
h	9	m
L0	9	m
a	150	m
b	50	m

Incident Precipitation		
Design Event =	11	mm in 24-hours
Area =	7,500	m^2
Volume =	82.500	m^3/day
	82,500	L/day

* 11 mm/24-hr =95% Percentile Accumulation

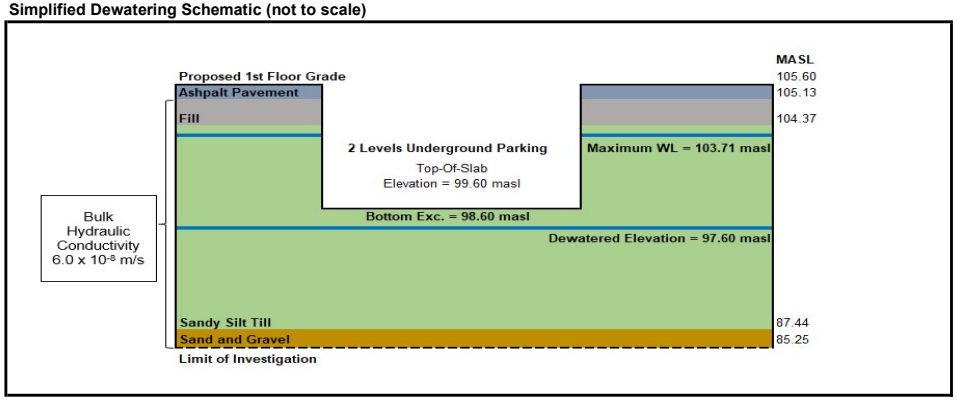
Summary

Summary	Short-Term Pumping Rate Q			Long-Term Pumping Rate Q
	m^3/day	L/day	L/s	L/day
Groundwater	33,900	33,900	0.39	11,300
Precipitation	82,500	82,500	0.95	-
Total	116,400	116,400	1.35	11,300

Notes:

1. Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term groundwater rate. Does not include infiltration from rain.
3. Rates rounded to the nearest 100L

Simplified Dewatering Schematic (not to scale)



Details of Excavation

	Parameter	Value	Units
GS = Ground Surface (masl)	GS	105.55	masl
WL = Assumed Depth of Groundwater (m/masl)	WL	2.05	m
		103.50	masl
a = Length of excavation (m)	a	190	m
b = Width of excavation (m)	b	105	m
D = Depth of Excavation (m/masl)	D	7.00	m
		98.55	masl

Project Details

Location: 603-643, 645 and 699 Kingston Road, Pickering, ON
Project No.: 4986-19-HD
Scenario: Podium 2-6
Date: November 17, 2023

Distance of Influence Formula (Cashman, P. and Preene, M., 2013):

$$L_0 = \sqrt{\frac{12HK}{S_y}}\,t$$

Where:

L0 = Distance of influence to line source of recharge (m)
H = Distance from initial static water level to bottom of saturated aquifer (m)
K = Hydraulic conductivity (m/s)
S_y = Specific yield of the aquifer formation [-]
t = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Value	Units	
L0	38	m	
H	15	m	
K	1.3E-06	m/s	
S_y	0.20	[-]	(Morris and Johnson, 1967)
t	1,209,600	s	

Dewatering Rate Formula for Planar Flow to All Sides of Excavation (Powers et al., 2007):

$$Q = 2\left|\frac{aK(H^2 - h^2)}{2L_0}\right| + 2\left|\frac{bK(H^2 - h^2)}{2L_0}\right|$$

Where:

Q = Anticipated unfactored pumping rate (m^3/day)

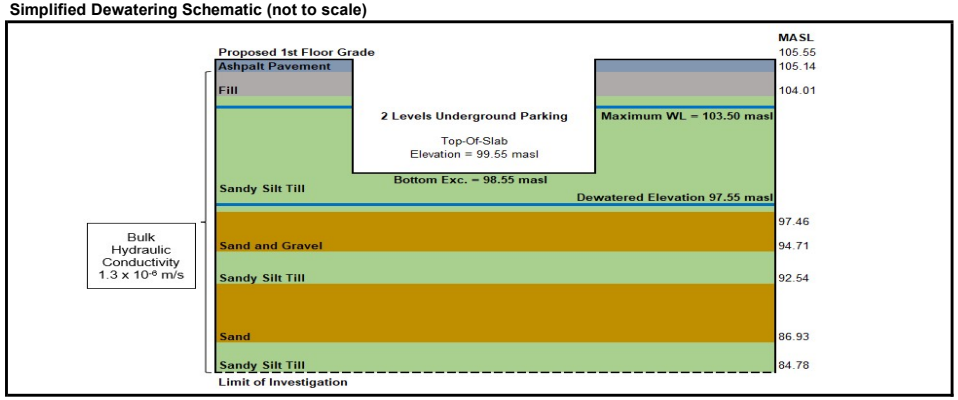
K = Hydraulic Conductivity (m/day)
H = Distance from initial static water level to bottom of the saturated aquifer (m)
h = Depth of water in the well while pumping (m)
L0 = Distance of influence to line source of recharge (m)
a = Length (m)
b = Width (m)

