GOLDER
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REPORT

Preliminary Hydrogeological Investigation

Proposed Residential Subdivision, 5113 Old Brock Road, Hamlet of Claremont, Pickering, Ontario

Submitted to:

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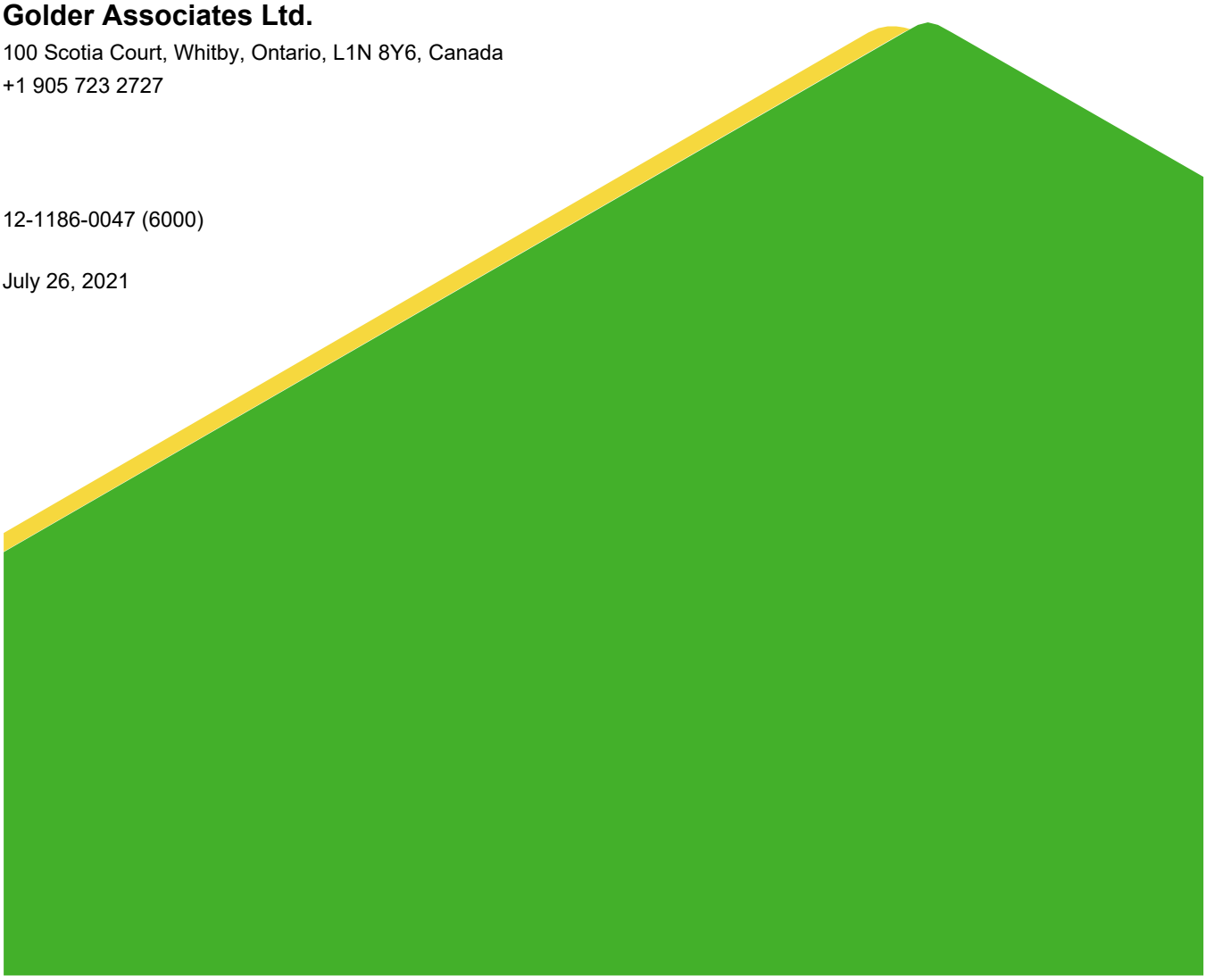
July 26, 2021



Distribution List

E-copy - Claremont Developments Inc.

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Claremont Developments Inc. (CDI) to carry out a preliminary hydrogeological investigation for a proposed 70-lot residential subdivision at 5113 Old Brock Road (Site) in the Hamlet of Claremont, City of Pickering, Ontario, as shown on the Key Plan, Figure 1.

This report serves to update a hydrogeological investigation in respect of the proposed rezoning and subdivision of 5113 Old Brock Road, as fully described in the Planning Report by Malone Given Parsons, dated July 2021. This report draws on our previous reporting for background information, including our 2012 Preliminary Geotechnical and Hydrogeological Investigation, and where this information is applied it will be referenced.

The purpose of the preliminary hydrogeological investigation is to characterize the subsurface conditions at the Site and prepare a pre-development and post-development water balance based on the development concept. The water balance was used to assess the potential hydrogeological impacts of the proposed development, including potential hydrogeological impacts to Key Hydrologic Features within the area of influence of the development, as discussed in Section 26 of the Oak Ridges Moraine Conservation Plan (2017). Golder concurrently carried out a preliminary geotechnical investigation and private servicing feasibility assessment, the results of which are reported under separate cover.

The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location or elevation, or if the project is not initiated within eighteen months of the date of the report, Golder should be given an opportunity to confirm that the recommendations are still valid. In addition, this report should be read in conjunction with the attached *"Important Information and Limitations of This Report"*. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2.0 BACKGROUND

2.1 Site and Project Description

The 38.18 ha Site is located to the northeast of the existing development in Claremont, as shown on Figure 1. The Site is bounded to the east by Brock Road (Claremont Bypass), existing residential properties to the south, Old Brock Road to the west, and residential properties and a woodlot to the north. The southern-most portion of the Site is bounded by Central Street (Durham Regional Road 5, also Concession Road 9). A railroad corridor is located off-Site to the north. The Site primarily consists of an irregularly-shaped, agricultural parcel of land with one privately-serviced residential dwelling.

The water balance assessment is based on Draft Plan of Subdivision, 21T-, Part of Lots 17 & 18, Concession 9, Lots 47 & 48, Registered Plan No. 12 (Geographic Township of Pickering), City of Pickering, Regional Municipality of Durham, prepared by Malone Givens Parsons Ltd., Reference No. 12-2110, Revised March 1, 2018. A copy of the Draft Plan is provided in Appendix B. The proposed residential subdivision will consist of 70 new residential lots and 1 existing lot with private services (individual water wells and sewage systems), two storm water management ponds, a park block, open space blocks and local roads.

2.2 Topography and Drainage

Based on provided Site-specific topographic data, the elevation of the Site ranges from approximately 263 m above sea level (masl) to 280 masl. Based on on-line information available from Ontario Ministry of Natural Resources and Forestry's on-line *Ontario Flow Assessment Tool* (OFAT)[1] and *Existing Storm Drainage Plan* (SCS Consulting Group Ltd. (SCS), Figure 2.1, July 2021), a drainage divide is present on the northern third of the Site.

The area to the north of the drainage divide drains locally to a first order stream, part of which is located on-Site in Open Space Block 75 (see Appendix B), which is an unnamed tributary of East Duffins Creek. The stream is shown to originate from a small pond just off-site to the northwest. Within the Site boundaries, the stream flows in a northeast direction. The area to the south of the drainage divide drains generally toward the southwest, and is within the catchment area of two unnamed tributaries of Mitchell Creek. At closest, one of the unnamed tributaries of Mitchell Creek is located approximately 50 m from the west Site boundary. Mitchell Creek is a tributary of East Duffins Creek.

Beacon Environmental (Beacon) has carried out a natural heritage evaluation of the Site (Beacon, July 2021, Natural Heritage Evaluation, 5113 Old Brock Road, Hamlet of Claremont, City of Pickering. Reference No. 221308). Based on Site-specific Ecological Land Classification community mapping prepared by Beacon Environmental (*Existing Conditions*, Figure 2, July 2021; copy included in Appendix B of this report), Open Space Block 75 at the north end of the Site includes woodland and two marsh/wetland areas. The stream that flows in a northeast direction generally coincides with the larger of these two wetland areas. Beacon reports that the stream channel is poorly defined on the Site, and that indications of groundwater discharge including seeps, iron staining and watercress growth are present. Golder also observed seepage in this area during field activities. For the purposes of assessment relative to the *Oak Ridges Moraine Conservation Plan* (2017) (Ministry of Municipal Affairs, May 2017), the Open Space Block 75 is considered to contain Key Natural Heritage Features (i.e., the wetland and woodland areas) and Key Hydrological Features (i.e., the stream and areas of groundwater seepage), as a part of the Glen Major Provincially Significant Wetland (PSW) Complex.

In addition, Beacon indicates the presence of a small wetland/marsh community at the southern-most end of the Site (to the northwest of Brock Road at Central Street) in Open Space Block 77. Based on topographic mapping, no watercourse is mapped in this area. It is understood from Beacon that this area is considered to be a low quality wetland fragment. Beacon reports no indications of groundwater in the wetland fragment from a natural heritage perspective. An evaluation of water level data and conditions within the Wetland 3 to September 2018, provided under separate cover, indicates that this wetland fragment is excluded from the policies *Oak Ridges Moraine Conservation Plan* (2017).

These designations are corroborated by on-line information available from the Ontario Ministry of Natural Resources and Forestry[2]. The information indicates that the Natural Heritage System and an Evaluated Provincially Significant Wetland are present in Open Space Block 75, as part of the Glen Major Provincially Significant Wetland Complex. An Evaluated Provincially Significant Wetland is also present in the valley lands of the unnamed tributary to Mitchell Creek located off-site to the west. Further, the low quality wetland fragment on

[1] http://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html
[2] http://www.gisapplication.lrc.gov.on.ca/mamnh/Index.html?site=MNR_NHLUPS_NaturalHeritage&viewer=NaturalHeritage&locale=en-US

Open Space Block 77 is not mapped as part of the Natural Heritage System nor as a Provincially Significant Wetland.

2.3 Physiography and Geology

The Site is located within the physiographic region known as the South Slope (The Physiography of Southern Ontario, Chapman and Putnam, 1984), which is an area of drumlinized till plains. The physiographic region known as the Oak Ridges Moraine is located approximately 125 m north of the Site. A plan showing the location of the Site on published physiographic mapping is provided as Figure 1A, attached.

According to Sharpe and Barnett (1997) (Surficial Geology of the Markham Area, NTS 30M14, southern Ontario; Geological Survey of Canada, Open File 3300, Scale 1:50,000) surficial geology at the Site is reported to consist of the Halton Till, a glacial deposit of clayey silt till to silt till ranging from 1 m to 15 m thick with interbedded fine sand, silt, and clay. Hummocky topography, typically associated with the Oak Ridges Moraine, is mapped just off-site to the north (i.e., from the off-site rail line and northward). Moraine deposits of fine sand to gravel outcrop approximately 1 km north of the Site. The till unit is mapped as overlain by glaciolacustrine sand to silty sand in the southern-most end of the Site (i.e., in the vicinity of Brock Road and Central Street). Recent relatively coarse-textured fluvial deposits of sand and gravel are reported within the floodplain of the unnamed tributary to Mitchell Creek that is located off-Site to the west.

2.4 Water Well Records

A review of the Ontario Ministry of the Environment, Conservation and Parks(MECP) Water Well Records was carried out for 381 wells in the Claremont area. It is noted that historically there was not a requirement to register dug wells with the MECP, and they can be under-represented in the Water Well Record database. The locations of the water well records are shown on Figure 2, Recorded Water Wells. A tabulated summary of the Water Well Record data is provided in Appendix C. The following Table 1 summarizes data from the Water Well Records that were reviewed:

Table 1: Summary of MECP Water Well Records

Category	No.	(%)	Well Depth (m)		
			Min.	Max.	Avg.
Shallow dug or bored wells	59	15%	5.2	15.2	9.1
Drilled overburden wells	256	67%	10.7	97.5	61.9
Drilled bedrock wells	4	1%	93.3	97.8	95.1
Observation wells	7	2%	-	-	-
Abandoned wells	40	10%	-	-	-
Records with poor or no information	15	4%	-	-	-
TOTAL	**381**	**100%**	**-**		

From the Table 1 above, the Water Well Records indicate that drilled overburden well use predominates in the Claremont area. Golder prepared two hydrostratigraphic sections based on the reported geological conditions, attached as Figure 3, Section A – A', and Figure 4, Section B – B'. Figure 3 is a section oriented in a north-south direction along Old Brock Road North (i.e., the western flank of the Site), and Figure 4 is a section oriented in an east-west direction at the south end of the Site. Based on the recorded information (see Figures 3 and 4), private water wells generally utilize three zones in the Claremont area, and the following is inferred from the Water Well Record data:

i) shallow water wells – shallow dug and bored wells are inferred to utilize various shallow, thin coarse-textured units or the glacial till unit for water supply. The coarse-textured units are not recorded at all well locations, and therefore are inferred to be laterally discontinuous;

ii) intermediate aquifer(s) – drilled wells utilize a number of confined coarse-textured aquifer units within the thick glacial till unit that underlies the Claremont area. A number of records indicate the presence of a sandy unit or units from approximate elevations of 230 masl to 250 masl, which for the purposes of this report are labelled on Figures 3 and 4 as the "intermediate aquifer(s)". The intermediate aquifer(s) is/are not recorded at all locations, and is/are or may be discontinuous, depending on location; and

iii) "target" aquifer – a deeper confined aquifer within the till unit is commonly screened for water supply at an elevation of approximately 178 m masl to 187 masl. This unit appears to be commonly screened for water supply in the Claremont area, and, as discussed under separate cover, is the target aquifer for private water well use for the proposed residential subdivision. For the purposes of this report, it is labelled as the "target aquifer" on Figures 3 and 4.

A fourth, deeper zone is also present, comprised of the bedrock and an immediately overlying coarse-textured unit that is seldom utilized in the Claremont area. The elevation of the bedrock is recorded at approximately 165 masl to 170 masl.

2.5 Previous Investigations

Golder previously carried out a subsurface investigation on part of the Site, as referenced below. Information from the investigation was incorporated into this report.

- "*Preliminary Geotechnical and Hydrogeological Investigation in Support of Draft Plan Submission for a Proposed Residential Subdivision, Lane Street and Brock Road, Claremont, City of Pickering, Ontario"* dated August 23, 2012.

3.0 SITE CHARACTERIZATION (FIELD INVESTIGATION COMPONENT)

3.1 Borehole Drilling and Monitoring Well/Piezometer Installation

The fieldwork for the preliminary geotechnical and hydrogeological investigation was carried out in February 2012 and October 2017, at which time boreholes BH12-1 through BH12-6 and BH17-7 through BH17-19 were advanced. A total of eleven 50 mm diameter groundwater monitoring wells were installed in boreholes completed at the following locations to permit further monitoring of groundwater conditions at the Site:

- BH12-2, BH12-4, BH12-6, BH17-7, BH17-8, BH17-9, BH17-11, BH17-14, BH17-16, BH17-18 and BH17-19.

All borehole and groundwater monitoring well locations are indicated on the Site Location Map, Figure 5. The boreholes were drilled to depths ranging from 5.9 m below ground surface (mbgs) to 9.6 m mbgs.

The boreholes were drilled using track-mounted drill rigs supplied and operated by specialist drilling contractors, and subcontracted to Golder. Standard Penetration Testing (SPT N-values) and sampling were carried out at regular depth intervals in the boreholes using conventional nominal 35 mm internal diameter split spoon sampling equipment. Where applicable, the shallow groundwater conditions were noted in the open boreholes during drilling.

The drilling of the boreholes was observed by Golder technical staff who logged the test pits and boreholes, and collected and cared for the recovered soil samples. All of the soil samples obtained during this investigation were brought to our Whitby laboratory for further examination, natural water content testing and selective soil classification testing.

Record of Borehole sheets from the investigation are provided in Appendix D. Grain size distribution curves for selected soil samples are also provided in Appendix D. It is noted that the boundaries between the strata have been inferred from drilling observations and non-continuous samples. They generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Further, conditions will vary between and beyond the boreholes.

Additional details of the borehole drilling program are provided in our concurrent geotechnical investigation report, and a summary of the subsurface conditions encountered is provided in Section 3.2.

To further assess groundwater conditions in Open Space Block 75 at the north end of the Site, a shallow piezometer (P) and staff gauge (SG) pair were installed by hand at two locations (i.e., P1/SG1 and P2/SG2) in wetland areas on December 6, 2017. To further assess conditions in Open Space Block 77 at the south end of the Site, a shallow piezometer and staff gauge pair were also installed by hand at one location (i.e., P3/SG3) in the wetland area. The locations of the piezometers/staff gauges are shown on Figure 5. The locations of the piezometer/staff gauge pairs were selected in the field by Beacon and Golder staff.

The ground surface and top-of-pipe/staff gauge elevations for the boreholes, monitoring wells, piezometers and staff gauges (as applicable) were surveyed by Rady-Pentek & Edward Surveying Ltd. in January 2018, and the survey coordinates were provided to Golder. It is understood that the elevations were surveyed relative to a geodetic benchmark. The surveyed elevations are shown on the Record of Borehole sheets in Appendix D.

3.2 Soil Conditions

The soils encountered as part of the investigations corroborate the mapped geological conditions described in Section 2.3. Underlying the topsoil, the soil conditions encountered are generally comprised of thin surficial deposits of clayey silt, sandy silt and silt underlain by a major strata of glacial till. Where encountered, the base of the surficial deposits ranged in depth from 0.2 mbgs to 1.8 mbgs, with an average of 0.9 mbgs (n = 17). The till ranged in gradation from clayey silt till to sand and silt till. Minor deposits of clayey silt, sandy silt, silty sand and sand were also locally encountered within the till unit, and typically in the southwest portion of the Site. Two sections have been attached to illustrate the soil conditions encountered at the Site: Figure 6, Section C – C', is oriented in a north-south direction at the eastern side of the Site, and Figure 7, Section D – D', is oriented in an east-west direction along part of Street 'A'.

3.3 Water Level Monitoring

Available groundwater measurements are presented in Table E-1, Appendix E. Groundwater levels were measured in the available monitoring wells in March 2012, April 2012, October and November 2017, and January 2018. On November 9, 2017, the depths to groundwater measured at the monitoring wells ranged from 0.66 mbgs (BH17-19) to >7.6 mbgs (BH17-14), and from elevations of 261.14 masl (BH12-6) to 272.48 masl

(BH17-16). On January 23, 2018, the depths to groundwater ranged from 0.22 m above ground surface (BH17-19) to >7.6 mbgs (BH17-14), and from elevations of 261.19 masl (BH12-6) to 273.86 masl (BH17-16). Using the available data, the minimum and maximum groundwater levels at the monitoring wells varied by 0.2 m to 5.3 m, with an average of 1.7 m (n = 10). The recorded water levels reflect the groundwater conditions on the dates they were measured, and seasonal and annual fluctuations should be expected.

Groundwater elevations at the monitoring well locations on November 9, 2017 and January 23, 2018, are plotted in section view on Figure 6, Section C – C', and Figure 7, Section D – D', and in plan view on Figure 8, Shallow Groundwater Flow, November 9, 2017 and Figure 9, Shallow Groundwater Flow, January 23, 2018. The shallow groundwater flow direction at the Site is inferred to be radial from a central location on the east side of the Site, ranging from toward the southwest to toward the northwest.

As discussed in Section 3.1, three piezometer/staff gauge pairs were installed on December 6, 2017 at the locations shown on Figure 5. Approximately 7 cm of water was ponded at the SG1 location at the time of installation, and SG2 and SG3 were dry. On December 7, 2017, the following depths to groundwater were measured in the piezometers: P1, 0.34 mbgs; P2, 0.53 mbgs; P3, 1.02 mbgs. These groundwater depths are shown schematically on Figure 6. Automatic data loggers were also installed to record water level data on a daily basis. The results of monitoring to September 2018 are discussed in Section 3.6.

3.4 Hydraulic Testing

To estimate the bulk hydraulic conductivity (K) of the soil materials adjacent to the screened intervals at monitoring wells, single well response tests (i.e., rising head tests) were carried out at monitoring wells BH12-2, BH12-4, BH12-6, BH17-7, BH17-11 and BH17-19.

The tests were carried out by rapidly purging a known volume of water with a dedicated Waterra tube and footvalve and monitoring the subsequent water level recovery. The Bouwer and Rice (1976) method was applied to rising head test data, using the unconfined solution. The data was analyzed using the AQTESOLV for Windows version 4.50 Professional software. A summary of the results is presented below in Table 2. A summary of the single-well response test data and the AQTESOLV printouts are provided in Appendix E.

Table 2: Hydraulic Conductivity Estimates

Location	Soil Description at Screened Interval	Depth of Sand Pack Interval (mbgs)	Estimated Hydraulic Conductivity K (cm/s)
BH12-2	Clayey Silt, Clayey Silt Till	5.5 to 7.6	7×10^{-5}
BH12-4	Clayey Silt Till, Sandy Silt	5.5 to 7.6	3×10^{-6}
BH12-6	(ML) Sandy Silt Till to (SW) Sand	7.4 to 9.6	5×10^{-4}
BH17-7	(ML-CL) Silt and Sand Till	5.8 to 7.6	1×10^{-6}
BH17-11	(ML-CL) Silt and Sand Till to (ML) Sandy Silt Till	5.8 to 7.6	6×10^{-7}
BH17-19	(ML-CL) Silt and Sand Till	6.1 to 7.9	2×10^{-6}

The estimated hydraulic conductivity values are considered to be reasonable for the soil types tested.

3.5 Guelph Permeameter Testing

Soil infiltration rate testing was carried out on November 9 and 15, 2017 to provide an estimate of the field-saturated hydraulic conductivity (K_{fs}) of surficial soils using a Guelph Permeameter (Model 2800K1). Infiltration rate tests were conducted in the unsaturated zone at four locations proximal to boreholes BH17-9, BH17-11, BH17-14, and BH17-18. The locations of these boreholes are shown on Figure 5.

The Guelph Permeameter was operated in accordance with the instructions outlined in the 2800K1 Guelph Permeameter manual (Soilmosture Equipment Corp., 2012) using a single head method. At each of the testing locations, the Guelph Permeameter was installed in a hand-augured hole to and in unsaturated ground conditions.

Once the outflow of water at the depth of installation reached a steady-state flow rate, the field-saturated hydraulic conductivity, Kfs, of the soil was estimated using following equation (Elrick et. al., 1989):

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

Where: C_1 = shape factor
Q_1 = flow rate (cm^3/s)
H_1 = water column height (cm)
a = well radius (cm)
α* = alpha factor (0.15 cm^{-1})

The field data and analyses of the infiltration rate tests are presented in Appendix E. Based on the resulting K_{fs} (cm/s), the corresponding infiltration rates (mm/hr) were estimated using the approximate relationship presented in the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA and CVCA, 2010). A summary of the infiltration rate testing results is presented below in Table 3.

Table 3: Summary of Infiltration Rate Testing

	Soil Description	Approximate Test Depth (mbgs)	Estimated Field-Saturated Hydraulic Conductivity K_{fs} (cm/s)	Estimated Infiltration Rate[1] (mm/hr)	Correction Factor [1]	Corrected Estimated Infiltration Rate (mm/hr)
BH17-11	(ML) Sandy Silt	0.37	1×10^{-4}	50	3.5	14
BH17-14	(ML) Silt	0.35	3×10^{-3}	111	3.5	32
BH17-9	(ML-CL) Silt and Sand Till	0.68	6×10^{-5}	46	2.5	18
BH17-18	(ML-CL/ML) Silt and Sand Till to Sandy Silt Till	0.67	2×10^{-4}	58	2.5	23
Average				**66**	**-**	**22**

[1] as per *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA and CVCA, 2010)

The estimated field saturated hydraulic conductivity values are considered to be reasonable for the soil types tested, with the exception of the result at BH17-14 which is at least an order of magnitude higher than expected for silt soils, likely due to secondary permeability (e.g., root hole, fractures). It is not recommended that an infiltration rate of 32 mm/hr be considered as representative of silt soils at the Site for any related use storm water management design.

The infiltration rate estimates from this investigation are based on the test methods discussed above, and are for the corresponding native soil types encountered in undisturbed conditions. They represent the soil conditions at the tested locations and depths only; conditions may vary between and beyond the tested locations. Care should be taken during construction of the proposed infiltration measures to preserve the existing soil structure and avoid compaction and re-working which could reduce its infiltrative properties.

For preliminary design purposes, a correction factor was applied to estimate the design infiltration rate in accordance with guidance provided in the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA and CVCA, 2010), to account for potential reductions in soil permeability due to compaction and smearing during the construction of a given infiltration feature and the gradual accumulation of fine sediments over the lifespan of the infiltration feature. Based on the guidance, a correction factor of 3.5 was applied to the estimated infiltration rates for BH17-11 and BH17-14, and 2.5 was applied to BH17-9 and BH17-18. As shown, the surficial soils were estimated to have an average design infiltration rate of 22 mm/hr.

3.6 Summary

Published mapping indicates that the surficial geology at the Site is comprised of the Halton Till (clayey silt till to silt till). Glaciolacustrine sand to silty sand is mapped overlying the till in the southern-most end of the Site. The Oak Ridges Moraine is mapped off-Site to the north. The results of the site-specific subsurface investigation generally corroborate the published mapping. Underlying surficial topsoil, the native subsoil conditions encountered in the boreholes were generally comprised of thin surficial deposits of clayey silt, sandy silt and silt to an average depth of 0.9 m, underlain by clayey silt till to sand and silt till beyond the depths of investigation. Minor deposits of clayey silt, sandy silt, silty sand and sand were also locally encountered within the till unit, and typically southwest portion of the Site. The estimated hydraulic conductivity of the till unit ranged from 6 x 10-7 cm/s to 7 x 10-5 cm/s. Given the moderate to low hydraulic conductivity of the predominant shallow soils, the development area is not expected to represent a significant recharge area in the East Duffins Creek and Mitchell Creek watersheds.

The community of Claremont is privately serviced with individual water wells. Deep drilled well use is predominant, utilizing various confined coarse-textured soil units within the thick glacial till deposits. Based on MOECC Water Well Record data, confined aquifer(s) in the elevation range of 230 masl to 250 masl were identified in a number of records, and are referred to for the purposes of this report as the intermediate aquifer(s). However, a deeper confined aquifer in the elevation range of 178 masl to 187 masl was commonly screened for water supply purposes in the Claremont area.

A drainage divide is present on the northern third of the Site. The on-site area to the north of the divide drains locally to a poorly-defined first order stream that is an unnamed tributary of East Duffins Creek. Within the Site boundaries (i.e., Open Space Block 75), the stream flows in a northeast direction. Open Space Block 75 includes woodland and two wetland/marsh areas, and the larger of the two wetlands is mapped as an Evaluated Provincially Significant Wetland, as part of the Glen Major Provincially Significant Wetland Complex. These are collectively considered to be Key Natural Heritage and Key Hydrologic Features, and part of the Natural Heritage System. The area to the south of the divide drains generally toward the southwest, and is within the catchment

area of two unnamed tributaries of Mitchell Creek. An Evaluated Provincially Significant Wetland is present off-site to the west in the valley lands of the tributary to Mitchell Creek. A small roadside wetland community is present at the southern-most portion of the Site (i.e., Open Space Block 77) which is considered to be a low quality wetland fragment, which is not mapped as part of the Natural Heritage System, nor as a Provincially Significant Wetland. A drainage feature is not mapped in this area, and Beacon reports no indications of groundwater from a natural heritage perspective.

The measured depth to groundwater on January 23, 2018 at the monitoring well locations ranged from approximately 0.22 m above ground surface to >7.6 mbgs, and from elevations of 261.19 masl to 273.86 masl, although seasonal and annual fluctuations should be anticipated. The shallow groundwater flow direction at the Site is inferred to be radial from a central location at the east property boundary, ranging from toward the southwest to toward the northwest.

Based on Beacon's observations of groundwater discharge indicators (i.e., seepage, iron staining and watercress growth), and Golder's observations of seepage, the stream in Open Space Block 75 is expected to receive groundwater baseflow contributions. However, it is noted that the vertical hydraulic gradient in the wetland at P1/SG1 on December 6 and 7, 2017, adjacent to the north of the stream, was downward, which indicates recharging conditions at that location, at that time. The groundwater head in the piezometers in the wetlands at P2 and P3 were below grade and standing water was not present at SG2 and SG3 on these dates. Further, it is noted that the head at the screened interval of monitoring well BH17-19, the closest monitoring well to Open Space Block 77, changed from below grade in October/November 2017 to above grade in January 2018. A further evaluation of water level data and conditions within Wetland 3 in Open Block 77 to September 2018 is provided under separate cover. The evaluation indicates that this wetland fragment is excluded from the policies *Oak Ridges Moraine Conservation Plan* (2017).

4.0 HYDROLOGIC WATER BALANCE

The purpose of the water balance assessment was to assess the potential hydrogeological impacts of the proposed development with respect to post-development infiltration rates, including potential impacts to groundwater-dependent resources. An average annual water balance was prepared to estimate existing (i.e. pre-development) and post-development water balance conditions on a site-wide basis, and on a "feature"-specific basis for each of the two wetland features in Open Space Block 75 and the wetland fragment in Open Space Block 77. In this way, the Study Area for the hydrologic water balance is comprised of the 38.18 ha Site plus the additional off-site catchment areas that drain to three wetland features, which sum to approximately 47.4 ha. For the purposes of this report, the three wetlands are named as follows:

- Wetland 1: Located at the north end of the Site along the tributary of East Duffins Creek in Open Space Block 75, defined by Beacon as a White Cedar Mineral Coniferous Swamp (SWC1). P1/SG1 are installed in this feature;
- Wetland 2: Located at the north end of the Site in Open Space Block 75, between the tributary to Duffins Creek and the development area, defined by Beacon as a Mineral Meadow Marsh (MAM2). P2/SG2 are installed in this feature; and
- Wetland 3: Wetland fragment located at the south end of the Site in Open Space Block 77, defined by Beacon as a Maple Mineral Deciduous Swamp (SWD3). P3/SG3 are installed in this feature.

The pre-development catchment areas were based on SCS Figure 2.1, *Existing Storm Drainage Plan* (July 2021), included in Appendix B. The location of the three wetlands are shown on SCS Figure 2.1, and on Beacon Figure 2

in Appendix B. The post-development catchment areas were based on SCS Figure 2.2, *Proposed Storm Drainage Plan* (July 2021), also included in Appendix B. Summaries prepared by Golder of the catchment areas used in this assessment are included as Figure F-1, *Pre-Development Site Plan*, and Figure F-2, *Post-Development Site Plan*, in Appendix F.

The existing lot is, and the proposed 70 lots will be, privately serviced with individual water wells and septic systems. The addition of water (i.e., septic effluent) to the septic systems from on-Site private wells utilizing a deep confined aquifer recharged from beyond the Site boundaries is considered to increase the post-development infiltration rate on an average annual basis. The post-development scenario discussed below includes the addition of infiltration from the septic systems for comparison to the pre-development scenario. Further, the storm water management design for the Site, prepared by SCS, includes the use of low impact development (LID) features, which were also considered in the post-development scenario.

4.1 Methods

The water balance assessment was completed using historic meteorological records (1986 to 2017) obtained from Environment Canada (EC) for the Buttonville Airport climate station (ID 6157012), provided information on current and proposed land uses, and existing soil types as identified through the subsurface investigation activities at the Site. The Buttonville Airport meteorological station is the closest station to the Site with expected similar climatic conditions and where significant historical records exist from which to evaluate climatic normals of the input parameters used in a water balance assessment.

The water balance estimate is based on the following equation:

$$P = S + ET + R + I$$

Where:

P = precipitation;

S = change in soil water storage;

ET = evapotranspiration;

R = surface runoff; and

I = infiltration (groundwater recharge).

Precipitation data collected at the Buttonville Airport climate station indicate a mean annual precipitation (P) of 863 mm/yr.

Short-term or seasonal changes in soil water storage (S) are anticipated to occur an annual basis as demonstrated by the typically dry conditions in the summer months and wet conditions in the winter and spring. Long-term changes (e.g., year to year) in soil water storage are considered to be negligible.

Evapotranspiration (ET) refers to water lost to the atmosphere from vegetated surfaces. The term combines evaporation (i.e., water lost from soil or water surfaces) and transpiration (i.e., water lost from plants and trees) because of the difficulties in measuring these two processes separately. Potential ET refers to the loss of water from a vegetated surface to the atmosphere under conditions of an unlimited water supply. The actual rate of ET is typically less than the potential rate under dry conditions (e.g., during the summer months when there is a moisture deficit). The mean annual potential ET for the Study Area is approximately 635 mm/yr based on data provided by EC.

Annual water surplus is the difference between P and the actual ET. The water surplus represents the total amount of water available for either surface runoff (R) or groundwater infiltration (I) on an annual basis. On a monthly basis, surplus water remains after actual evapotranspiration has been removed from the sum of rainfall

and snow melt, and maximum soil or snow pack storage is exceeded. Maximum soil storage is quantified using a water holding capacity (WHC) specific to the soil type and land use. The climatic data for relevant WHCs obtained from Environment Canada are presented in Table F-1, Appendix F.

Infiltration rates were estimated using the method presented in the Ontario Ministry of the Environment and Climate Change (MOECC) Stormwater Management Planning and Design (SWM) Manual (MOECC, 2003). There are three main factors that determine the percent infiltration of the total surplus: topography, soil type and ground cover. The sum of the fractions representing the three factors establishes the approximate annual average percentage of surplus which can be infiltrated in an area with a sufficient downward groundwater gradient.

4.2 Water Balance Parameters

Based on the results of the borehole drilling program (see Section 3.1), the main surficial soil types at the Site were classified as loam to silt loam based on the U.S. Department of Agriculture classification system and the relative percentages of sand, silt and clay. For the purpose of this assessment, the dominant surficial soils were considered to be silt loam. Water holding capacities were then assigned using the values listed in “Table 3.1: Hydrologic Cycle Component Values” (HCCV Table 3.1) of the MOECC SWM Manual (MOECC, 2003) and the vegetative cover type, as summarized in Table 4, below. The soil was classified as Hydrologic Soil Group “C” shown in HCCV Table 3.1. Impervious surfaces considered to result in 10% evapotranspiration and 90% runoff, and were therefore not assigned a water holding capacity.

The Site currently consists mainly of corn fields (or “moderately rooted crops” in HCCV Table 3.1); meadow areas (or “pasture and shrubs” in HCCV Table 3.1); a farmstead located in the west catchment of the Site (or “urban lawns” in HCCV Table 3.1); and, a woodlot (or “mature forest” in HCCV Table 3.1) located at the north end of the Site, as depicted on Beacon Figure 2, in Appendix B. The house, barn and driveways of the farmstead were considered as impermeable surfaces in the water balance assessment.

Based on the above, the following pre-development water holding capacities have been assigned:

Table 4: Summary of Soil Type and Water Holding Capacity

Soil Type (HCCV Table 3.1)	Land Use	Water Holding Capacity
Silt Loam	Mature Forest	400 mm
	Pasture and Shrubs	250 mm
	Moderately Rooted Crops	200 mm
	Urban Lawns	125 mm

Based on the Draft Plan of Subdivision (see Appendix B) and other provided information, the post-development land use will consist primarily of single-detached residences and driveways on the lots with individual private well and sewage systems, paved roadways with sidewalks, a central park area, open space blocks, and two stormwater management ponds (SWMP). The proposed post-development drainage areas are shown on SCS Figure 2.2, provided in Appendix B, and Figure F-2, Appendix F. The existing farm house and woodlot will be retained in addition to a 30 m naturalized buffer (Block 79) between the residential area and the woodlot/wetland areas in Open Space Block 75, and a 30 m naturalized buffer (Block 78) between the southern SWMP (Block 74) and the wetland in Open Space Block 77. The proposed storm drainage plan diverts all runoff from Catchments

205, 215 and 216 to the wetland in Open Space Block 77 in order to increase post-development runoff contributions to the wetland fragment.

The post-development surficial soil types across the Site are expected to remain consistent with the pre-development soil types (i.e., silt loam). As such, the post-development water holding capacities will be unchanged from those presented in Table 4, above. The surplus data obtained from EC for each of the above water holding capacities was split into infiltration and run-off components by applying an infiltration factor based on *HCCV Table 3.1*. The infiltration factors were based on a sum of Site-specific topography, surficial soil type and vegetative cover factors as presented in Table F-2, Appendix F, and described below:

- Both the pre-development and post-development grades were assigned a topographic factor of 0.1 (i.e., “hilly”) based on typical grades observed on-Site and the Preliminary Grading Plan (July 2021) provided by SCS;
- The silt loam soil type was considered to be “medium combinations of clay and loam” and assigned a soil factor of 0.2; and
- The woodlot was considered to be “woodland” and assigned a factor of 0.2. The corn field at the Site was considered to be “cultivated land” and assigned a factor of 0.1. The meadow areas were considered to be in between “cultivated land” and “woodland” and assigned a factor of 0.15. Impermeable surfaces and the two SWMPs were assigned an infiltration factor of 0 (i.e., the surplus would be entirely runoff).

Summing the topography, soils and cover factors, the infiltration factors shown in Table F-2 were applied to the average annual surplus to estimate average annual infiltration rates for each water holding capacity.

The water balance calculations also accounted for the proposed LID features, as designed by SCS. The proposed LID plan includes the addition of 36 soakaway pits located in the front yards of selected lots to capture a portion of rainfall runoff from the roofs of those houses. The soakaway pits are proposed for lots where a separation distance between the invert and seasonally high water table is a minimum of 1 m. At this time the soakaway pits are proposed for lots in the central and northern portions of the Site where a greater depth to the water table has been identified, compared to the southern end of the Site (e.g., see Figure 6). Lot selection will be finalized based on the results of the groundwater monitoring program. The typical soakaway pit configuration, as provided by SCS, includes a 54 m^2 footprint area, 0.5 m pit depth and 1.2 m cover, resulting in an expected detention volume of approximately 10.8 m^3 per soakaway pit with an expected detention time of 72 hr. With an assumed house size of 450 m^2, the soakaway pits have been designed to accommodate up to 5 mm of precipitation over a 72 hr period.

Additional infiltration from the proposed soakaway pits was estimated on an annual basis by analyzing the daily precipitation record at Buttonville Airport (1986 to 2017). The soakaway pits were assumed to infiltrate all rainfall depth that was equal to or less than 5 mm in a 72 hr period, after removing 2 mm on a daily basis to account for initial abstraction from the roof surface. This resulted in an infiltration factor of 0.21 (21%) for the roofs of those houses which will be connected to a soakaway pit.

4.3 Water Balance Results

The catchment areas for the Site plus all three wetland features (i.e., the Study Area) are shown on Figure F-1, Appendix F, for pre-development conditions and Figure F-2, Appendix F, for post-development conditions. The following summarizes the water balance results for the approximate 47.4 ha Study Area.

4.3.1 Pre-Development Condition

Based on the parameters described in Section 4.2, the average annual pre-development water balance was estimated for the 47.4 ha Study Area, Site, and the three wetlands as summarized in Table 5 below, and as detailed in Table F-3, Appendix F.

Table 5: Average Annual Pre-Development Water Budget (m^3/yr)

Catchment	Precipitation (P)	Evapotranspiration (ET)	Infiltration (I)	Runoff (R)
Wetland 1	159,670	111,480	19,810	28,380
Wetland 2	19,700	13,940	2,420	3,340
Wetland 3	57,720	35,040	5,930	16,750
Site	329,880	231,380	39,900	58,600
Study Area	409,890	280,820	48,840	80,230

4.3.2 Post-Development Condition (Excluding Sewage Systems)

Based on the parameters described in Section 4.2, the average annual post-development water balance, excluding the influence of the individual sewage systems, was estimated for the approximate 47.4 ha Study Area, Site and the three wetlands as summarized in Table 6 below, and as detailed in Table F-3, Appendix F.

Table 6: Average Annual Post-Development Water Budget (m^3/yr)

Catchment	Precipitation (P)	Evapotranspiration (ET)	Infiltration (I)	Runoff (R)
Wetland 1	129,000	86,860	16,150	25,990
Wetland 2	18,060	12,100	2,340	3,620
Wetland 3	35,080	18,220	3,450	13,410
Site	329,880	194,080	33,950	101,850
Study Area	409,890	243,510	42,900	123,480

From the water balance summaries for the Site (Tables 5 and 6), the proposed development is estimated to result in an average annual decrease in infiltration of approximately 15% (from 39,900 m^3/year to 33,950 m^3/year) and an increase in runoff of approximately 74% (from 58,600 m^3/year to 101,850 m^3/year) resulting from the changes in land use at the Site. Further discussion of these results is provided in Section 5.

4.3.3 Post-Development Condition including Individual Sewage Systems

Average annual post-development infiltration volumes at the Site are expected to decrease relative to pre-development conditions; and runoff volumes are expected to increase. However, the proposed residential

development will be serviced with individual sewage systems which will offset the reduction in post-development infiltration volumes as most of the septic effluent discharged to the systems is expected to infiltrate.

