BURNSIDE

Hydrogeological Assessment and Water Balance

Wooden Sticks Golf Club
40 Elgin Park Drive
Uxbridge ON

Hydrogeological Assessment and Water Balance

Wooden Sticks Golf Club
40 Elgin Park Drive
Uxbridge ON

R.J. Burnside & Associates Limited
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Newmarket ON L3Y 0A4 CANADA

November 2022
300050985.0001

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Revision	Date	Description
-	November 4, 2022	Initial Submission

R.J. Burnside & Associates Limited

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by Wooden Sticks Golf Club to complete a hydrogeological assessment in support of a hotel expansion proposed on the Wooden Sticks Golf Course located at 40 Elgin Park Drive in the Town of Uxbridge, Ontario (the subject property). The hotel expansion is proposed on the west side of the existing clubhouse, which is located in the northwest corner of the subject property, with a new parking lot proposed on the east side of the existing driveway entrance to the clubhouse. This study therefore focusses on the northwest corner of the subject property and the study area has been defined by the area bounded by Elgin Park Drive to the north, a residential development to the west and extends approximately 50 m south of the existing clubhouse and 100 m to the east of the existing driveway.

The purpose of this study is to characterize the geological and hydrogeological conditions in the study area, identify potential development impacts on the local groundwater and surface water conditions, and identify potential constraints for construction related to the local soil and groundwater conditions. The scope of the hydrogeological study involved a review of available regional information as well as the completion of site-specific investigations that included one year of monitoring of groundwater levels in the vicinity of the proposed development, hydraulic conductivity testing and groundwater quality sampling. This study also included a water balance assessment to determine potential impacts to recharge conditions as a result of the proposed development.

The key findings of the hydrogeological study are summarized below:

- The study area is located on the Oak Ridges Moraine and is covered by a layer of silty sand which is interpreted to be part of the Oak Ridges Moraine Aquifer Complex (ORAC). The ORAC is interpreted to be approximately 16 m thick in the vicinity of the study area.

- Groundwater levels in the study area were found at depths or more than 10 m below ground surface (mbgs), at an elevation of 277 masl to 278 masl. Very little seasonal variation was observed in the groundwater levels. Groundwater flow in the ORAC is interpreted to be to the north in the vicinity of the study area, toward Lake Simcoe.

- The study area has been mapped as a Significant Groundwater Recharge Area (SGRA) in the mapping available from the Ministry of the Environment, Conservation and Parks (MECP) Source Protection Information Atlas as well as a Wellhead Protection Area for quantity (WHPA-Q). As such, it is important that best management practices are incorporated into the development to maintain pre-development recharge rates.

- The Aquifer Vulnerability mapping available from the MECP Source Protection Information Atlas shows the subject property and study area are within a high aquifer vulnerability area (HVA). The proposed hotel expansion does not include any of the restricted land uses considered high risk for areas of high aquifer vulnerability, and as such does not pose a threat to the groundwater quality of the underlying aquifers.

- Based on our review of WHPA mapping available from Durham Region, the study area is located between the two Town of Uxbridge municipal water supply WHPAs and does not fall within any WHPA for water quality.

- Based on the review of the Oak Ridges Moraine Conservation Plan, the proposed development conforms with the hydrogeological related policies within the plan. No hydrologically sensitive features (permanent or intermittent streams, wetlands, kettle lakes or seepage areas and springs) are located in the study area. The study area is not located within a WHPA and none of the restricted land uses for areas of high aquifer vulnerability are proposed.

- A water balance assessment was completed to determine the potential impacts to rechange conditions in the study area as a result of the proposed development. The calculations show that with no mitigation measures, the proposed development has the potential to reduce infiltration by approximately 1,200 m^3/year in the study area. As part of the stormwater management plans, it is proposed to direct runoff from the new parking lot and the hotel roof to infiltration swales, which will be designed to infiltrate the 25 mm storm event. With the implementation of these low impact development (LID) measures, the water balance calculations show a potential 40% increase (2,400 m^3/year) in infiltration from pre-development conditions.

- The proposed development will be serviced by the municipal watermain and there is no proposed on-site groundwater usage for the proposed development. Due to the depth of the water table (i.e., more than 10 mbgs), construction dewatering for the installation of services is not anticipated.

- Prior to construction, it will be necessary to ensure that all inactive wells within the development footprint have been located and properly decommissioned by a licensed water well contractor according to Ontario Regulation 903. This includes all groundwater monitoring wells installed for study purposes, which must be decommissioned in accordance with provincial regulations prior to or during the site development, unless they are maintained throughout the construction period for monitoring purposes.