Parameter	Value	Units
Q	124.26	m^3/day
	1.438	L/s
K	1.1E-01	m/day
H	15	m
h	9	m
L0	38	m
a	190	m
b	105	m

Incident Precipitation		
Design Event =	11	mm in 24-hours
Area =	19,950	m^2
Volume =	219.400	m^3/day
	219,400	L/day

* 11 mm/24-hr =95% Percentile Accumulation

Simplified Dewatering Schematic (not to scale)



Summary

Summary	Short-Term Pumping Rate Q			Long-Term Pumping Rate Q
	m^3/day	L/day	L/s	L/day
Groundwater	248.500	248,500	2.88	82,800
Precipitation	219.400	219,400	2.54	-
Total	467.900	467,900	5.42	82,800

Notes:

1. Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term groundwater rate. Does not include infiltration from rain.
3. Rates rounded to the nearest 100L

Details of Excavation

	Parameter	Value	Units
GS = Ground Surface (masl)	**GS**	104.95	**masl**
WL = Assumed Depth of Groundwater (m/masl)	**WL**	0.38	**m**
		104.57	**masl**
a = Length of excavation (m)	**a**	180	**m**
b = Width of excavation (m)	**b**	36	**m**
D = Depth of Excavation (m/masl)	**D**	4.00	**m**
		100.95	**masl**

Project Details

Location: 603-643, 645 and 699 Kingston Road, Pickering, ON
Project No.: 4986-19-HD
Scenario: Podium 1
Date: November 17, 2023

Distance of Influence Formula (Cashman, P. and Preene, M., 2013):

$$L_0 = \sqrt{\frac{12HK}{S_y}}\,\mathrm{t}$$

Where:

L0 = Distance of influence to line source of recharge (m)
H = Distance from initial static water level to bottom of saturated aquifer (m)
K = Hydraulic conductivity (m/s)
S_y = Specific yield of the aquifer formation [-]
t = Time (s) required to draw the static groundwater level to the desired level (assumed to be equivalent to 14 days)

Parameter	Value	Units	
L0	8	**m**	
H	14	**m**	
K	6.0E-08	**m/s**	
S_y	0.20	**[-]**	(Morris and Johnson, 1967)
t	1,209,600	**s**	

Dewatering Rate Formula for Planar Flow to All Sides of Excavation (Powers et al., 2007):

$$Q = 2\left|\frac{aK(H^2 - h^2)}{2L_0}\right| + 2\left|\frac{bK(H^2 - h^2)}{2L_0}\right|$$

Where:

Q = Anticipated unfactored pumping rate (m^3/day)

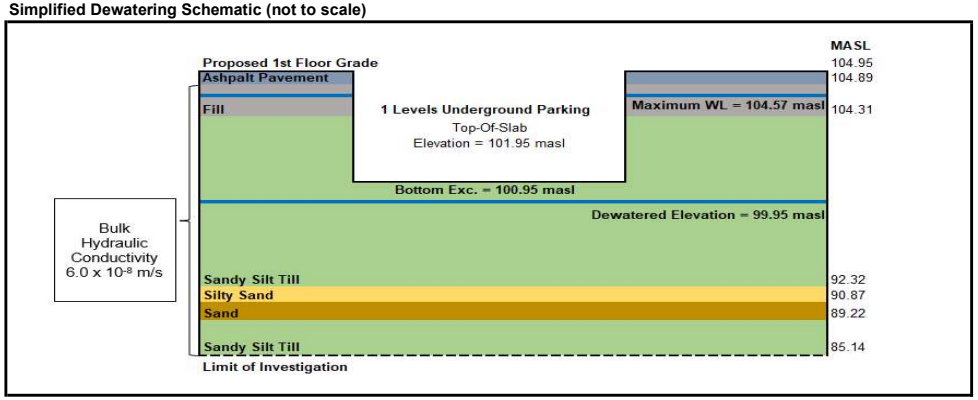
K = Hydraulic Conductivity (m/day)
H = Distance from initial static water level to bottom of the saturated aquifer (m)
h = Depth of water in the well while pumping (m)
L0 = Distance of influence to line source of recharge (m)
a = Length (m)
b = Width (m)