For the purpose of this water balance estimate, it has been conservatively assumed that sewage will be discharged at a per capita rate of 225 L/day/person (MOECC, 2008) with a typical Ontario household size of 2.4 people (2011 Census). The average annual post-development water balance, including sewage systems, was estimated for the approximate 47.4 ha Study Area, Site, and the three wetlands as summarized in Table 7 below, and as detailed in Table F-3, Appendix F.

Table 7: Average Annual Post-Development Water Budget including Sewage Systems (m^3/yr)

Catchment	Precipitation (P)	Evapotranspiration (ET)	Infiltration (I)	Runoff (R)
Wetland 1	129,000	86,860	18,320	25,990
Wetland 2	18,060	12,100	2,940	3,620
Wetland 3	35,080	18,220	5,420	13,410
Site	329,880	194,080	47,750	101,850
Study Area	409,890	243,510	56,670	123,480

With the addition of the septic effluent, the average annual post-development infiltration within the Site is estimated to increase by approximately 19% over pre-development conditions (39,900 m^3/year to 47,750 m^3/year). Further discussion of these results is provided in Section 5.

4.3.4 Post-Development Condition including Individual Sewage Systems and LID

Based on the parameters described in Section 4.2, the average annual post-development water balance, including the influence of the individual sewage systems and the proposed soakaway pit LID design, was estimated for the approximate 47.4 ha Study Area, Site and the three wetlands as summarized in Table 8 below, and as detailed in Table F-3, Appendix F.

Table 8: Average Annual Post-Development Water Budget including Sewage Systems and LID (m^3/yr)

Catchment	Precipitation (P)	Evapotranspiration (ET)	Infiltration (I)	Runoff (R)
Wetland 1	129,000	86,860	18,390	25,910
Wetland 2	18,060	12,100	3,010	3,540
Wetland 3	35,080	18,220	5,420	13,410
Site	329,880	194,080	50,430	99,170
Study Area	409,890	243,510	59,360	120,810

Accounting for infiltration from the proposed soakaway pits, the average annual post-development infiltration within the Site is estimated to increase by approximately 26% over pre-development conditions (39,900 m^3/year to

50,430 m^3/year). An estimated increase in average annual runoff of approximately 69% (from 58,600 m^3/year to 99,170 m^3/year) is expected with the use of proposed soakaway pit LIDs, compared to 74% under post-development conditions with no mitigation.

5.0 DISCUSSION

Details of the pre-development and post-development (with private sewage systems and LIDs) water balance prepared for the Study Area, Site and the three wetlands features present on the Site are provided in Section 4.3.4. Average annual changes to the water balance are generally the result of the changes in impermeable surfaces, vegetative cover and catchment area, and the presence of the individual sewage systems and LIDs. The following summary of the changes in average annual infiltration and runoff for these four catchment areas is provided in Table 9.

Table 9: Summary of Average Annual Changes

Component	Wetland 1	Wetland 2	Wetland 3	Site
Change in Average Annual Infiltration (Pre-Development to Post-Development with Septic and LID)				
Difference (m^3/yr)	-1,420	590	-510	10,530
Difference (%)	-7%	24%	-9%	26%
Change in Average Annual Runoff (Pre-Development to Post-Development with Septic and LID)				
Difference (m^3/yr)	-2,470	200	-3,340	40,570
Difference (%)	-9%	6%	-20%	69%

The presence of the individual sewage systems on the lots will supplement post-development infiltration rates, as the potable water source for the lots is proposed to be a deep, confined aquifer that is recharged from beyond the Site boundaries, and since most of the septic effluent is expected to infiltrate. With the addition of the septic effluent and the use of soakaway pits as an LID measure, the average annual post-development infiltration at the Site will be increased by approximately 26% over pre-development conditions; the average annual post-development runoff at the Site will be increased by approximately 69% over pre-development conditions.

An Evaluated Provincially Significant Wetland is present in the Mitchell Creek tributary valley lands opposite the western Site boundary that flanks Old Brock Road North. Based on the Preliminary Grading Plan (SCS, July 2021), it is expected that infiltration from the southwest and west catchments at the Site (see Figure F-2, Appendix F) will largely continue to contribute to groundwater baseflow contributions to the unnamed tributary of Mitchell Creek off-site to the west. Assuming an increase in post-development infiltration rates similar to that estimated for the Site (i.e., 31%), groundwater baseflow contributions to the Mitchell Creek tributary from the Site are expected to increase by a similar percentage. The variation in annual precipitation of up to approximately 30%, and an assumed measurement error in stream gauging methods in the order of 10%, suggest that a change in discharge rate as a result of the proposed development would be difficult to discern from stream gauging measurements in the unnamed tributary to Mitchell Creek. Historical flow records in Mitchell Creek downstream of Claremont are available from Water Survey of Canada (WSC) Station 02HC045 for 1974 to 1982. These records

indicate a typical baseflow in Mitchell Creek in the order of 100 L/s. The expected additional infiltration from the entire post-development site is approximately 10,530 m^3/year, which suggests that additional groundwater contributions post-development would be less than 1 L/s or less than a 1% increase in baseflow in Mitchell Creek. The drainage area of catchments currently flowing west across Old Brock Road from the Site, which will be captured and directed to the West SWM Pond, consist of less than 2% of the drainage area of the Provincially Significant Wetland to the west of the Site (i.e. approximately 13.62 ha of the 700 ha drainage area as estimated from OFAT). The discharge from the West SWM Pond will be directed southeast to the Southeast SWM pond ultimately discharging to Mitchell Creek at the south end of Claremont. With the small reduction in catchment area contributing to the unnamed tributary of Mitchell Creek on the west side of Old Brock Road it is expected that any changes in surface water runoff caused by the proposed development would be difficult to discern from stream gauging measurements in the unnamed tributary to Mitchell Creek. As such, the proposed development is expected to have a negligible effect on the Provincially Significant Wetland in the Mitchell Creek tributary valley west of the Site and its related hydrological functions.

At the north end of the Site, Open Space Block 75 includes an area that is part of the Natural Heritage System, including the unnamed tributary to Duffins Creek, Wetland 1 (a part of the Glen Major Provincially Significant Wetland Complex), Wetland 2, and woodlot areas, which are collectively considered to be Key Natural Heritage/Hydrologic Features. Post-development changes to average annual infiltration and runoff rates are provided above in Table 9. The annual quantity and temporal distribution of surface water runoff to the tributary and wetlands will be altered due to changes in land use at the Site. On average, the smaller wetland feature (Wetland 2) will typically experience higher surface runoff for most of the year, resulting in an average annual increase in runoff of approximately 6%. Post-development average annual infiltration rates within the Wetland 2 catchment will increase by approximately 24%. However, the Wetland 2 catchment ultimately discharges to the Wetland 1 catchment, and therefore the results for the Wetland 1 catchment are more important to the hydrology of the Key Natural Heritage/Hydrologic Features.

On average, there will be less runoff to the Wetland 1 catchment (i.e. to the tributary of Duffins Creek) during winter and spring (December to May) and more runoff to the tributary in summer and fall. On an average annual basis, runoff in the Wetland 1 catchment will decrease by approximately 9%. Average annual infiltration rates will decrease by approximately 7%. Variations of 10% or less are generally considered to be a balance of pre- and post-development conditions. The nearest WSC flow station on Duffins Creek is downstream of Claremont, near Pickering (02HC019), and is too far downstream to use for comparative purposes. Any change in the average annual discharge rate in the tributary, as a result of the expected changes in runoff or infiltration, would be difficult to discern from stream gauging measurements. As such, the proposed development is expected to have a negligible effect on the Key Hydrologic Features in the Wetland 1 catchment area at the north end of the Site and its related hydrological functions.

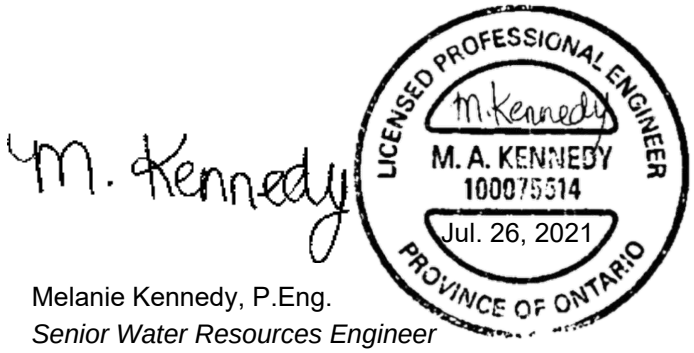
The annual quantity and temporal distribution of surface water runoff to the wetland fragment at the south end of the Site in Open Space Block 77 (Wetland 3) will be altered due to changes in land use and catchment area. On average, there will be less runoff to the wetland fragment, particularly during winter and spring (December to May). The storm drainage plan proposed by SCS diverts all runoff from Catchments 205, 215 and 216 to the wetland in Open Space Block 77 in order to increase post-development runoff contributions to Wetland 3. With the diversion of this flow, average annual runoff to Wetland 3 will decrease by approximately 20% relative to pre-development conditions, as shown in Table 9. This may result in a noticeable reduction in runoff to this wetland fragment.

As shown in Table 9, a 9% reduction in the average annual infiltration rate is estimated for the Wetland 3 catchment area. Variations of 10% or less are generally considered to be a balance of pre- and post-development conditions. However, the presence of the southern SWMP in Block 74 has the potential to impact groundwater levels in the vicinity of the pond and is not quantified by the water balance estimate described above. The permanent pool elevation of the SWMP is understood to be 263.5 masl, which is below measured groundwater levels at monitoring wells BH17-18 and BH17-19 and which ranged from 267.3 masl to 269.7 masl on the dates measured. As a result, it is expected that groundwater contributions from the Site (in an upgradient direction from the SWMP) will be largely intercepted by the SWMP, which is situated between the residential lots and Wetland 3. Given the low hydraulic conductivity of the glacial till unit, the potential zone of influence of the dewatering effect is expected to be limited, and in the order of 20 m, and would not extend into Open Space Block 77 due to the presence of the 30 m open space buffer (i.e., Block 78). If Wetland 3 is to be retained, and to reduce the potential for groundwater level lowering within Block 78 open space buffer, it is recommended that a low-permeability cut-off wall be installed at the east-west aligned boundary between Blocks 74 and 78, through the thin surficial sandy silt soils that have been in the area, and keyed approximately 2 m into the top of the glacial till unit. It is noted that Wetland 3 is not considered to be part of the mapped Natural Heritage System and is not mapped as a Provincially Significant Wetland. An evaluation of water level data and conditions within the Wetland 3 to September 2018, provided under separate cover, indicates that this wetland fragment is excluded from the policies of the *Oak Ridges Moraine Conservation Plan* (2017).

As discussed in Section 2.4, groundwater is used for potable purposes in the Claremont area. While some shallow dug and bored well use may remain, deeper drilled wells utilizing confined aquifers is predominant. Roof run-off from 36 of the proposed residential lots is proposed to be first directed to soakaway pits to promote additional infiltration of clean water. Some precipitation from paved areas (e.g., driveways and roads) may also infiltrate in grassed areas. This infiltration is not expected to significantly degrade the groundwater quality at the Site, although stormwater from driveways and roads may have increased concentrations of one or more of reduced metals, oil and grease, and road salt. With the exception of road salt, these materials quickly become immobile in the shallow subsurface. A more detailed assessment of the potential impacts to groundwater quality from the use of individual private sewage is provided under separate cover, in a letter concurrently prepared by Golder, addressed to Claremont Developments Inc., entitled "*Private Servicing Feasibility, Proposed Residential Subdivision, Claremont, City of Pickering, Ontario*" dated July 2021.

Signature Page

Yours truly,
Golder Associates Ltd.

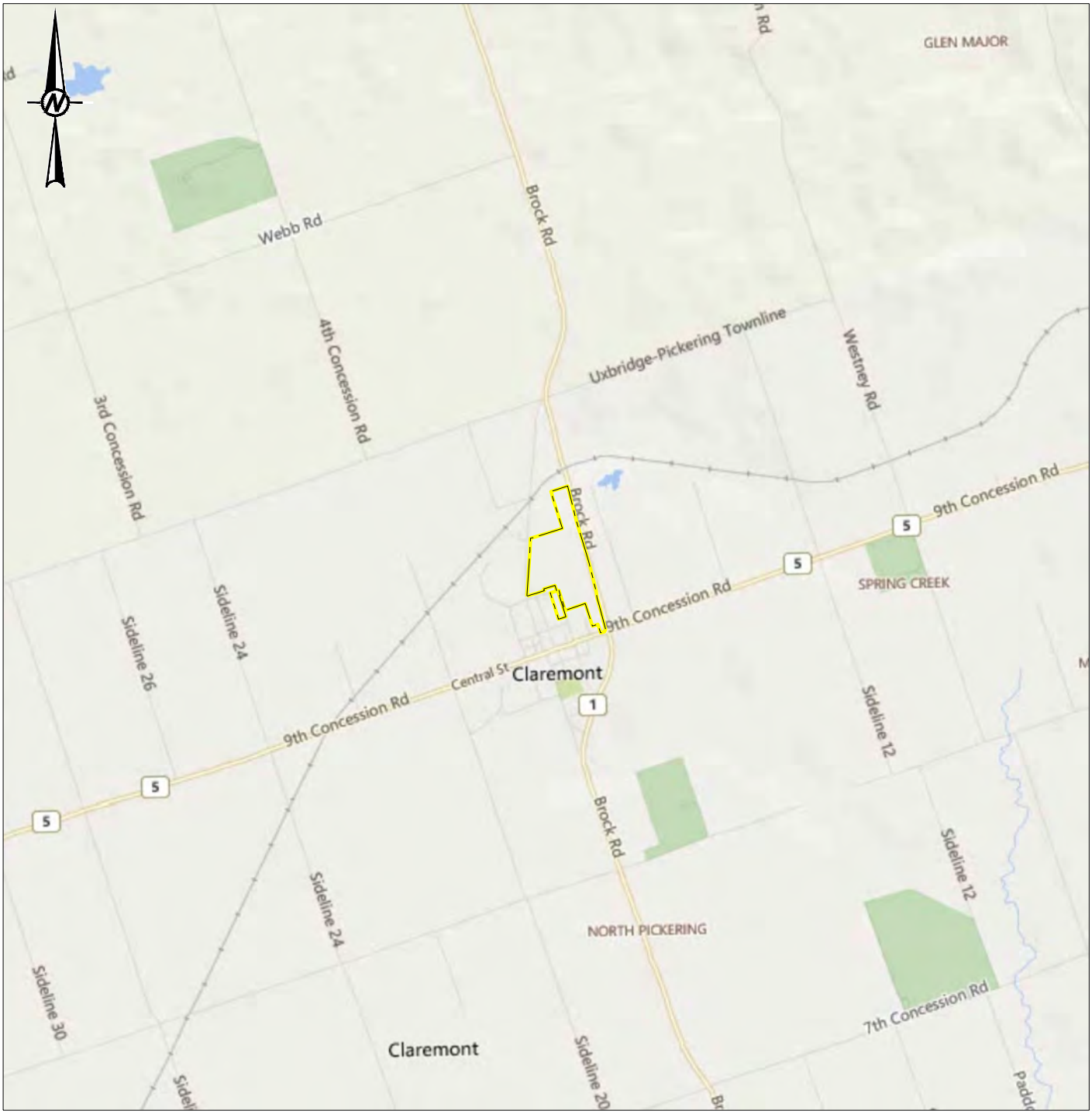


Melanie Kennedy, P.Eng.
Senior Water Resources Engineer

Chris Kozuskanich, P.Geo
Associate, Senior Hydrologist

ZK/DH/MK/CMK/lb/af/sv

Figures



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LEGEND

APPROXIMATE SITE LOCATION

NOTE(S)

1. ALL LOCATION ARE APPROXIMATE

REFERENCE(S)

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BASE IMAGERY - © 2017 DIGITAL GLOBE IMAGE COURTESY OF USGS EARTHSTAR GEOGRAPHICS SIO © 2017 MICROSOFT CORPORATION
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2017
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CLAREMONT DEVELOPMENTS INC.

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
KEY PLAN

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

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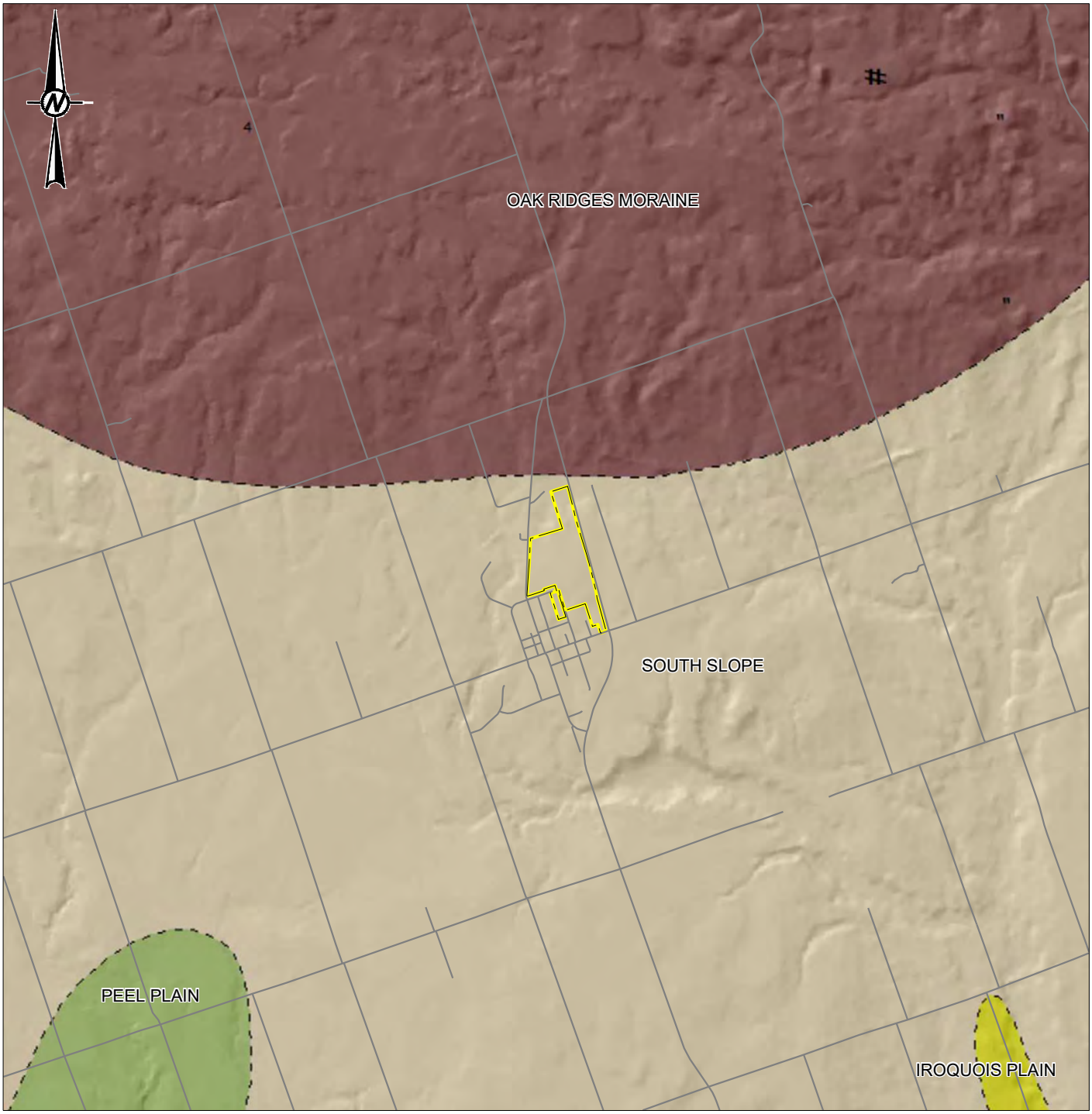

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LEGEND

APPROXIMATE SITE LOCATION

NOTE(S)

1. ALL LOCATION ARE APPROXIMATE
2. CHAPMAN & PUTNAM, OPEN GOVERNMENT OF CANADA LICENCE

REFERENCE(S)

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CLAREMONT DEVELOPMENTS INC.

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
PHYSIOGRAPHY

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-01-24
DESIGNED	
PREPARED	JPR
REVIEWED	
APPROVED	CMK

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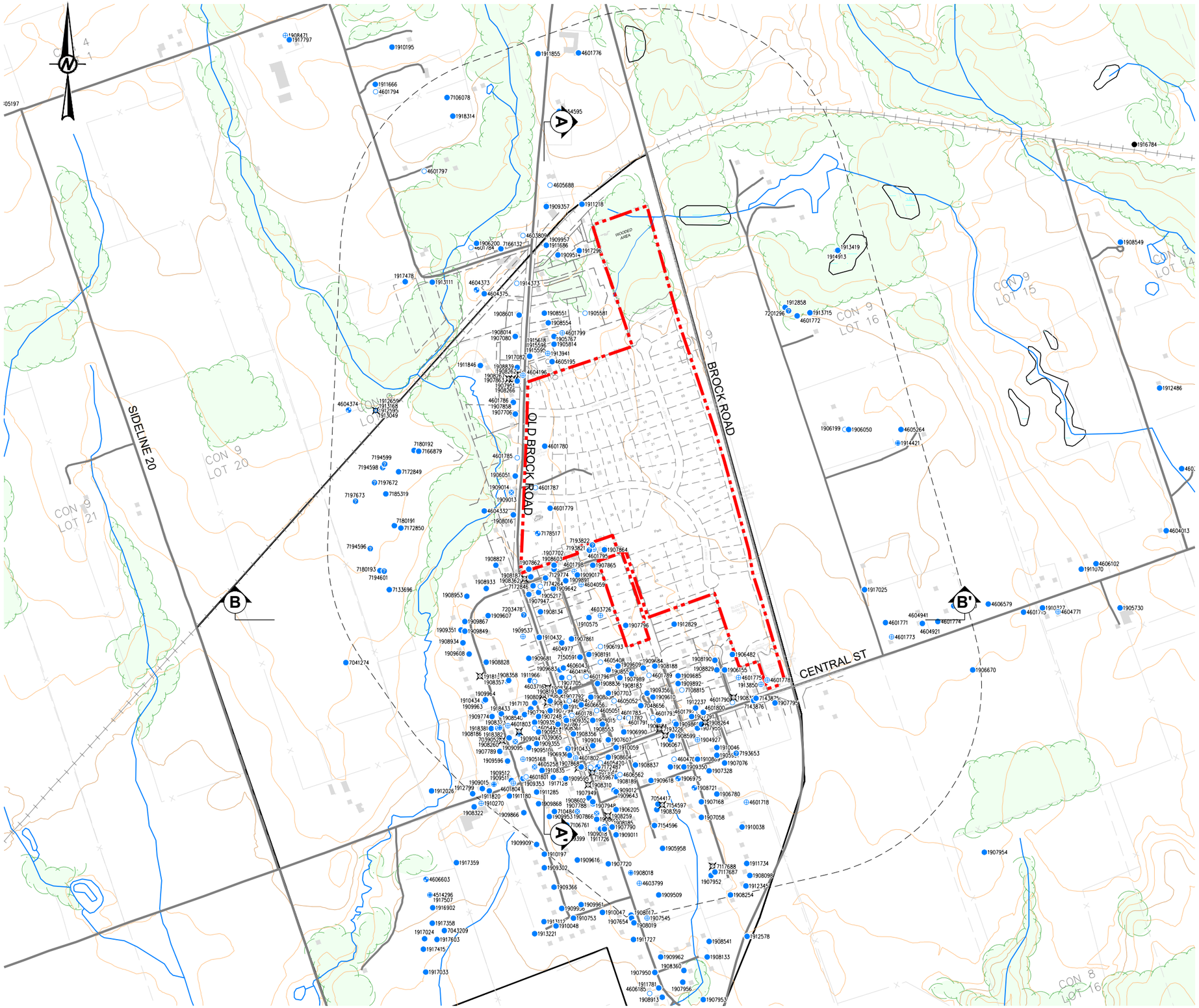

LEGEND:

- Property Line

Recorded MOECC Water Well Record Number

- Shallow Dug or Bored <10 m
- Deep Bored Well >10 m
- Drilled Overburden Well
- Test or Observation Well
- Drilled Bedrock Well
- Sandpoint
- Line of Section

NOTES:

1. DATUM IS UTM NAD 83 ZONE 17

REFERENCES:

1. MAPPING BASED ON ESRI GEOGRAPHYNETWORK OBM FEATURES
2. DRAFT PLAN OF SUBDIVISION, MALONE GIVENS PARSONS LTD., (DP 01, MAR. 01, 2018)

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CLIENT
CLAREMONT DEVELOPMENTS INC.

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
RECORDED WATER WELLS

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT NO.	CONTROL	REV.	FIGURE
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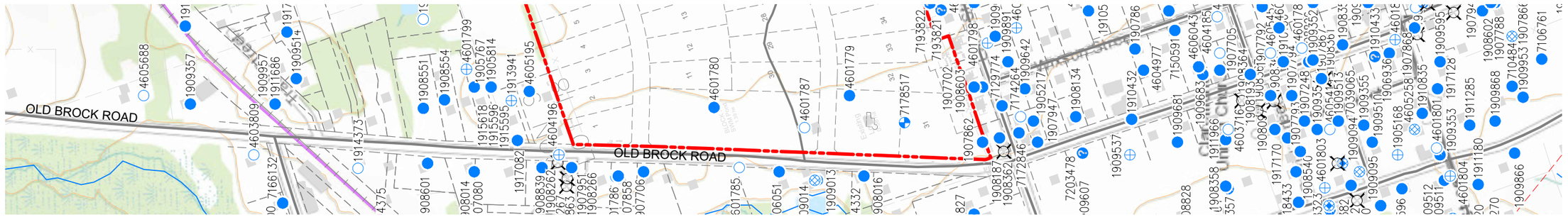

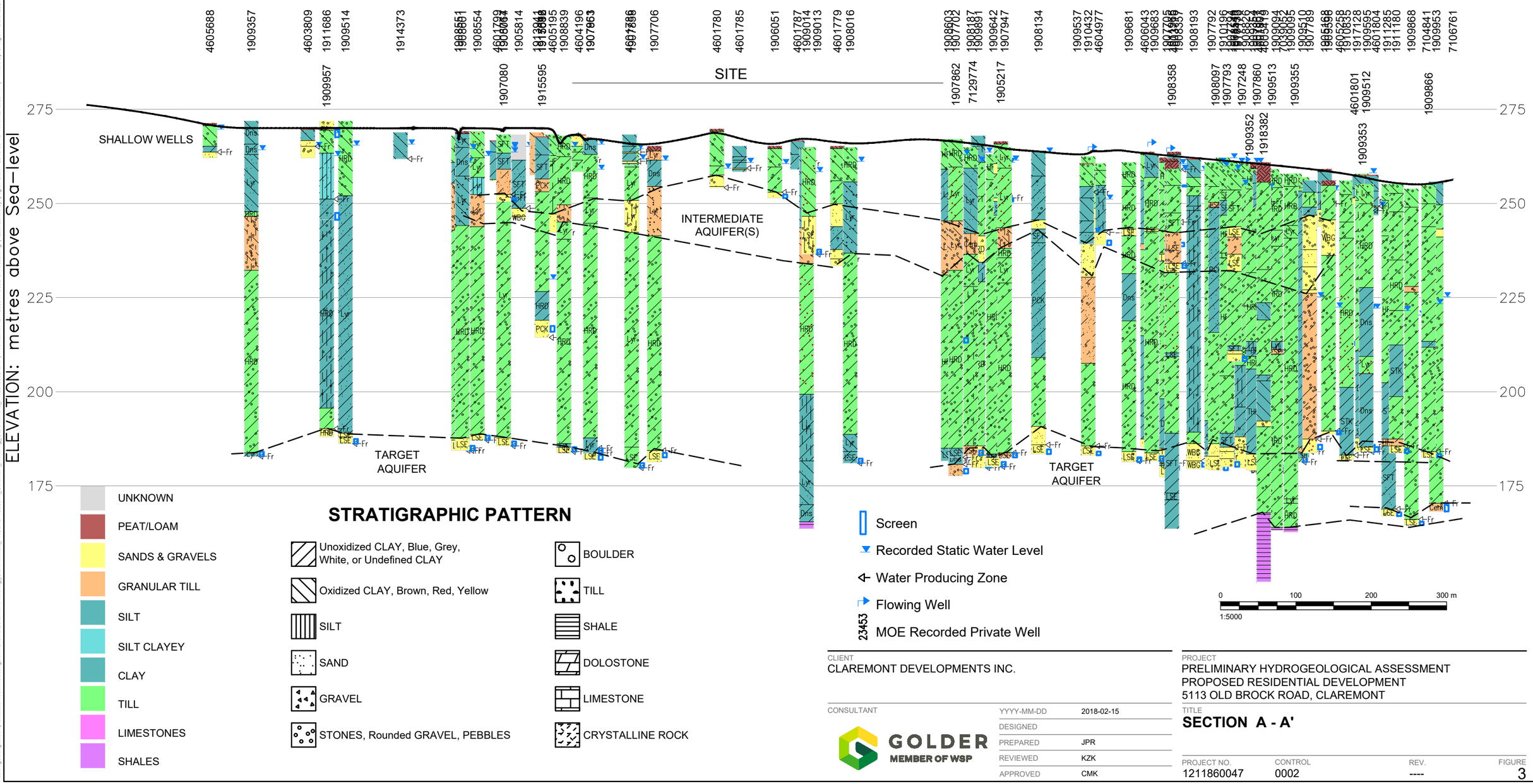

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SECTION A - A'

PROJECT NO.	CONTROL	REV.	FIGURE
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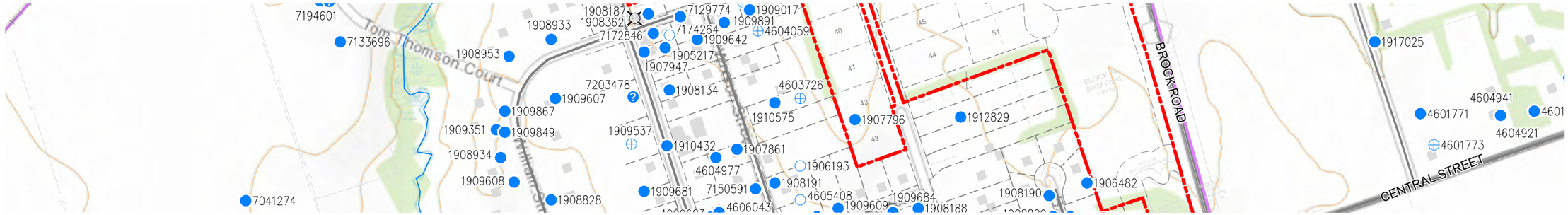

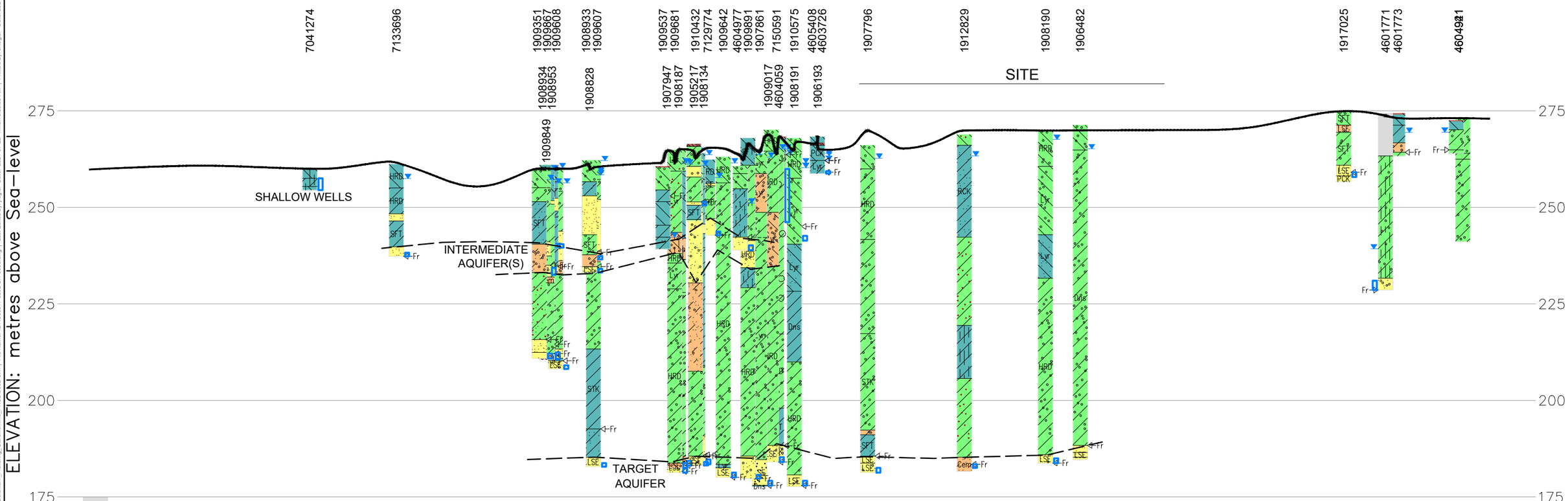

STRATIGRAPHIC PATTERN

- UNKNOWN
- PEAT/LOAM
- SANDS & GRAVELS
- GRANULAR TILL
- SILT
- SILT CLAYEY
- CLAY
- TILL
- LIMESTONES
- SHALES
- Unoxidized CLAY, Blue, Grey, White, or Undefined CLAY
- Oxidized CLAY, Brown, Red, Yellow
- SILT
- SAND
- GRAVEL
- STONES, Rounded GRAVEL, PEBBLES
- BOULDER
- TILL
- SHALE
- DOLOSTONE
- LIMESTONE
- CRYSTALLINE ROCK

- Screen
- Recorded Static Water Level
- Water Producing Zone
- Flowing Well
- 23453 MOE Recorded Private Well

0 100 200 300 m
1:5000

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SECTION B - B'

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
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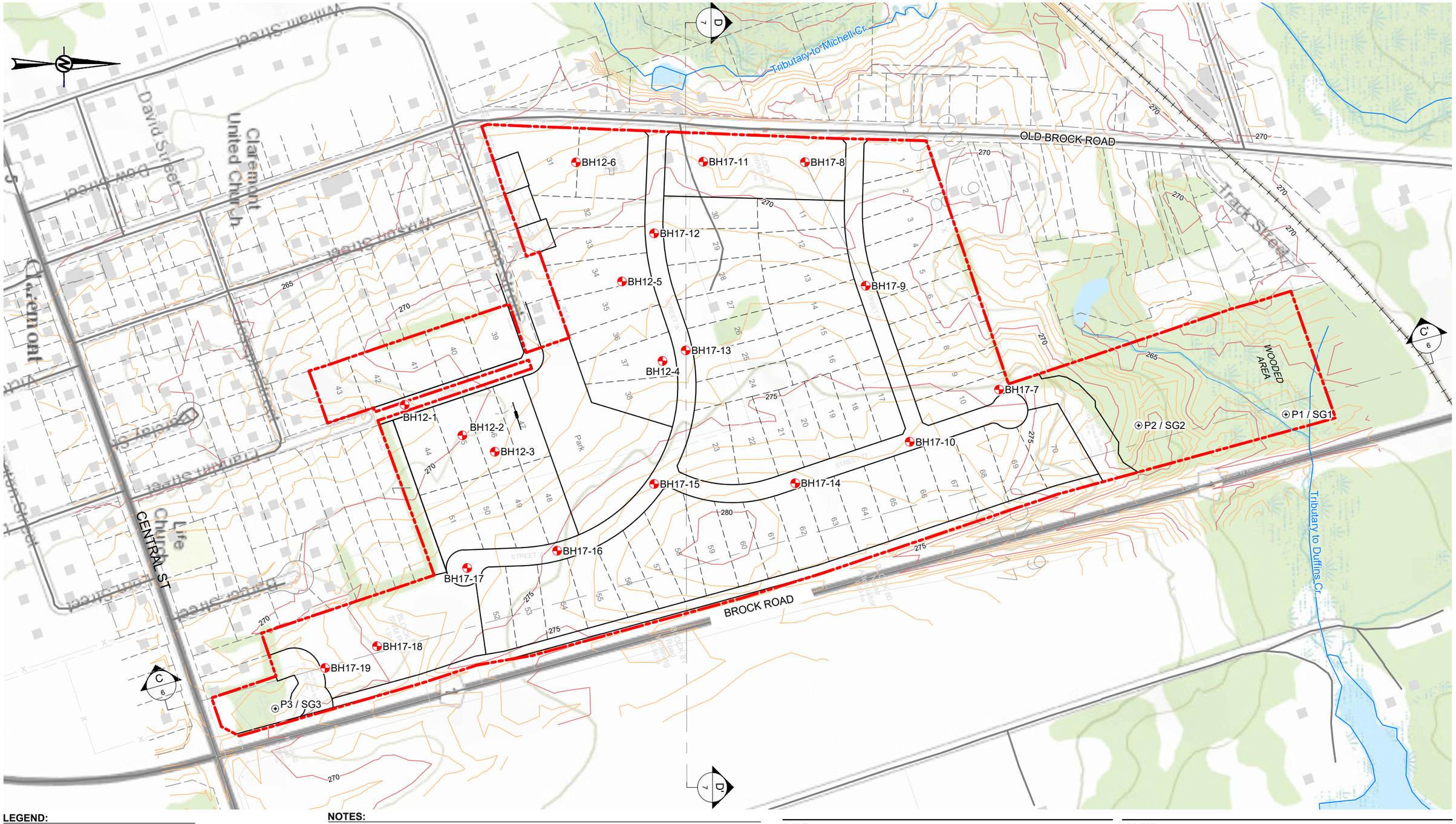


LEGEND:

- Property Line
- Borehole or Observation Well
- Piezometer and Staff Gauge
- Line of Section and Plan Reference

NOTES:

1. Datum UTM NAD 83 Zone 17

REFERENCES:

1. LIO Terrain Base Mapping, Queen's Printer 2017
2. Draft Plan & Site Topographic Mapping Provided by Malone Given Parsons, February 2018

0 80 160 240 m
1:4000

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

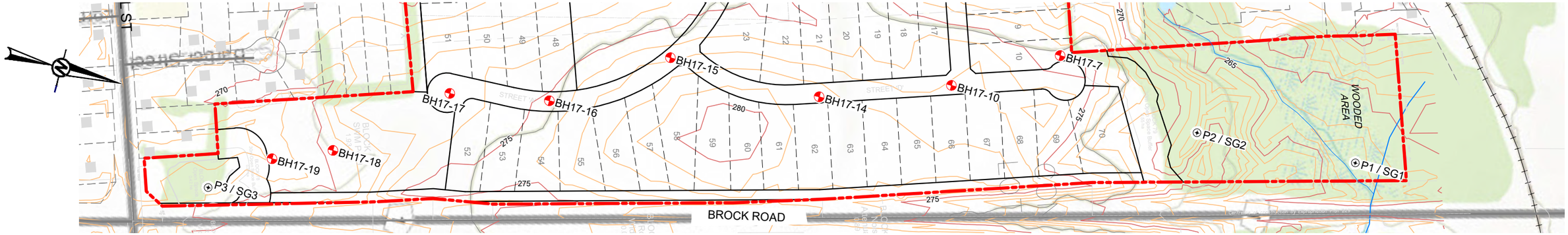
YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



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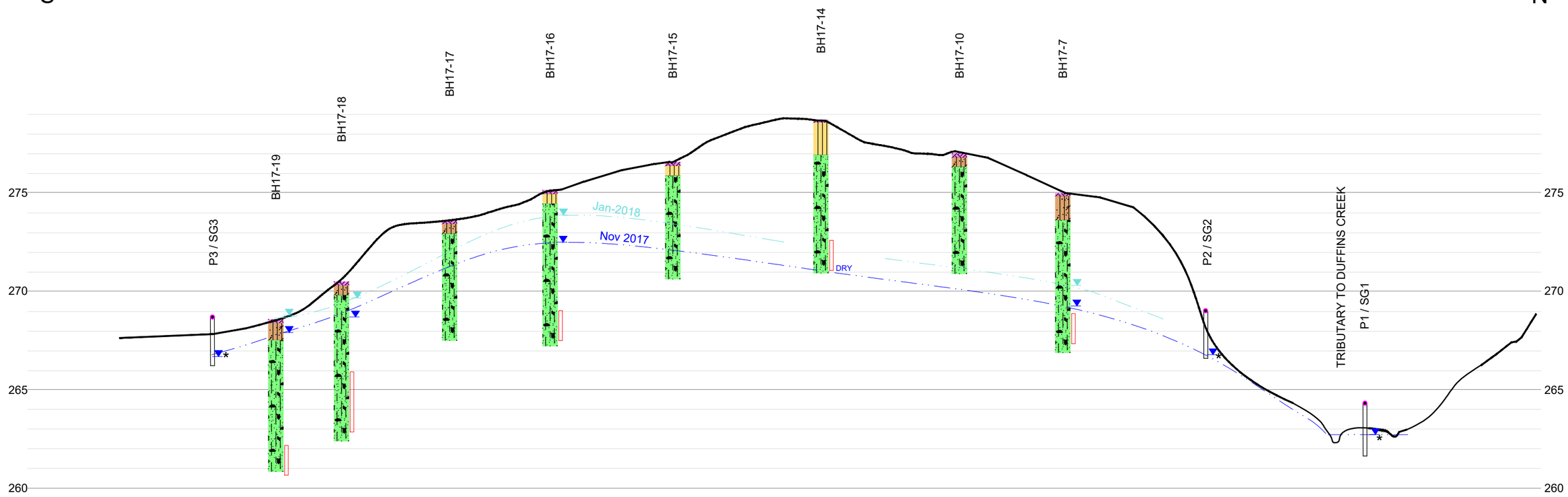