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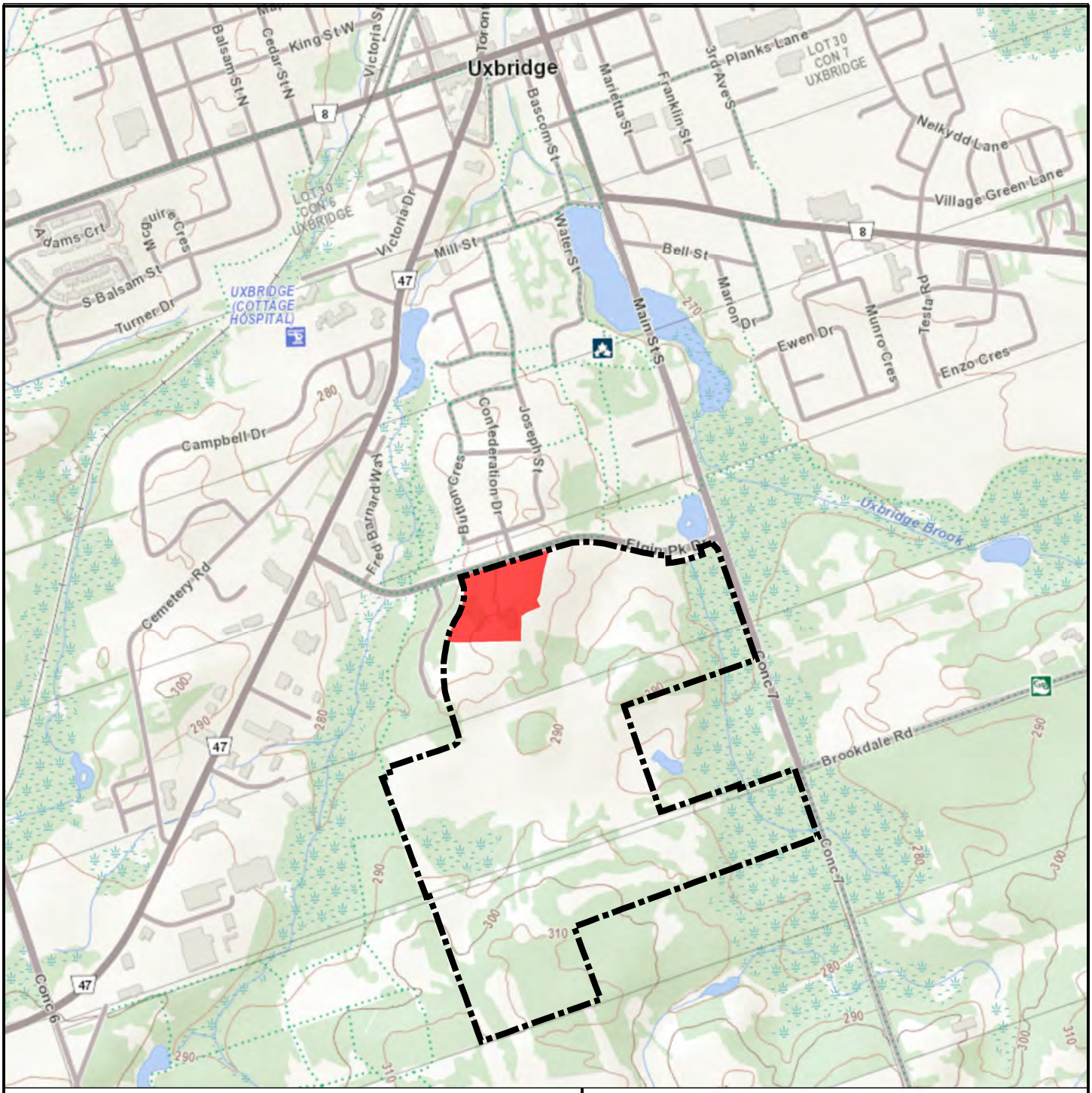
1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by Wooden Sticks Golf Club to complete a hydrogeological assessment in support of a hotel expansion proposed on the Wooden Sticks Golf Course located in the Town of Uxbridge, Ontario (herein referred to as the subject property). The subject property is bounded by Elgin Park Drive to the north, a proposed residential subdivision and valley lands associated with Uxbridge Brook to the west, Concession Road 7 to the east and rural residential and agricultural lands to the south (Figure 1). The hotel expansion is proposed on the west side of the existing clubhouse, which is located in the northwest corner of the subject property, with a new parking lot proposed on the east side of the existing driveway entrance to the clubhouse. This study therefore focusses on the northwest corner of the subject property and the study area has been defined by the area bounded by Elgin Park Drive to the north, a residential development to the west and extends approximately 50 m south of the existing clubhouse and 100 m to the east of the existing driveway, as shown on Figure 1. The subject property is located within the jurisdiction of Lake Simcoe Region Conservation Authority (LSRCA).