Parameter	Value	Units
Q	14.63	**m^3/day**
	0.169	**L/s**
K	5.2E-03	**m/day**
H	14	**m**
h	9	**m**
L0	8	**m**
a	180	**m**
b	36	**m**

Incident Precipitation		
Design Event =	11	mm in 24-hours
Area =	6,480	m^2
Volume =	71.300	m^3/day
	71,300	L/day

* 11 mm/24-hr =95% Percentile Accumulation

Simplified Dewatering Schematic (not to scale)



Summary

Summary	Short-Term Pumping Rate Q			Long-Term Pumping Rate Q
	m^3/day	L/day	L/s	L/day
Groundwater	29,300	29,300	0.34	9,800
Precipitation	71.300	71,300	0.83	-
Total	100.600	100,600	1.16	9,800

Notes:

1. Considering a groundwater factor of safety of: **2**
2. Long-term pumping rate approximately 1/3rd short-term groundwater rate. Does not include infiltration from rain.
3. Rates rounded to the nearest 100L

APPENDIX F

MECP Water Well Record

WATER WELL RECORDS WITHIN 500M OF SITE

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PICKERING TOWN	17 651509 4853534 W	2016/01 603	1.79			MO	0015 10	7262371 (Z183676) A194335	BRWN FILL LOOS 0003 BRWN SILT SAND 0025
PICKERING TOWN	17 651547 4852865 W	2015/11 724	2			MT	0005 10	7253330 (Z219334) A156245	BRWN FILL GRVL LOOS 0005 BRWN SAND SILT DNSE 0010 GREY SILT SAND DNSE 0015
PICKERING TOWN	17 651544 4852840 W	2015/11 724	2			MT	0005 10	7253328 (Z219332) A180381	BRWN FILL GRVL LOOS 0005 BRWN SILT SAND DNSE 0010 GREY SILT SAND DNSE 0015
PICKERING TOWN	17 651494 4853615 W	2014/09 724	2.04			MT	0015 10	7228398 (Z195962) A164767	BRWN FILL GRVL LOOS 0005 BRWN TILL SAND DNSE 0010 BRWN SAND SILT DNSE 0015 GREY SAND SAND DNSE 0020 GREY SAND TILL DNSE 0025
PICKERING TOWN	17 651290 4853027 W	2019/05 761	2		///:	MO	0020 10	7335757 (Z302043) A267435	BRWN FILL PCKD 0006 GREY TILL SAND SILT 0030
PICKERING TOWN	17 651478 4853604 W	2014/09 724	2.04			MT	0015 10	7228397 (Z195695) A164762	BRWN FILL GRVL LOOS 0005 BRWN TILL SAND DNSE 0010 BRWN SAND SILT DNSE 0015 GREY SAND SAND DNSE 0020 GREY SAND TILL DNSE 0025
PICKERING TOWN	17 651426 4853325 W	2019/05 761	2	UT 0027	///:	MO	0020 10	7335756 (Z302042) A267434	BRWN FILL PCKD 0003 GREY TILL SILT SAND 0030
PICKERING TOWN	17 651239 4853123 W	2019/05 761	2	UT 0015	///:	MO	0020 10	7335755 (Z302041) A267432	BRWN FILL PCKD 0008 GREY TILL SAND SILT 0030
PICKERING TOWN	17 651518 4853400 W	2019/03 736	2	UT 0013	///:	MO	0007 10	7331993 (Z307516) A266668	SAND STNS 0010 SAND WBRG SLTY 0017
PICKERING TOWN	17 651523 4853385 W	2019/03 736	2		///:	MO	0055 10	7331992 (Z307517) A259801	SAND GRVL 0010 BRWN SAND HARD 0020 TILL SLTY 0065
PICKERING TOWN	17 651510 4853412 W	2019/03 736	2		///:	MO	0010 10	7331991 (Z307515) A266667	SAND STNS 0005 BRWN SAND 0010 GREY TILL HARD 0020
PICKERING TOWN	17 651508 4853461 W	2019/01 7215						7329547 (C44123) A259397 P	
PICKERING TOWN	17 651733 4853650 W	7215	40	UT 0008		TH	0015 10	7315926 (Z285567) A247000	FILL 0004 BRWN SILT SAND HARD 0008 GREY SILT CLAY TILL 0015