LEGEND:

- Organics / Topsoil
- Fill
- Sand
- Sand Trace Silt
- Silty Sand
- Silty Gravelly Sand
- Silt
- Sandy Silt
- Sandy Silt with to some Clay
- Clayey Silt
- Granular Till
- Silt Till
- Silty Sand / Sandy Silt Till
- Silty Clay Till
- BH17-15 — Borehole ID
- Recorded Water Level 23-Jan-2018
- Recorded Water Level 09-Nov-2017
- * Piezometer Water Levels 07-Dec-2017
- Screen

0 80 160 240 m
1:4000

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SITE SECTION C - C'

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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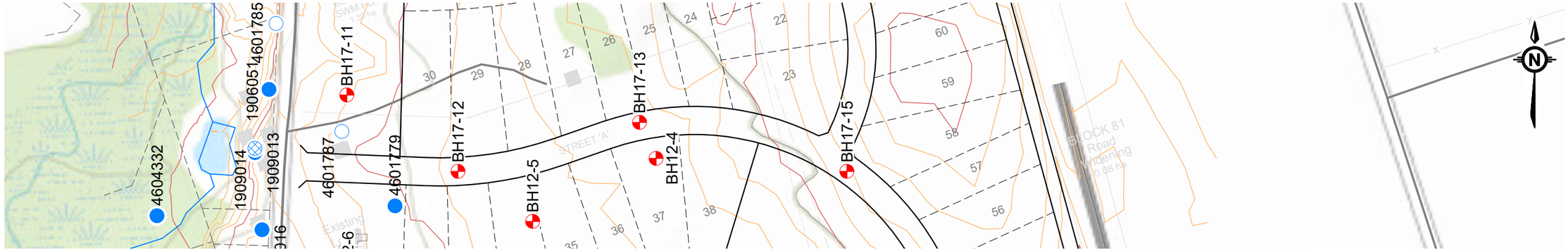

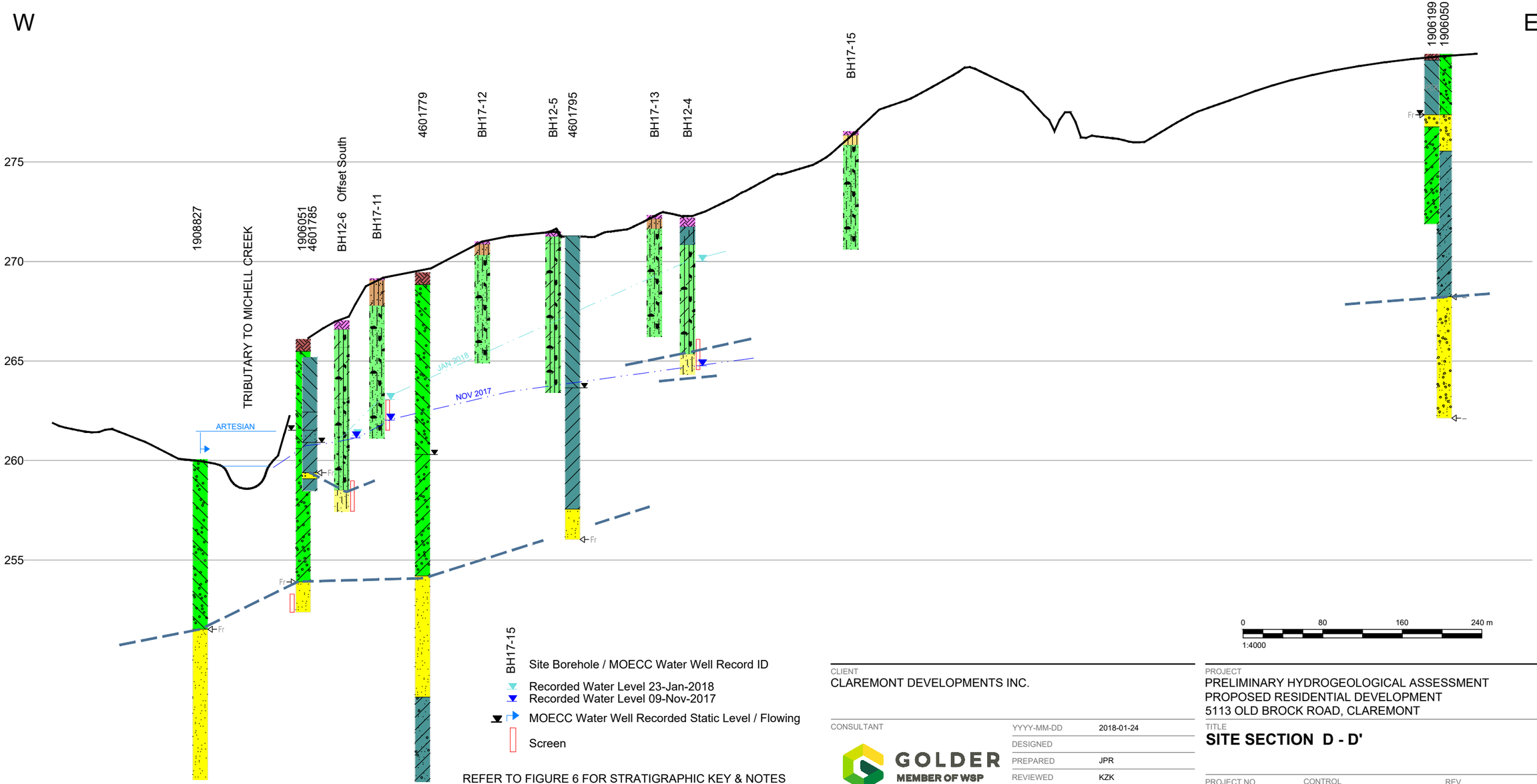

BH17-15 Site Borehole / MOECC Water Well Record ID

Recorded Water Level 23-Jan-2018

Recorded Water Level 09-Nov-2017

MOECC Water Well Recorded Static Level / Flowing

Screen

REFER TO FIGURE 6 FOR STRATIGRAPHIC KEY & NOTES

0 80 160 240 m

1:4000

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-01-24
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SITE SECTION D - D'

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

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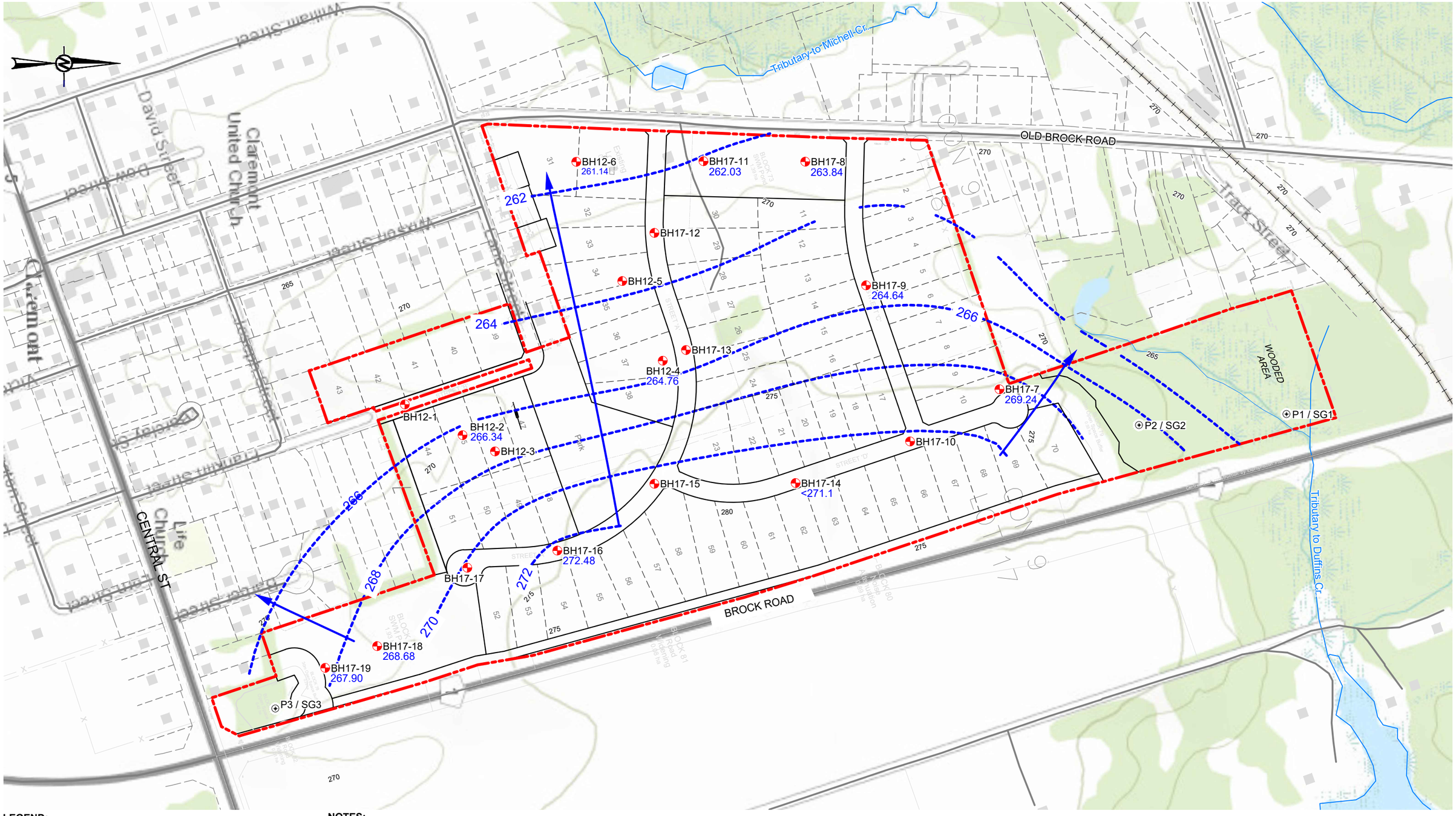


LEGEND:

- Borehole or Observation Well
- 268.68 Static Water Elevation 9 November 2017 (masl)
- Water Table Contour

NOTES:

1. Datum is UTM NAD 83 Zone 17

REFERENCES:

1. Draft Plan Malone Givens Parson provided March 2018

0 80 160 240 m

1:4000

CLIENT
CLAREMONT DEVELOPMENTS INC.

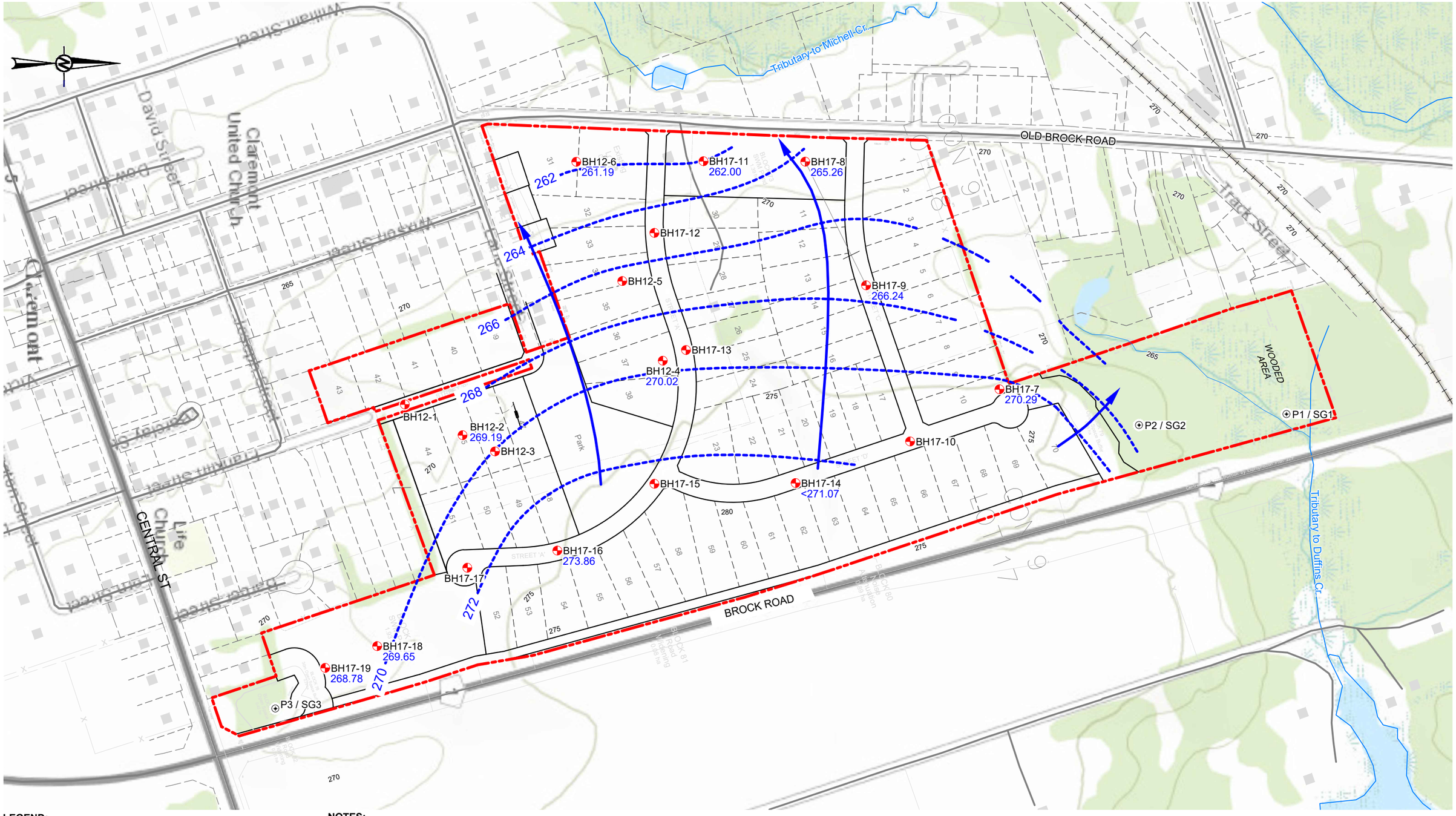
CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SHALLOW GROUNDWATER FLOW NOVEMBER 9, 2017

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	8



LEGEND:

- Borehole or Observation Well
- 268.68 Static Water Elevation 23 January 2018 (masl)
- Water Table Contour

NOTES:

1. DATUM IS UTM NAD 83 ZONE 17

REFERENCES:

1. Draft Plan Malone Givens Parson provided 02 February 2018

0 80 160 240 m

1:4000

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2018-02-15
DESIGNED	
PREPARED	JPR
REVIEWED	KZK
APPROVED	CMK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, CLAREMONT

TITLE
SHALLOW GROUNDWATER FLOW JANUARY 23, 2018

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0002	----	9

APPENDIX A

Important Information and Limitations of this Report

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

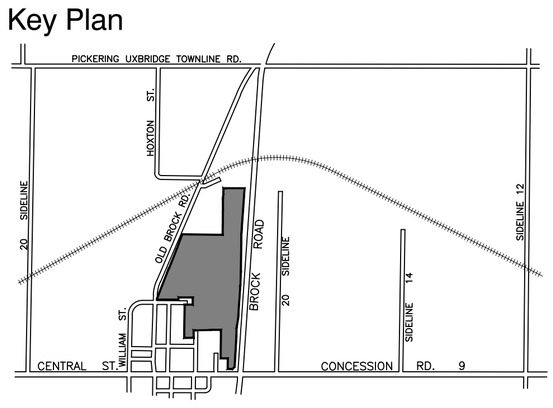
APPENDIX B

Design Information, Plans, Surveys

Draft Plan of Subdivision 21T-

Part of Lots 17 & 18, Concession 9
Lots 47 & 48, Registered Plan No. 12
(Geographic Township of Pickering)
City of Pickering
Regional Municipality of Durham

Key Plan



SUBJECT LANDS

Schedule of Land Use

Lot/Block	Land Use	Units	Area(ha)
1-70	Estate Residential Lots	70	22.98
71	Existing Residential	1	0.58
72	Park		1.70
73-74	SWM Pond		3.32
75-77	Open Space		4.24
78-79	30m Open Space Buffers		0.84
80	Noise Attenuation		0.89
81-82	Road Widening		0.09
83-85	to be conveyed to adjacent lot		0.33
	Roads Streets A-D (20m R.O.W.) 1,605m		3.21
Total		71	38.18

NOTES

All measurements are in metres.
All elevations refer to Geodetic Datum.
All corner roundings are 5.0mR, unless otherwise stated.

Owner's Authorization

I , , hereby authorize Malone Given Parsons Ltd. to prepare and submit this Draft Plan of Subdivision to the Town of Pickering.

Date:

Surveyor's Certificate

I hereby certify that the boundaries of the land to be subdivided and their relationship to the adjoining properties are correctly shown on this Draft Plan.

Date:

Additional Information

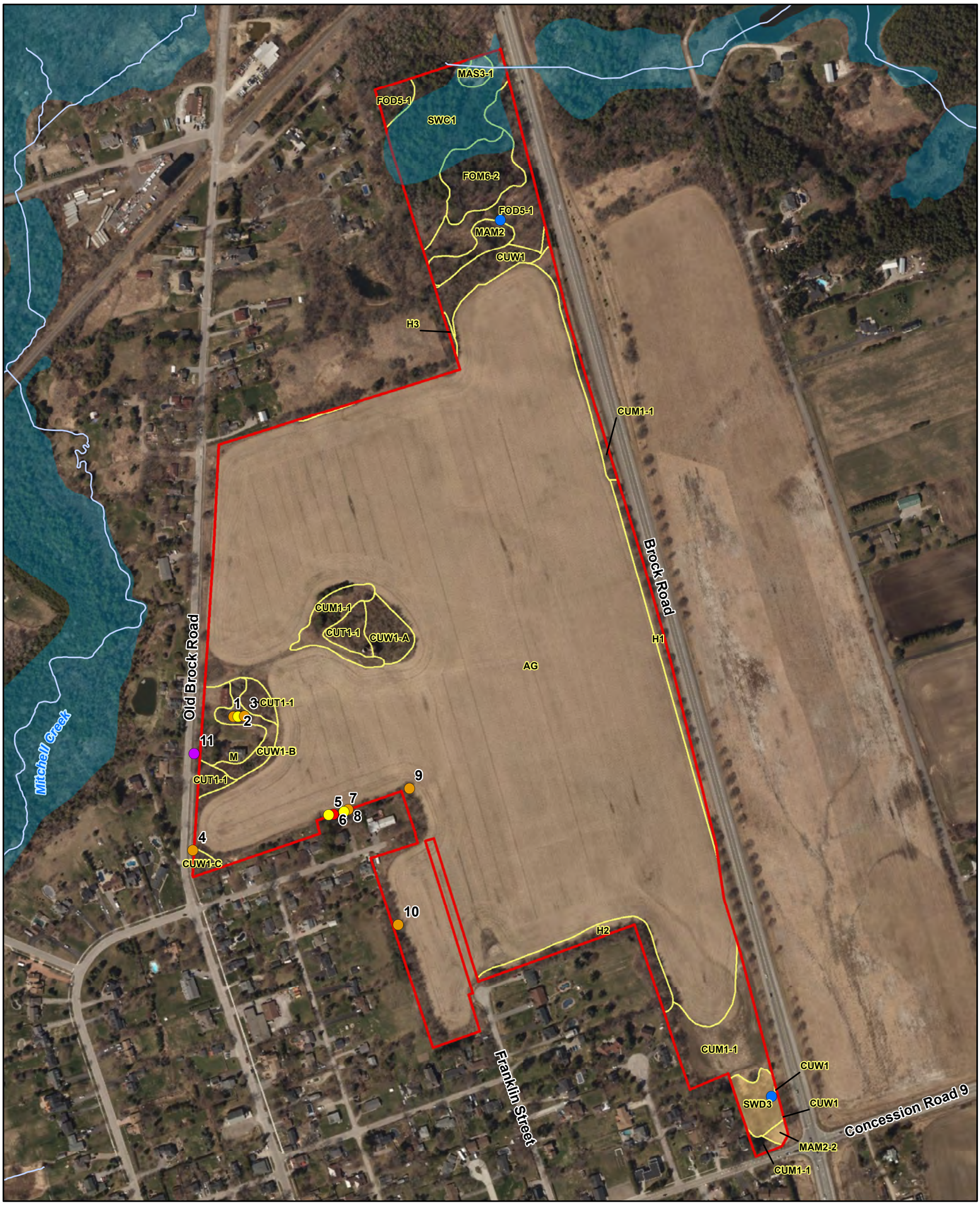
As required under section 51(17) of the Planning Act (R.S.O. 1990 C.P. 13)
a), e), f), j) As shown on Draft Plan.
b), g) As shown on Draft and Key Plans.
c) As shown on Key Plan.
d) Residential.
h), k) Municipal services to be provided.
i) Silt Loam soil.
l) As shown on Draft Plan.
Note: Contours relate to Canadian Geodetic Datum.

MALONE GIVEN PARSONS LTD.
140 Renfrew Drive, Suite 201
Markham, Ontario, L3R 6B3
Tel. (905) 513-0170
Fax. (905) 513-0177

Project No. 12-2110
Date: January 31, 2018
Revised: March 1, 2018

Scale:

0 50 100 150 200m



Legend

- Subject Property
- ELC Communities
- Amphibian Survey Locations
- Watercourse (MNRF 2021)
- Provincially Significant Wetland (MNRF 2021)
- Unevaluated Wetland

Butternut (2018)

- Non-Retainable (Category 1)
- Retainable (Category 2)
- Potentially Archivable (Category 3)
- Cultivated

ELC Code	ELC Vegetation Type
AG	Agriculture – Row Crops
CUM1-1	Dry-Moist Old Field Meadow
CUT1-1	Sumac Cultural Thicket
CUW1	Cultural Woodland
H	Hedgerow
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
FOM6-2	Fresh-Moist Hemlock-Hardwood Mixed Forest
SWD3	Maple Mineral Deciduous Swamp
SWC1	White Cedar Mineral Coniferous Swamp
M	Manicured
MAM2-2	Reed Canary Grass Mineral Meadow Marsh
MAM2	Mineral Meadow Marsh
MAS3-1	Cattail Organic Shallow Marsh

Existing Conditions

Figure 2

Claremont Developments Inc.

UTM Zone 17 N, NAD 83

First Base Solutions
Web Mapping Service 2020

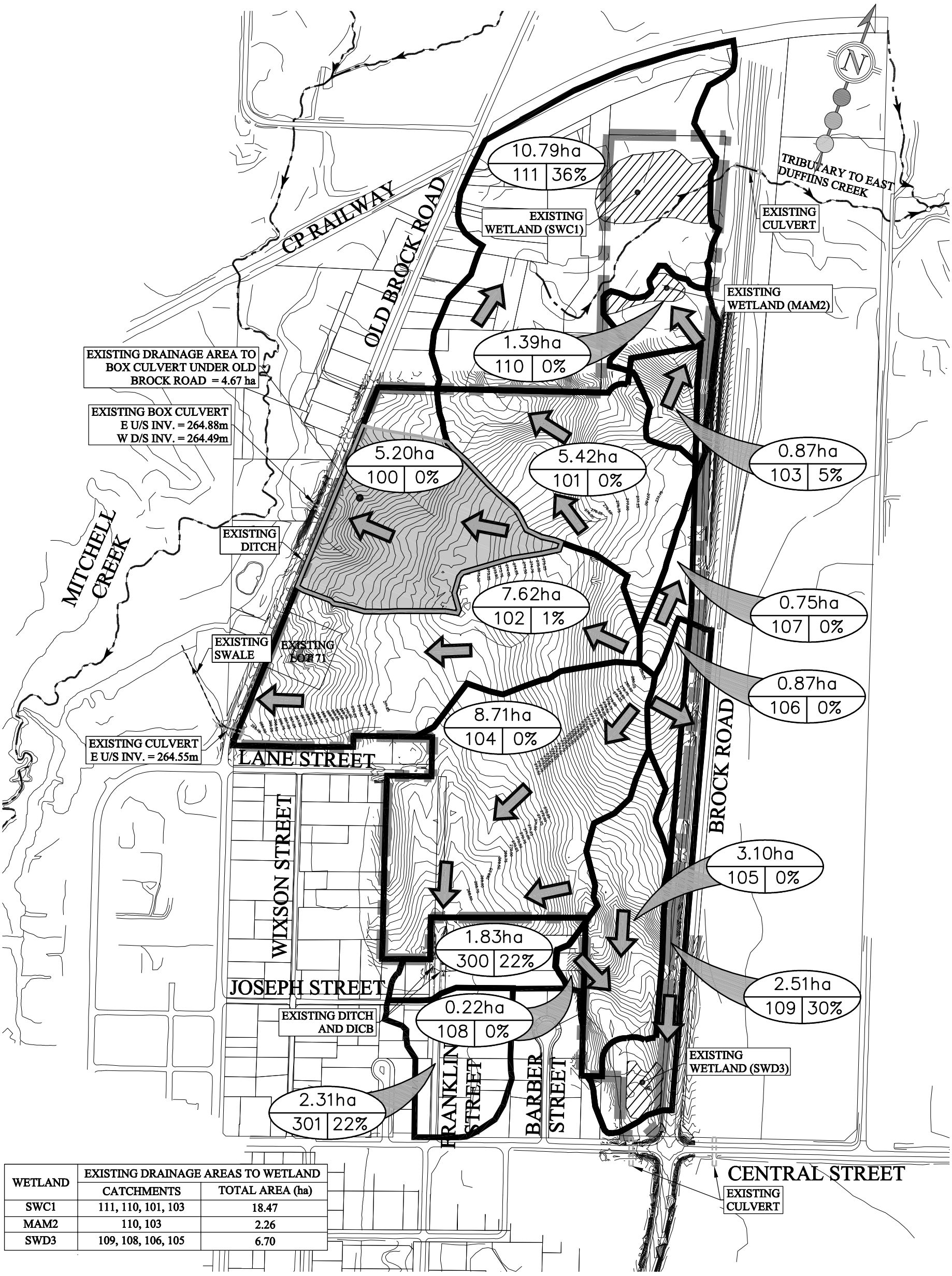
N W E S

0 50 100 200 Meters

1:4,500

BEACON ENVIRONMENTAL

Project 221308
July 2021



WETLAND	EXISTING DRAINAGE AREAS TO WETLAND	
	CATCHMENTS	TOTAL AREA (ha)
SWC1	111, 110, 101, 103	18.47
MAM2	110, 103	2.26
SWD3	109, 108, 106, 105	6.70

LEGEND:

- PROPERTY BOUNDARY
- STORM DRAINAGE BOUNDARY
- WATERCOURSE
- 270.25 EXISTING CONTOUR
- 12.52ha / 211 | 25% — DRAINAGE AREA (HECTARES); % IMPERVIOUSNESS; CATCHMENT ID
- OVERLAND FLOW
- EXISTING WETLAND

CLAREMONT DEVELOPMENTS INC. 3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR		EXISTING STORM DRAINAGE PLAN
SCS consulting group ltd 30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	PROJECT No: 1470 / FIGURE No: 2.1
	SCALE: 1:5000	DATE: JULY 2021	

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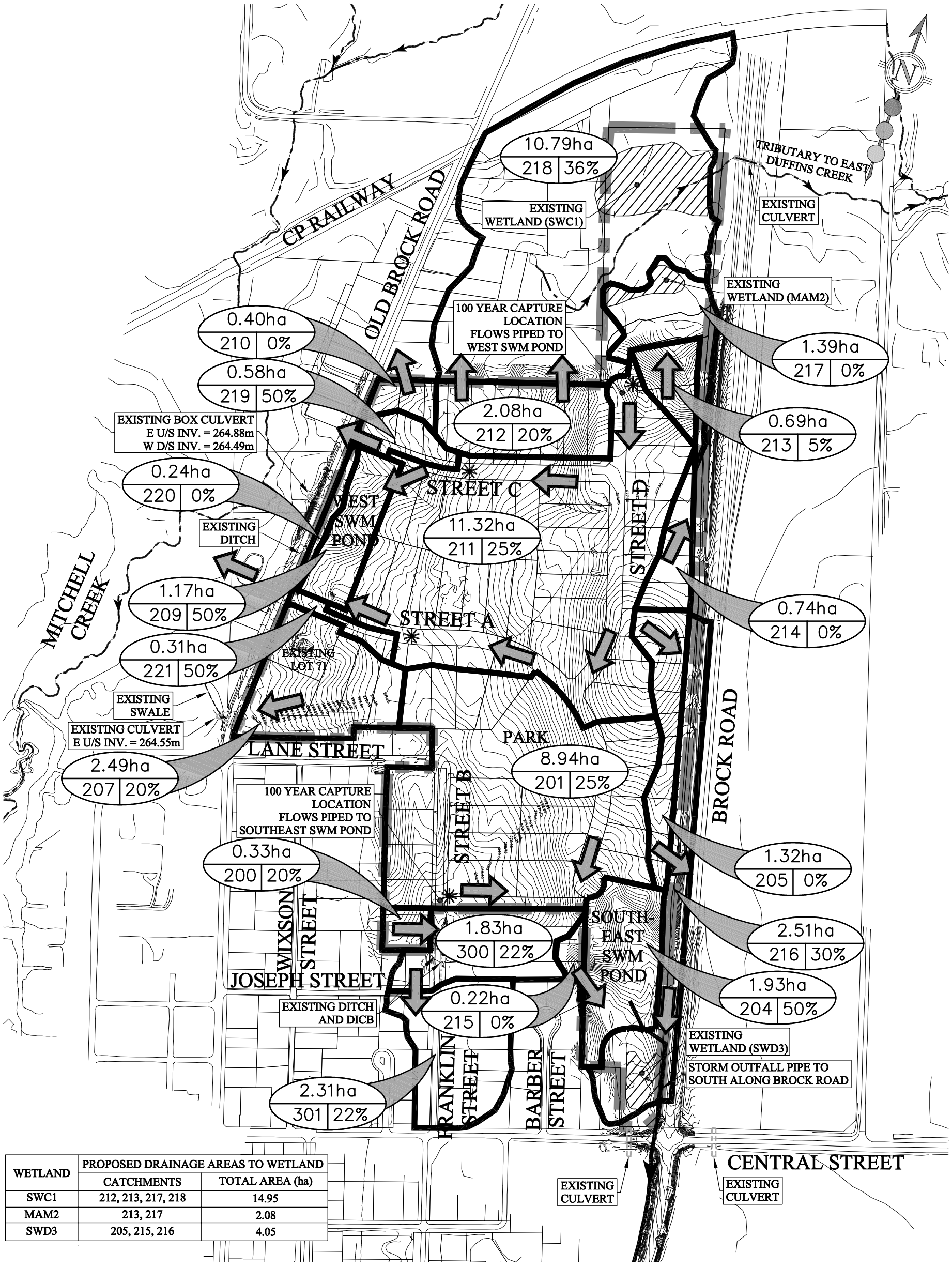

WETLAND	PROPOSED DRAINAGE AREAS TO WETLAND	
	CATCHMENTS	TOTAL AREA (ha)
SWC1	212, 213, 217, 218	14.95
MAM2	213, 217	2.08
SWD3	205, 215, 216	4.05

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

- PROPERTY BOUNDARY
- STORM DRAINAGE BOUNDARY
- WATERCOURSE
- 270.25 EXISTING CONTOUR
- 12.52ha / 211 | 25% — DRAINAGE AREA (HECTARES); % IMPERVIOUSNESS; CATCHMENT ID
- OVERLAND FLOW
- EXISTING WETLAND
- 100 YEAR CAPTURE POINT

CLAREMONT DEVELOPMENTS INC. 3190 STEELES AVE. EAST, SUITE 300 MARKHAM, ONTARIO L3R 1G9 TEL: (905) 477-1177 FAX: (905) 477-1279	5113 BROCK ROAD - FSSR		PROPOSED STORM DRAINAGE PLAN
SCS consulting group ltd 30 CENTURIAN DRIVE, SUITE 100 MARKHAM, ONTARIO L3R 8B8 TEL: (905) 475-1900 FAX: (905) 475-8335	DESIGNED BY: L.C.M.	CHECKED BY: S.E.K.	PROJECT No: 1470 / FIGURE No: 2.2
	SCALE: 1:5000	DATE: JULY 2021	

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Areas Draining to Existing Wetlands

Toko Claremont
Project Number: 1470
Date: March 2018
Designer Initials: N.O.T.

North Wetland (SWC1)

Existing Conditions	Drainage Area (ha)	% of Total Drainage Area
External Catchment 111 (Estate residential, wooded area and wetland)	10.79	58%
External Catchment 110 (Wooded area and buffer)	1.39	8%
Catchment 101 (Existing agricultural)	5.42	29%
Catchment 103 (Existing agricultural)	0.87	5%
Total Drainage Area	*18.47*	*100%*

Proposed Conditions	Drainage Area (ha)	% of Total Drainage Area
External Catchment 218 (Estate residential, wooded area and wetland)	10.79	72%
External Catchment 217 (Wooded area and buffer)	1.39	9%
Catchment 213 (Rear yards)	0.69	5%
Catchment 212 (Rear yards)	2.08	14%
Total Drainage Area	*14.95*	*100%*

North Wetland (MAM2)

Existing Conditions	Drainage Area (ha)	% of Total Drainage Area
Catchment 110 (Wooded area and buffer)	1.39	62%
Catchment 103 (Existing agricultural)	0.87	38%
Total Drainage Area	*2.26*	*100%*

Proposed Conditions	Drainage Area (ha)	% of Total Drainage Area
Catchment 217 (Wooded area and buffer)	1.39	67%
Catchment 213 (Rear yards)	0.69	33%
Total Drainage Area	*2.08*	*100%*

South Wetland (SWD3)

Existing Conditions	Drainage Area (ha)	% of Total Drainage Area
External Catchment 109 (Brock Road ditch and existing wetland)	2.51	37%
External Catchment 108 (Existing residential yards)	0.22	3%
Catchment 106 (Existing agricultural)	0.87	13%
Catchment 105 (Existing agricultural)	3.1	46%
Total Drainage Area	*6.70*	*100%*

Proposed Conditions	Drainage Area (ha)	% of Total Drainage Area
External Catchment 216 (Brock Road ditch and existing wetland)	2.51	62%
External Catchment 215 (Existing residential yards)	0.22	5%
Catchment 205 (Rear yards)	1.32	33%
Total Drainage Area	*4.05*	*100%*

APPENDIX C

MOECC Water Well Records

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1904927	8 18	Jul-77	650263 4870522	266.7	6.1	Fr			6.1	27	30	10.7	2214 BR	WS DO	**MOE# 1904927** 0.0 BRWN CLAY STNS PCKD 2.4 FGVL LOOS 3.0 BRWN CLAY STNS PCKD 6.1 BLUE CLAY SAND LYRD 11.9
1905168	9 19	Sep-78	649813 4870472	259.1	9.1	Fr			5.5			6.1	3109 BR	WS DO	**MOE# 1905168** 0.0 TPSL 0.6 BRWN CLAY 6.1 BLUE CLAY SLTY 10.7 BLUE GRVL STNY 15.2
1905217	9 18	Dec-78	649853 4870902	266.4	14.9	Fr	14.9	-0.9	5.5	41	120	13.7	4743 CT	WS DO	**MOE# 1905217** 0.0 BLCK TPSL 0.6 BLUE CLAY STNS 5.8 GREY GRVL 8.5 BLUE CLAY STNS 14.9 GREY SAND 15.8 BLUE CLAY SOFT VERY 19.5 GREY CLAY STNS HPAN 19.8
1905581	9 18	Oct-79	649973 4871622	268.2	3.0	Fr			3.0	27	30	6.1	2214 BR	WS DO	**MOE# 1905581** 0.0 BLCK TPSL 0.3 BRWN SAND PCKD 3.0 BRWN SAND 7.0
1905767	9 18	Jun-80	649893 4871562	268.2	16.8	Fr			3.0	114	90	4.6	4738 CT	WS DO	**MOE# 1905767** 0.0 BRWN CLAY SAND SOFT 5.5 GREY CLAY SAND SOFT 16.5 GREY FSND 20.4 GREY CSND STNS 21.3 GREY GRVL 21.6
1905814	9 18	Jun-80	649893 4871542	268.2	19.5	Fr			3.0	91	135		4738 CT	WS DO	**MOE# 1905814** 0.0 PRDG 6.7 GREY CLAY SAND SOFT 19.5 GREY MSND 21.6 GREY GRVL SAND WBRG 22.3
1905957	8 18	Dec-80	650313 4870482	268.2	10.7	Fr	13.4	-3.0	4.9	18	165		2218 CT	WS -	**MOE# 1905957** 0.0 BRWN TPSL CLAY 1.2 BRWN SAND 2.7 BRWN CLAY STNS 10.7 BLUE SAND CLAY 16.5
1905958	8 18	Aug-80	650173 4870242	259.1	71.9	Fr	71.9	-0.9	6.1	159	180	71.9	5459 RC	WS PU	**MOE# 1905958** 0.0 BLCK TPSL 0.6 BLUE STNS CLAY 2.4 BRWN CLAY STNS 11.9 GREY SAND STNS 14.0 BLUE CLAY STNS 39.9 BLUE CLAY STNS SAND 68.9 BLUE CLAY STNS 70.4 GREY SAND STNS 73.2
1906050	9 16	Jul-81	650653 4871322	280.4	18.3 12.2	- -			NR				2517 RA	AS DO	**MOE# 1906050** 0.0 BRWN CLAY GVLY SNDY 3.0 BRWN SAND GRVL 4.9 GREY CLAY SNDY GVLY 12.2 BRWN SAND GRVL 18.3
1906051	9 18	Nov-80	649793 4871202	265.2	12.2	Fr	12.8	-0.9	4.6	68	75	10.7	5459 CT	WS DO	**MOE# 1906051** 0.0 BLCK TPSL 0.6 BRWN CLAY STNS 5.5 BLUE CLAY STNS 12.2 BLUE SAND 13.7
1906067	8 18	Jun-81	650193 4870522	268.2	81.7	Fr	82.9	-0.9	FLW	91	30	4.6	4738 CT	WS DO	**MOE# 1906067** 0.0 BRWN CLAY GRVL BLDR 7.3 GREY CLAY SAND

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															STNS 24.4 GREY CLAY STNS 76.8 GREY FSND CLAY 81.7 GREY MSND GRVL 83.8
1906155	9 18	Nov-81	650333 4870702	271.3	81.1	Fr			3.7	91	90	6.1	4738 CT	WS DO	**MOE# 1906155** 0.0 BRWN CLAY GRVL DNSE 5.2 BRWN BLDR CLAY 6.4 BRWN CLAY GRVL LOOS 9.1 GREY CLAY STNS HARD 24.4 GREY CLAY STNS MGRD 54.9 GREY CLAY STKY 81.1 GREY FSND VERY 84.4 GREY SAND STNS LOOS 85.0 GREY GRVL 85.6
1906193	9 18	Aug-81	650013 4870762	266.7	4.6	Fr			4.6	27	30	6.4	2214 BR	WS DO	**MOE# 1906193** 0.0 TPSL 0.6 BRWN CLAY PCKD 4.6 GREY CLAY SAND LYRD 7.9
1906199	9 16	Jul-81	650643 4871322	280.4	3.0	Fr			3.0	32	60	3.0	2214 BR	WS DO	**MOE# 1906199** 0.0 TPSL 0.3 BRWN CLAY PCKD 3.0 GRVL 3.7 BLUE CLAY STNS 8.5
1906205	8 18	Sep-81	650053 4870342	262.1	92.7	Fr	92.7	-0.9	38.1	227	120	92.7	5459 RC	WS PU	**MOE# 1906205** 0.0 BRWN CLAY 3.4 BLUE CLAY STNS 9.1 BRWN SAND GRVL 11.0 BLUE CLAY STNS 13.4 BRWN SAND GRVL 14.0 BLUE CLAY SNDY STNY 78.6 BLUE CLAY SILT SOFT 80.2 BLUE CLAY STNS 92.4 GREY SAND STNS CLN 94.8
1906482	9 17	Dec-82	650353 4870742	271.3	82.9	Fr			6.1	55	240	7.3	4738 CT	WS DO	**MOE# 1906482** 0.0 BRWN CLAY STNS 6.4 GREY CLAY STNS DNSE 82.9 GREY FSND VERY 84.7 GREY SAND STNS LOOS 86.0 GREY GRVL 86.6
1906780	8 8	Nov-83	650313 4870382	262.1	63.7	Fr	84.1	-0.9	40.2	45	180	76.2	4738 CT	WS DO	**MOE# 1906780** 0.0 BRWN CLAY SAND SOFT 6.7 GREY CLAY SAND SOFT 63.7 GREY FSND VERY 83.5 GREY CSND STNS LOOS 85.0
1906936	9 19	Apr-84	649933 4870482	259.1	74.4	Fr			FLW				4738 CT	WS DO	**MOE# 1906936** 0.0 BRWN CLAY MSND 5.5 GREY CLAY GRVL 11.0 GREY CLAY STNS HARD 33.5 GREY CLAY STNS 74.4 GREY FSND 76.8 GREY CSND 78.3 GREY GRVL LOOS 79.2
1906975	8 18	Jul-84	650213 4870422	259.1	13.4	-	12.2	-1.2	3.0	27	300	13.4	2104 CT	OW DO	**MOE# 1906975** 0.0 BRWN TPSL SOFT 0.6 BRWN CLAY STNS PCKD 13.4 BRWN SAND GRVL LOOS 14.6 BRWN CLAY MGRD 15.8
1906990	9 18	Jun-84	650073 4870542	262.1	78.3	Fr	80.2	-0.9	FLW	91	120	9.1	4738 CT	WS DO	**MOE# 1906990** 0.0 BRWN CLAY STNS 6.1 GREY CLAY STNS HARD