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PICKERING TOWN	17 651859 4853635 W	2018/06 721	40	UT 0008		TH	0015 10	7315925 (Z285569) A247002	FILL 0004 GREY CLAY SILT WBRG 0015
PICKERING TOWN	17 651443 4853606 W	2017/01 738	2			MO	0010 10	7288920 (Z257467) A211867	SNDY TILL 0020
PICKERING TOWN	17 651438 4853616 W	2017/01 738	2			MO	0010 10	7288919 (Z257468) A211866	SNDY TILL 0020
PICKERING TOWN	17 651531 4853635 W	2012/10 724	2			MO	0010 10	7190980 (Z160697) A109671	BRWN FILL 0005 BRWN TILL SILT HARD 0010 GREY TILL HARD 0020
PICKERING TOWN	17 651565 4853343 W	2009/05 660	2.00			MO		7125150 (M05150) A082740	BRWN SILT SAND PCKD 0002 BRWN SILT TILL HARD 0007 GREY SILT TILL HARD 0013
PICKERING TOWN	17 651543 4853487 W	2009/03 724	1.5			MT	0008 10	7122456 (Z93173) A081890	BRWN 0001 BRWN SILT CLAY DNSE 0014 GREY SILT CLAY DNSE 0018
PICKERING TOWN	17 650986 4852936 W	2007/04 721	0.79					7044062 (Z70361) A041768	
PICKERING TOWN	17 650971 4852926 W	2007/04 721	0.79					7044063 (Z70360) A055063	
PICKERING TOWN	17 650945 4852828 W	2011/07 724	2				0005 10	7166731 (Z134953) A120954	BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0015
PICKERING TOWN	17 651656 4852833 W	2012/05 724	2.04			MT	0010 10	7183709 (Z150891) A131171	BRWN LOAM ---- LOOS 0001 BRWN SILT SAND DNSE 0010 GREY SILT SAND DNSE 0020
PICKERING TOWN	17 651536 4852845 W	2012/05 724	2.04			MT	0010 10	7183708 (Z150892) A131170	BRWN LOAM ---- LOOS 0001 BRWN SILT CLAY DNSE 0010 GREY SILT CLAY DNSE 0020
PICKERING TOWN	17 650935 4852797 W	2011/07 724	2			MT	0010 10	7166730 (Z134954) A120953	BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0020
PICKERING TOWN	17 650955 4852775 W	2011/07 724	2			MT	0008 10	7166729 (Z134952) A120952	BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0010 GREY SILT SAND LOOS 0018
PICKERING TOWN	17 650967 4852770 W	2011/07 724	2			MT	0010 10	7166728 (Z136822) A120951	BLCK 0000 BRWN SAND GRVL LOOS 0001 BRWN SILT SAND LOOS 0012 GREY SILT SAND LOOS 0020