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															33.5 GREY CLAY STNS MGRD 78.3 GREY SAND STNS LOOS 81.1
1907058	8 18	Oct-84	650273 4870322	259.1	28.7	Fr	30.8	-0.9	16.5	45	120	27.4	4738 CT	WS DO	**MOE# 1907058** 0.0 BRWN CLAY GRVL SOFT 3.0 GREY GRVL CLAY PCKD 17.7 GREY CLAY STNS MGRD 28.7 GREY SAND STNS LOOS 31.7
1907076	8 18	Aug-84	650333 4870462	265.2	34.1	Fr	35.7	-0.9	22.3	18	360	35.1	4738 CT	WS DO	**MOE# 1907076** 0.0 BRWN CLAY MGVL 5.5 GREY CLAY GRVL LOOS 20.7 GREY CLAY SAND SOFT 30.5 GREY FSND VERY 32.9 GREY MSND CLAY LOOS 34.1 GREY SAND STNS LOOS 36.6
1907080	9 18	Aug-84	649793 4871562	268.2	15.8	Fr	16.8	-0.9	3.4	91	60	10.7	4738 CT	WS DO	**MOE# 1907080** 0.0 BRWN CLAY STNS SOFT 4.9 GREY CLAY SOFT 9.1 GREY FSND CLAY 15.8 GREY CSND STNS 17.7
1907168	8 18	Nov-84	650273 4870362	259.1	28.0	Fr	30.5	-0.9	15.8	68	60	18.9	4738 CT	WS DO	**MOE# 1907168** 0.0 BRWN CLAY STNS MGRD 4.9 GREY GRVL CLAY PCKD 15.8 GREY CLAY SAND SOFT 28.0 GREY GRVL LOOS 31.4
1907248	9 19	Oct-84	649853 4870582	259.1	73.8	Fr	73.8	-0.9	FLW	205	120	73.8	5459 RC	WS DO	**MOE# 1907248** 0.0 BRWN CLAY STNS 2.4 BLUE CLAY STNS 52.1 BLUE CLAY SILT 63.1 BLUE CLAY SAND STNS 71.0 GREY SAND STNS 79.2
1907328	8 18	Feb-85	650293 4870442	265.2	31.4	Fr	32.6	-0.9	21.3	45	90	25.6	4738 CT	WS DO	**MOE# 1907328** 0.0 BRWN CLAY STNS DNSE 6.4 GREY GRVL CLAY LOOS 11.3 GREY CLAY STNS HARD 31.4 GREY SAND LOOS 33.5
1907607	9 18	Nov-85	650033 4870522	262.1	76.8	Fr	81.4	-0.9	FLW	91	30	4.6	4738 CT	WS DO	**MOE# 1907607** 0.0 BRWN CLAY STNS MGRD 6.7 GREY CLAY STNS HARD 44.2 GREY CLAY STNS MSND 76.8 GREY FSND 79.6 GREY SAND GRVL LOOS 82.3
1907702	9 18	May-86	649893 4870962	265.2	84.4	Fr	85.6	-1.2	4.3	136	240	33.2	3903 RC	WS DO	**MOE# 1907702** 0.0 BRWN CLAY STNS HARD 5.5 GREY CLAY SILT STNS 23.5 BRWN GRVL SAND CLAY 41.1 GREY STNS LYRD HARD 41.8 GREY GRVL STNS LYRD 43.3 GREY CLAY STNS HARD 57.9 GREY CLAY STNS SILT 80.2 GREY GRVL SAND CLAY 81.4 GREY CLAY DNSE 84.4 BRWN SAND GRVL CLAY 87.5
1907703	9 18	May-86	650033 4870642	265.2	78.6	Fr	81.7	-1.2	FLW	273	240	45.7	3903 RC	WS DO	**MOE# 1907703** 0.0 BRWN CLAY STNS HARD 5.2 GREY CLAY STNS

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
													HARD 35.1 GREY GRVL SAND DRTY 38.1 GREY CLAY STNS HARD 78.6 BRWN SAND GRVL LOOS 82.9
1907704	8 18	May-86	650273 4870562	265.2	81.1 Fr	82.0 -1.2	FLW	136	240	61.0	3903 RC	WS DO	**MOE# 1907704** 0.0 BRWN CLAY TPSL DNSE 1.2 BRWN GRVL BLDR CLAY 9.1 BRWN SAND CLAY STNS 17.7 GREY CLAY SAND STNS 33.5 GREY GRVL CLAY DRTY 36.3 GREY CLAY STNS SAND 39.6 GREY CLAY DNSE 50.3 GREY CLAY STNS LYRD 81.1 GREY CSND STNS LOOS 83.2
1907705	9 18	May-86	649913 4870682	262.1	81.1 Fr	81.7 -1.2	FLW	136	240	61.0	3903 RC	WS DO	**MOE# 1907705** 0.0 BRWN TPSL DNSE 1.2 BRWN CLAY STNS HARD 8.5 GREY CLAY STNS SAND 25.6 BRWN GRVL STNS LOOS 27.4 GREY CLAY STNS SAND 64.0 GREY CLAY DNSE 77.1 BRWN SAND SILT STNS 81.1 GREY CLAY DNSE 81.7 GREY GRVL SAND LOOS 84.7
1907706	9 18	Mar-86	649793 4871362	265.2	80.8 Fr	81.4 -1.2	3.7	546	240	36.6	3903 RC	WS DO	**MOE# 1907706** 0.0 BLCK TPSL DNSE 1.2 BRWN FSND CLAY LYRD 3.7 GREY CLAY DNSE 10.7 BRWN CSND CLAY LYRD 23.8 GREY CLAY STNS HARD 80.8 BRWN SAND LOOS 83.8
1907788	8 19	Jul-86	649953 4870337	259.1			36.6	23			2517 OTH	AB NU	**MOE# 1907788** 0.0 BRWN TPSL SAND 3.4 GREY CLAY STNS 52.7 GREY CLAY HARD 53.6 GREY CLAY SOFT 71.0 GREY SILT SOFT MUCK 80.8 GREY CLAY 109.4 BLCK SHLE ROCK 110.3
1907789	9 19	Jul-86	649753 4870492	256.0	68.6 Fr	70.1 -1.2	30.8	136	180		2517 RA	WS DO	**MOE# 1907789** 0.0 BRWN CLAY 3.0 GREY CLAY GRVL SILT 7.0 GREY CLAY SAND GRVL 9.1 GREY GRVL SAND 18.3 BRWN SAND 22.9 GREY GRVL STNS 29.0 GREY STNS 29.9 GREY GRVL CLAY 68.6 GREY PGVL 72.2
1907790	8 18	Jun-86	650043 4870297	260.0	91.4 Fr	91.7 -1.2	39.6	45	240	88.4	5457 CT	WS DO	**MOE# 1907790** 0.0 BLCK TPSL 0.6 BRWN CLAY 5.5 BRWN CLAY GRVL 7.3 BRWN SILT BLDR WBRG 11.3 BRWN GRVL BLDR 14.6 BRWN HPAN 29.0 BRWN HPAN WBRG 47.5 GREY CLAY SOFT 51.8 GREY CLAY GRVL WBRG 91.4 GREY SAND GRVL WBRG 93.9
1907791	9 18	Jul-86	650248 4870582	266.1	86.3 Fr	87.2 -1.2	4.3	50	420	15.8	4738 CT	WS DO	**MOE# 1907791** 0.0 BRWN CLAY STNS MGRD 6.7 GREY CLAY GRVL MGRD 24.4 GREY CLAY STNS MGRD 56.4 GREY CLAY SNDS MGRD 77.7 GREY CLAY SAND SOFT 86.3 GREY

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															SAND GRVL LOOS 88.4
1907792	9 19	Jul-86	649883 4870622	260.9	77.1	Fr	80.2	-1.2	FLW	109	120	6.4	4738 CT	WS DO	**MOE# 1907792** 0.0 BRWN CLAY STNS MGRD 5.8 GREY CLAY STNS MGRD 9.8 GREY CLAY GRVL MGRD 19.8 GREY CLAY STNS MGRD 68.6 GREY CLAY SAND SOFT 77.1 GREY CLAY FSND 78.0 GREY SAND STNS CGRD 81.4
1907793	9 19	Mar-86	649833 4870602	259.1	73.8	Fr	77.7	-1.2	FLW	91	90	5.5	4738 CT	WS DO	**MOE# 1907793** 0.0 BRWN CLAY STNS MGRD 5.5 GREY CLAY GRVL SOFT 8.2 GREY CLAY SAND SOFT 12.2 GREY CLAY STNS HARD 22.3 GREY CLAY GRVL LOOS 23.5 GREY CLAY STNS HARD 54.9 GREY CLAY STNS MGRD 70.1 GREY CLAY SAND SOFT 73.8 GREY FSND VERY 75.0 GREY SAND MGRD 76.8 GREY SAND GRVL CGRD 78.9
1907794	9 19	Apr-86	649883 4870597	260.9	77.7	Fr	78.6	-1.2	FLW	50	180	18.3	4738 CT	WS DO	**MOE# 1907794** 0.0 BRWN CLAY STNS SOFT 5.8 GREY CLAY STNS HARD 18.9 GREY CLAY STNS MGRD 64.0 GREY CLAY SAND SOFT 77.7 GREY SAND GRVL LOOS 79.9
1907795	8 18	Apr-86	650463 4870617	267.9	32.0	Fr	32.9	-1.2	23.2	36	120	32.0	4738 CT	WS DO	**MOE# 1907795** 0.0 BRWN CLAY STNS 6.4 GREY CLAY STNS 32.0 GREY SAND GRVL LOOS 34.1
1907796	9 18	May-86	650078 4870817	266.1	80.5	Fr	83.5	-1.2	3.4	55	720	4.3	4738 CT	WS DO	**MOE# 1907796** 0.0 BRWN CLAY STNS MGRD 6.1 GREY CLAY GRVL HARD 24.4 GREY CLAY STNS MGRD 48.8 GREY CLAY STNS STKY 73.8 GREY GRVL CLAY 75.0 GREY CLAY SAND SOFT 80.5 GREY SAND LOOS 82.3 GREY SAND GRVL LOOS 84.7
1907858	9 18	Aug-86	649788 4871392	266.1	86.3	Fr	85.0	-1.2	4.3	91	240	45.7	3903 RC	WS DO	**MOE# 1907858** 0.0 BRWN CLAY STNS LYRD 6.4 GREY CLAY GRVL LYRD 15.2 GREY GRVL DRTY LYRD 23.8 GREY CLAY STNS LYRD 80.8 GREY CLAY GRVL LOOS 86.3
1907860	9 19	Aug-86	649903 4870562	260.9	81.4	Fr	80.2	-1.2	NR	227	180	30.5	3903 RC	WS DO	**MOE# 1907860** 0.0 BRWN FILL PCKD 1.5 GREY PRDG CMTD HARD 1.8 BLUE CLAY SAND LYRD 3.0 GREY CLAY STNS HARD 78.6 BLCK GRVL CLAY LOOS 81.4 GREY CLAY DNSE 81.7
1907861	9 18	Jul-86	649938 4870782	264.0	86.0	Fr	84.7	-1.2	0.9	91	240	61.0	3903 RC	WS DO	**MOE# 1907861** 0.0 BRWN CLAY STNS LYRD 5.2 GREY GRVL CLAY LYRD 15.2 GREY CLAY STNS LYRD 79.2 BLCK CSND STNS LOOS 86.0 GREY CLAY DNSE 86.3

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1907862	9 18	Aug-86	649828 4870962	267.0	84.4	Fr	52.7	-1.2	4.0	91	240	61.0	3903 RC	WS DO	**MOE# 1907862** 0.0 BRWN CLAY STNS HARD 7.3 GREY CLAY SNDS LYRD 21.6 BRWN GRVL CLAY LYRD 34.7 GREY CLAY STNS HARD 82.0 BLCK CLAY SAND LOOS 84.4
1907863	9 18	Jul-86	649798 4871447	267.0	82.0	Fr	82.0	-1.2	1.2	91	240	61.0	3903 RC	WS DO	**MOE# 1907863** 0.0 BRWN CLAY DNSE 4.0 GREY CLAY STNS HARD 15.5 GREY CLAY GRVL LYRD 22.3 GREY CLAY STNS HARD 79.2 GREY CLAY CSND LYRD 83.2
1907864	9 18	Jul-86	650023 4871012	271.9	86.0	Fr	84.7	-1.2	7.0	91	240	61.0	3903 RC	WS DO	**MOE# 1907864** 0.0 BRWN CLAY STNS HARD 7.3 GREY CLAY STNS HARD 17.7 BRWN GRVL CLAY LYRD 29.0 GREY CLAY SILT LYRD 84.4 BLCK SAND GRVL LOOS 86.0
1907865	9 18	Jul-86	649993 4870972	271.0	88.1	Fr	86.9	-1.2	6.4	91	240	45.7	3903 RC	WS DO	**MOE# 1907865** 0.0 BRWN CLAY STNS HARD 8.2 GREY CLAY STNS HARD 17.1 BRWN GRVL CLAY LYRD 29.0 GREY CLAY SILT LYRD 84.4 BLCK SAND GRVL LOOS 88.1
1907866	8 19	Aug-86	650003 4870332	260.0					NR				2517 CT	AS NU	**MOE# 1907866** 0.0 BRWN TPSL 0.9 BRWN CLAY STNS 11.6 GREY HPAN 68.0 BLUE CLAY 72.8 GREY CLAY STNS 73.8 BLUE CLAY 90.5 GREY CLAY STNS 93.3 BLCK SHLE 96.9
1907867	9 19	Aug-86	649903 4870562	260.9	81.7	Fr	80.2	-1.2	NR	227	240	15.2	3903 RC	WS DO	**MOE# 1907867** 0.0 BRWN FILL CMTD PCKD 1.5 GREY PRDG CMTD 1.8 BRWN CLAY SAND LYRD 3.0 GREY CLAY STNS HARD 78.6 BLCK SAND CGVL LOOS 81.4 GREY CLAY DNSE 82.0
1907868	8 19	Sep-86	649963 4870452	260.0	76.8	Fr	77.7	-1.8	NR	227	240	22.9	3903 RC	WS DO	**MOE# 1907868** 0.0 BRWN CLAY SAND LYRD 4.0 GREY CLAY SAND LYRD 9.4 BRWN GRVL SAND LYRD 14.0 GREY CLAY STNS HARD 46.9 GREY CLAY SAND LYRD 53.9 GREY CLAY STNS HARD 67.1 GREY CLAY DNSE 74.1 GREY CLAY SAND LYRD 76.8 BLCK SAND CLAY LYRD 79.9 GREY CLAY DNSE 89.3 GREY SAND LYRD LYRD 91.7 GREY CLAY STNS HARD 97.5
1907947	9 18	Oct-86	649828 4870897	264.9	81.1	Fr	81.1	-1.2	3.4	136	240	45.7	3903 RC	WS DO	**MOE# 1907947** 0.0 BRWN CLAY SNDS LYRD 5.5 GREY CLAY SNDS LYRD 21.3 BRWN GRVL CLAY DRTY 26.8 GREY CLAY STNS HARD 29.3 GREY CLAY GRVL LYRD 36.0 GREY CLAY STNS HARD 81.1 BRWN GRVL CLAY LOOS 82.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1907948	8 19	Oct-86	649993 4870357	260.0	92.7	Fr	91.4	-1.2	39.6	91	240	79.2	3903 RC	WS DO	**MOE# 1907948** 0.0 BRWN CLAY STNS LYRD 4.3 GREY CLAY STNS HARD 9.4 GREY CLAY GRVL LYRD 11.9 GREY CLAY SILT LYRD 51.8 GREY CLAY DNSE 78.0 GREY CLAY DNSE SOFT 90.5 BLCK CLAY CSND LYRD 92.7
1907949	8 19	Sep-86	649983 4870372	260.0	92.7	Fr	91.4	-1.2	39.6	91	240	79.2	3903 RC	WS DO	**MOE# 1907949** 0.0 BRWN CLAY STNS LYRD 4.0 GREY CLAY STNS HARD 9.4 GREY CLAY GRVL LYRD 11.6 GREY CLAY STNS LYRD 51.8 GREY CLAY DNSE 76.2 GREY CLAY DNSE SOFT 91.1 BLCK SAND GRVL LYRD 92.7 GREY CLAY DNSE 93.3
1907951	9 18	Nov-86	649798 4871447	266.1	82.3	Fr	82.9	-1.2	7.0	55	120	9.8	4738 CT	WS DO	**MOE# 1907951** 0.0 BRWN CLAY STNS MGRD 5.5 GREY CLAY STNS MGRD 9.8 GREY CLAY SAND 11.0 GREY CLAY SAND SOFT 20.7 GREY SAND MGRD LOOS 23.8 GREY GRVL SAND LOOS 25.9 GREY GRVL CLAY PCKD 44.8 GREY CLAY SNDS STKY 70.1 GREY CLAY SAND SOFT 82.3 GREY GRVL SAND LOOS 84.1
1907955	8 18	Sep-86	650263 4870552	266.1	84.7	Fr	85.6	-1.2	39.9	36	120	64.0	4738 CT	WS DO	**MOE# 1907955** 0.0 BRWN CLAY SNDS MSND 6.7 GREY CLAY GRVL PCKD 9.8 GREY CLAY STNS 59.4 GREY CLAY SAND MSND 82.9 GREY CLAY 84.7 GREY SAND GRVL LOOS 86.9
1907989	9 18	Oct-86	650093 4870692	266.1	39.6	Fr			15.2	73	125		2517 RA	WS DO	**MOE# 1907989** 0.0 CLAY ROCK 38.1 GRVL BLDR 39.6
1907990	8 18	Sep-86	649993 4870442	260.0	78.6	Fr	48.2	-1.2	NR	682	120		2517 RA	WS DO	**MOE# 1907990** 0.0 BRWN CLAY STNS 48.8 GREY CLAY 61.0 GREY SAND CLAY 79.9
1908014	9 18	Nov-86	649793 4871562	267.9	82.3	Fr	81.1	-1.2	4.3	91	240	45.7	3903 RC	WS DO	**MOE# 1908014** 0.0 BRWN CLAY STNS LYRD 4.6 GREY CLAY STNS LYRD 80.2 GREY SAND CGVL LOOS 82.3
1908015	8 18	Nov-86	649993 4870572	260.0	79.6	Fr	78.3	-1.2	NR	91	240	38.1	3903 RC	WS DO	**MOE# 1908015** 0.0 UNKN 7.0 GREY CLAY SILT LYRD 76.2 GREY CLAY SILT LYRD 77.7 GREY SAND GRVL 79.6
1908016	9 18	Nov-86	649788 4871102	264.9	83.8	Fr	82.6	-1.2	3.7	91	240	45.7	3903 RC	WS DO	**MOE# 1908016** 0.0 BRWN CLAY STNS HARD 9.1 BRWN CLAY CSND LYRD 28.0 GREY CLAY STNS HARD 76.2 BRWN CLAY SAND LYRD 80.8 GREY CLAY CSND LOOS 83.8
1908097	9	Dec-86	649843	260.0	77.1	Fr	79.6	-1.2	FLW	218	120	2.4	4738	WS	**MOE# 1908097**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	19		4870617										CT	DO	0.0 BRWN CLAY STNS MGRD 5.5 GREY CLAY STNS MGRD 9.8 GREY GRVL CLAY LOOS 11.0 GREY CLAY SAND PCKD 44.2 GREY CLAY STNS MGRD 73.8 GREY FSND 77.1 GREY GRVL SAND LOOS 80.8
1908134	9	Feb-87	649858	264.0	78.0	Fr	79.2	-1.2	0.3	55	1800	2.4	4738	WS	**MOE# 1908134**
	18		4870852										CT	DO	0.0 BRWN CLAY SAND MGRD 6.7 GREY CLAY SAND STNS 18.3 GREY SAND MGRD 20.7 GREY CLAY SAND SOFT 24.4 GREY CLAY SAND PCKD 54.9 GREY CLAY STNS MGRD 73.2 GREY FSND 78.0 GREY GRVL SAND LOOS 80.5
1908183	9	Jan-87	650063	266.1	82.9	Fr	81.7	-1.2	1.2	136	240	61.0	3903	WS	**MOE# 1908183**
	18		4870682										RC	DO	0.0 BRWN CLAY STNS LYRD 7.0 GREY CLAY STNS LYRD 25.9 GREY CLAY STNS HARD 48.8 GREY CLAY DNSE 61.0 GREY CLAY STNS HARD 79.9 GREY SAND GRVL LOOS 82.9
1908184	8	Jan-87	650163	267.9	89.9	Fr	88.7	-1.2	40.2	136	240	64.0	3903	WS	**MOE# 1908184**
	18		4870572										RC	DO	0.0 BRWN CLAY SAND LYRD 5.2 GREY CLAY STNS HARD 19.8 GREY CLAY GRVL LYRD 24.4 GREY CLAY STNS HARD 48.8 GREY CLAY DNSE 54.9 GREY CLAY STNS HARD 86.0 BRWN SAND CLAY LYRD 87.2 GREY SAND LOOS 89.9
1908185	8	Dec-86	650023	260.0	93.0	Fr	91.7	-1.2	42.7	91	240	70.1	3903	WS	**MOE# 1908185**
	19		4870297										RC	DO	0.0 BRWN CLAY SAND LYRD 5.5 GREY CLAY STNS HARD 7.6 GREY CLAY GRVL LYRD 17.1 GREY CLAY STNS HARD 48.8 GREY CLAY SOFT DNSE 51.8 GREY CLAY STNS HARD 65.5 GREY CLAY DNSE 90.5 GREY SAND CLAY LYRD 93.0
1908186	9	Oct-86	649748	256.9	87.8 - 70.1	Fr	68.9	-1.2	33.8	55	360	51.8	3903	WS	**MOE# 1908186**
	19		4870552										RC	DO	0.0 BRWN CLAY SNDY STNS 5.5 GREY CLAY STNS HARD 15.2 GREY GRVL CLAY CMTD 25.9 GREY CLAY STNS HARD 69.2 GREY GRVL CLAY LOOS 70.1 GREY CLAY DNSE 86.6 GREY CLAY SAND LYRD 87.8 GREY CLAY DNSE 93.9 GREY SHLE DNSE 94.8
1908187	9	Mar-87	649833	264.9	81.7	Fr	80.5	-1.2	3.7	91	240	51.8	3903	WS	**MOE# 1908187**
	18		4870942										RC	DO	0.0 BRWN CLAY STNS HARD 5.5 BRWN CLAY SAND LYRD 22.9 BRWN GRVL DRTY CMTD 28.3 GREY CLAY GRVL LYRD 36.9 GREY CLAY STNS HPAN 79.2 GREY GRVL CLAY LOOS 81.7
1908188	9	Apr-87	650153	267.0	86.3	Fr			2.1	91	240	45.7	3903	WS	**MOE# 1908188**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	18		4870712										RC	DO	0.0 BRWN CLAY STNS HARD 8.5 BRWN CLAY SNDS LYRD 23.8 BRWN GRVL DRTY LYRD 37.8 GREY CLAY GRVL LYRD 48.8 GREY CLAY DNSE 73.2 GREY CLAY STNS HARD 79.2 GREY CLAY SAND LYRD 83.8 BLCK GRVL SAND LOOS 86.3
1908189	8 18	Mar-87	650053 4870427	260.9	81.1	Fr	79.9	-1.2	FLW	136	240	45.7	3903 RC	WS DO	**MOE# 1908189** 0.0 BRWN CLAY STNS HARD 2.1 GREY CLAY STNS HARD 24.4 BRWN GRVL DRTY LYRD 36.9 GREY CLAY STNS HARD 79.2 BLCK GRVL SAND LOOS 81.1
1908190	9 18	Mar-87	650308 4870727	270.1	86.3	Fr	85.0	-1.2	2.4	136	240	53.3	3903 RC	WS DO	**MOE# 1908190** 0.0 BRWN CLAY STNS HARD 9.4 BRWN CLAY GRVL LYRD 27.1 BRWN CLAY SAND LYRD 38.4 GREY CLAY STNS HARD 84.1 BLCK SAND GRVL LOOS 86.3
1908191	9 18	Feb-87	649983 4870742	264.9	86.9	Fr	85.6	-1.2	4.6	136	300	61.0	3903 RC	WS DO	**MOE# 1908191** 0.0 BRWN CLAY STNS HARD 7.3 BRWN CLAY GRVL LYRD 24.4 BRWN CLAY SAND LYRD 36.6 GREY CLAY DNSE 54.9 GREY CLAY STNS HARD 84.1 BLCK SAND GRVL LOOS 87.2
1908193	9 18	Nov-86	649908 4870646	261.8	80.2	Fr	80.8	-0.9	3.0	45	150	30.5	5457 CT	WS DO	**MOE# 1908193** 0.0 BLCK TPSL 0.3 BRWN CLAY 4.9 BRWN CLAY BLDR 7.3 GREY CLAY GRVL 9.8 GREY HPAN SILT 12.5 GREY HPAN 13.7 GREY HPAN 72.5 GREY CLAY GRVL 75.6 GREY SAND GRVL WBRG 80.2 BRWN SAND GRVL WBRG 82.3
1908259		May-87	650032 4870326	260.0					NR				4738 -	AQ -	**MOE# 1908259** 0.0
1908260	9 19	May-87	649759 4870520	255.4					NR				4738 -	AQ -	**MOE# 1908260** 0.0
1908262	8 19	May-87	649804 4871463	268.2					NR				4738 -	AQ -	**MOE# 1908262** 0.0
1908264		Apr-87	650283 4870567	266.1					NR				4738 -	AQ -	**MOE# 1908264** 0.0
1908266	9 9	Apr-87	649776 4871453	265.8					NR				4738 -	AQ -	**MOE# 1908266** 0.0
1908267	9 19	Apr-87	649785 4871452	266.4					NR				4738 -	AQ -	**MOE# 1908267** 0.0
1908307	8 19	May-87	649955 4870449	259.7					NR				4738 -	AQ -	**MOE# 1908307** 0.0
1908308	8	May-87	650180	264.3					NR				4738	AQ	**MOE# 1908308**

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	19		4870533								-	-	0.0
1908309	9 18	May-87	650356 4870631	267.9			NR				4738 -	AQ -	**MOE# 1908309** 0.0
1908310	8 19	May-87	649981 4870406	260.0			NR				4738 -	AQ -	**MOE# 1908310** 0.0
1908323	9 19	May-87	649748 4870552	256.9	26.2 Fr	25.0 -1.2	0.9	68	240	21.3	3903 RC	WS DO	**MOE# 1908323** 0.0 BRWN CLAY SNDS LYRD 5.5 GREY CLAY STNS HARD 15.2 BRWN CLAY SAND LOOS 26.2
1908356	9 18	Jul-87	649943 4870537	260.9	74.4 Fr	79.9 -1.2	FLW	109	60	5.5	4738 CT	WS DO	**MOE# 1908356** 0.0 BRWN CLAY STNS MGRD 5.5 GREY CLAY GRVL 20.1 GREY CLAY STNS STKY 67.1 GREY CLAY SOFT 79.2 GREY GRVL SAND LOOS 81.1
1908357	9 19	May-87	649773 4870672	259.1	25.0 Fr	25.0 -1.2	FLW	82	60	15.2	4738 CT	WS DO	**MOE# 1908357** 0.0 BRWN CLAY STNS MGRD 4.3 GREY CLAY STNS MGRD 11.6 GREY CLAY STNS SOFT 16.8 GREY GRVL CLAY LOOS 25.0 BRWN GRVL SAND LOOS 26.2
1908358	9 19	May-87	649776 4870675	259.1			NR				4738 CT	AQ NU	**MOE# 1908358** 0.0 BRWN CLAY STNS MGRD 4.3 GREY CLAY STNS MGRD 11.6 GREY CLAY STNS STKY 16.2 GREY GRVL CLAY LOOS 25.0 GREY GRVL SAND LOOS 27.4 GREY CLAY SNDS MGRD 48.8 GREY CLAY SAND LOOS 49.7 GREY CLAY STNS MGRD 70.1 GREY CLAY SOFT 86.0 GREY CLAY SAND LOOS 87.8 GREY CLAY MGRD 95.4
1908359	8 18	May-87	650158 4870342	260.0	25.9 Fr	27.7 -0.9	12.2	68	60	15.2	4738 CT	WS DO	**MOE# 1908359** 0.0 BRWN CLAY STNS 5.2 GREY GRVL CLAY LOOS 10.1 GREY CLAY STNS 25.9 GREY SAND STNS LOOS 28.7
1908361	4 19	Jul-87	649902 4870559	260.0			NR				4738 -	AQ -	**MOE# 1908361** 0.0
1908362	9 18	Jul-87	649817 4870937	264.9			NR				4738 -	AQ -	**MOE# 1908362** 0.0
1908364	9 19	Jul-87	649877 4870656	260.0			NR				4738 -	AQ -	**MOE# 1908364** 0.0
1908366	9 19	Jun-87	649876 4870618	260.0			NR				4738 -	AQ -	**MOE# 1908366** 0.0
1908367	9 19	Jun-87	649865 4870637	260.9			NR				4738 -	AQ -	**MOE# 1908367** 0.0
1908540	9 19	Aug-87	649793 4870592	257.9	46.9 Fr	48.5 -1.2	2.7	55	105	39.6	4738 CT	WS DO	**MOE# 1908540** 0.0 BRWN CLAY STNS MGRD 4.3 GREY CLAY STNS

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															SOFT 14.0 GREY GRVL LOOS 16.8 GREY GRVL CLAY 21.3 GREY GRVL SAND LOOS 25.9 GREY CLAY STNS MGRD 45.7 GREY CLAY SOFT 46.9 GREY FSND 47.9 GREY SAND STNS MGRD 49.7
1908551	9 18	Jun-87	649868 4871622	267.9	83.5	Fr	82.3	-1.2	7.0	91	240	30.5	3903 RC	WS DO	**MOE# 1908551** 0.0 BRWN CLAY SNDS LYRD 7.0 GREY CLAY SAND LYRD 12.5 BRWN GRVL CLAY DRTY 25.0 GREY CLAY STNS 80.8 GREY SAND CGRD LOOS 83.5
1908552	9 18	May-87	650033 4870702	264.9	79.6	Fr	78.3	-1.2	NR	91	240	48.8	3903 RC	WS DO	**MOE# 1908552** 0.0 BRWN CLAY SAND LYRD 6.1 GREY CLAY STNS HARD 76.5 GREY SAND GRVL LOOS 79.6
1908553	9 18	May-87	650018 4870562	263.0	81.7	Fr	80.5	-1.2	NR	91	240	45.7	3903 RC	WS DO	**MOE# 1908553** 0.0 BRWN CLAY SAND LYRD 5.2 GREY CLAY STNS HARD 13.7 BRWN GRVL CLAY LYRD 23.2 GREY CLAY STNS HARD 48.8 GREY CLAY SILT DNSE 78.9 GREY SAND GRVL LOOS 81.7
1908554	9 18	May-87	649878 4871597	269.1	82.0	Fr	80.8	-1.2	6.4	91	240	51.8	3903 RA	WS DO	**MOE# 1908554** 0.0 BRWN CLAY SNDS LYRD 7.0 GREY CLAY STNS LYRD 12.2 GREY SILT CLAY LYRD 16.8 GREY GRVL CLAY LYRD 25.3 GREY CLAY STNS HARD 80.5 GREY SAND GRVL LOOS 82.0
1908599	8 18	Aug-87	650198 4870532	264.0	93.6	Fr	92.4	-1.2	42.7	91	240	73.2	3903 RC	WS DO	**MOE# 1908599** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS HARD 5.2 GREY CLAY SNDS LYRD 60.4 GREY SAND STNS HARD 79.9 GREY SAND CLAY LYRD 93.6
1908600	8 19	Aug-87	650003 4870317	260.0	80.2	Fr	78.9	-1.2	NR	91	240	30.5	3903 RC	WS DO	**MOE# 1908600** 0.0 BRWN CLAY STNS HARD 6.7 GREY CLAY STNS HARD 76.2 GREY SAND CLAY LYRD 77.7 BRWN SAND MSND LOOS 80.2
1908601	9 18	Sep-87	649803 4871617	269.1	84.7	Fr	83.5	-1.2	4.6	91	240	39.6	3903 RC	WS DO	**MOE# 1908601** 0.0 BLCK TPSL FGVL DNSE 0.6 BRWN CLAY SAND LYRD 4.3 GREY CLAY DNSE 11.9 BRWN CLAY CSND LYRD 25.0 GREY CLAY STNS HARD 81.4 BRWN SAND LOOS 84.7
1908602	8 19	Sep-87	649993 4870362	260.0	93.3	Fr	91.4	-1.2	40.2	91	240	54.9	3903 RC	WS DO	**MOE# 1908602** 0.0 BRWN CLAY STNS LYRD 4.3 GREY CLAY STNS HARD 9.4 GREY CLAY GRVL LYRD 12.8 GREY CLAY STNS LYRD 51.8 GREY CLAY DNSE 78.6 GREY CLAY DNSE SOFT 90.2 BLCK SAND GRVL LYRD 93.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1908603	9 18	Sep-87	649893 4870972	267.0	85.3	Fr	84.1	-1.2	4.3	91	240	45.7	3903 RC	WS DO	**MOE# 1908603** 0.0 BRWN CLAY STNS HARD 7.9 GREY CLAY SAND LYRD 21.6 BRWN GRVL CLAY LYRD 36.0 GREY CLAY STNS HARD 82.0 BLCK CLAY SAND LOOS 85.3
1908604	8 18	Sep-87	650033 4870477	262.1	81.4	Fr	80.2	-1.2	NR	136	240	36.6	3903 RC	WS DO	**MOE# 1908604** 0.0 BRWN CLAY STNS LYRD 7.9 GREY CLAY SILT LYRD 77.4 GREY SAND GRVL LOOS 81.4
1908721	8 17	Sep-87	650255 4870398	261.8	13.7	Fr	13.1	-2.4	0.6	23	210	13.7	4635 CT	OW DO	**MOE# 1908721** 0.0 TPSL 0.3 WHTE CLAY SAND 0.9 WHTE CLAY 13.7 BRWN SAND FSND 14.9 BRWN SAND SILT FSND 26.5
1908826	9 18	Nov-87	649923 4870577	260.9	74.7	Fr	78.3	-1.2	FLW	136	60	6.1	4738 CT	WS DO	**MOE# 1908826** 0.0 BRWN CLAY STNS 4.6 GREY CLAY STNS 7.0 GREY GRVL CLAY 20.7 GREY CLAY STNS PCKD 36.6 GREY CLAY STNS MGRD 67.1 GREY CLAY SOFT 74.7 GREY FSND 77.7 GREY GRVL SAND LOOS 79.6
1908827	9 19	Nov-87	649743 4870972	263.0	46.9	Fr	48.2	-1.5	5.2	45	120	39.6	4738 CT	WS DO	**MOE# 1908827** 0.0 BRWN CLAY SAND 5.5 GREY GRVL CLAY 10.4 GREY CLAY SAND SOFT 15.2 GREY SAND MGRD 20.4 GREY CLAY SAND 28.7 GREY CLAY SAND MGRD 39.6 GREY CLAY SAND SOFT 46.9 GREY SAND STNS LOOS 49.7
1908828	9 19	Sep-87	649718 4870722	259.1	20.7	Fr	21.6	-0.9	0.6	91	60	7.6	4738 CT	WS DO	**MOE# 1908828** 0.0 BRWN CLAY STNS MGRD 4.9 GREY CLAY SAND SOFT 15.2 GREY SAND LOOS 17.1 GREY CLAY SAND 20.7 GREY GRVL SAND LOOS 22.6
1908829	9 18	Jul-87	650313 4870702	270.1	56.7	Fr	57.6	-0.9	41.5	68	60	47.5	4738 CT	WS DO	**MOE# 1908829** 0.0 BRWN CLAY STNS MGRD 4.3 GREY CLAY STNS MGRD 10.4 GREY GRVL CLAY 20.7 GREY CLAY STNS MGRD 40.8 GREY CLAY SOFT 50.3 GREY CLAY SAND LOOS 56.7 GREY SAND GRVL LOOS 58.5
1908836	9 18	Sep-87	650005 4870667	264.9	82.3	Fr	81.1	-1.2	0.6	91	240	18.3	3903 RC	WS DO	**MOE# 1908836** 0.0 BRWN CLAY STNS LYRD 7.0 GREY CLAY GRVL LYRD 25.9 GREY CLAY STNS HARD 48.8 GREY CLAY DNSE 64.0 GREY CLAY STNS HARD 80.8 GREY GRVL SAND LOOS 82.3
1908837	8 18	Oct-87	650103 4870457	262.1	81.7	Fr	80.5	-1.2	NR	136	180	30.5	3903 RC	WS DO	**MOE# 1908837** 0.0 BRWN CLAY STNS LYRD 2.1 GREY CLAY STNS HARD 24.4 BRWN GRVL CLAY LYRD 36.6 GREY CLAY

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															DNSE 73.2 GREY CLAY DNSE 79.2 GREY GRVL SAND LOOS 81.7
1908838	9 18	Oct-87	649988 4870632	264.0	80.5	Fr	79.2	-1.2	0.3	91	240	18.3	3903 RC	WS DO	**MOE# 1908838** 0.0 BRWN CLAY STNS LYRD 5.2 GREY CLAY SAND LYRD 13.7 BRWN GRVL CLAY LYRD 22.6 GREY CLAY STNS HARD 41.1 GREY CLAY STNS LYRD 47.2 GREY CLAY DNSE 78.6 GREY GRVL LOOS 80.5
1908839	9 18	Apr-87	649798 4871482	267.9	83.8	Fr	82.6	-1.2	2.7	91	240	61.0	3903 RC	WS DO	**MOE# 1908839** 0.0 BRWN CLAY STNS HARD 5.5 GREY CLAY STNS HARD 18.3 GRVL CLAY DRTY 22.9 GREY CLAY GRVL LYRD 27.4 GREY CLAY STNS HARD 81.7 BLCK CLAY SAND LYRD 82.6 GREY CSND GRVL LOOS 84.1
1908933	9 19	Jan-88	649718 4870912	262.1	27.4	Fr	28.0	-0.9	3.0	45	120	9.1	4738 CT	WS DO	**MOE# 1908933** 0.0 BRWN CLAY STNS 5.5 GREY CLAY SAND 9.1 GREY FSND 19.2 GREY CLAY STNS SOFT 24.4 GREY GRVL CLAY 27.4 BRWN GRVL SAND LOOS 29.0
1908934	9 19	Jan-88	649658 4870772	260.0	25.0	Fr	25.6	-1.8	0.3	27	120	26.8	4738 CT	WS DO	**MOE# 1908934** 0.0 BRWN CLAY STNS MGRD 4.9 GREY CLAY STNS MGRD 18.9 GREY SAND LOOS 22.6 GREY CLAY GRVL 25.0 GREY GRVL SAND LOOS 27.7
1908953	9 19	Jan-88	649668 4870892	260.9	26.2	Fr	20.4	-0.9	0.6	23	120	22.9	5459 CT	WS DO	**MOE# 1908953** 0.0 BRWN FILL CLAY 0.9 BRWN CLAY SAND 4.3 BRWN CLAY 6.1 BLUE CLAY SOFT 8.5 BLUE SAND MGRD 11.9 BLUE CLAY SAND 13.4 BLUE CLAY SAND 26.2 BLUE GRVL 27.4
1909011	8 18	Apr-88	650053 4870277	260.9	93.9	Fr	92.7	-1.2	43.3	91	240	54.9	3903 RC	WS DO	**MOE# 1909011** 0.0 BRWN CLAY SAND LYRD 5.8 GREY CLAY SAND HARD 18.3 GREY CLAY GRVL LYRD 36.6 GREY CLAY STNS HARD 53.3 GREY CLAY DNSE 80.8 GREY CLAY STNS HARD 91.7 GREY SAND STNS LYRD 93.9
1909012	8 18	Mar-88	650048 4870392	257.9	83.2	Fr	82.0	-1.2	NR	91	240	45.7	3903 RC	WS DO	**MOE# 1909012** 0.0 BRWN SAND CLAY LYRD 5.8 GREY CLAY SAND LYRD 30.8 GREY CLAY DNSE 77.7 GREY CLAY SAND LYRD 80.8 GREY SAND CLAY LYRD 83.2
1909013	9 18	Mar-88	649783 4871157	264.9	28.3	Fr	27.1	-1.2	6.4	14	240	25.9	3903 RC	WS DO	**MOE# 1909013** 0.0 BRWN CLAY SNDS HARD 18.3 BRWN GRVL DRTY LOOS 28.3
1909014	18	Feb-88	649783 4871160	264.9					NR				3903 RC	AS DO	**MOE# 1909014** 0.0 BRWN CLAY SAND LYRD 21.3 BRWN GRVL CLAY

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															LYRD 30.8 GREY CLAY SNDS HARD 65.5 GREY CLAY SILT LYRD 83.2 BRWN CLAY SAND LYRD 94.8 GREY CLAY DNSE 99.4 BRWN SHLE FCRD PORS 101.2
1909015	9 19	Jan-88	649708 4870396	253.9	21.9	Fr	20.7	-1.2	2.7	91	240	15.2	3903 RC	WS DO	**MOE# 1909015** 0.0 BRWN CLAY STNS HARD 5.5 BRWN CLAY SNDS LYRD 18.3 BRWN CLAY SAND LYRD 19.5 BRWN SAND GRVL LOOS 21.9
1909016	9 18	Apr-88	649993 4870507	260.0	81.4	Fr	80.2	-1.2	NR	227	240	30.5	3903 RC	WS DO	**MOE# 1909016** 0.0 BRWN CLAY STNS HARD 3.0 GREY CLAY STNS HARD 24.4 BRWN GRVL DRTY CLAY 36.6 GREY CLAY STNS LYRD 79.2 GREY GRVL SAND LOOS 81.4
1909017	9 18	Feb-88	649953 4870947	270.1	86.0	Fr	84.7	-1.2	4.9	91	240	45.7	3903 RC	WS DO	**MOE# 1909017** 0.0 BRWN CLAY STNS HARD 5.5 GREY CLAY STNS HARD 21.3 BRWN GRVL CLAY LYRD 35.4 GREY CLAY STNS HARD 81.7 GREY SAND GRVL LOOS 86.0
1909018	9 18	Apr-88	650013 4870292	263.0	82.3	Fr	81.1	-1.2	0.9	91	240	61.0	3903 RC	WS DO	**MOE# 1909018** 0.0 BRWN CLAY STNS SNDY 5.2 GREY CLAY SNDS LYRD 13.7 BRWN GRVL CLAY LYRD 22.9 GREY CLAY SNDS LYRD 48.8 GREY CLAY DNSE 79.6 GREY SAND GRVL LOOS 82.3
1909094	9 19	May-88	649803 4870537	257.9	47.9	Fr	46.6	-1.2	21.3	68	240	42.7	3903 RC	WS DO	**MOE# 1909094** 0.0 BRWN CLAY STNS HARD 3.7 GREY CLAY STNS HARD 14.9 GREY CLAY GRVL LYRD 19.2 GREY CLAY STNS HARD 44.5 GREY CLAY SILT LYRD 46.6 BRWN GRVL CLAY LOOS 47.9 GREY CLAY STNS HARD 93.9 GREY SHLE DNSE 94.5
1909095	9 19	May-88	649793 4870517	257.9					NR				3903 RC	AS DO	**MOE# 1909095** 0.0 BRWN CLAY STNS HARD 3.4 GREY CLAY STNS HARD 13.7 BRWN CLAY GRVL LYRD 17.1 GREY CLAY STNS HARD 86.3 GREY CLAY BLDR LYRD 87.5 GREY CLAY STNS HARD 93.9 GREY SHLE DNSE 95.1
1909350	8 18	Sep-88	650228 4870452	263.0	50.3	Fr	65.2	-1.2	36.6	36	120	61.0	4738 CT	WS DO	**MOE# 1909350** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS 25.9 GREY GRVL CLAY LOOS 29.0 GREY CLAY SAND MSND 50.3 GREY SAND VERY FSND 58.8 GREY SAND CLAY VERY 62.5 GREY SAND FSND 66.4
1909351	9 19	Aug-88	649653 4870805	260.0	44.2	Fr	47.9	-1.2	2.7	41	120	43.3	4738 CT	WS DO	**MOE# 1909351** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS 8.5 GREY CLAY SAND SOFT 19.5 GREY GRVL SAND CLAY

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															26.8 GREY CLAY SNDS MSND 44.2 GREY SAND FSND 47.5 GREY SAND MSND 49.1
1909352	9 18	Jul-88	649925 4870572	260.9	74.4	Fr	78.6	-0.9	FLW	91	60	6.1	4738 CT	WS DO	**MOE# 1909352** 0.0 BRWN CLAY STNS MGRD 4.9 GREY CLAY GRVL 23.8 GREY CLAY STNS MGRD 67.1 GREY CLAY STNS SOFT 74.4 GREY FSND 76.8 GREY SAND GRVL LOOS 79.6
1909353	9 19	Aug-88	649813 4870422	255.1	71.0	Fr	69.8	-1.2	32.9	91	240	61.0	3903 RC	WS DO	**MOE# 1909353** 0.0 BRWN CLAY STNS HARD 4.3 GREY CLAY GRVL LYRD 12.5 GREY CLAY STNS HARD 44.2 GREY CLAY DNSE 64.0 GREY CLAY DNSE SOFT 67.4 GREY GRVL SAND LOOS 71.0
1909354	9 19	Aug-88	649843 4870567	259.1	79.9	Fr	78.3	-1.2	NR	136	240	45.7	3903 RC	WS DO	**MOE# 1909354** 0.0 BRWN CLAY STNS HARD 5.2 GREY CLAY GRVL LYRD 27.4 GREY CLAY STNS HARD 45.7 GREY CLAY SILT LYRD 49.7 GREY CLAY STNS HARD 53.0 GREY CLAY DNSE THIK 75.6 GREY CSND LOOS 79.9
1909355	9 19	Jul-88	649848 4870512	257.9	76.5	Fr	75.3	-1.2	NR				3903 RC	WS DO	**MOE# 1909355** 0.0 BRWN CLAY STNS HARD 4.3 GREY CLAY GRVL LYRD 19.8 GREY CLAY SNDS LYRD 48.8 GREY CLAY DNSE 64.0 GREY CLAY SOFT 72.2 GREY FSND SILT LYRD 75.0 GREY CLAY GRVL LYRD 76.5
1909356	9 18	Aug-88	650133 4870642	264.9	84.4	Fr	83.2	-1.2	3.0	91	240	48.8	3903 RC	WS DO	**MOE# 1909356** 0.0 BRWN CLAY STNS HARD 6.4 GREY CLAY STNS HARD 48.8 GREY CLAY DNSE 71.6 GREY CLAY STNS HARD 82.9 GREY CLAY SAND LYRD 84.7
1909399	8 19	Sep-88	649913 4870267	256.0	88.1	Fr	86.6	-1.8	30.5	227	60	88.4	5459 RC	WS DO	**MOE# 1909399** 0.0 FILL 0.9 BRWN CLAY STNS 3.0 BLUE CLAY STNS 39.6 BLUE CLAY SOFT 41.1 BLUE CLAY STNS HARD 70.1 BLUE CLAY SOFT 86.6 GRVL 88.4
1909510	9 19	Oct-88	649828 4870502	256.9	72.8	Fr	71.6	-1.2	NR	45	240		3903 RC	WS DO	**MOE# 1909510** 0.0 BRWN CLAY SNDS LYRD 3.7 GREY CLAY SNDY LYRD 71.6 GREY GRVL CLAY LYRD 73.2 GREY SILT LOOS 74.4
1909511	9 19	Oct-88	649738 4870407	255.1	24.4	Fr	23.2	-1.2	4.3	45	240	21.3	3903 RC	WS DO	**MOE# 1909511** 0.0 BRWN CLAY SNDS LYRD 4.6 GREY CLAY STNS HARD 16.5 BRWN GRVL CLAY DRTY 24.4 GREY CLAY STNS HARD 54.9 GREY GRVL CLAY LYRD 55.2 GREY CLAY STNS HARD 97.5 GREY SHLE FCRD 97.8

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1909512	9 19	Oct-88	649783 4870417	255.1	7.0	Fr	69.8	-1.2	32.9	91	240	61.0	3903 RC	WS DO	**MOE# 1909512** 0.0 BRWN CLAY SNDS LYRD 5.2 GREY CLAY STNS HARD 27.4 GREY CLAY DNSE 45.7 GREY CLAY SNDS LYRD 50.3 GREY CLAY DNSE 69.8 BRWN SAND GRVL LOOS 71.0
1909513	9 19	Sep-88	649853 4870542	259.1	79.9	Fr	78.6	-1.2	NR	136	240	24.4	3903 RC	WS DO	**MOE# 1909513** 0.0 BRWN CLAY STNS HARD 5.2 GREY CLAY STNS HARD 27.4 GREY CLAY SILT DNSE 76.8 GREY FSND HARD PCKD 78.9 GREY SAND GRVL LOOS 79.9
1909514	9 18	Sep-88	649903 4871772	271.9	85.6	Fr	84.4	-1.2	6.4	91	240	27.4	3903 RC	WS DO	**MOE# 1909514** 0.0 BRWN CLAY STNS HARD 19.8 GREY CLAY SAND LYRD 82.9 GREY FSND LOOS 83.8 GREY SAND GRVL LOOS 85.6
1909537	3 4	Dec-88	649813 4870788	260.6	7.6	Fr			18.3	36	60	20.7	3129 BR	WS DO	**MOE# 1909537** 0.0 TPSL 0.3 BRWN CLAY STNS 6.1 BLUE CLAY 9.1 BRWN CLAY 15.2 BLUE CLAY 18.3 BLUE CLAY SNDY 21.3
1909595	8 19	Nov-88	649923 4870422	257.9	72.5	Fr	71.9	-1.8	-0.3	36	220	71.0	2662 RA	WS DO	**MOE# 1909595** 0.0 BRWN CLAY STNS 3.7 GREY CLAY STNS 72.5 GREY SAND 73.8
1909596	9 19	Dec-88	649773 4870467	256.0	66.4	Fr	66.4	-0.9	33.5	32	240	64.0	2662 RA	WS DO	**MOE# 1909596** 0.0 BRWN TPSL 1.2 GREY CLAY STNS 10.4 GREY GRVL SNDY WBRG 19.8 GREY CLAY STNS 66.4 GREY SAND 67.4
1909607	9 19	Dec-88	649723 4870842	262.1	69.5	Fr	78.3	-0.9	FLW	82	60	16.8	4738 CT	WS DO	**MOE# 1909607** 0.0 BRWN CLAY STNS MGRD 4.9 GREY CLAY STNS MGRD 10.1 GREY SAND GRVL LOOS 23.5 GREY GRVL CLAY 26.2 GREY CLAY STNS MGRD 48.8 GREY CLAY STKY 69.5 GREY CLAY SAND 76.8 GREY SAND LOOS 79.2
1909608	9 19	Nov-88	649674 4870743	259.7	49.4	Fr	50.6	-0.9	3.4	68	60	18.3	4738 CT	WS DO	**MOE# 1909608** 0.0 BRWN CLAY STNS 5.5 GREY CLAY STNS 15.8 GREY SAND GRVL LOOS 23.5 GREY GRVL CLAY 26.8 GREY CLAY STNS 46.3 GREY SAND VERY FSND 48.8 GREY CLAY SOFT 49.4 GREY SAND STNS LOOS 51.5
1909609	9 18	Nov-88	650058 4870712	266.1	80.5	Fr	82.6	-1.2	2.7	91	60	6.1	4738 CT	WS DO	**MOE# 1909609** 0.0 BRWN CLAY STNS 7.0 GREY CLAY GRVL 16.8 GREY CLAY STNS MGRD 48.8 GREY CLAY STNS STKY 80.5 GREY SAND GRVL LOOS 83.8

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1909610	9 18	Oct-88	650148 4870632	264.9	76.2	Fr	82.0	-1.2	2.1	45	180	27.4	4738 CT	WS DO	**MOE# 1909610** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS 47.9 GREY CLAY SAND 49.1 GREY CLAY STNS STKY 76.2 GREY CLAY FSND 80.5 GREY SAND STNS LOOS 83.2
1909618	8 18	Jan-89	650143 4870417	260.9	93.6	Fr	92.4	-1.2	39.9	91	240	61.0	3903 RC	WS DO	**MOE# 1909618** 0.0 BRWN CLAY STNS HARD 11.9 GREY CLAY STNS LYRD 53.3 GREY CLAY DNSE 79.2 GREY CLAY DNSE 91.7 GREY SAND GRVL LOOS 93.6
1909642	9 18	Dec-88	649891 4870912	263.0	82.9	Fr	81.7	-1.2	1.5	91	2400	61.0	3903 RC	WS DO	**MOE# 1909642** 0.0 BRWN CLAY STNS HARD 6.7 GREY CLAY STNS HARD 79.6 GREY CLAY FSND LYRD 80.5 BRWN SAND GRVL LOOS 82.9
1909643	9 18	Nov-88	650053 4870388	260.9					NR				3903 RC	AS -	**MOE# 1909643** 0.0 BRWN CLAY STNS HARD 11.3 GREY CLAY STNS SILT 79.6 GREY SAND SILT DRTY 80.5
1909681	9 18	Feb-89	649828 4870732	260.9	79.2	Fr	78.3	-1.2	NR	91	240	30.5	3903 RC	WS DO	**MOE# 1909681** 0.0 BRWN CLAY STNS HARD 6.4 GREY CLAY STNS HARD 17.7 BRWN GRVL DRTY LOOS 19.5 GREY CLAY STNS HARD 29.6 GREY CLAY DNSE 42.1 GREY CLAY STNS HARD 76.8 GREY SAND GRVL LOOS 79.6
1909682	8 18	Feb-89	650193 4870452	262.1	81.4	Fr	82.9	-1.2	FLW	227	240	61.0	3903 RC	WS DO	**MOE# 1909682** 0.0 BRWN CLAY STNS HARD 5.8 GREY CLAY STNS HARD 18.9 BRWN GRVL DRTY LOOS 20.7 GREY CLAY STNS HARD 77.4 GREY GRVL DRTY LOOS 78.6 GREY GRVL SAND LOOS 84.1
1909683	9 18	Feb-89	649908 4870702	263.0	81.4	Fr	80.2	-1.2	NR	91	240	30.5	3903 RC	WS DO	**MOE# 1909683** 0.0 BRWN CLAY SAND LYRD 6.1 GREY CLAY STNS HARD 19.8 BRWN GRVL DRTY LOOS 20.4 GREY CLAY STNS HARD 79.2 GREY SAND GRVL LOOS 81.4
1909684	9 18	Feb-89	650123 4870707	267.0	85.3	Fr	84.4	-1.2	2.7	91	240	38.1	3903 RC	WS DO	**MOE# 1909684** 0.0 BRWN CLAY STNS HARD 5.5 GREY CLAY STNS HARD 19.2 BRWN GRVL DRTY LOOS 25.0 GREY CLAY STNS LYRD 49.4 GREY CLAY DNSE 73.2 GREY CLAY STNS HARD 82.9 GREY CLAY GRVL LYRD 85.6
1909685	9 18	Feb-89	650213 4870687	267.0	85.0	Fr	83.8	-1.2	3.0	91	240	61.0	3903 RC	WS DO	**MOE# 1909685** 0.0 BRWN CLAY STNS HARD 7.3 GREY CLAY STNS HARD 22.9 BRWN GRVL DRTY LOOS 24.1 GREY CLAY STNS LYRD 82.6 GREY SAND GRVL LOOS 85.0
1909774	9	Mar-89	649733	256.9	51.5	Fr	50.3	-1.2	3.0	68	240	30.5	3903	WS	**MOE# 1909774**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	19		4870582								RC	DO	0.0 BRWN CLAY STNS HARD 4.3 GREY CLAY STNS HARD 14.0 GREY CLAY STNS PCKD 26.5 GREY CLAY STNS HARD 45.4 GREY SILT FSND LYRD 47.2 BRWN CLAY FSND LYRD 50.9 GREY GRVL SAND LYRD 51.5
1909849	9 19	May-89	649663 4870802	260.9	48.8 Fr	48.5 -1.8	21.3	68	120	50.3	5459 RC	WS DO	**MOE# 1909849** 0.0 BRWN CLAY SAND 9.1 GREY FSND 10.1 BLUE CLAY STNS 29.0 GRVL CMTD 30.5 BLUE CLAY STNS 48.8 GRVL CMTD 50.3
1909866	8 19	Jun-89	649815 4870334	254.8	70.7 Fr	71.3 -0.9	31.4	68	120		4738 RC	WS DO	**MOE# 1909866** 0.0 BRWN CLAY STNS 4.9 GREY CLAY GRVL 11.0 GREY CLAY STNS MGRD 41.5 GREY CLAY SAND 43.0 GREY CLAY STNS MGRD 70.7 GREY SAND LOOS 72.2
1909867	9 19	Feb-89	649663 4870827	260.9	46.3 Fr	49.1 -1.2	4.6	45	60	30.5	4738 CT	WS DO	**MOE# 1909867** 0.0 BRWN CLAY STNS MGRD 4.9 GREY CLAY GRVL SOFT 9.8 GREY CLAY SAND LOOS 20.4 GREY GRVL CLAY LOOS 25.0 GREY CLAY STNS MGRD 46.3 GREY FSND VERY 48.2 GREY CLAY SOFT 48.8 GREY SAND STNS LOOS 50.3
1909868	8 19	Mar-89	649853 4870357	253.9	87.8 Fr	88.4 -0.9	33.5	32	120	80.8	4738 CT	WS DO	**MOE# 1909868** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS 25.9 GREY GRVL CLAY 27.4 GREY CLAY STNS 87.8 GREY SAND STNS LOOS 89.3
1909869	9 18	Apr-89	650208 4870562	264.9	87.8 Fr	88.7 -1.2	2.1	45	120	33.5	4738 CT	WS DO	**MOE# 1909869** 0.0 BRWN CLAY STNS MGRD 5.5 GREY CLAY STNS MGRD 19.8 GREY GRVL CLAY PCKD 22.9 GREY CLAY STNS MGRD 73.2 GREY CLAY SAND SOFT 80.8 GREY GRVL LOOS 81.1 GREY CLAY SAND SOFT 87.8 GREY SAND GRVL LOOS 89.9
1909891	9 18	May-89	649923 4870932	267.9	88.1 Fr	87.2 -0.9	4.3	41	150	64.0	1413 RC	WS DO	**MOE# 1909891** 0.0 BRWN CLAY SAND SOFT 7.0 GREY CLAY STNS SOFT 26.5 GREY SAND STNS HARD 33.5 GREY CLAY SAND SLTY 38.7 GREY CLAY STNS HARD 82.3 BLCK SAND STNS CGRD 88.1
1909892	9 18	May-89	650213 4870667	264.9	84.1 Fr	83.2 -0.9	3.0	136	180	15.2	1413 RC	WS DO	**MOE# 1909892** 0.0 BRWN CLAY PCKD 4.3 GREY CLAY STNS HARD 33.5 BLUE CLAY DNSE 45.1 GREY CLAY SAND LYRD 48.8 BLUE CLAY DNSE 76.5 GREY CLAY STNS SOFT 82.3 BLCK GRVL SAND LOOS 84.1
1909909	8	Apr-89	649848	255.1	86.0 Fr	84.7 -1.2	35.1	91	240	61.0	3903	WS	**MOE# 1909909**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	19		4870252								RC	DO	0.0 BRWN CLAY STNS HARD 6.4 GREY CLAY SILT LYRD 56.4 GREY CLAY SAND LYRD 75.9 GREY CLAY DNSE 84.7 GREY SAND STNS LYRD 86.0
1909953	8 19	Jul-89	649881 4870324	255.7	85.3 Fr	85.6 -1.8	30.5	91	180	85.3	5459 RC	WS DO	**MOE# 1909953** 0.0 BRWN CLAY SAND 6.1 GREY CLAY STNS 12.5 GRVL 14.6 GREY CLAY STNS 85.3 GRVL CMTD 87.5
1909963	9 19	May-89	649713 4870625	256.9			NR				5459 OTH	AS NU	**MOE# 1909963** 0.0 BRWN CLAY SAND 3.7 GREY CLAY STNS 14.6 GRVL 17.7 GREY CLAY STNS 22.9 GRVL CMTD 23.5 GREY CLAY 33.5
1909964	9 19	May-89	649716 4870625	256.9			NR				5459 OTH	AS NU	**MOE# 1909964** 0.0 BRWN CLAY SAND 4.0 GREY CLAY STNS 14.6 GRVL CGRD 17.7 GREY CLAY 23.8 GRVL CMTD 25.0 GREY CLAY STNS 49.1 GRVL 49.7 BLUE CLAY STNS 86.3 GRVL CMTD 86.9
1910038	8 18	Jul-89	650378 4870297	262.1	31.7 Fr	29.9 -1.8	22.3	45	60	22.9	1413 RC	WS DO	**MOE# 1910038** 0.0 BRWN CLAY SOFT 4.9 GREY CLAY STNS HARD 29.0 BRWN SAND FSND 31.7
1910046	8 18	Jun-89	650313 4870502	267.0	87.8 Fr	90.2 -1.2	41.1	36	180		4738 RC	WS DO	**MOE# 1910046** 0.0 BRWN CLAY STNS 5.5 GREY GRVL CLAY 12.8 GREY CLAY STNS 45.4 GREY CLAY SAND 51.8 GREY SAND CLAY PCKD 87.8 GREY SAND STNS LOOS 91.4
1910059	1 18	Jul-89	650053 4870502	267.9	90.8 Fr	89.6 -1.2	34.1	91	240	51.8	3903 RC	WS DO	**MOE# 1910059** 0.0 BRWN CLAY STNS HARD 7.3 GREY CLAY STNS LYRD 29.6 GREY CLAY DNSE 74.7 GREY CLAY STNS LYRD 87.8 GREY SAND CLAY LYRD 90.8
1910196	9 18	Aug-89	649923 4870607	262.1	75.6 Fr	79.6 -1.2	FLW	91	60		4738 RC	WS DO	**MOE# 1910196** 0.0 BRWN CLAY STNS 4.9 GREY CLAY GRVL 7.3 GREY CLAY SAND STNS 59.7 GREY CLAY MGRD 75.6 GREY FSND 78.6 GREY GRVL SAND LOOS 80.8
1910432	9 18	Jan-90	649855 4870786	262.4	76.8 Fr	78.3 -0.9	FLW	227	60		4738 RC	WS CO	**MOE# 1910432** 0.0 BRWN CLAY STNS 4.9 GREY CLAY GRVL 13.7 GREY SAND STNS 32.0 GREY SAND CLAY STNS 54.9 GREY CLAY STNS 76.8 GREY GRVL SAND LOOS 79.2
1910433	9 14	Jan-90	649929 4870499	260.0			NR				4738 -	- NU	**MOE# 1910433** 0.0
1910434	9 19	Jan-90	649713 4870622	256.9	48.2 Fr	42.1 -1.8	1.8	91	60		4738 RC	WS DO	**MOE# 1910434** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS 16.8 GREY GRVL SAND LOOS 19.2 GREY CLAY GRVL PCKD

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															24.4 GREY GRVL SAND LOOS 25.0 GREY CLAY STNS MGRD 42.7 GREY FSND 45.7 GREY CLAY STNS 48.2 GREY SAND MGRD 50.3
1910575	9 18	Apr-90	649983 4870837	267.9	22.9	Fr	25.3	-1.2	6.4	91	60		4738 RC	WS DO	**MOE# 1910575** 0.0 BRWN CLAY STNS 4.9 GREY CLAY STNS MGRD 9.8 GREY CLAY GRVL 22.9 GREY GRVL SAND LOOS 26.5
1910835	9 19	Sep-90	649862 4870443	256.0	72.8	Fr	42.7	-0.9	FLW	36	120		4738 RC	WS DO	**MOE# 1910835** 0.0 BRWN CLAY STNS 3.7 GREY CLAY STNS 11.0 GREY CLAY GRVL 15.2 GREY CLAY SNDS HARD 54.9 GREY CLAY STKY 72.8 GREY GRVL SAND LOOS 74.1
1910889	8 18	Nov-90	650263 4870472	266.1	88.4	Fr	90.2	-0.9	40.2	45	120	88.4	4738 RC	WS DO	**MOE# 1910889** 0.0 BRWN CLAY STNS 6.7 GREY CLAY STNS 34.1 GREY SAND CLAY 36.0 GREY CLAY SAND 39.6 GREY CLAY STKY 50.3 GREY SAND CLAY VERY 88.4 GREY SAND 91.1
1911180	8 19	May-91	649778 4870377	255.1	69.5	Fr	70.4	-0.9	33.5	91	60		4738 RC	WS DO	**MOE# 1911180** 0.0 BRWN CLAY STNS 2.4 GREY CLAY STNS 7.3 GREY CLAY GRVL 20.1 GREY CLAY STNS HARD 33.5 GREY CLAY STNS 42.7 GREY CLAY STKY 56.4 GREY CLAY STNS 67.7 GREY SAND CLAY 69.5 GREY GRVL SAND LOOS 71.3
1911285	8 19	Aug-91	649848 4870387	255.1	86.3	Fr	87.2	-0.9	36.9	55	180		4738 RC	WS DO	**MOE# 1911285** 0.0 BRWN CLAY STNS 4.3 GREY CLAY GRVL 13.7 GREY CLAY STNS HARD 52.7 GREY CLAY STKY 67.7 GREY GRVL CLAY HARD 69.5 GREY CLAY SAND SOFT 86.3 GREY GRVL SAND LOOS 88.1
1911726	8 19	Jul-93	650023 4870292	260.0	90.2	Fr	91.1	-0.9	41.1	91	120	91.4	4738 RC	WS DO	**MOE# 1911726** 0.0 BRWN CLAY STNS 3.4 GREY CLAY STNS MGRD 9.8 GREY CLAY STNS HARD 42.7 GREY CLAY FSND VERY 47.2 GREY CLAY STKY 79.2 GREY CLAY SOFT 90.2 GREY SAND STNS 92.0
1911820	9 19	Sep-93	649726 4870390	255.1	17.7	Fr	22.6	-0.9	0.3	45	120	6.1	4743 CT	WS DO	**MOE# 1911820** 0.0 BLCK TPSL 0.6 BRWN CLAY SAND 7.6 BLUE CLAY STNS 17.7 GREY SAND GRVL CLN 23.5
1911846	9 18	Nov-93	649703 4871487	264.9	77.1	Fr	77.7	-0.9	3.0	55	120	36.6	4738 RC	WS DO	**MOE# 1911846** 0.0 BRWN CLAY STNS 3.4 GREY CLAY STNS MGRD 12.2 GREY CLAY SAND LOOS 16.8 GREY CLAY STNS MGRD 62.8 GREY GRVL CLAY LOOS 63.7 GREY CLAY

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															SAND MGRD 77.1 GREY SAND LOOS 78.6
1911966	9 19	Mar-94	649831 4870675	261.8	16.8	Fr	22.3	-0.9	1.2	32	120	15.2	4743 CT	WS DO	**MOE# 1911966** 0.0 BLCK TPSL 0.6 BRWN TPSL 5.8 GREY CLAY STNS 16.8 BRWN GRVL CLAY LOOS 23.2 BRWN CLAY SAND LYRD 24.7
1912237	9 6	Nov-94	650258 4870604	267.0	79.9	Fr	85.3	-0.9	5.2	114	60	85.3	4738 RC	WS DO	**MOE# 1912237** 0.0 BRWN CLAY STNS 3.7 GREY CLAY STNS 14.6 GREY GRVL CLAY 17.7 GREY CLAY STNS 45.1 GREY CLAY STKY 79.9 GREY FSND 84.4 GREY GRVL SAND 86.3
1912829	9 18	Mar-96	650203 4870820	268.8	85.3	Fr	85.3	-0.9	5.5	77	120	85.3	5459 RC	WS DO	**MOE# 1912829** 0.0 BRWN CLAY SNDS 2.7 GREY CLAY SAND ROCK 26.5 GREY CLAY SNDS 49.4 GREY CLAY SLTY 63.1 GREY CLAY SNDS 83.5 GREY SAND CLAY CMTD 87.2
1912858	9 16	Apr-96	650489 4871637	274.9	10.1	Fr	13.4	-2.1	11.3	32	120	15.2	4738 RC	WS DO	**MOE# 1912858** 0.0 BRWN CLAY STNS 10.1 BRWN SAND STNS LOOS 15.5
1913715	9 16	Jun-98	650553 4871623	275.8	48.2	Fr	48.5	-0.9	16.8	45	90	45.7	5459 CT	WS DO	**MOE# 1913715** 0.0 BRWN CLAY 6.4 GREY CLAY STNS 14.0 BRWN CLAY SAND 18.3 BRWN SAND 18.9 GREY CLAY SOFT 20.4 GREY CLAY STNS HARD 40.2 GREY CLAY SAND HARD 48.2 GREY SAND CGRD 49.4
1913850	9 17	Oct-98	650427 4870665	267.9					NR	114	150	10.1	6874 CT	- DO	**MOE# 1913850** 0.0 BLUE CLAY 10.1
1913941	9 18	Feb-99	649877 4871518	268.8	7.6	Fr			6.1	114	210	11.3	6874 CT	WS DO	**MOE# 1913941** 0.0 BRWN SAND CLAY 11.3
1914373	9 18	Dec-99	649797 4871699	268.8	7.0	Fr			3.0	114	121	7.0	6874 CT	WS DO	**MOE# 1914373** 0.0 BRWN CLAY SNDY 7.0
1915595	9 18	Mar-02	649830 4871511	NR	17.1	Fr	17.4	-0.9	1.5	91	210	5.5	7108 RC	WS DO	**MOE# 1915595** 0.0 BLCK TPSL 0.3 BRWN SAND LOOS 1.8 GREY CLAY STNS SOFT 17.1
1915596	9 18	Mar-02	649830 4871511	NR	53.3	Fr	50.3	-1.5	37.8	45	180	38.1	7108 RC	WS DO	**MOE# 1915596** 0.0 BLCK TPSL 0.3 BRWN CLAY SAND 4.9 GREY CLAY SOFT 11.3 GREY GRVL CLAY PCKD 14.6 GRN CLAY STNS 41.1 GREY CLAY HARD 48.8 GREY SAND PCKD 53.3
1915618	9 18	Jan-01	649830 4871511	NR	21.9	Fr	20.1	-0.9	2.4	45	180	15.2	7108 RC	WS DO	**MOE# 1915618** 0.0 BLCK TPSL LOOS 0.3 BRWN CLAY SAND 5.2 GREY CLAY STNS SOFT 15.8 GREY CLAY MGVL 20.7

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															GREY GRVL SAND DNSE 21.9
1917025	10 16	Mar-04	650694 4870909	274.9	15.8	Fr	15.8	-1.2	NR	136	240	15.5	7108 CT	WS DO	**MOE# 1917025 TAG#A001169** 0.0 BRWN CLAY STNS SOFT 3.7 BRWN SAND CLAY LOOS 5.5 GREY CLAY STNS SOFT 14.0 BRWN SAND SILT LOOS 16.8 BRWN SAND PCKD 18.3
1917082	9 18	Apr-04	649830 4871511	NR	2.1	Fr			NR				6874 CT	WS DO	**MOE# 1917082** 0.0 UNKN 2.4
1917128	8 19	Jul-04	649891 4870425	NR	86.9	Fr	88.7	-0.9	NR	41	180		7108 RC	WS DO	**MOE# 1917128 TAG#A001180** 0.0 BLCK TPSL SOFT 0.3 BRWN CLAY STNS SOFT 3.7 GREY CLAY 13.1 BRWN SAND LOOS 14.0 GREY CLAY STNS 29.0 GREY CLAY HARD 41.1 GREY CLAY 68.0 GREY CLAY SOFT 87.5 BLCK SAND PCKD 88.7
1917170	9 19	Jun-04	649817 4870587	NR	31.1	Fr	30.8	-0.9	NR	109	60	27.7	1413 RC	WS DO	**MOE# 1917170 TAG#A006660** 0.0 BRWN CLAY SAND FILL 2.4 BRWN CLAY STNS HARD 4.9 GREY CLAY GRVL LYRD 20.7 GREY GRVL STNS LOOS 29.6 GREY SAND GRVL MGVL 31.1
1917296	9 4	Sep-04	649958 4871783	NR	21.0	Fr	22.6	-1.2	NR	45	180	11.9	7108 CT	WS DO	**MOE# 1917296 TAG#A015961** 0.0 BLCK TPSL SOFT SOFT 0.3 BRWN CLAY SAND SOFT 2.4 GREY CLAY STNS SOFT 6.4 GREY CLAY SILT LYRD 18.3 GREY CLAY 21.3 BRWN SAND STNS PCKD 22.6
1918164		Mar-06	649702 4870686	NR					NR				6463 -	AB -	**MOE# 1918164 TAG#A031507** 0.0
1918381	9 38	Aug-06	649731 4870551	NR					NR				4743 CT	AB -	**MOE# 1918381 TAG#A045895** 0.0 BRWN TPSL SNDY 6.7 BRWN SAND 7.9 GREY CLAY 14.6 GREY GRVL CLAY 26.8 BLCK 27.4 GREY CLAY SAND 51.8 RED CLAY 70.1 RED CLAY SAND 73.2 RED CLAY 88.4
1918382	9 38	Jul-06	649753 4870553	NR					NR				4743 CT	AB -	**MOE# 1918382 TAG#A045889** 0.0 BRWN TPSL SAND 5.2 GREY CLAY GRVL 28.3 GREY CLAY STNS 37.2 RED CLAY SAND 41.8 GREY CLAY STNS 56.4 GREY CLAY SAND 57.9 RED CLAY 68.6 BRWN GRVL 70.1 GREY CLAY STNS 93.0 GREY SHLE 111.3
1918433	9 38	Aug-06	649757 4870589	NR	17.1	Fr	16.2	-1.2	4.0	36	960	7.9	1413 RA	WS DO	**MOE# 1918433 TAG#A038599** 0.0 BRWN CLAY DNSE 6.1 GREY CLAY STNS HARD 11.0 BRWN GRVL CLAY CMTD 17.4 BRWN GRVL CLAY LYRD 23.2 GREY CLAY STNS DNSE 48.2 GREY SAND SILT SOFT 50.9 GREY CLAY DNSE 87.5 GREY SAND

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
															88.4
4601718	8 18	May-64	650389 4870361	266.7	14.6 5.5	Fr Fr			3.0	5			5412 BR	WS DO	**MOE# 4601718** 0.0 TPSL 0.3 BRWN CLAY 6.1 BLUE CLAY STNS 13.1 BLUE CLAY MSND 15.2
4601721	8 18	Apr-66	649987 4870451	262.1	6.7	Fr			0.6	27			5412 BR	WS CO	**MOE# 4601721** 0.0 TPSL 0.3 BRWN CLAY 3.0 BLUE CLAY 6.7 GRVL 7.9
4601722	8 18	Jun-67	649998 4870445	262.1	5.2	Fr			0.6				5420 BR	WS DO	**MOE# 4601722** 0.0 TPSL 0.3 BRWN CLAY 2.4 BLUE CLAY 5.2 CLAY MSND 6.1
4601771	9 16	May-58	650748 4870824	274.3	45.7	Fr	43.3	-2.4	35.1	32	60	36.6	1413 CT	WS DO	**MOE# 4601771** 0.0 PRDG 11.0 HPAN STNS 42.7 GRVL MSND 45.7
4601772	9 16	Jan-60	650520 4871615	271.3	55.2	Fr			18.3	77	300	30.5	2113 CT	WS DO	**MOE# 4601772** 0.0 TPSL 0.3 STNS CLAY 4.9 CLAY MSND GRVL 7.9 GREY CLAY GRVL 10.4 GRVL MSND 13.7 MSND 20.4 GRVL MSND 27.4 CLAY MSND GRVL 53.3 GRVL MSND 54.9 GRVL 55.2
4601775	9 17	Oct-62	650369 4870682	271.3	10.7	Fr			7.6				5420 BR	WS DO	**MOE# 4601775** 0.0 TPSL 0.3 YLLW CLAY 4.3 BLUE CLAY 9.1 BLUE CLAY STNS MSND 14.0
4601778	9 17	Oct-67	650443 4870676	271.3	3.0	Fr			3.0				3102 BR	WS DO	**MOE# 4601778** 0.0 TPSL 0.6 CLAY 3.0 GRVL CLAY 3.7 CLAY STNS 9.8
4601779	9 18	Oct-59	649883 4871119	265.2	29.9	Fr	29.6	-2.1	9.1	77	600	21.3	2113 CT	WS DO	**MOE# 4601779** 0.0 TPSL 0.6 BRWN CLAY GRVL 9.1 GREY CLAY GRVL 15.2 MSND 21.3 CLAY MSND GRVL 27.4 GRVL MSND 29.9 GRVL 31.7
4601780	9 18	Oct-59	649869 4871279	269.7	15.5	Fr			10.4	36	180	11.0	2113 CT	WS ST	**MOE# 4601780** 0.0 TPSL 0.6 BRWN CLAY GRVL 9.8 GREY CLAY GRVL 12.2 GRVL MSND 15.2 GRVL 15.5
4601781	9 18	Nov-59	649939 4870585	262.1	3.0	Fr			3.0	682			5412 BR	WS DO	**MOE# 4601781** 0.0 BRWN CLAY 3.0 QSND 5.5
4601782	9 18	Apr-62	650062 4870578	265.2	8.2 4.6	Fr Fr			1.8				5420 BR	WS PU	**MOE# 4601782** 0.0 TPSL 0.3 YLLW CLAY 1.5 BLUE CLAY MSND 3.7 BLUE CLAY MSND 8.2 MSND 8.5
4601783	9 18	Sep-62	650062 4870579	265.2	7.9	Fr			6.1				5420 BR	WS DO	**MOE# 4601783** 0.0 TPSL 0.3 YLLW CLAY 4.0 BLUE CLAY STNS 7.6 GRVL MSND 8.5
4601785	9	Oct-62	649798	265.2	5.8	Fr			4.3				5412	WS	**MOE# 4601785**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	18		4871249										BR	DO	0.0 BRWN CLAY 2.7 BLUE CLAY 3.7 BLUE CLAY MSND 4.3 BLUE CLAY 5.8 CSND 6.1 BLUE CLAY 6.7
4601786	9	Oct-62	649787	265.2	7.0	Fr			3.7				5412	WS	**MOE# 4601786**
	18		4871395		4.6	Fr							BR	DO	0.0 BRWN CLAY 3.0 BLUE CLAY 4.6 MSND 4.9 BLUE CLAY 7.0 MSND 7.6 BLUE CLAY MSND 7.9
4601787	9	Nov-62	649845	266.7	6.1	Fr			4.0				5420	WS	**MOE# 4601787**
	18		4871172										BR	DO	0.0 TPSL 0.3 YLLW CLAY 3.7 BLUE CLAY MSND 7.6
4601789	9	Jun-63	650138	270.4	6.1	Fr			3.0				5420	WS	**MOE# 4601789**
	18		4870688										BR	DO	0.0 TPSL 0.3 YLLW CLAY 2.7 BLUE CLAY STNS MSND 8.2
4601790	9	Jun-63	650353	270.4	6.1	Fr			4.3				5412	WS	**MOE# 4601790**
	18		4870618										BR	DO	0.0 BRWN CLAY 4.3 BLUE CLAY STNS 7.6
4601791	9	Oct-63	650085	265.2	6.1	Fr			3.0				5412	WS	**MOE# 4601791**
	18		4870578		3.0	Fr							BR	DO	0.0 BRWN CLAY 3.0 BRWN CLAY MSND 4.0 BLUE CLAY 6.1 BLUE CLAY MSND 6.7 BLUE CLAY 7.6
4601792	9	Dec-63	650204	265.2	8.5	Fr			5.5				5420	WS	**MOE# 4601792**
	18		4870567										BR	DO	0.0 TPSL 0.3 YLLW CLAY 3.7 BLUE CLAY 7.9 CLAY MSND 10.7
4601793	9	May-64	650148	266.7	4.6	Fr			4.6	9			5412	WS	**MOE# 4601793**
	18		4870579		3.0	Fr							BR	DO	0.0 TPSL 0.3 BRWN CLAY 2.7 FSND 3.4 BLUE CLAY FSND 4.6 BLUE CLAY STNS 6.4
4601795	9	Nov-66	649996	271.3	15.2	Fr			7.6	159			5412	WS	**MOE# 4601795**
	18		4871013										BR	DO	0.0 BRWN CLAY 7.6 BLUE CLAY 13.7 MSND 15.2
4601796	9	Dec-66	649976	264.6	7.6	Fr			NR	9			5412	WS	**MOE# 4601796**
	18		4870685										BR	DO	0.0 TPSL 0.3 BRWN CLAY STNS 3.7 BLUE CLAY STNS 7.6 FSND 7.9 BLUE CLAY 8.5
4601798	9	Oct-66	649945	269.7	8.2	Fr			3.7				5420	WS	**MOE# 4601798**
	18		4870956										BR	DO	0.0 TPSL 0.3 BRWN CLAY 3.0 BLUE CLAY STNS 7.6 GRVL STNS 8.2 CLAY 9.8
4601799	9	Nov-66	649914	266.7	10.4	Fr			0.6				5420	WS	**MOE# 4601799**
	18		4871571										BR	DO	0.0 TPSL 0.3 BRWN CLAY 3.0 BLUE CLAY 10.4 MSND 10.7
4601800	9	Mar-67	650278	268.2	11.3	Fr			4.6	14	330	15.8	2104	WS	**MOE# 4601800**
	18		4870593										CT	PU	0.0 TPSL 0.6 BRWN CLAY MSND 6.1 GREY CLAY MSND 11.3 GRVL CSND CLAY 16.5 GREY CLAY STNS 17.1
4601801	9	Sep-62	649821	257.6	6.7	Fr			4.3				5420	WS	**MOE# 4601801**