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PICKERING TOWN	17 651590 4853660 W	2012/10 724	2			MO	0010 10	7190981 (Z160698) A109687	BRWN FILL 0001 BRWN TILL SILT HARD 0006 GREY TILL HARD 0020
PICKERING TOWN	17 651582 4853583 W	2022/01 7464						7415976 (C53144) A343034 P	
PICKERING TOWN	17 651286 4853022 W	2019/05 761	2		///:	MO	0009 5	7335763 (Z302049) A267439	BRWN FILL LOOS 0002 GREY SAND SILT HARD 0008 GREY TILL SAND SILT 0014
PICKERING TOWN	17 651503 4853399 W	2019/05 761	2		///:	MO	0010 5	7335761 (Z302047) A267438	BRWN FILL LOOS 0002 GREY TILL SAND SILT 0015
PICKERING TOWN	17 651508 4853405 W	2019/05 761	2	UT 0027	///:	MO	0020 10	7335762 (Z302048) A267440	BRWN FILL LOOS 0002 GREY SAND SILT HARD 0008 GREY TILL SAND HARD 0030
PICKERING TOWN	17 651257 4853065 W	2019/05 761	2		///:	MO	0010 10	7335760 (Z302050) A267441	BRWN FILL LOOS 0003 GREY TILL SAND SILT 0020
PICKERING TOWN	17 651332 4853073 W	2019/05 761	2	UT 0050	///:	MO	0055 10	7335758 (Z302044) A267436	BRWN FILL LOOS 0002 GREY TILL HARD 0035 GREY TILL SILT HARD 0060 GREY GRVL SAND HARD 0065
PICKERING TOWN	17 651404 4853162 W	2019/05 761	2	UT 0024	///:	MO	0020 10	7335759 (Z302045) A267437	BRWN FILL PCKD 0005 GREY TILL SAND HARD 0030
PICKERING TOWN 02 440	17 651361 4853532 W	2006/10 141	5.5		10///:			1918489 (Z53348) A	
PICKERING TOWN 028	17 651846 4853697 W	2005/08 694	5					1917749 (Z10103) A	
PICKERING TOWN CON 01 028	17 651572 4853540 W	1994/11 5459				CO		1912210 (141557) A	GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0037 GREY LMSN
PICKERING TOWN CON 01 028	17 651574 4853540 W	1994/11 545	6	FR 0022	20/23/30/1	CO	0029 2	1912209 (141554)	GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0022 BLCK CSND 0037 GREY LMSN 0037
PICKERING TOWN CON 01 028	17 651571 4853540 W	1994/11 545	6	FR 0021	12/15/30/1	CO	0026 12	1912208 (141555)	GREY CLAY SAND 0018 GREY SAND STNS SILT 0021 BLCK SAND LOOS 0038 GREY LMSN
PICKERING TOWN CON 01 028	17 651573 4853540 W	1994/11 545	6	FR 0022	12/16/30/1	CO	0025 3	1912207 (141552)	GREY CLAY SAND STNS 0017 GREY SAND GRVL SILT 0022 BLCK SAND LOOS 0037 GREY LMSN 0037

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PICKERING TOWN RANGE 03 028	17 651706 4853617 W	2021/05 7241						7391385 (Z364300) A331071 P	
PICKERING TOWN RANGE 03 028	17 651781 4853551 W	2021/05 7241						7391384 (Z364320) A317763 P	
PICKERING TOWN RANGE 03 028	17 651647 4853545 W	2021/05 7241						7391383 (Z364321) A318007 P	
PICKERING TOWN RANGE 03 028	17 651626 4853523 W	2021/05 7241						7391382 (Z364322) A318006 P	
PICKERING TOWN RANGE 03 028	17 651583 4853577 W	2021/04 7464						7391084 (Z351810) A317478 P	
PICKERING TOWN RANGE 03 028	17 651579 4853554 W	2021/04 7464						7391083 (Z351801) A317477 P	
PICKERING TOWN RANGE 03 029	17 651772 4852736 W	2021/12 7230						7418456 (C55701) A316594 P	
PICKERING TOWN RANGE 03 029	17 651493 4853474 W	2022/04 7282		UT 0006	///:	MO		7417553 (3TEQ9L6Z) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651509 4853483 W	2022/04 7282		UT 0005	///:	MO		7417552 (TOZTIQLF) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651516 4853406 W	2022/04 7282		UT 0004	///:	MO		7417551 (K3VJ3NQI) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651493 4853472 W	2022/04 7282		UT 0008	///:	MO		7417554 (FIHF92XT) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651515 4853402 W	2022/04 7282		UT 0004	///:	MO		7417550 (USDOVCDH) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651487 4853522 W	2022/04 7282		UT 0002	///:	MO		7417548 (BLZT38S6) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651779 4852734 W	2021/12 7230						7418455 (C55702) A320690 P	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
PICKERING TOWN RANGE 03 029	17 651509 4853531 W	2022/04 7282		UT 0004	///:	MO		7417549 (WY6FDB5G) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651541 4852865 W	2015/11 724	0.79			MT	0033 33	7253329 (Z219331) A181297	BRWN FILL GRVL LOOS 0007 BRWN SILT SAND DNSE 0033 GREY SILT SAND DNSE 0066
PICKERING TOWN RANGE 03 029	17 651495 4853563 W	1969/09 542	34	FR 0018	14/14/10/2:	DO		4604328 ()	LOAM 0001 BRWN CLAY STNS 0012 BLUE CLAY STNS 0018 GREY GRVL CSND 0027
PICKERING TOWN RANGE 03 029	17 651477 4853507 W	2022/04 7282		UT 0002	///:	MO		7417555 (THYICPQ6) _NO_TAG A	
PICKERING TOWN RANGE 03 029	17 651488 4853524 W	2022/04 7282		UT 0004	///:	MO		7417547 (CRJNJ32K) _NO_TAG A	
PICKERING TOWN RANGE 03 030	17 650885 4853159 W	1952/02 482	4					4601908 () A	RED MSND CLAY STNS 0018 GREY CLAY GRVL 0055 HPAN 0078 GRVL SILT 0079 BLCK SHLE 0097
PICKERING TOWN RANGE 03 031	17 650891 4852820 W	2015/07 7147						7245784 (C28817) A P	
PICKERING TOWN RANGE 03 031	17 650915 4852783 W	1967/09 230	6	FR 0102	90/95/3/2:3	DO		4601916 ()	PRDG 0040 CLAY 0100 GRVL 0102