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	19		4870426										BR	DO	0.0 TPSL 0.3 YLLW CLAY 3.7 BLUE CLAY 6.1 MSND GRVL 7.6
4601802	9 19	Nov-62	649949 4870475	260.6	10.7	Fr			6.1	18			5420 BR	WS DO	**MOE# 4601802** 0.0 TPSL 0.3 YLLW CLAY 4.3 BLUE CLAY 10.7 BLUE MSND 11.3
4601803	9 19	Nov-62	649774 4870558	258.5	7.9	Fr			4.3				5420 BR	WS DO	**MOE# 4601803** 0.0 TPSL 0.3 YLLW CLAY 3.0 BLUE CLAY 7.3 CLAY MSND 9.4
4601804	9 19	Sep-65	649788 4870410	257.6	8.2	Fr			8.2	5			5412 BR	WS DO	**MOE# 4601804** 0.0 TPSL 0.3 BRWN CLAY 4.3 BLUE CLAY 8.2 GRVL 8.5 BLUE CLAY 10.7
4603716	9 19	Aug-68	649843 4870672	263.7	4.6	Fr	8.8	-0.3	4.6	14			3102 BR	WS PU	**MOE# 4603716** 0.0 TPSL 0.6 BLUE CLAY 4.6 GREY CLAY 9.1
4603726	9 18	Oct-68	650013 4870842	268.2	6.1	Fr	8.8	-0.6	4.9	9		9.1	2214 BR	WS DO	**MOE# 4603726** 0.0 BRWN CLAY 2.4 GREY MSND SILT 6.1 GREY CLAY STNS 9.4
4604059	9 18	Jun-69	649963 4870922	268.2	4.6	Fr			4.6	27	60	9.1	2214 BR	WS DO	**MOE# 4604059** 0.0 BLCK TPSL 0.3 BRWN CLAY 4.6 GRVL MSND 4.9 BLUE CLAY STNS 10.7
4604185	9 18	Oct-69	649933 4870682	263.7	6.1	Fr			6.1		60	8.5	2214 BR	WS DO	**MOE# 4604185** 0.0 BLCK TPSL 0.6 BRWN CLAY STNS 6.1 BLUE CLAY STNS 9.1
4604196	9 18	Sep-69	649813 4871462	268.2	6.7	Fr			6.7		60	9.1	2214 BR	WS DO	**MOE# 4604196** 0.0 BLCK TPSL 0.3 BRWN MSND 3.0 GREY CLAY STNS 4.6 BLUE CLAY GRVL 6.7 GREY CLAY STNS 9.8
4604332	9 19	Dec-69	649713 4871112	263.7	82.0 76.2 8.5 8.5	Fr Fr Fr Fr	81.7	-1.2	FLW	36	480	27.4	5420 CT	WS PU	**MOE# 4604332** 0.0 BRWN CLAY STNS 8.5 BRWN MSND 17.4 GREY CLAY GRVL 52.4 BLUE CLAY 76.2 BLUE CLAY SILT 78.3 BLUE CLAY 82.0 GREY MSND GRVL 82.9
4604374	9 18	Apr-70	649363 4871372	269.7	5.5	Fr	6.4	-0.6	NR				1621 CT	OW NU	**MOE# 4604374** 0.0 CLAY GRVL 5.5 MSND GRVL 7.9
4604375	9 18	Apr-70	649713 4871672	266.7	8.2	Fr	8.5	-1.8	1.2	1091	900	4.3	1621 CT	WS CO	**MOE# 4604375** 0.0 CLAY GRVL 8.2 MSND GRVL 10.4 CLAY MSND 10.7
4604789	8 18	Jul-71	650203 4870472	265.2	2.7	Fr			2.7	18	60	5.2	2214 BR	WS DO	**MOE# 4604789** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 2.7 MSND 3.0 GREY CLAY STNS 5.2
4604977	9	Nov-71	649913	260.6	18.3	-	20.4	-1.2	9.4	18	240	16.8	3903	WS	**MOE# 4604977**

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	18		4870772										RC	DO	0.0 BLCK CLAY STNS 1.8 YLLW CLAY STNS SAND 5.8 BLUE CLAY SAND SILT 18.3 GREY SAND 21.6
4605051	9 18	Oct-71	650003 4870597	259.1	4.6	Fr			4.6	18	240	8.2	2214 BR	WS DO	**MOE# 4605051** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 4.6 BRWN MSND 4.9 BLUE CLAY STNS 8.5
4605052	9 18	Oct-71	650048 4870622	112.8	4.6	Fr			4.6	9	60	7.6	2214 BR	WS DO	**MOE# 4605052** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 4.6 BRWN MSND 4.9 BRWN CLAY STNS 7.6
4605195	9 18	Sep-72	649888 4871497	268.2	25.9	Fr	22.9	-1.2	6.7	45	120	10.1	1413 RC	WS DO	**MOE# 4605195** 0.0 BRWN CLAY STNS 5.5 GREY CLAY SILT STNS 21.0 BLCK SAND 25.9
4605258	9 19	Apr-72	649843 4870452	259.1	17.4	Fr			FLW	36	240	18.3	2104 CT	WS DO	**MOE# 4605258** 0.0 TPSL 0.6 BRWN CLAY SAND 10.7 GREY GRVL SAND CLAY 17.4 LMSN 25.0
4605408	9 18	Aug-72	650013 4870722	266.7	7.6	Fr			2.7				5459 BR	WS DO	**MOE# 4605408** 0.0 TPSL 0.3 BRWN CLAY STNS 3.0 BLUE CLAY 6.1 BLUE CLAY SAND 7.6
4605419	9 19	Nov-72	649843 4870552	259.1	4.9	Fr			2.4				5459 BR	WS DO	**MOE# 4605419** 0.0 TPSL 0.6 BRWN CLAY STNS 4.9 BLUE CLAY SAND 7.3 BLUE CLAY 9.1
4605420	8 18	Nov-72	650013 4870462	262.1	7.6 5.5	Fr Fr			1.5				5459 BR	WS DO	**MOE# 4605420** 0.0 TPSL 0.3 BRWN CLAY STNS 3.7 BLUE CLAY SAND 5.5 GREY SAND 7.6
4605452	9 18	May-73	649933 4870622	263.7	2.7	Fr			2.7	18	60	6.7	2214 BR	WS DO	**MOE# 4605452** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 2.7 BRWN SAND 3.0 BLUE CLAY STNS 7.3
4606043	9 18	Jul-74	649917 4870707	263.7	76.2	Fr	77.4	-0.9	FLW	136	60	6.1	5459 CT	WS DO	**MOE# 4606043** 0.0 BRWN TPSL 0.6 BRWN CLAY STNS 7.6 BLUE CLAY 24.4 BLUE SAND CLAY 25.9 BLUE CLAY STNS 48.8 BLUE CLAY 70.1 BLUE CLAY 76.2 BLUE SAND GRVL 78.3
4606562	8 18	Jul-76	650063 4870432	262.1	4.6	Fr			4.6	23	60	6.1	2214 BR	WS DO	**MOE# 4606562** 0.0 BRWN CLAY STNS PCKD 3.7 BLUE CLAY SAND SLTY 9.1
4606656	9 18	Oct-76	649963 4870612	265.2	73.8	Fr	77.4	-0.9	FLW	455	10		5459 RC	WS DO	**MOE# 4606656** 0.0 BRWN CLAY SAND 6.1 BLUE CLAY 15.2 BLUE CLAY STNS 53.3 BLUE CLAY GRVL 66.1 BLUE CLAY 71.6 BLUE FSND 73.2 BLUE CLAY 73.8 BLUE SAND GRVL 82.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
7039052	9 26	Nov-06	649777 4870527	NR	43.0	Fr	44.5	-1.5	12.2	32	240	25.6	7108 RC	WS DO	**MOE# 7039052 TAG#A044311** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 5.5 GREY CLAY 26.2 GREY SAND CLAY 27.4 GREY CLAY BLDR 41.5 GREY SILT CLAY 42.7 BRWN SAND 46.0
7039065	9 26	Nov-06	649803 4870543	NR					NR				7108 -	AS -	**MOE# 7039065 TAG#A044312** 0.0
7048656	9 28	Jul-07	650117 4870610	NR	78.0	Fr	79.6	-1.2	2.4	41	120	9.4	7108 CT	WS DO	**MOE# 7048656 TAG#A055443** 0.0 BLCK TPSL SOFT 0.3 BRWN CLAY SAND SOFT 5.2 GREY CLAY STNS SOFT 9.1 GREY GRVL CLAY LOOS 9.4 GREY CLAY STNS PCKD 29.3 BRWN SAND PCKD 31.7 GREY CLAY STNS 47.5 GREY CLAY HARD 79.2 BRWN SAND PCKD 80.8
7054417	8 19	Nov-07	650161 4870356	NR	53.0	Fr			36.6	23	60	53.0	1413 RC	WS DO	**MOE# 7054417 TAG#A060292** 0.0 BRWN TPSL 0.3 BRWN TPSL SNDY STNS 5.5 GREY CLAY TILL STNS 17.4 GREY CLAY TILL HARD 51.2 GREY SAND FSND 53.6 GREY CLAY TILL HARD 54.3
7104841	8 19	Mar-08	649894 4870337	NR	70.1 9.1	Fr Fr			38.1	77	60	61.0	1413 RA	WS DO	**MOE# 7104841 TAG#A060328** 0.0 BRWN CLAY HARD 7.6 BRWN GRVL LOOS 9.1 GREY CLAY STNS STNS 69.2 GREY GRVL LOOS 70.1 GREY CLAY DNSE 86.0 GREY SAND STNS 89.3
7106761	8 19	Apr-08	649926 4870302	NR	70.1 9.1	Fr Fr			38.1	77	120	53.9	1413 RA	WS DO	**MOE# 7106761 TAG#A060329** 0.0 BRWN CLAY HARD 7.6 BRWN GRVL LOOS 9.1 GREY CLAY HARD 69.2 GREY GRVL LOOS 70.1 GREY CLAY DNSE 86.0 GREY SAND MGRD CLN 89.3
7108815	9 19	May-08	650223 4870650	NR					2.4				1413 -	AB -	**MOE# 7108815** 0.0
7129774	9 21	Jun-09	649871 4870939	NR	19.5	Fr	18.6	-0.9	4.6	91	60	12.2	1413 RC	WS DO	**MOE# 7129774 TAG#A081437** 0.0 BRWN CLAY HARD 6.1 BRWN SAND GRVL LOOS 6.7 GREY CLAY STNS HARD 15.2 GREY MSND 19.5
7133696	9 22	Sep-09	649468 4870909	NR	23.8	Fr	22.9	-0.9	3.7	45	60	15.2	1413 RC	WS DO	**MOE# 7133696 TAG#A087976** 0.0 BRWN CLAY HARD 6.1 GREY CLAY HARD 12.8 GREY FSND 14.6 GREY CLAY SOFT 21.3 GREY FSND 23.8
7143875	8 17	Apr-10	650414 4870629	NR	29.9	Fr	31.7	-1.5	22.9	45	96	24.4	7108 RC	WS DO	**MOE# 7143875 TAG#A087501** 0.0 BLCK TPSL MGRD 0.3 BRWN CLAY STNS MGRD 6.1 GREY CLAY BLDR MGRD 29.9 BRWN SAND PCKD 33.2
7143876	8	Apr-10	650408	NR	32.0	Un			213.1				7108	AQ	**MOE# 7143876**

MOECC Water Well Record Summary

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR mbgl	FND Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
	17		4870623										CT	DO	0.0 CLAY FILL 1.5 32.0 32.9
7150591	9	Jul-10	649960	NR	79.9	Fr	8.2	-13.7	3.0	45	120	4.0	7108	WS	**MOE# 7150591 TAG#A100790**
	24		4870735										RC	DO	0.0 BLCK TPSL SOFT 0.3 BRWN CLAY STNS MGRD 6.1 GREY CLAY BLDR MGRD 50.9 GREY CLAY STNS HARD 70.1 GREY CLAY SOFT 79.9 BRWN GRVL SAND PCKD 82.9

QUALITY:		TYPE:		USE:				METHOD :	
Fr	Fresh	WS	Water Supply	CO	Comercial	NU	Not Used	CT	Cable Tool
Mn	Mineral	AQ	Abandoned Quality	DO	Domestic	IR	Irrigation	JT	Jetting
Sa	Salty	AS	Abandoned Supply	MU	Municipal			RC	Rotary Conventional
Su	Sulphur	AB	Abandonment Record	PS	Public			RA	Rotary Air
--	Unrecorded	TH	Test Hole or Observation	ST	Stock	-	Not Recorded	BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD 27 or Field Verified.

APPENDIX D

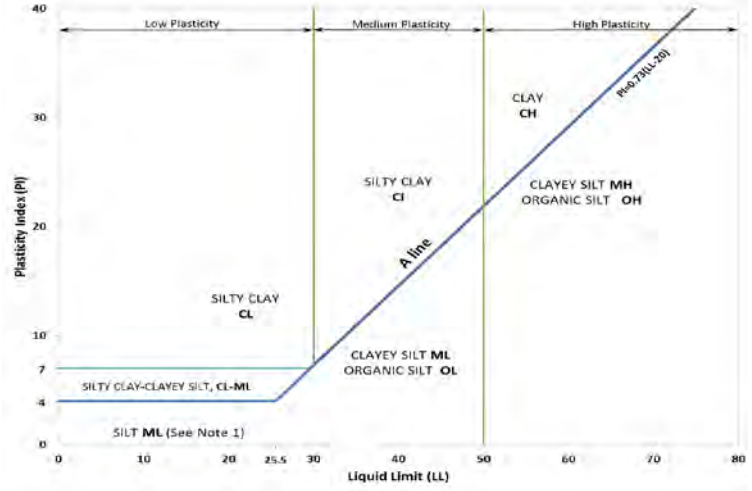
Record of Borehole Sheets, Grain Size Distribution Curves

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators					Organic Content	USCS Group Symbol	Primary Name
				Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)			
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
GS	Grab Sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size
TP	Thin-walled, piston – note size
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 - 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects.
2. Definition of compactness terms are based on SPT-'N' ranges as provided in Terzaghi, Peck and Mesri (1996) and correspond to typical average N_{60} values. Many factors affect the recorded SPT-'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), groundwater conditions, and grainsize. As such, the recorded SPT-'N' value(s) should be considered only an approximate guide to the compactness term. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation
w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-1

SHEET 1 OF 1

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		268.79							
0	TRACK MOUNTED POWER AUGER 150 mm Dia. Solid Stem Augers	TOPSOIL		0.00							
				268.49	1	50 DO	9				
		(ML) CLAYEY SILT and SAND, trace gravel, zones of fine to medium sand; brown to grey, (TILL); W~PL, stiff to hard.		0.30							
1					2	50 DO	13			MH	
					3	50 DO	27				
2					4	50 DO	28				
3					5	50 DO	70				
4											
					6	50 DO	47				
5				263.30							▽
		(ML) sandy SILT, trace gravel; brown, (TILL); non-cohesive, moist, very dense.		5.49							
6					7	50 DO	50/.1				
				262.24							
		(SM) SILTY SAND, trace gravel; brown; non-cohesive, wet, very dense.		6.55							
7											
					8	50 DO	50/.13				
				260.92							
8		END OF BOREHOLE		7.87							Water encountered during drilling at a depth of 1.5 m below ground surface, Feb. 23/12 Water level in open portion of borehole at a depth of 3.0 m below ground surface upon completion of drilling, Feb. 23/12 Borehole caved to a depth of 5.5 m below ground surface upon completion of drilling, Feb. 23/12
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-2

SHEET 1 OF 2

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		269.61							
0	TRACK MOUNTED POWER AUGER 200 mm Dia. Hollow Stem Augers	TOPSOIL		0.00 / 269.15	1	50 DO	6				
		(ML) CLAYEY SILT and SAND, trace gravel; brown, (TILL); W~PL, stiff to hard.		0.46							
1					2	50 DO	10				
					3	50 DO	21				
2					4	50 DO	36				Bentonite Seal
3					5	50 DO	62				
				265.80							
4		(SM) sandy SILT, trace gravel; brown to grey, (TILL); moist, very dense.		3.81	6	50 DO	69				
5				264.28							
		(ML) CLAYEY SILT, trace sand; grey; moist, hard.		5.33							
6					7	50 DO	44				
				262.75							Silica Sand Filter
7		(ML) CLAYEY SILT and SAND, trace gravel; grey, (TILL); W<PL, hard.		6.86							
					8	50 DO	73			MH	Water encountered during drilling at a depth of 5.2 m below ground surface, Feb. 23/12
8				261.53							
		END OF BOREHOLE		8.08							Water level in open borehole at a depth of 7.3 m below ground surface upon completion of drilling, Feb. 23/12
9											Water level in monitoring well measured at a depth of 0.93 m below ground surface, Mar. 5/12
10											Water level in

CONTINUED NEXT PAGE

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-2

SHEET 2 OF 2

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									monitoring well measured at a depth of 0.42 m below ground surface or at an elevation of 269.19 m above sea level, Jan. 23/18
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-3

SHEET 1 OF 1

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl; 10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		270.16							
0	TRACK MOUNTED POWER AUGER 150 mm Dia. Solid Stem Augers	TOPSOIL		0.00 / 269.88	1A						
		(ML) CLAYEY SILT, some sand, trace gravel; brown; W>PL, stiff.		0.28	1A	50 DO	14				
1					2	50 DO	9				
		(ML) CLAYEY SILT and SAND, trace gravel; brown, (TILL); W>PL, very stiff to hard.		268.79 / 1.37	3	50 DO	20				
2					4	50 DO	44				
		(SW) SAND, fine to medium, trace gravel; brown; wet, very dense.		267.26 / 2.90	5	50 DO	56				▽
3				266.35							
		(ML) sandy SILT, trace to some gravel; grey, (TILL); cohesive, moist, very dense.		3.81	6	50 DO	50/ .15				
4											
5											
6					7	50 DO	50/ .13				
7											
					8	50 DO	50/ .1				
8				262.08							
		END OF BOREHOLE		8.08							
9											
10											

Water encountered during drilling at a depth of 2.9 m below ground surface, Feb. 23/12

Water level in open portion of borehole at a depth of 2.4 m below ground surface upon completion of drilling, Feb. 23/12

Borehole caved to a depth of 2.9 m below ground surface upon completion of drilling, Feb. 23/12

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-4

BORING DATE: February 23, 2012

SHEET 1 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W WI) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		272.19							
0	TRACK MOUNTED POWER AUGER 150 mm Dia. Solid Stem Augers	TOPSOIL		0.00	1A						
				271.73	1B	50 DO	14				
		(ML) CLAYEY SILT, trace to some sand, trace gravel; brown; W>PL, firm.		0.46	2	50 DO	7				
1				270.82							
		(ML) CLAYEY SILT and SAND, some gravel; brown, (TILL); W>PL, stiff to hard.		1.37	3	50 DO	13				
2					4	50 DO	39				Bentonite Seal
3					5	50 DO	100				
4											
					6	50 DO	50/ .15				
5											
6					7	50 DO	50/ .13				
				265.33							Silica Sand Filter
7		(ML) SILT and SAND, trace gravel; brown; non-cohesive, wet, very dense.		6.86							
				264.32	8	50 DO	50/ .1			MH	
8		END OF BOREHOLE		7.87							Water encountered during drilling at a depth of 1.5 m below ground surface, Feb. 23/12 Water level in open borehole at a depth of 1.8 m below ground surface upon completion of drilling, Feb. 23/12 Water level in monitoring well at a depth of 4.92 m below ground surface, Mar. 5/12
9											
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-4

SHEET 2 OF 2

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									Water level in monitoring well measured at a depth of 2.17 m below ground surface or at an elevation of 270.02 m above sea level, Jan. 23/18
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-5

BORING DATE: February 23, 2012

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		271.49							
0	TRACK MOUNTED POWER AUGER 150 mm Dia. Solid Stem Augers	TOPSOIL		0.00 / 271.24							
		(ML) CLAYEY SILT, trace to some sand; dark brown, organic stained, (REWORKED TILL); W>PL, firm.		0.25 / 270.88	1A / 1B	50 DO	6				
		(ML) CLAYEY SILT and SAND, trace gravel; brown to grey, (TILL); W~PL, very stiff.		0.61							
1					2	50 DO	14				
					3	50 DO	14				
2					4	50 DO	17				
3					5	50 DO	18				
4					6	50 DO	29				
5				266.16							
		(ML) CLAYEY SILT, some sand, trace gravel; grey, (TILL-LIKE); W>PL, stiff.		5.33							
6					7	50 DO	12				
				264.63							
7		(ML) CLAYEY SILT and SAND, trace gravel, grey, (TILL); W~PL, hard.		6.86							▽
					8	50 DO	61				
8				263.41							
		END OF BOREHOLE		8.08							Water encountered during drilling at a depth of 7.3 m below ground surface, Feb. 23/12 Water level in open borehole at a depth of 7.3 m below ground surface upon completion of drilling, Feb. 23/12
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-6

BORING DATE: February 23, 2012

SHEET 1 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		267.03							
0	TRACK MOUNTED POWER AUGER 200 mm Dia. Hollow Stem Augers	TOPSOIL		0.00	1A	50 DO	10				
				266.57	1B						
		(ML) CLAYEY SILT, trace to some sand, trace gravel; brown; W~PL, stiff.		0.46	2	50 DO	8				
1											
				265.66							
		(ML) CLAYEY SILT and SAND, trace gravel; brown, (TILL); W>PL, very stiff to hard.		1.37	3	50 DO	22				
2					4	50 DO	25				
3					5	50 DO	55				Bentonite Seal
				263.07							
4		(ML) sandy SILT, trace gravel; brown to grey, (TILL); cohesive, moist, very dense.		3.96	6	50 DO	50/ .1				
5											
6					7	50 DO	50/ .1				
7											
					8	50 DO	50/ .13				
8				258.50							
		(SW) SILTY SAND, fine to medium; grey; wet, very dense.		8.53							Silica Sand Filter
9					9	50 DO	50/ .13			MH	
				257.43							
		END OF BOREHOLE		9.60							Water encountered during drilling at a depth
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH12-6

SHEET 2 OF 2

BORING DATE: February 23, 2012

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									of 5.2 m below ground surface, Feb. 23/12 Water level in open borehole at a depth of 7.3 m below ground surface upon completion of drilling, Feb. 23/12 Water level in monitoring well at a depth of 5.56 m below ground surface, Mar. 5/12 Water level in monitoring well measured at a depth of 5.84 m below ground surface or at an elevation of 261.19 m above sea level, Jan. 23/18
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: DW

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-7

BORING DATE: October 05, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		274.95							
0		TOPSOIL		0.00							
		(ML) sandy SILT; brown; non-cohesive, moist, compact to loose		0.15	1	SS	14				
1					2	SS	9				
				273.58							
		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w<PL to w~PL, stiff to hard		1.37	3	SS	9				
2					4	SS	30				
3					5	SS	23			MH	Bentonite Seal
4		- Auger grinding at 4.3 m			6	SS	21				
5											
6		- Grey at 6.3 m			7	SS	33				
7											Silica Sand Filter and Screen
					8	SS	19				
8				266.87							
		END OF BOREHOLE		8.08							
9		NOTE: 1. Borehole dry upon completion of drilling, Oct. 5/2017. 2. Groundwater level measured in monitoring well at a depth of 5.44 m on October. 26/2017. 3. Water level in monitoring well measured at a depth of 4.66 m below ground surface or at an elevation of 270.29 m above sea level, Jan. 23/18.									
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-8

BORING DATE: October 05, 2017

SHEET 1 OF 2

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		267.86							
0		TOPSOIL		0.00	1A						
				267.48		SS	17				
		(ML) sandy SILT, trace gravel; brown, oxidation staining; non-cohesive, moist, compact		0.38	1B						
					2A						
1				266.82							Bentonite Seal
		(ML-CL/CL) SILT and SAND to sandy SILTY CLAY, trace to some gravel; brown, oxidation staining (TILL); cohesive, w>PL to w~PL, stiff to hard		1.04	2B	SS	15				
					3	SS	11				
2					4	SS	18				
3		- Auger grinding at 2.9 m			5	SS	31				
4											
					6	SS	43				
5											
6											Silica Sand Filter and Screen
		- Grey and sand inclusion at 6.3 m			7	SS	32				
7											
					8	SS	22				
8				259.78							
		END OF BOREHOLE		8.08							
		NOTES:									
		1. Groundwater encountered at a depth of 4.5 m during drilling on Oct. 5 /2017.									
9		2. Groundwater measured in open borehole at a depth of 5.1 m upon completion of drilling on Oct. 5/2017.									
		3. Groundwater level measured in monitoring well at a depth of 4.09 m on Oct. 26/2017.									
		4. Water level in monitoring well									
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-8

SHEET 2 OF 2

BORING DATE: October 05, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		measured at a depth of 2.60 m below ground surface or at an elevation of 265.26 m above sea level, Jan. 23/18									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-9

BORING DATE: October 05, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		272.19							
0		TOPSOIL		0.00 / 271.99	1A	SS	12				
		(ML) sandy SILT, trace gravel; brown, oxidation staining; non-cohesive, moist, compact		0.20	1B						
				271.50							
		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w>PL to w<PL, stiff to hard		0.69							
1					2	SS	12				
2					3	SS	13				
					4	SS	11				
3											Bentonite Seal
					5	SS	15				
4											
					6	SS	13				
5											
6											
					7	SS	18				
7		- Silty sand inclusion at 7 m									Silica Sand Filter and Screen
					8	SS	57				
8				264.11							
		END OF BOREHOLE		8.08							
9		NOTES: 1. Borehole dry upon completion of drilling, Oct. 5/2017. 2. Groundwater level measured in monitoring well at a depth of 7.31 m on Oct. 30/2017. 3. Water level in monitoring well measured at a depth of 5.95 m below ground surface or at an elevation of 266.24 m above sea level, Jan. 23/18.									
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-10

SHEET 1 OF 1

BORING DATE: October 05, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		276.98							
0		TOPSOIL		0.00							
				276.75							
		(ML) sandy SILT, trace gravel; brown; non-cohesive, moist, compact		0.23	1	SS	11				
				276.29							
		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w~PL to w<PL, stiff to hard		0.69	2	SS	18				
1											
					3	SS	13				
2											
					4	SS	25				
3											
					5	SS	42				
4											
					6	SS	55				
5		- Auger grinding at 5.5 m									
					7	SS	40				
6				270.88							
		END OF BOREHOLE		6.10							
		NOTE:									
		1. Borehole dry upon completion of drilling, Oct. 5/2017.									
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-11

SHEET 1 OF 2

BORING DATE: October 05, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		269.14							
0		TOPSOIL		0.00							
		(ML) sandy SILT, trace gravel; brown to dark brown, oxidation staining, rootlets; non-cohesive, moist, compact		0.10	1	SS	17				
1					2	SS	16				
				267.77							
		(ML-CL/ML) SILT and SAND to sandy SILT, some gravel; brown, oxidation staining (TILL); cohesive, w>PL to w<PL, stiff to hard		1.37	3	SS	7				
2					4	SS	15				
3					5	SS	31				Bentonite Seal
		- Wet inclusion at 3.3 m									
4											
					6	SS	79/ 0.23			MH	
5											
6											
					7	SS	99/ 0.25				
		- Auger grinding at 6.7 m									Silica Sand Filter and Screen
7											
					8	SS	94/ 0.25				
8				261.11							
		END OF BOREHOLE		8.03							
		NOTES:									
		1. Groundwater encountered at a depth of 3.0 m during drilling on Oct. 5 /2017.									
9		2. Groundwater measured in open borehole at a depth of 3.6 m upon completion of drilling on Oct. 5/2017.									
		3. Groundwater level measured in monitoring well at a depth of 6.91 m on Oct. 26/2017.									
		4. Water level in monitoring well									
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-11

SHEET 2 OF 2

BORING DATE: October 05, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
10		*--- CONTINUED FROM PREVIOUS PAGE ---*									
		measured at a depth of 7.14 m below ground surface or at an elevation of 262.00 m above sea level, Jan. 23/18.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-12

SHEET 1 OF 1

BORING DATE: October 06, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		271.00							
0		TOPSOIL		0.00							
		(ML) sandy SILT, trace gravel; brown, oxidation staining, rootlets; non-cohesive, moist, compact		0.15	1	SS	15				
				270.31							
1		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w<PL to w~PL, stiff to very stiff		0.69	2	SS	12				
					3	SS	18				
2		- Auger grinding at 2.1 m			4	SS	20				
3					5	SS	22				
4											
5					6	SS	22				
6					7	SS	23				
				264.90							
		END OF BOREHOLE		6.10							
7		NOTE: 1. Borehole dry upon completion of drilling on Oct. 6/2017.									
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-13

SHEET 1 OF 1

BORING DATE: October 06, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		272.32							
0		TOPSOIL		0.00 / 272.12							
		(ML) SILT, some sand; dark brown; non-cohesive, moist, loose		0.20 / 271.63	1	SS	7				
1		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w>PL to w~PL, firm to hard		0.69	2	SS	10				
2					3	SS	6				
					4	SS	17				
3					5	SS	21				
4											
5		- Auger grinding at 5.2 m - Grey at 5.3 m			6	SS	34				
6					7	SS	11				
		END OF BOREHOLE		266.22 / 6.10							
7		NOTE: 1. Borehole dry upon completion of drilling on Oct. 6/2017.									
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-14

SHEET 1 OF 1

BORING DATE: October 04, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ●, rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		278.67							
0		TOPSOIL		0.00	1A						
		(ML) SILT, some sand, trace gravel; light brown to brown, rootlets; non-cohesive, moist, loose to compact		0.15	1B	SS	9				
1					2	SS	11				
				276.89	3A	SS	16				
		(ML-CL/ML) SILT and SAND to sandy SILT, some gravel; brown, oxidation staining (TILL); cohesive, w<PL, very stiff to hard		1.78	3B						
2					4	SS	36			MH	
3					5	SS	33				Bentonite Seal
4											
		- Sand inclusion at 4.8 m and 6.4 m			6	SS	63				
5											
6					7	SS	64				
7		- Auger grinding at 7.3 m									Silica Sand Filter and Screen
				270.91	8	SS	50/ 0.14				
		END OF BOREHOLE		7.76							
8		NOTE:									
		1. Borehole dry upon completion of drilling on Oct. 4/2017.									
		2. Monitoring well dry on Oct. 30/2017.									
9		3. Monitoring well was dry on Jan. 23/18.									
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-15

SHEET 1 OF 1

BORING DATE: October 10, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		276.53							
		TOPSOIL		0.00 / 276.33							
		(ML) SILT, some sand; light brown, rootlets; non-cohesive, moist, compact		0.20 / 275.84	1	SS	14				
1		(ML-CL) SILT and SAND, trace to some gravel; brown, oxidation staining (TILL); cohesive, w~PL to w<PL, stiff to hard - Auger grinding at 1.2 m, 4.5 m and 5.5 m		0.69	2	SS	13				
					3	SS	23				
2					4	SS	49				
3					5	SS	42				
		- Sand inclusion at 3.4 m									
4											
					6	SS	65				
5											
					7	SS	50/ 0.13				
				270.61							
6		END OF BOREHOLE		5.92							
		NOTE: 1. Borehole dry upon completion of drilling on Oct. 10/2017.									
7											
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-16

SHEET 1 OF 2

BORING DATE: October 06, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp W Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		275.11							
0		TOPSOIL		0.00 / 274.91							
		(ML) SILT, some sand; brown, rootlets; non-cohesive, moist, compact		0.20 / 274.42	1	SS	17				
		(ML-CL/ML) SILT and SAND to sandy SILT, some gravel; brown, oxidation staining (TILL); cohesive, w~PL to w<PL, very stiff to hard		0.69	2	SS	21				
1											
					3	SS	15				
2											
					4	SS	31				
		- Auger grinding at 2.7 m, 4.5 m, 5.1 m and 6.9 m									Bentonite Seal
3					5	SS	50/ 0.05				
4											
					6	SS	50/ 0.10				
5											
6											
					7	SS	98/ 0.25			MH	
											Silica Sand Filter and Screen
7		- Grey at 7 m			8	AS					
					9	SS	50/ 0.13				
				267.21							
8		END OF BOREHOLE		7.90							
		NOTES:									
		1. Groundwater encountered at a depth of 6.0 m during drilling on Oct. 6/2017.									
		2. Groundwater measured in open borehole at a depth of 7.1 m upon completion of drilling on Oct. 6/2017.									
9		3. Groundwater measured in monitoring well at a depth of 2.47 m on Oct. 30/2017.									
		4. Water level in monitoring well measured at a depth of 1.25 m below									
10		*CONTINUED NEXT PAGE*									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-16

SHEET 2 OF 2

BORING DATE: October 06, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		ground surface or at an elevation of 273.86 m above sea level, Jan. 23/18.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-17

SHEET 1 OF 1

BORING DATE: October 10, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕; Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		273.59							
0		TOPSOIL		0.00 / 273.39							
		(ML) sandy SILT, trace gravel; brown, trace rootlets; non-cohesive, moist, compact		0.20 / 272.90	1	SS	20				
1		(ML-CL) SILT and SAND, some gravel; brown, oxidation staining (TILL); cohesive, w~PL to w<PL, stiff to hard		0.69	2	SS	13				
					3	SS	10				
2					4	SS	29				
3					5	SS	13				
4											
					6	SS	52				
5		- Auger grinding at 5.5 m									
					7	SS	87				
6		END OF BOREHOLE		267.49 / 6.10							
7		NOTES: 1. Groundwater encountered at a depth of 4.0 m during drilling on Oct. 10/2017. 2. Groundwater measured in open borehole at a depth of 4.8 m upon completion of drilling on Oct. 10/2017.									
8											
9											
10											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

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PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-18

SHEET 1 OF 2

BORING DATE: October 10, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		270.47							
		TOPSOIL		0.00 / 270.27							
		(ML) sandy SILT; light brown, rootlets; non-cohesive, moist, compact		0.20 / 269.78	1	SS	10				
1		(ML-CL/ML) SILT and SAND to sandy SILT, some gravel; brown to grey, oxidation staining (TILL); cohesive, w~PL to w<PL, stiff to hard		0.69	2	SS	12				
					3	SS	20				
2					4	SS	27				Bentonite Seal
3					5	SS	18				
4											
					6	SS	57				
5		- Auger grinding at 5.1 m and 6.6 m									
6		- Sand inclusion at 6 m			7	SS	86/ 0.28				Silica Sand Filter and Screen
7											
					8	SS	15				
8				262.39							
		END OF BOREHOLE		8.08							
		NOTES:									
9		1. Groundwater encountered at a depth of 6.0 m during drilling on Oct. 10/2017.									
		2. Groundwater measured at a depth of 5.7 m upon completion of drilling on Oct. 10/2017.									
		3. Groundwater level measured in monitoring well at a depth of 2.18 m on Oct. 30/2017.									
10		4. Water level in monitoring well									
		CONTINUED NEXT PAGE									

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-18

SHEET 2 OF 2

BORING DATE: October 10, 2017

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	SOIL PROFILE: STRATA PLOT	SOIL PROFILE: ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. + Q - ● / rem V. ⊕ U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp — W — Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		measured at a depth of 0.82 m below ground surface or at an elevation of 269.65 m above sea level, Jan. 23/18.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RV

CHECKED: AJH

PROJECT: 12-1186-0047

LOCATION: SEE FIGURE 2

RECORD OF BOREHOLE: BH17-19

BORING DATE: October 10, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 760mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat V. +, rem V. ⊕, Q - ●, U - ○) (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}) / WATER CONTENT PERCENT (Wp, W, Wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		GROUND SURFACE		268.56							
		TOPSOIL		0.00 / 268.36							
		(ML) sandy SILT, trace gravel; dark brown to brown, rootlets; non-cohesive, moist, compact to loose		0.20	1	SS	10				
1				267.49	2A						
		(ML-CL) SILT and SAND, some gravel; brown to grey, oxidation staining (TILL); cohesive, w~PL to w<PL, firm to hard		1.07	2B	SS	4				
					3	SS	13			MH	
2					4	SS	50				
3		- Grey at 2.9 m			5	SS	47				Bentonite Seal
4		- Sand inclusion at 4.0 m			6	SS	50/ 0.13				
5		- Auger grinding at 5.2 m									
6					7	SS	50/ 0.10				
7				260.84	8	SS	50/ 0.10				Silica Sand Filter and Screen
		END OF BOREHOLE		7.72							
8		NOTES:									
		1. Groundwater encountered at a depth of 6.0 m during drilling on Oct. 10/2017.									
		2. Groundwater measured at a depth of 6.2 m upon completion of drilling on Oct. 10/2017.									
9		3. Groundwater level measured in monitoring well at a depth of 1.16 m on Oct. 26/2017.									
		4. Water level in monitoring well measured at a depth of 0.22 m above ground surface or at an elevation of 268.78 m above sea level, Jan. 23/18									
10											

DEPTH SCALE

1 : 50

GOLDER

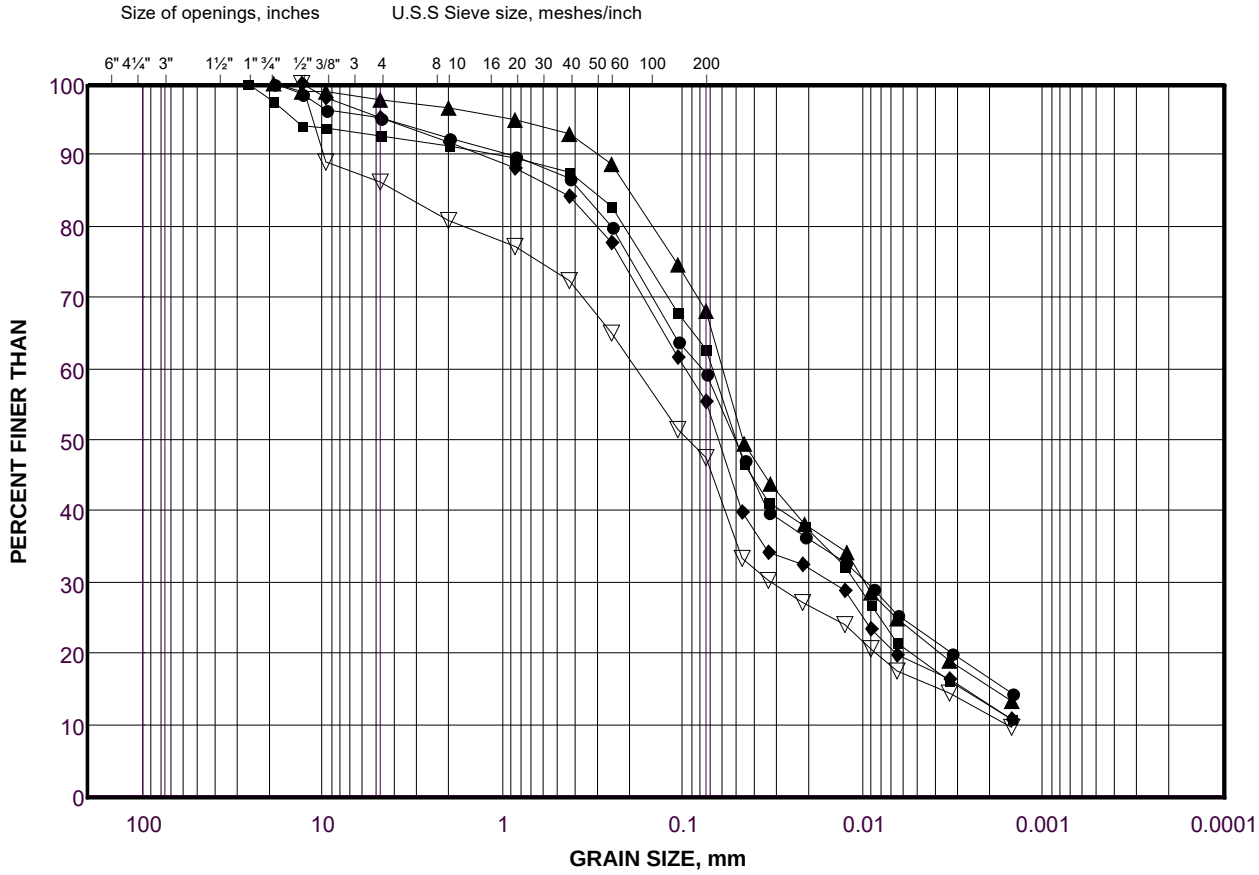
LOGGED: RV

CHECKED: AJH

GRAIN SIZE DISTRIBUTION

(ML-CL) SILT and SAND TILL

FIGURE 3



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	17-19	3	1.7
■	17-14	4	2.5
◆	17-7	5	3.2
▲	17-11	6	4.8
▽	17-16	7	6.3