Notes:

UTM: UTM in Zone, Easting, Northing and Datum is NAD83; L: UTM estimated from Centroid of Lot; W: UTM not from Lot Centroid
DATE CNTR: Date Work Completed and Well Contractor Licence Number
CASING DIA: .Casing diameter in inches
WATER: Unit of Depth in Feet. See Table 4 for Meaning of Code
PUMP TEST: Static Water Level in Feet / Water Level After Pumping in Feet / Pump Test Rate in GPM / Pump Test Duration in Hour : Minutes
WELL USE: See Table 3 for Meaning of Code
SCREEN: Screen Depth and Length in feet
WELL: WEL (AUDIT #) Well Tag. A : Abandonment; P: Partial Data Entry Only
FORMATION: See Table 1 and 2 for Meaning of Code

Table 1. Core Material and Descr

Code	Description
BLDR	BOULDERS
BSLT	BASALT
CGRD	COARSE-GRAINED
CGVL	COARSE GRAVEL
CHRT	CHERT
CLAY	CLAY
CLN	CLEAN
CLYY	CLAYEY
CMTD	CEMENTED
CONG	CONGLOMERATE
CRYS	CRYSTALLINE
CSND	COARSE SAND
DKCL	DARK-COLOURED
DLMT	DOLOMITE
DNSE	DENSE
DRTY	DIRTY
DRY	DRY
FCRD	FRACTURED
FGRD	FINE-GRAINED
FGVL	FINE GRAVEL
FILL	FILL
FLDS	FELDSPAR
FLNT	FLINT
FOSS	FOSILIFEROUS
GNIS	GNEISS
GRNT	GRANITE

Code	Description
GRSN	GREENSTONE
GRVL	GRAVEL
GRWK	GREYWACKE
GVLY	GRAVELLY
GYPS	GYPSUM
HARD	HARD
HPAN	HARDPAN
IRFM	IRON FORMATION
LIMY	LIMY
LMSN	LIMESTONE
LOAM	TOPSOIL
LOOS	LOOSE
LTCL	LIGHT-COLOURED
LYRD	LAYERED
MARL	MARL
MGRD	MEDIUM-GRAINED
MGVL	MEDIUM GRAVEL
MRBL	MARBLE
MSND	MEDIUM SAND
MUCK	MUCK
OBDN	OVERBURDEN
PCKD	PACKED
PEAT	PEAT
PGVL	PEA GRAVEL
PORS	POROUS
PRDG	PREVIOUSLY DUG

Code	Description
PRDR	PREV. DRILLED
QRTZ	QUARTZITE
QTZ	QUARTZ
ROCK	ROCK
SAND	SAND
SHLE	SHALE
SHLY	SHALY
SHRP	SHARP
SHST	SCHIST
SILT	SILT
SLTE	SLATE
SLTY	SILTY
SNDS	SANDSTONE
SNDY	SANDYSOAPSTONE
SOFT	SOFT
SPST	SOAPSTONE
STKY	STICKY
STNS	STONES
STNY	STONEY
THIK	THICK
THIN	THIN
TILL	TILL
UNKN	UNKNOWN
VERY	VERY
WBRG	WATER-BEARING
WDFR	WOOD

Code	Description
WTHD	WEATHERED

Notes (Cont'd):

Table 2. Core Colour

Code	Description
WHIT	WHITE
GREY	GREY
BLUE	BLUE
GREN	GREEN
YLLW	YELLOW
BRWN	BROWN
RED	RED
BLCK	BLACK
BLGY	BLUE-GREY

Table 3. Well Use

Code	Description
DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling and A/C
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring TestHole

Table 4. Water Detail

Code	Description
FR	Fresh
SA	Salty
SU	Sulphur
MN	Mineral
Uk	Unknown
GS	Gas
IR	Iron

Source: Ministry of the Environment, Conservation, and Parks. Water Well Information System. January 1, 1899 to June 30, 2022. Last Updated March 31, 2023. https://data.ontario.ca/dataset/well-records