Project Number: 12-1186-0047

Checked By: AJH

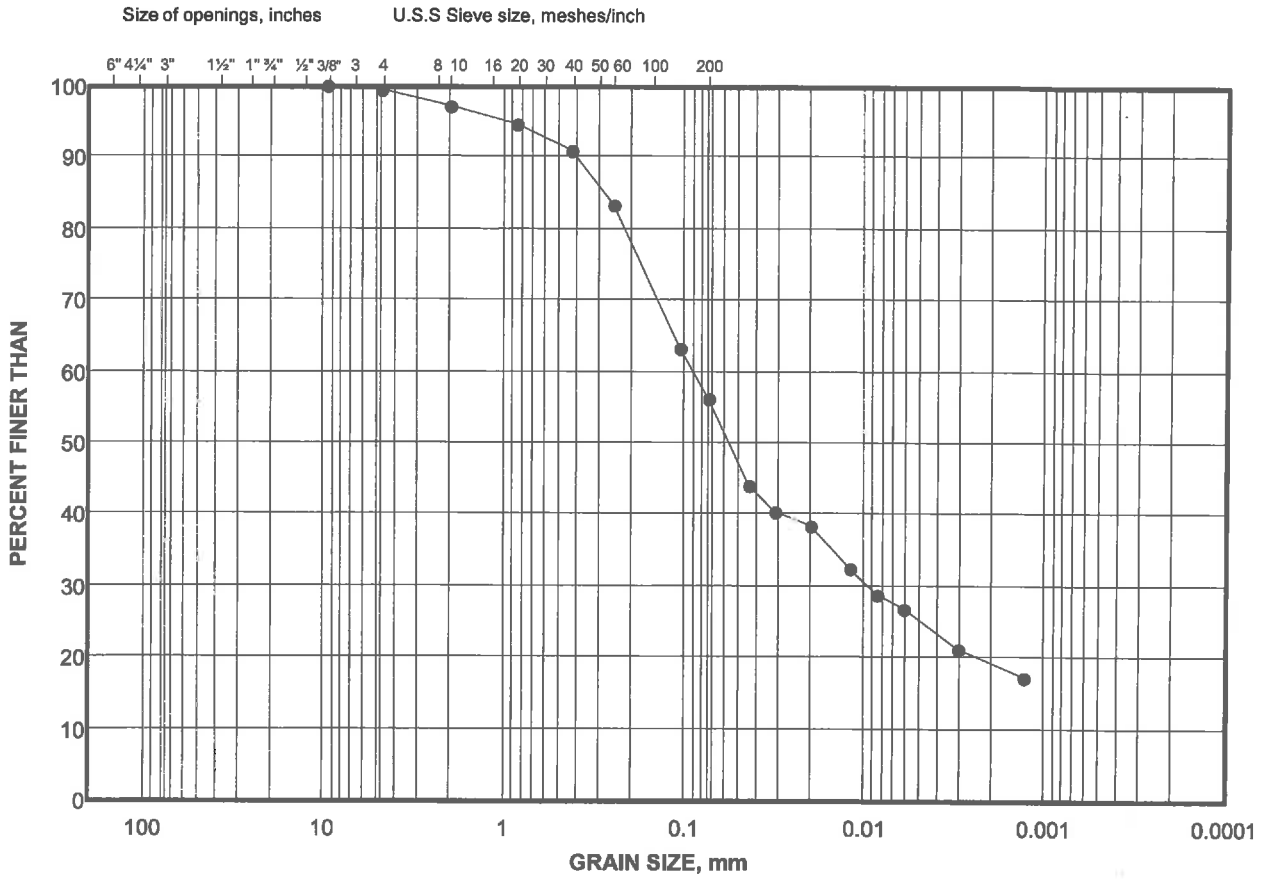
Golder Associates

Date: 03-Nov-17

GRAIN SIZE DISTRIBUTION

MTO LS-702

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	17-11	2	

Project Number: 12-1186-0047

Checked By: _____

Golder Associates

Date: 19-Dec-17

SOIL SIEVE AND HYDROMETER ANALYSIS

Initial weight of dry sample = 76.71(g)
Weight measured for back sieving = 50.11(g)
Weight of Sample for Hydrometer = 50.11(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
150mm	0.00	0.00	150.00	100.0
125mm	0.00	0.00	125.00	100.0
75mm	0.00	0.00	75.00	100.0
63mm	0.00	0.00	63.00	100.0
53mm	0.00	0.00	53.00	100.0
37.5mm	0.00	0.00	37.50	100.0
26.5mm	0.00	0.00	26.50	100.0
19.0mm	0.00	0.00	19.00	100.0
13.2mm	0.00	0.00	13.20	100.0
9.5mm	0.00	0.00	9.50	100.0
4.75mm	0.39	0.51	4.75	99.5
2.00mm	2.20	2.36	2.00	97.1
PAN	74.49	97.13	0.00	0.0

HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
850µm	1.35	2.62	0.85	94.5
425µm	3.14	3.47	0.43	91.0
250µm	7.13	7.73	0.25	83.3
106µm	17.45	20.00	0.11	63.3
75µm	21.05	6.98	0.08	56.3

HYDROMETER

	DATE (MM\DD\YYYY)	TIME (HH:MM:SS)
Started :	18/12/2017	9:04:00 AM
Finished :	19/12/2017	8:20:00 AM

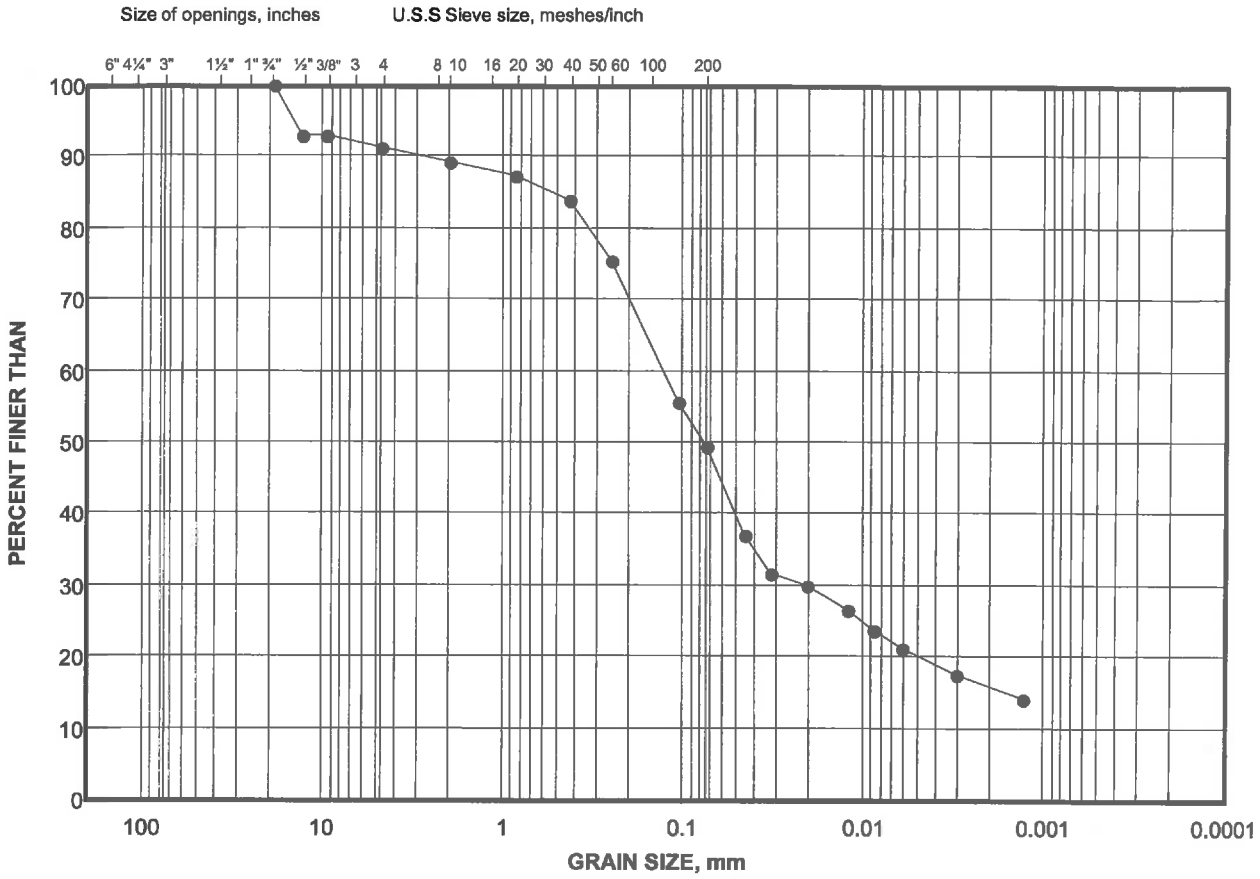
Elapsed Time (min)	HYDROMETER READING	DEFLOCCULANT CORRECTION	WATER TEMP (°C)	CORRECTED HYDROMETER READING	PARTICLE SIZE (mm)	% PASSING	PLOT
1.00	28.00	5.0	23.0	23.00	0.0443	44.1	True
2.00	26.00	5.0	23.0	21.00	0.0318	40.3	True
5.00	25.00	5.0	23.0	20.00	0.0202	38.4	True
15.00	22.00	5.0	22.9	17.00	0.0119	32.6	True
30.00	20.00	5.0	22.7	15.00	0.0086	28.8	True
60.00	19.00	5.0	22.4	14.00	0.0061	26.9	True
250.00	16.00	5.0	21.6	11.00	0.0031	21.1	True
1440.00	14.00	5.0	22.4	9.00	0.0013	17.3	True

Project Number	12-1186-0047	Depth	
Project Task	1000	Units	Metric
Borehole Number	17-11	Testing Date	19/12/2017 1:38:11 PM
Sample Number	2	Tested By	Sieve - LB, Hydrometer - RC
Checked By		LabID	17-2862

Golder Associates

GRAIN SIZE DISTRIBUTION
MTO LS-702

FIGURE



LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	17-14	2B	

Project Number: 12-1186-0047

Checked By: _____

Golder Associates

Date: 19-Dec-17

SOIL SIEVE AND HYDROMETER ANALYSIS

Initial weight of dry sample = 129.11(g)
Weight measured for back sieving = 50.14(g)
Weight of Sample for Hydrometer = 50.14(g)

COARSE SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
150mm	0.00	0.00	150.00	100.0
125mm	0.00	0.00	125.00	100.0
75mm	0.00	0.00	75.00	100.0
63mm	0.00	0.00	63.00	100.0
53mm	0.00	0.00	53.00	100.0
37.5mm	0.00	0.00	37.50	100.0
26.5mm	0.00	0.00	26.50	100.0
19.0mm	0.00	0.00	19.00	100.0
13.2mm	9.15	7.09	13.20	92.9
9.5mm	9.15	0.00	9.50	92.9
4.75mm	11.38	1.73	4.75	91.2
2.00mm	13.71	1.80	2.00	89.4
PAN	115.10	89.38	0.00	0.0

HYDROMETER BACK SIEVING

SIEVE	CUM. MASS RETAINED (g)	% RETAINED	PARTICLE SIZE(mm)	% PASSING
850µm	1.12	2.00	0.85	87.4
425µm	3.11	3.55	0.43	83.8
250µm	7.89	8.52	0.25	75.3
106µm	18.97	19.75	0.11	55.6
75µm	22.44	6.19	0.08	49.4

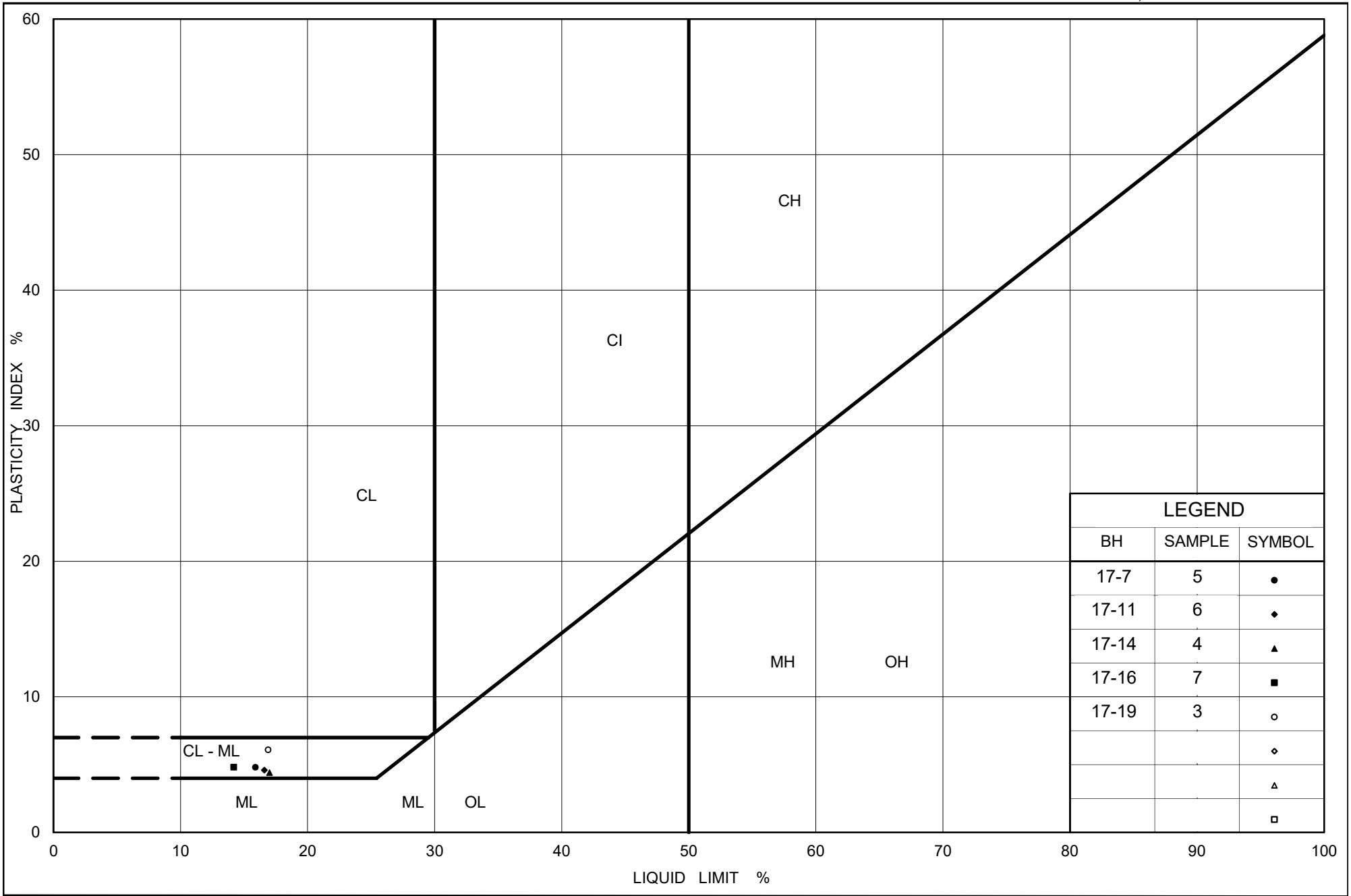
HYDROMETER

	DATE (MM\DD\YYYY)	TIME (HH:MM:SS)
Started :	18/12/2017	8:37:00 AM
Finished :	19/12/2017	8:16:00 AM

Elapsed Time (min)	HYDROMETER READING	DEFLOCCULANT CORRECTION	WATER TEMP (°C)	CORRECTED HYDROMETER READING	PARTICLE SIZE (mm)	% PASSING	PLOT
1.00	26.00	5.0	22.5	21.00	0.0452	37.1	True
2.00	23.00	5.0	22.5	18.00	0.0326	31.8	True
5.00	22.00	5.0	22.5	17.00	0.0208	30.0	True
15.00	20.00	5.0	22.4	15.00	0.0122	26.5	True
30.00	18.50	5.0	22.4	13.50	0.0087	23.8	True
60.00	17.00	5.0	22.3	12.00	0.0062	21.2	True
250.00	15.00	5.0	21.6	10.00	0.0031	17.7	True
1419.00	13.00	5.0	22.4	8.00	0.0013	14.1	True

Project Number	12-1186-0047	Depth	
Project Task	1000	Units	Metric
Borehole Number	17-14	Testing Date	19/12/2017 1:42:52 PM
Sample Number	2B	Tested By	Sieve - LB, Hydrometer - RC
Checked By		LabID	17-2863

Golder Associates



Golder Associates

PLASTICITY CHART
(ML-CL) SILT and SAND TILL

Figure No.	4
Project No.	12-1186-0047
Checked By:	AJH

Well Record

Ontario — Ministry of the Environment and Climate Change

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☑ Imperial

W… Tag#: A 222232 …Below)

A222232

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Geranium	Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Brock Rd	Pickering		

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Claremont	Ontario	

UTM Coordinates Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3 1 7	6 5 0 3 0 7	4 8 7 1 0 4 7		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Clay			0	80
Brown	Sand	Clay + stones	mixed	80	204
Grey	Clay			204	302
Brown	Sand	stones	mixed	302	317

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	120	Bentseal	45.82 ft^3

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☑ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify ____

Well Use

☑ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☑ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	steel	188	0	310

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5½	Steel	12	310	316

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh	Untested	Other, specify
316	☐	☑	☑	
	☐	☐	☐	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	316	6½
0	120	10½

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify ____

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

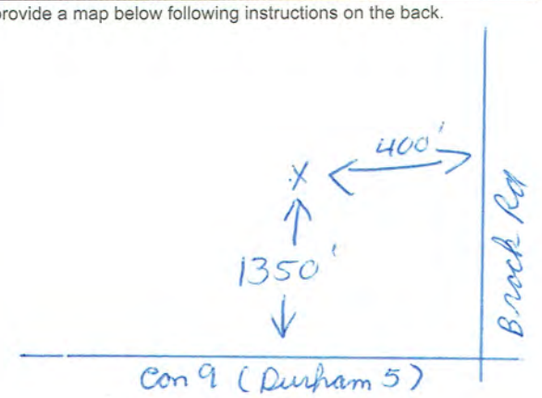
Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	42			
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson Water Wells	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Prince Mark

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2535		2018 03 28

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2018 03 27	2018 03 27

Ministry Use Only

Audit No. Z265555

Received

0506E (2014/11)

Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: A222231

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Geranium	Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Brock Rd	Pickering	17	9

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Claremont	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	650155	4871335		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Clay			0	25
Grey	Clay	Stones		25	84
Grey	clay	Sand Brown	Mixed	84	98
Grey	clay			98	292
Grey	sand			292	306

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	120	Bentonite	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☑ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☑ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6"	steel	.188	0	297

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6"	SS	12	297	304

Status of Well

☑ Water Supply
☐ Replacement Well
☑ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth	Kind of Water	
292 (m/ft) ☐ Gas	☑ Fresh ☑ Untested ☐ Other, specify	
Water found at Depth (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	
Water found at Depth (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
304	0	6 1/2
120	0	10 1/4

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

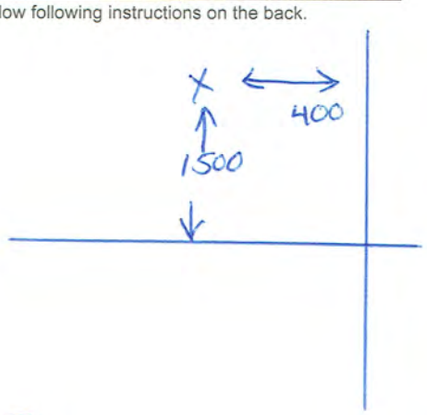
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



well #2

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson's Water Wells LTD	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address
ON		

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Mark Prince

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2535	Peter Wilson	2018 03 29

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2018 03 14

Ministry Use Only

Audit No. Z265561

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Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A22235

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Geranium	Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Brock Rd	Pickering	17	9

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Claremont	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	650165	4871307		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Clay			0	26
Grey	Clay	Stones		26	80
Grey	Clay			80	300
Grey	sand	&	mixed	300	312
Grey	sand	Stones		312	317
Grey	gravel	Clay		317	320

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	100	Bentonite	

Method of Construction

☐ Cable Tool ☐ Diamond
☑ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* ____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☑ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	steel	.188	0	310

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
6	55	14	317	310

Status of Well

☐ Water Supply
☐ Replacement Well
☑ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth	Kind of Water	
312 (m/ft) ☐ Gas	☑ Fresh ☑ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0"	317	6"
0	100	10"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ____

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

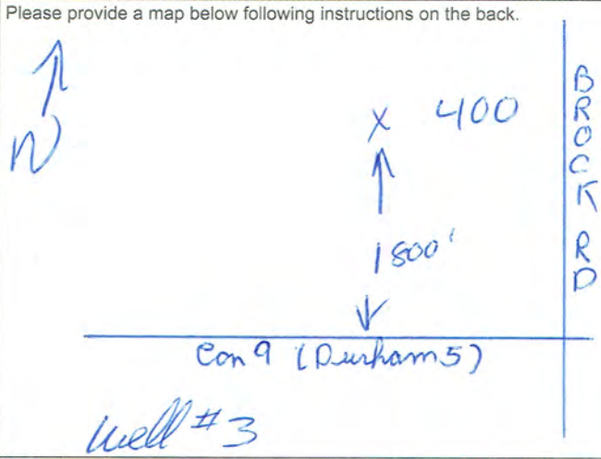
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson Water Wells Ltd	5459

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
13787 Hwy 48	Stouffville		L4A3B3	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
	Mark Prince

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
2535		2018 03 29

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2018 03 07

Ministry Use Only

Audit No. Z265562

Received

0506E (2014/11)

Ministry's Copy

TW-1

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: Tag#: A 222217

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Geranium	Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
3190 Steeles Ave E, Ste 300	Markham	ON	L3R 1G9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Old Brock Rd	Pickering	18	9

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Claremont	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	649938	4871406		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	clay			0	35
Brown	sand		fine	35	38
Grey	clay			38	53
Grey	silt			53	60
Grey	clay			60	70
Brown	gravel	stones		70	113
Grey	clay			113	265
Grey	sand		med - coarse	265	293
Grey	clay			293	295

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(m³/ft³)*
0	120	Benseal	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☑ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used ☑ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter *(cm/in)*	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness *(cm/in)*	Depth (m/ft) From	To
6 1/4	steel	188	0	289

Construction Record - Screen

Outside Diameter *(cm/in)*	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5 1/2	steel	14	289	292

Status of Well

☑ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
292	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter *(cm/in)*
0	120	10"
0	292	6 1/4

Results of Well Yield Testing

After test of well yield, water was: ☑ Clear and sand free ☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

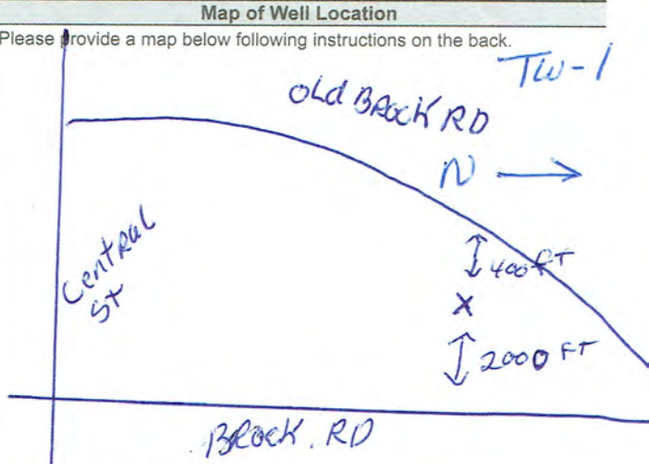
Well production *(l/min / GPM)*

Disinfected? ☑ Yes ☐ No

	Draw Down Time *(min)*	Draw Down Water Level *(m/ft)*	Recovery Time *(min)*	Recovery Water Level *(m/ft)*
Static Level	32			
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Chlorinated 200 PPM 17 hrs 50 PPM

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilsons Water Wells Ltd	5459

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
13787 Hwy 48	Stouffville	on	L4A-3B3	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
	mark Prince			2018 02 28

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2017 02 26

Ministry Use Only

Audit No. Z265549

Received

0506E (2014/11)

Ministry's Copy

TW-4

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: Tag#: A 222218

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Geranium	Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
3190 Steeles Ave E, Ste 300	Markham	ON	L3R 1G9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Old Brock Rd	Pickering	18	9

County/District/Municipality	City/Town/Village	Province	Postal Code
Durham	Claremont	Ontario	

UTM Coordinates Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3 17	650003	4871197		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand	gravel	mixed	0	1
Grey	Clay			1	70
Brown	gravel	Stones		70	108
grey	Clay			108	128
grey	Clay	Silt	mixed	128	160
gray	Clay			160	278
Brown	Sand	Stones	mixed	278	295

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	120	Benseal	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☑ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6¼	Steel	.155	0	287

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
5½	SSteel	14	287	294
	SS	12	294	297

Status of Well

☑ Water Supply
☐ Replacement Well
☑ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth	Kind of Water	
297 (m/ft) ☐ Gas	☑ Fresh ☑ Untested ☐ Other, specify	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	120	10"
0	297	6¼

Results of Well Yield Testing

After test of well yield, water was:
☑ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 150

Pumping rate (l/min / GPM): 12

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 36.3

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft): 150

Recommended pump rate (l/min / GPM): 20

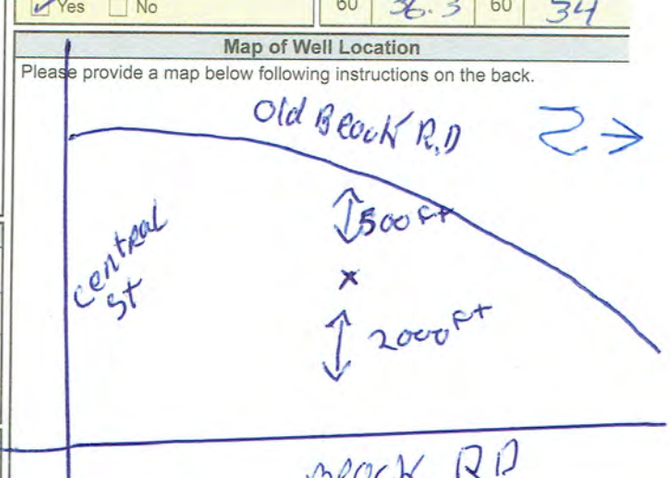
Well production (l/min / GPM): 50+

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	34		
1	36	1	35.8
2	36.3	2	34
3	36.2	3	34
4	36.2	4	34
5	36.2	5	34
10	36.3	10	34
15	36.3	15	34
20	36.3	20	34
25	36.3	25	34
30	36.3	30	34
40	36.3	40	34
50	36.3	50	34
60	36.3	60	34

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Chlorinated 200 PPM ~ 20 hr 50 PPM

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Wilson's Water Wells Ltd	5459

Business Address (Street Number/Name)	Municipality
13787 Hwy 48	Stouffville

Province	Postal Code	Business E-mail Address
ON	L4A 3B3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
	Mark Prince

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
		2018 02 28

Well owner's information package delivered: ☐ Yes ☑ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2018 02 24

Ministry Use Only

Audit No. Z265550

Received

0506E (2014/11)

Ministry's Copy

APPENDIX E

Hydraulic Testing

12-1186-0047

Table E-1: Groundwater Depths and Elevations

Proposed Residential Subdivision, Claremont, City of Pickering, Ontario

Location	Ground Surface	Top of Pipe Elev.	2-Mar-2012		5-Mar-2012		2-Apr-2012		26,30-Oct-17		9-Nov-2017		14-Nov-2017		18-Jan-2018		23-Jan-2018	
	(masl)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)
BH12-2	269.61	270.59	1.00	268.61	1.01	268.60	1.18	268.43	3.27	266.34	3.28	266.34	3.27	266.34	1.57	268.04	0.42	269.19
BH12-4	272.19	273.20	4.43	267.76	4.85	267.34	4.52	267.67	7.24	264.95	7.43	264.76	-	-	2.63	269.56	2.17	270.02
BH12-6	267.03	267.93	5.57	261.46	5.60	261.43	5.57	261.46	5.91	261.12	5.89	261.14	5.92	261.11	5.89	261.14	5.84	261.19
BH17-7	274.95	275.91	-	-	-	-	-	-	5.53	269.42	5.71	269.24	5.75	269.20	4.59	270.36	4.66	270.29
BH17-8	267.86	268.82	-	-	-	-	-	-	4.14	263.73	4.03	263.84	4.08	263.78	2.68	265.18	2.60	265.26
BH17-9	272.19	273.12	-	-	-	-	-	-	7.36	264.83	7.55	264.64	7.61	264.58	6.43	265.76	5.95	266.24
BH17-11	269.14	269.97	-	-	-	-	-	-	7.01	262.13	7.11	262.03	7.13	262.01	7.24	261.90	7.14	262.00
BH17-14	278.67	279.62	-	-	-	-	-	-	dry	<271.07	dry	<271.07	dry	<271.07	dry	<271.07	dry	<271.07
BH17-16	275.11	275.91	-	-	-	-	-	-	2.62	272.50	2.63	272.48	2.59	272.52	1.35	273.76	1.25	273.86
BH17-18	270.47	271.31	-	-	-	-	-	-	2.27	268.20	1.79	268.68	1.76	268.71	1.05	269.42	0.82	269.65
BH17-19	268.56	269.55	-	-	-	-	-	-	1.23	267.33	0.66	267.90	0.46	268.10	***-0.09***	***268.65***	-0.22	268.78

Notes:

1. Elevations based on survey coordinates provided by Rady-Pentek Edwards

masl = metres above sea level

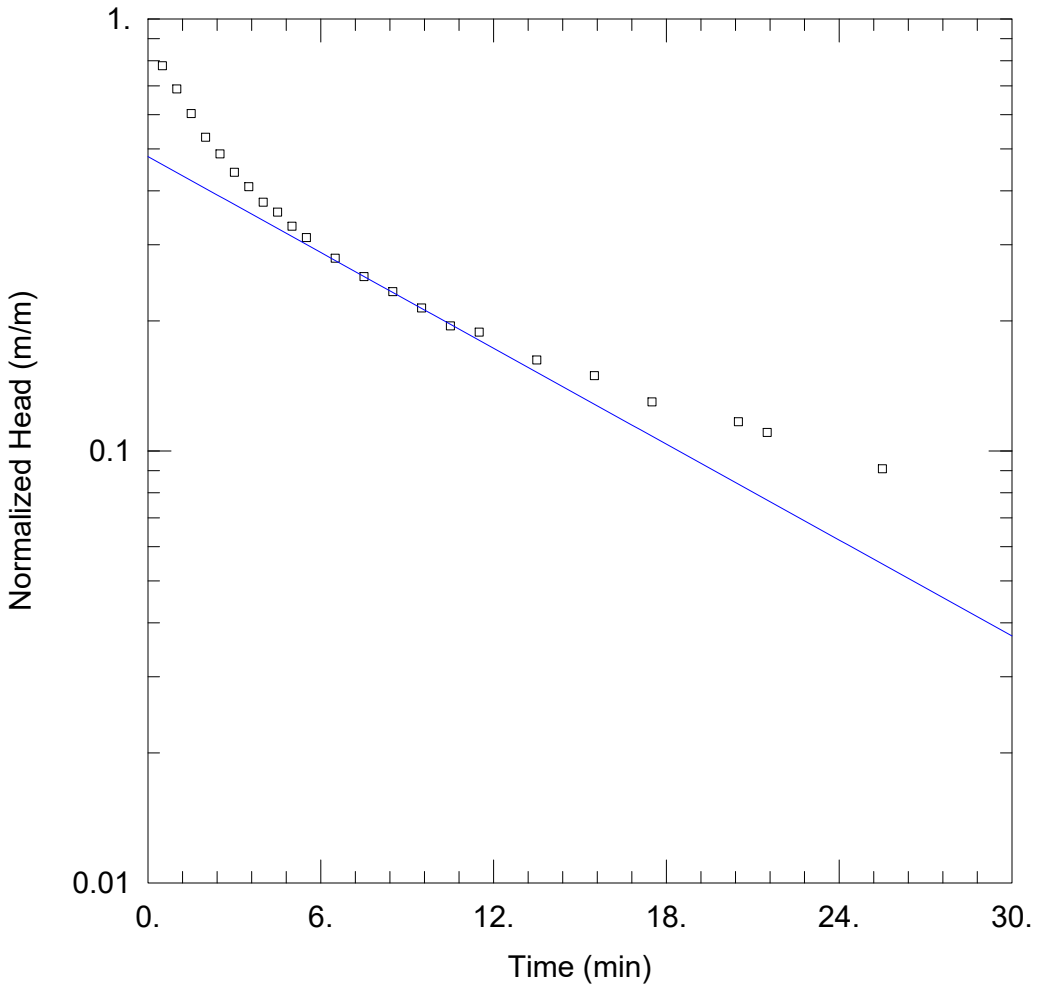
mbgs = metres below ground surface

- = no data available

0.73 = data in ***bold italicized*** font represents ice surface

Entered by: ZK

Checked by: CMK



WELL TEST ANALYSIS

Data Set: C:\...\12-1186-0047_MW2.aqt
Date: 02/16/18 Time: 15:59:17

PROJECT INFORMATION

Company: Golder Associates Ltd.
Client: Geranium Developments
Project: 12-1186-0047
Location: Claremont, Ontario
Test Well: MW-2
Test Date: April 2, 2012

AQUIFER DATA

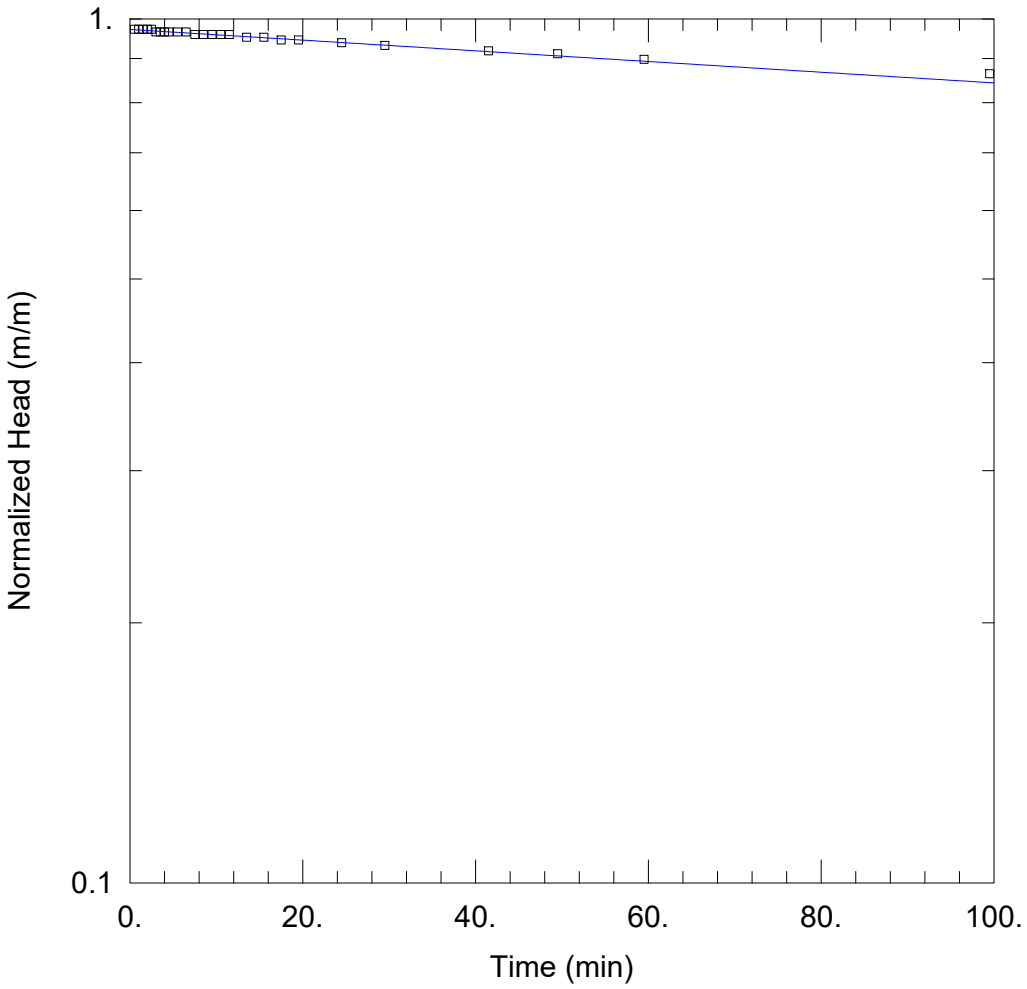
Saturated Thickness: 6.5 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-2)

Initial Displacement: -1.54 m
Total Well Penetration Depth: 6.5 m
Casing Radius: 0.026 m
Static Water Column Height: 6.5 m
Screen Length: 2.1 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 6.64E-5 cm/sec
y0 = -0.7394 m



WELL TEST ANALYSIS

Data Set: C:\...\12-1186-0047_MW4.aqt
Date: 02/16/18 Time: 15:59:47

PROJECT INFORMATION

Company: Golder Associates Ltd.
Client: Geranium Developments
Project: 12-1186-0047
Location: Claremont, Ontario
Test Well: MW-4
Test Date: April 2, 2012

AQUIFER DATA

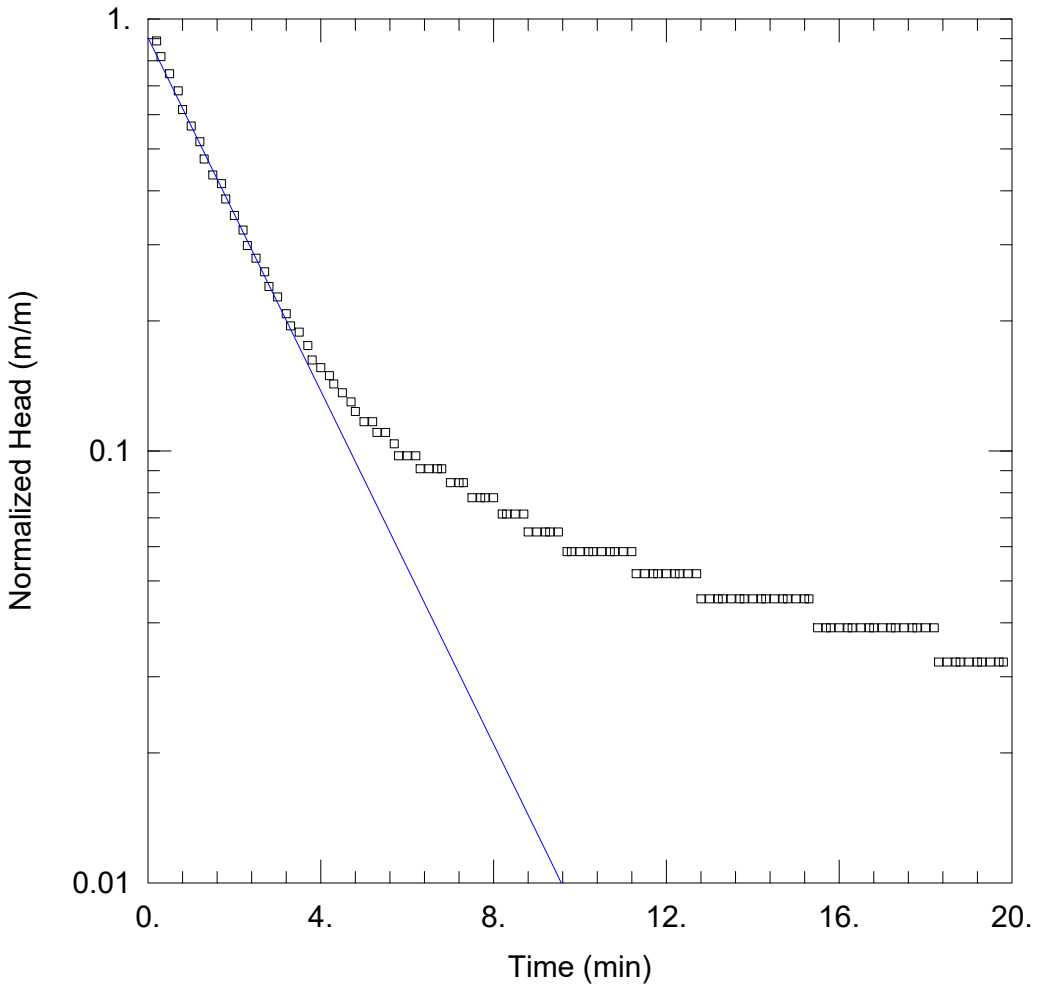
Saturated Thickness: 1.01 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

Initial Displacement: -1.47 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.034 m
Static Water Column Height: 3. m
Screen Length: 2.1 m
Well Radius: 0.075 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.354E-6 cm/sec
y0 = -1.429 m



WELL TEST ANALYSIS

Data Set: C:\...\12-1186-0047_BH12-6.aqt
Date: 02/16/18 Time: 16:00:30

PROJECT INFORMATION

Company: Golder Associates Ltd.
Client: Geranium Corporation
Project: 12-1186-0047
Location: Calremont, Ontario
Test Well: BH12-6
Test Date: March 5, 2012

AQUIFER DATA

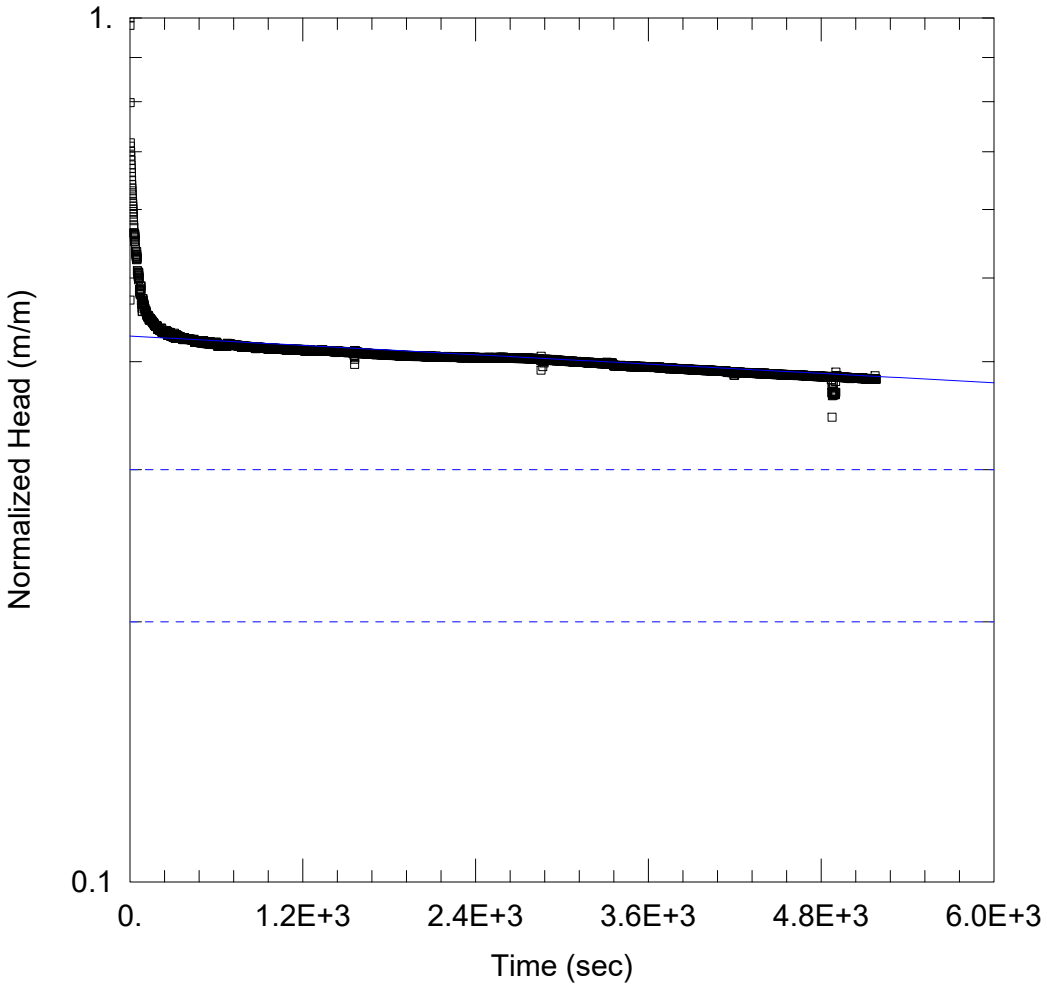
Saturated Thickness: 1.07 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH12-6)

Initial Displacement: -1.54 m
Total Well Penetration Depth: 2.2 m
Casing Radius: 0.026 m
Static Water Column Height: 4.04 m
Screen Length: 2.2 m
Well Radius: 0.1 m

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 5.172E-6 m/sec
y0 = -1.393 m



WELL TEST ANALYSIS

Data Set: C:\Users\pmenkveld\Desktop\1211860047_Claremont\1211860047_Claremont_MW17-7.aqt
Date: 11/01/17 Time: 14:26:39

PROJECT INFORMATION

Company: Golder Associates Ltd.
Project: 1211860047
Location: Claremont
Test Well: MW17-7
Test Date: October 26, 2017

AQUIFER DATA

Saturated Thickness: 2.19 m Anisotropy Ratio (Kz/Kr): 1.

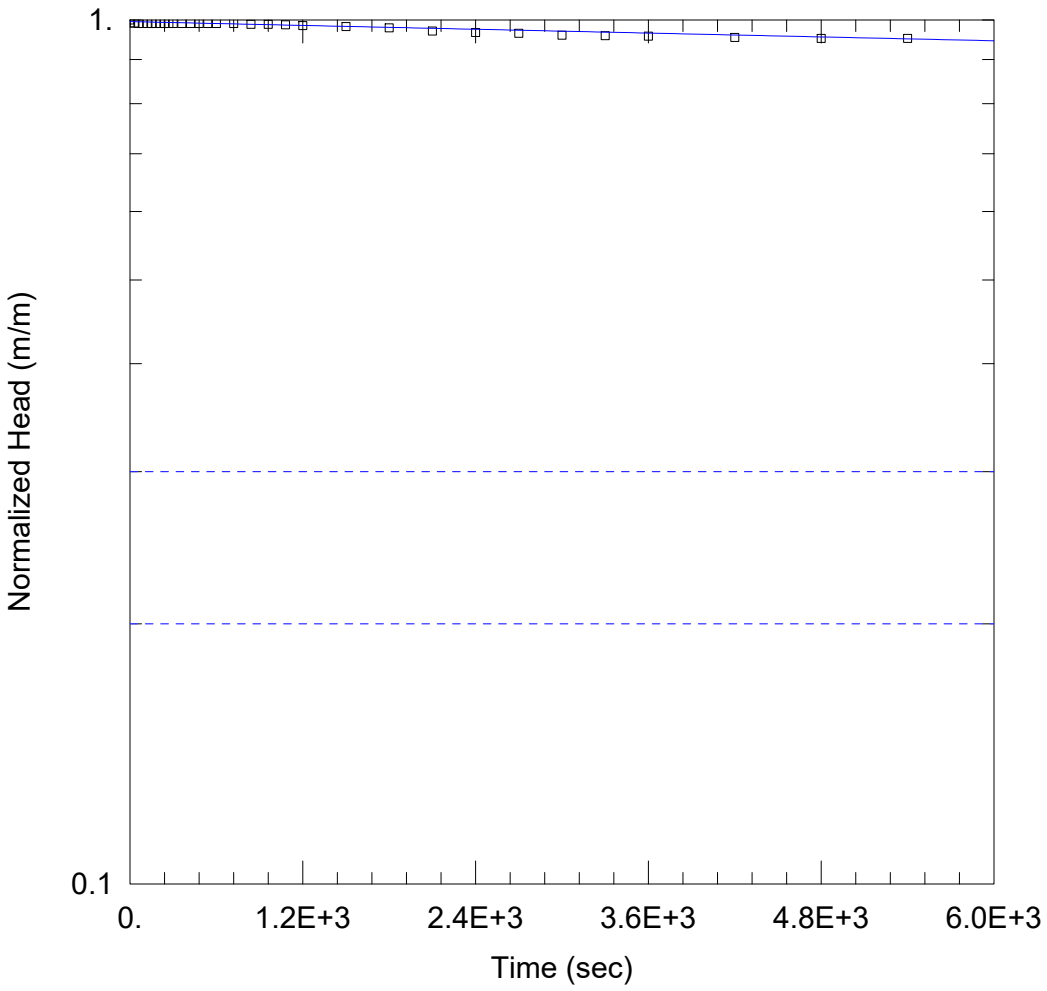
WELL DATA (MW17-7)

Initial Displacement: 1.514 m
Total Well Penetration Depth: 2.19 m
Casing Radius: 0.02625 m
Static Water Column Height: 2.19 m
Screen Length: 1.53 m
Well Radius: 0.055 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.272E-8 m/sec
y0 = 0.6485 m



WELL TEST ANALYSIS

Data Set: C:\...\1211860047_Claremont_MW17-11.aqt
Date: 11/01/17 Time: 15:36:43

PROJECT INFORMATION

Company: Golder Associates Ltd.
Project: 1211860047
Location: Claremont
Test Well: MW17-11
Test Date: October 26, 2017

AQUIFER DATA

Saturated Thickness: 1.05 m Anisotropy Ratio (Kz/Kr): 1.

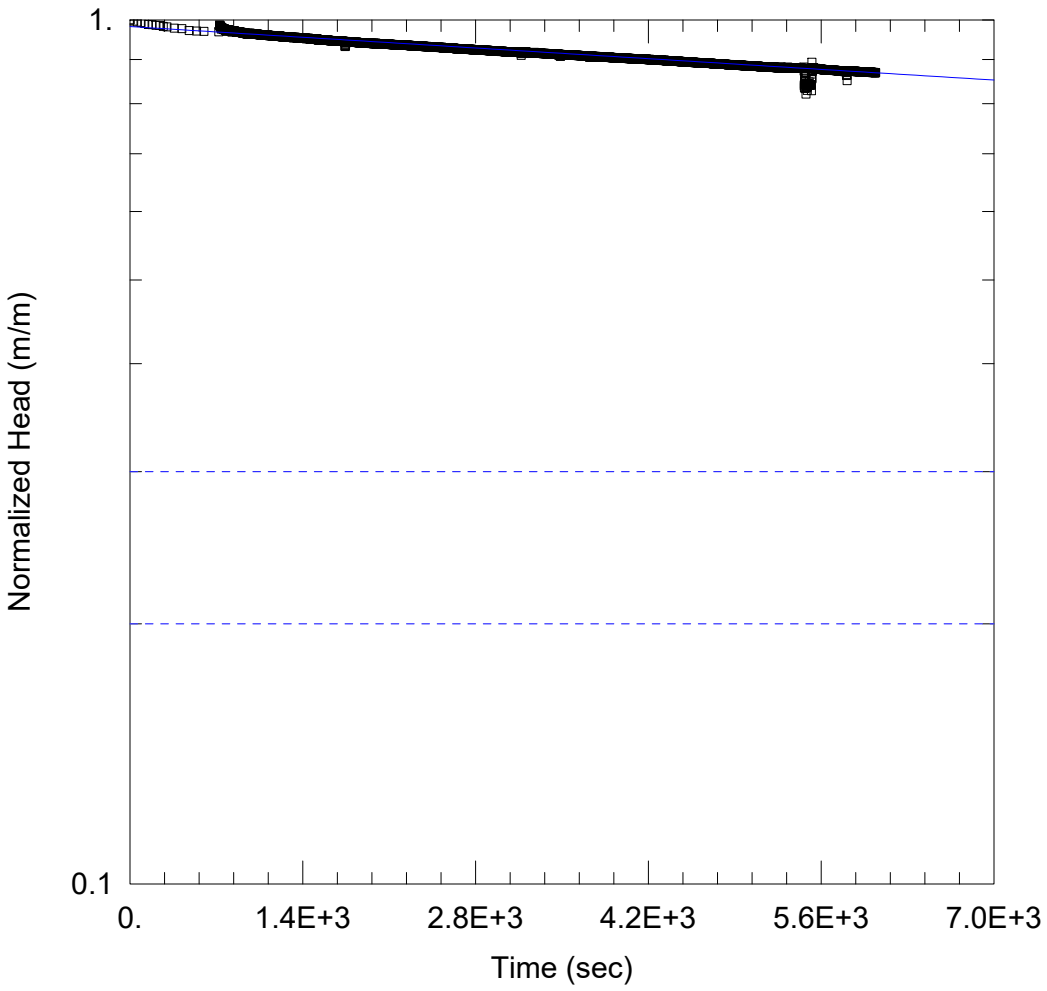
WELL DATA (MW17-11)

Initial Displacement: 0.854 m
Total Well Penetration Depth: 1.05 m
Casing Radius: 0.02625 m
Static Water Column Height: 1.05 m
Screen Length: 1.05 m
Well Radius: 0.055 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 6.087E-9 m/sec y0 = 0.8502 m



WELL TEST ANALYSIS

Data Set: C:\...\1211860047_Claremont_MW17-19.aqt
Date: 11/01/17 Time: 15:31:30

PROJECT INFORMATION

Company: Golder Associates Ltd.
Project: 1211860047
Location: Claremont
Test Well: MW17-19
Test Date: October 26, 2017

AQUIFER DATA

Saturated Thickness: 6.74 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW17-19)

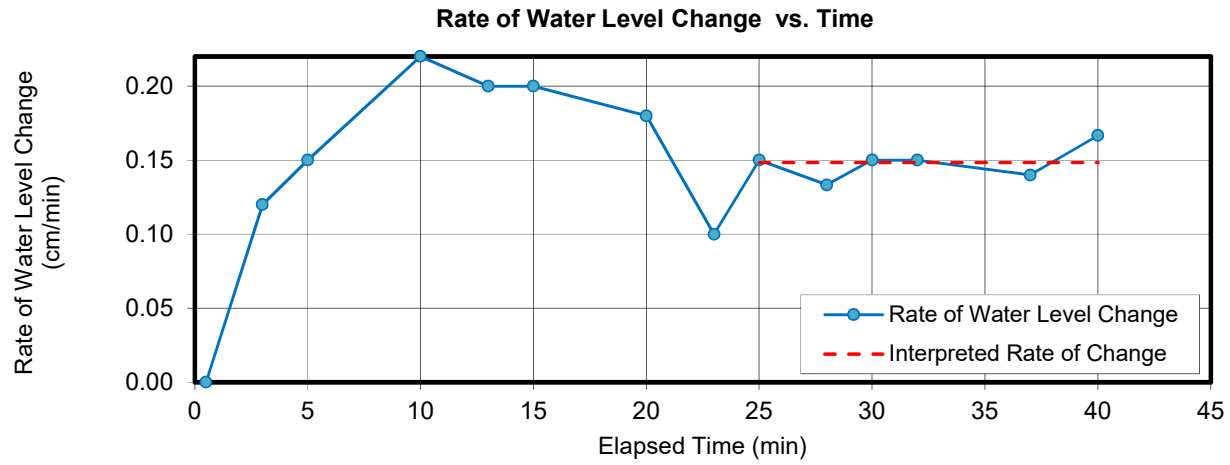
Initial Displacement: 1.574 m
Total Well Penetration Depth: 6.74 m
Casing Radius: 0.02625 m
Static Water Column Height: 6.74 m
Screen Length: 1.5 m
Well Radius: 0.055 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.571E-8 m/sec
y0 = 1.546 m

Constant Head Permeameter Test Report - BH17-9 (adjacent)

Approximate Location: 663915 mE, 4887042 mN (Zone 17T)
Approximate Depth Tested: 0.68 mbgs



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0		-	-
0.5		0.00	0.00
3.0	0.30	0.30	0.12
5.0	0.60	0.30	0.15
10.0	1.70	1.10	0.22
13.0	2.30	0.60	0.20
15.0	2.70	0.40	0.20
20.0	3.60	0.90	0.18
23.0	3.90	0.30	0.10
25.0	4.20	0.30	0.15
28.0	4.60	0.40	0.13
30.0	4.90	0.30	0.15
32.0	5.20	0.30	0.15
37.0	5.90	0.70	0.14
40.0	6.40	0.50	0.17

=input data

Soil Type 2 - (ML-CL) Silt and Sand, some gravel; cohesive (till)

Interpreted Rate of:

Water Level Change (R_1) = 2.5.E-03 cm/s

Steady Intake Water Rate (Q_1) = 8.7E-02 cm^3/s

hole radius (a) = 3 cm

Water column height in hole (H_1) = 7 cm

Shape factor for H_1/a = (C_1) = 1.014 -

Soil Type Coefficient α^* = 0.04 cm^{-1}

Single Head Analysis

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

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **6E-05** cm/s

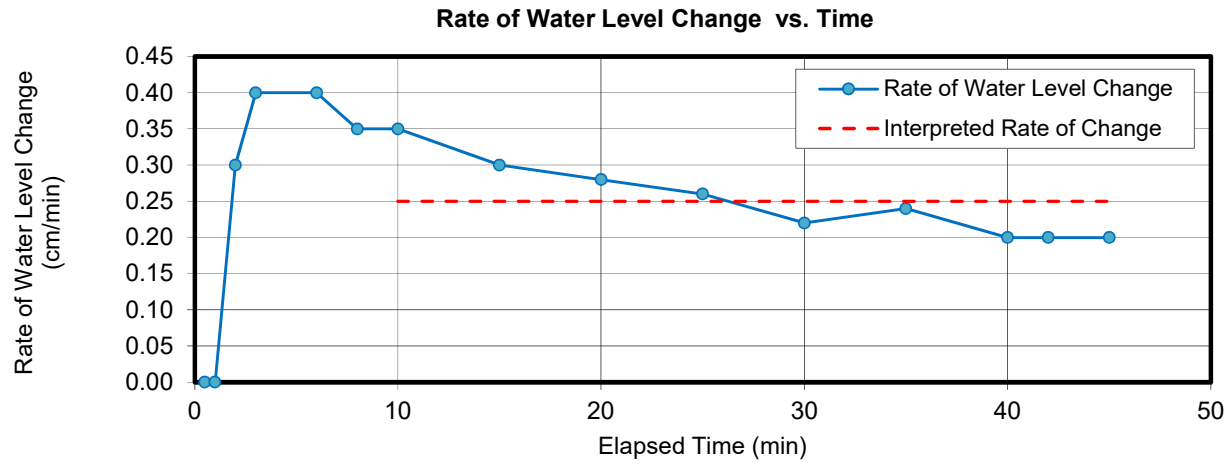
DATE: Oct. 2017
PROJECT: 1211860047

Golder Associates

DRAWN: jjg
REVIEW: CMK

Constant Head Permeameter Test Report - BH17-11 (adjacent)

Approximate Location: 663925 mE, 4886742 mN (Zone 17T)
Approximate Depth Tested: 0.37 mbgs



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0		-	-
0.5		0.00	0.00
1.0		0.00	0.00
2.0	0.30	0.30	0.30
3.0	0.70	0.40	0.40
6.0	1.90	1.20	0.40
8.0	2.60	0.70	0.35
10.0	3.30	0.70	0.35
15.0	4.80	1.50	0.30
20.0	6.20	1.40	0.28
25.0	7.50	1.30	0.26
30.0	8.60	1.10	0.22
35.0	9.80	1.20	0.24
40.0	10.80	1.00	0.20
42.0	11.20	0.40	0.20
45.0	11.80	0.60	0.20

=input data

Soil Type 2 - (ML) Sandy Silt, trace gravel; non-cohesive

Interpreted Rate of:

Water Level Change (R_1) = 4.2.E-03 cm/s

Steady Intake Water Rate (Q_1) = 1.5E-01 cm^3/s

hole radius (a) = 3 cm

Water column height in hole (H_1) = 5 cm

Shape factor for H_1/a = (C_1) = 0.842 -

Soil Type Coefficient α^* = 0.04 cm^{-1}

Single Head Analysis

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

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **1E-04** cm/s

DATE: Oct. 2017
PROJECT: 1211860047

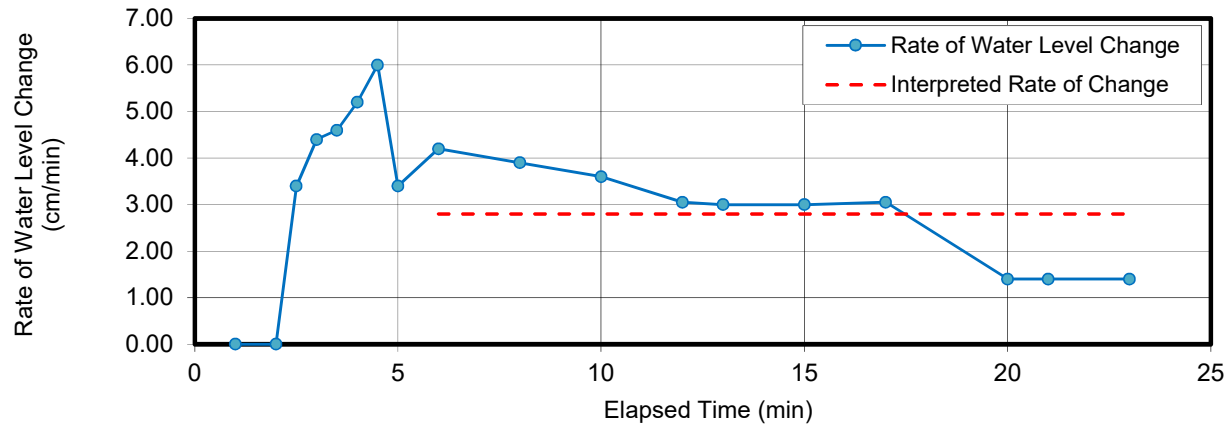
Golder Associates

DRAWN: jjg
REVIEW: CMK

Constant Head Permeameter Test Report - BH17-14 (adjacent)

Approximate Location: 664070 mE, 4886543 mN (Zone 17T)
Approximate Depth Tested: 0.35 mbgs

Rate of Water Level Change vs. Time



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0		-	-
1.0		0.00	0.00
2.0		0.00	0.00
2.5	1.70	1.70	3.40
3.0	3.90	2.20	4.40
3.5	6.20	2.30	4.60
4.0	8.80	2.60	5.20
4.5	11.80	3.00	6.00
5.0	13.50	1.70	3.40
6.0	17.70	4.20	4.20
8.0	25.50	7.80	3.90
10.0	32.70	7.20	3.60
12.0	38.80	6.10	3.05
13.0	41.80	3.00	3.00
15.0	47.80	6.00	3.00
17.0	53.90	6.10	3.05
20.0	58.10	4.20	1.40
21.0	59.50	1.40	1.40
23.0	62.30	2.80	1.40

=input data

Soil Type 3 - (ML) Silt, some sand, trace gravel; non-cohesive

Interpreted Rate of:

Water Level Change (R_1) = 4.7.E-02 cm/s

Steady Intake Water Rate (Q_1) = 1.6E+00 cm^3/s

hole radius (a) = 3 cm

Water column height in hole (H_1) = 5 cm

Shape factor for H_1/a = (C_1) = 0.803 -

Soil Type Coefficient α^* = 0.12 cm^{-1}

Single Head Analysis

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

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **3E-03** cm/s

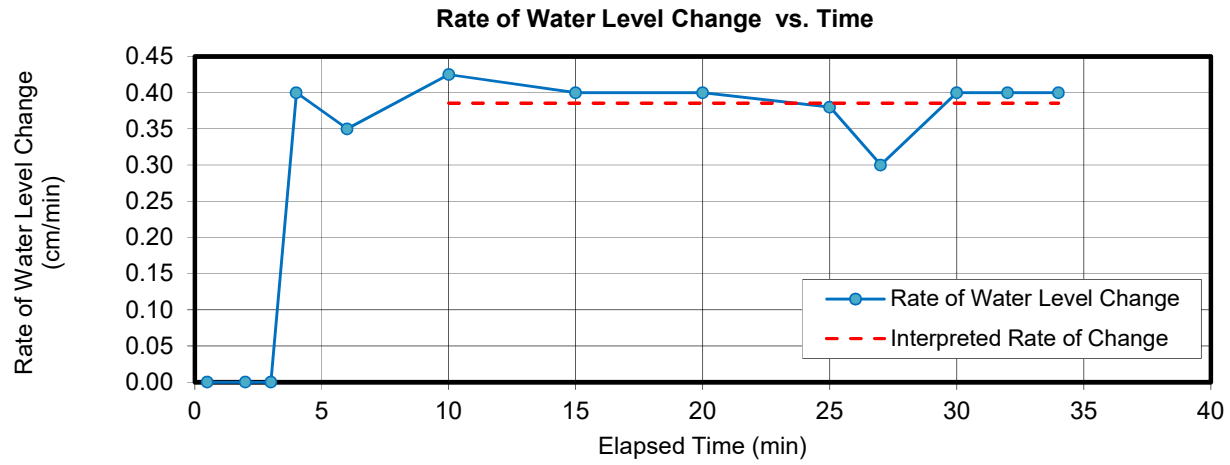
DATE: Oct. 2017
PROJECT: 1211860047

Golder Associates

DRAWN: kzk
REVIEW: CMK

Constant Head Permeameter Test Report - BH17-18 (adjacent)

Approximate Location: 663915 mE, 4887042 mN (Zone 17T)
Approximate Depth Tested: 0.67 mbgs



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0		-	-
0.5		0.00	0.00
2.0		0.00	0.00
3.0	0.00	0.00	0.00
4.0	0.40	0.40	0.40
6.0	1.10	0.70	0.35
10.0	2.80	1.70	0.43
15.0	4.80	2.00	0.40
20.0	6.80	2.00	0.40
25.0	8.70	1.90	0.38
27.0	9.30	0.60	0.30
30.0	10.50	1.20	0.40
32.0	11.30	0.80	0.40
34.0	12.10	0.80	0.40

=input data

Soil Type 2 - (ML-CL) Silt and Sand, some gravel; cohesive (till)

Interpreted Rate of:

Water Level Change (R_1) = 6.4.E-03 cm/s

Steady Intake Water Rate (Q_1) = 2.3E-01 cm^3/s

hole radius (a) = 3 cm

Water column height in hole (H_1) = 7 cm

Shape factor for H_1/a = (C_1) = 1.014 -

Soil Type Coefficient α^* = 0.04 cm^{-1}

Single Head Analysis

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

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **2E-04** cm/s

DATE: Oct. 2017
PROJECT: 1211860047

Golder Associates

DRAWN: jjg
REVIEW: CMK

APPENDIX F

Water Balance Tables

LEGEND

- APPROXIMATE PRE-DEVELOPMENT OUTLET LOCATION
- APPROXIMATE SITE LOCATION
- PRE-DEVELOPMENT MEADOW AREA
- PRE-DEVELOPMENT MATURE FOREST AREA
- PRE-DEVELOPMENT WETLAND AREA
- CATCHMENT DIVIDE
- 201 / 10.0 Ha — CATCHMENT AREA NO. / AREA IN HECTARE

NOTE(S)

1. ALL LOCATION ARE APPROXIMATE

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2017
BASE IMAGERY - © 2017 DIGITAL GLOBE IMAGE COURTESY OF USGS EARTHSTAR GEOGRAPHICS SIO © 2017 MICROSOFT CORPORATION
PRODUCED BY GOLDER ASSOCIATES LTD UNDER LICENSE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2017
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

0 100 200
1:4,000 METRES

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-07-22
DESIGNED	
PREPARED	STB
REVIEWED	CMK
APPROVED	MK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, PICKERING, ONTARIO

TITLE
PRE-DEVELOPMENT SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0007	A	F-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

Path: \\golder.gds\comp\toronto\local\data\office\mississauga\SIM\Clients\Geranium\Pickering_Claremont\99_PRO\1211860047_Geranium_Pickering_Claremont\40_PROD\0007_Hydrology_Assessment\ | File Name: 1211860047-0001-CS-0001.dwg | Last Edited By: sbowerman Date: 2021-07-22 Time:10:26:25 AM | Printed By: SBowerman Date: 2021-07-22 Time:10:58:59 AM

LEGEND

- APPROXIMATE POST-DEVELOPMENT OUTLET LOCATION
- APPROXIMATE SITE LOCATION
- POST-DEVELOPMENT MEADOW AREA
- POST-DEVELOPMENT MATURE FOREST AREA
- PRE-DEVELOPMENT WETLAND AREA
- CATCHMENT DIVIDE
- 201 / 10.0 Ha — CATCHMENT AREA NO. / AREA IN HECTARE

NOTE(S)

1. ALL LOCATION ARE APPROXIMATE

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2017
BASE DRAFT PLAN OF SUBDIVISION - PROVIDE BY MALONE GIVEN PARSONS LTD., PROJECT 12-2110, SEPTEMBER 11, 2017, 2017 09 11 DP CLAREMONT 2110.DWG.
BASE IMAGERY - © 2017 DIGITAL GLOBE IMAGE COURTESY OF USGS EARTHSTAR GEOGRAPHICS SIO © 2017 MICROSOFT CORPORATION
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

0 100 200
1:4,000 METRES

CLIENT
CLAREMONT DEVELOPMENTS INC.

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2021-07-22
DESIGNED	
PREPARED	STB
REVIEWED	CMK
APPROVED	MK

PROJECT
PRELIMINARY HYDROGEOLOGICAL ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
5113 OLD BROCK ROAD, PICKERING, ONTARIO

TITLE
POST-DEVELOPMENT SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
1211860047	0007	A	F-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

0 25 mm

Path: \\golder.gds\comp\toronto\local\toffice\mississauga\SIM\Clients\Geranium\Pickering_Claremont\99_PRO\1211860047_Geranium_Pickering_Claremont\40_PROD\0007_Hydrology_Assessment\ | File Name: 1211860047-0001-CS-0002.dwg | Last Edited By: sbowerman Date: 2021-07-22 Time:10:31:19 AM | Printed By: SBowerman Date: 2021-07-22 Time:10:59:23 AM

Table F-1: Environment Canada Precipitation, Surplus Data, Buttonville Airport, Ontario

BUTTONVILLE AIRPORT, ON WATER BUDGET MEANS - 1986-2017

Water Holding Capacity	125	mm
Heat Index	39.55	
Lower Zone	75	mm
A	1.122	
Date Range	1986	2017

Date	Temperature	Precipitation	Rain	Melt	Potential Evaporation	Actual Evapotranspiration	Deficit	Surplus	Snow	Soil	Accumulated Precipiation
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	38	27	124	272
February	-5.6	51	20	24	1	1	0	42	33	125	323
March	-0.4	55	36	49	10	10	0	75	4	125	378
April	6.7	75	71	7	34	34	0	45	0	124	453
May	13.4	80	80	0	80	80	0	15	0	110	534
June	18.7	90	90	0	116	116	0	8	0	76	622
July	21.3	82	82	0	136	118	-18	0	0	40	705
August	20.3	77	77	0	120	87	-33	4	0	27	777
September	16	83	83	0	80	68	-12	7	0	35	855
October	9.2	73	73	0	40	38	-2	7	0	63	73
November	3.2	74	68	5	13	13	0	20	0	103	148
December	-2.6	64	37	15	3	3	0	32	12	119	211
AVE	7.8										
TTL		863	743	119	635	570	-65	293			

Water Holding Capacity	200	mm
Heat Index	39.55	
Lower Zone	75	mm
A	1.122	
Date Range	1986	2017

Date	Temperature	Precipitation	Rain	Melt	Potential Evaporation	Actual Evapotranspiration	Deficit	Surplus	Snow	Soil	Accumulated Precipiation
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	26	27	192	272
February	-5.6	51	20	24	1	1	0	38	33	197	323
March	-0.4	55	36	49	10	10	0	72	4	200	378
April	6.7	75	71	7	34	34	0	45	0	199	453
May	13.4	80	80	0	80	80	0	15	0	185	534
June	18.7	90	90	0	116	116	0	8	0	151	622
July	21.3	82	82	0	136	132	-5	0	0	101	705
August	20.3	77	77	0	120	102	-18	4	0	73	777
September	16	83	83	0	80	71	-9	7	0	78	855
October	9.2	73	73	0	40	38	-2	6	0	106	73
November	3.2	74	68	5	13	13	0	12	0	154	148
December	-2.6	64	37	15	3	3	0	27	12	176	211
AVE	7.8										
TTL		863	743	119	635	602	-34	260			

Entered by: DPH
Checked by: MK

Table F-1: Environment Canada Precipitation, Surplus Data, Buttonville Airport, Ontario

Water Holding Capacity	250	mm
Heat Index	39.55	
Lower Zone	75	mm
A	1.122	
Date Range	1986	2017

Date	Temperature	Precipitation	Rain	Melt	Potential Evaporation	Actual Evapotranspiration	Deficit	Surplus	Snow	Soil	Accumulated Precipiation
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	22	27	236	272
February	-5.6	51	20	24	1	1	0	34	33	244	323
March	-0.4	55	36	49	10	10	0	69	4	250	378
April	6.7	75	71	7	34	34	0	45	0	249	453
May	13.4	80	80	0	80	80	0	15	0	235	534
June	18.7	90	90	0	116	116	0	8	0	201	622
July	21.3	82	82	0	136	135	-2	0	0	148	705
August	20.3	77	77	0	120	109	-11	4	0	113	777
September	16	83	83	0	80	73	-7	7	0	116	855
October	9.2	73	73	0	40	38	-2	6	0	144	73
November	3.2	74	68	5	13	13	0	11	0	193	148
December	-2.6	64	37	15	3	3	0	26	12	216	211
AVE	7.8										
TTL		863	743	119	635	614	-22	247			

Water Holding Capacity	400	mm
Heat Index	39.55	
Lower Zone	75	mm
A	1.122	
Date Range	1986	2017

Date	Temperature	Precipitation	Rain	Melt	Potential Evaporation	Actual Evapotranspiration	Deficit	Surplus	Snow	Soil	Accumulated Precipiation
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	21	27	371	272
February	-5.6	51	20	24	1	1	0	28	33	385	323
March	-0.4	55	36	49	10	10	0	62	4	398	378
April	6.7	75	71	7	34	34	0	44	0	399	453
May	13.4	80	80	0	80	80	0	15	0	384	534
June	18.7	90	90	0	116	116	0	8	0	350	622
July	21.3	82	82	0	136	136	0	0	0	296	705
August	20.3	77	77	0	120	118	-2	3	0	252	777
September	16	83	83	0	80	77	-3	7	0	251	855
October	9.2	73	73	0	40	39	-1	6	0	279	73
November	3.2	74	68	5	13	13	0	10	0	328	148
December	-2.6	64	37	15	3	3	0	24	12	353	211
AVE	7.8										
TTL		863	743	119	635	629	-6	228			

Entered by: DPH
Checked by: MK

Table F-2: Summary of Annual Infiltration Rates
Claremont, Ontario

			Infiltration Factor				Depth of Water (mm)					
Land Use	**Surficial Soil**	**Description**	**Topo**	**Soils**	**Cover**	**Total**	**Precip**	**Water Holding Capacity**	**Evapo-transpiration**	**Surplus**	**Infiltration**	**Runoff**
Wooded Area	Silt Loam	Mature Forest	0.10	0.20	0.20	0.50	863	400	630	228	114	114
Meadow	Silt Loam	Pasture and Shrubs	0.10	0.20	0.15	0.45	863	250	614	246	111	135
Corn Field	Silt Loam	Moderately Rooted Crops	0.10	0.20	0.10	0.40	863	200	602	259	104	155
Lawns and Parks	Silt Loam	Urban Lawns	0.10	0.20	0.10	0.40	863	125	569	292	117	175
Buildings / Driveways / Streets / Sidewalks	Impermeable	Impermeable Surfaces	0.00	0.00	0.00	0.00	863	90% precip	86	777	0	777
Buildings - Soakaway Pit	Impermeable	Impermeable Surfaces	0.00	0.00	0.00	0.35	863	90% precip	86	777	272	505
SWM Ponds	Impermeable	Open Water	0.00	0.00	0.00	0.00	863	Precip - PE	635	228	0	228

Entered by: DPH
Checked by: MK

Table 1: Existing Conditions Water Balance Results

Catchment	Area	Precipitation		Potential Evapotranspiration		Actual Evapotranspiration	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Wetland 1	18.48	863	159,670	635	117,350	111,480	261	48,190	107	19,810	154	28,380
Wetland 2	2.28	863	19,700	635	14,480	13,940	253	5,760	106	2,420	146	3,340
Wetland 3	6.68	863	57,720	635	42,420	35,040	340	22,680	89	5,930	251	16,750
West	12.81	863	110,680	635	81,340	76,980	263	33,700	104	13,290	159	20,410
South	8.72	863	75,340	635	55,370	52,780	259	22,560	104	9,030	155	13,530
107	0.75	863	6,480	635	4,760	4,540	259	1,940	104	780	155	1,160
Site	38.18	863	329,880	635	242,440	231,380	258	98,500	105	39,900	153	58,600
Total	**47.44**	**-**	**409,890**	**-**	**301,240**	**280,820**	**-**	**129,070**	**-**	**48,840**	**-**	**80,230**

Table 2: Proposed Development Water Balance Results

Catchment	Area	Precipitation		Potential Evapotranspiration		Actual Evapotranspiration	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Wetland 1	14.93	863	129,000	635	94,810	86,860	282	42,140	108	16,150	174	25,990
Wetland 2	2.09	863	18,060	635	13,270	12,100	285	5,960	112	2,340	173	3,620
Wetland 3	4.06	863	35,080	635	25,780	18,220	415	16,860	85	3,450	330	13,410
West SWM	13.62	863	117,680	635	86,487	61,340	414	56,340	76	10,380	337	45,960
South SWM	11.20	863	96,770	635	71,120	57,540	350	39,230	80	8,960	270	30,270
207	2.49	863	21,510	635	15,810	13,270	331	8,240	108	2,680	223	5,560
210	0.40	863	3,460	635	2,540	2,290	293	1,170	118	470	175	700
214	0.74	863	6,390	635	4,700	3,990	324	2,400	109	810	215	1,590
Site	38.18	863	329,880	635	242,440	194,080	356	135,800	89	33,950	267	101,850
Total	**47.44**	**-**	**409,890**	**-**	**301,250**	**243,510**	**-**	**166,380**	**-**	**42,900**	**-**	**123,480**

Table 3: Proposed Development Water Balance Results Including Infiltration from Septic Fields

Catchment	Area	Precipitation		Potential Evapotranspiration		Actual Evapotranspiration	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Wetland 1	14.93	863	129,000	635	94,810	86,860	282	42,140	123	18,320	174	25,990
Wetland 2	2.09	863	18,060	635	13,270	12,100	285	5,960	141	2,940	173	3,620
Wetland 3	4.06	863	35,080	635	25,780	18,220	415	16,860	133	5,420	330	13,410
West SWM	13.62	863	117,680	635	86,487	61,340	414	56,340	107	14,510	338	45,970
South SWM	11.20	863	96,770	635	71,120	57,540	350	39,230	110	12,310	270	30,260
207	2.49	863	21,510	635	15,810	13,270	331	8,240	139	3,460	223	5,560
210	0.40	863	3,460	635	2,540	2,290	293	1,170	265	1,060	175	700
214	0.74	863	6,390	635	4,700	3,990	324	2,400	215	1,590	215	1,590
Site	38.18	863	329,880	635	242,440	194,080	356	135,800	125	47,750	267	101,850
Total	**47.44**	**-**	**409,890**	**-**	**301,250**	**243,510**	**-**	**166,380**	**-**	**56,670**	**-**	**123,480**

Table 4: Proposed Development Water Balance Results Including Infiltration from Septic Fields and LID Mitigation

Catchment	Area	Precipitation		Potential Evapotranspiration		Actual Evapotranspiration	Surplus		Infiltration		Runoff	
	(ha)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Wetland 1	14.93	863	129,000	635	94,810	86,860	282	42,140	123	18,390	174	25,910
Wetland 2	2.09	863	18,060	635	13,270	12,100	285	5,960	144	3,010	169	3,540
Wetland 3	4.06	863	35,080	635	25,780	18,220	415	16,860	133	5,420	330	13,410
West SWM	13.62	863	117,680	635	86,487	61,340	414	56,340	124	16,900	320	43,590
South SWM	11.20	863	96,770	635	71,120	57,540	350	39,230	110	12,310	270	30,260
207	2.49	863	21,510	635	15,810	13,270	331	8,240	148	3,690	214	5,340
210	0.40	863	3,460	635	2,540	2,290	293	1,170	265	1,060	175	700
214	0.74	863	6,390	635	4,700	3,990	324	2,400	215	1,590	216	1,600
Site	38.18	863	329,880	635	242,440	194,080	356	135,800	132	50,430	260	99,170
Total	**47.44**	**-**	**409,890**	**-**	**301,250**	**243,510**	**-**	**166,380**	**-**	**59,360**	**-**	**120,810**

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