The subject property is also located on the Oak Ridges Moraine (ORM) and associated policies for protecting water resources on this feature, such as Oak Ridges Moraine Conservation Plan (ORMCP) and Source Water Protection apply. The subject property is mapped as an area of High Aquifer Vulnerability (HVA) (ORMCP and LSRCA) and is also located within a Significant Groundwater Recharge Area (SGRA) and a Wellhead Protection Area Q2 (WHPA-Q2). Due to the location of subject property within these vulnerable areas, applicable policies require the maintenance of groundwater recharge similar to pre-development conditions to the extent feasible. These will be addressed in the water balance and discussed herein.

The hydrogeological assessment and water balance is intended to provide detailed soil and groundwater information specific to the study area in support of the site plan application. The hydrogeological assessment was designed to characterize the geological and hydrogeological conditions on the study area, identify potential development impacts on local surface water and groundwater resources, and recommend mitigation measures to address potential impacts. As part of the assessment, water balance calculations have been completed to determine the pre-development water balance components, determine potential changes to the water balance as a result of the proposed development concept, and to provide appropriate infiltration targets as input to stormwater management plans for the subject property.



LEGEND

APPROXIMATE STUDY AREA

SUBJECT PROPERTY

0 250 500 1,000

Metres

N

BURNSIDE

Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO

HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

SITE LOCATION

Drawn	Checked	Date	Figure No.
SK	MM	NOVEMBER 2022	1
Scale		Project No.	
1:15,000		300050985	

File Path:Nigel/Shared Work Areas/ A:\050985 Wooden Sticks\06_GIS\050985 Site Location.mxd Print Date: 2022/11/01 Time: 10:05 AM

1.1 Scope of Work

The scope of work for the hydrogeological assessment included the completion of the following tasks.

1. Review the Ministry of Environment, Conservation and Parks (MECP) well records: A list of the available MECP water well records are provided in Appendix A, and the well locations are shown on Figure 6. It is noted that well locations listed in the MECP well records are approximations only and may not accurately reflect well locations in the field.

2. Review of published hydrogeological information and policies: A review of existing mapping and reports for the area was completed. These included provincial and surficial geology mapping and recharge mapping prepared by LSRCA. A review of applicable legislation included in the Source Water Protection; Lake Simcoe and Couchiching- Black River SPA and Oak Ridges Moraine Conservation Plan was also completed for the subject property.

3. Review existing borehole and monitoring well logs for the study area: In April 2021 GHD drilled boreholes at nine locations across the study area and completed monitoring wells at three of these locations. A well nest (shallow and deep well) was constructed at one location for a total of four monitoring wells. The location of the boreholes and monitoring wells are shown on Figure 4 and the borehole logs are provided in Appendix B.

4. Review laboratory grainsize distribution testing: Analyses were completed by the geotechnical consultant (GHD) on representative soil samples obtained during the drilling program. These data were reviewed to characterize the surficial sediments and estimate the hydraulic conductivity of the soils encountered. Copies of the soil grainsize analyses are provided in Appendix C.

5. In situ hydraulic conductivity testing: Single well response tests were completed in all four groundwater monitoring wells (BH-1, BH-3s, BH-3d and BH-4) to assess the in situ hydraulic conductivity of the shallow soils on the study area. The hydraulic conductivity field testing results are provided in Appendix D.

6. Groundwater level monitoring: Monitoring has been completed to measure the depth to the water table and assess the horizontal and vertical groundwater flow conditions. Groundwater level measurements were obtained monthly in the monitoring wells between April 2021 and March 2022. Automatic water level recorders (dataloggers) were installed in two of the monitoring wells (BH-1 and BH-3d) in order to record continuous water level fluctuations. The groundwater monitoring data collected to date and hydrographs are provided in Appendix E.

7. Water quality testing: Groundwater samples were collected from two monitoring wells (BH-1 and BH-4) to characterize the baseline groundwater quality across the study area. The water samples were submitted to AGAT Laboratories for analysis of general quality indicators (e.g., pH, hardness, and conductivity), basic ions (including chloride and nitrate) and selected metals. The testing results are provided in Appendix F.

8. Water balance calculations: Pre-development and post-development water balance calculations were completed to document existing conditions, evaluate post development conditions, establish an infiltration target, and assess the potential effectiveness of the proposed low impact development (LID) measures to mitigate the changes land development may have on the local groundwater infiltration volumes. The local climate data and detailed water balance calculations are provided in Appendix G.

2.0 Physical Setting

2.1 Physiography and Topography

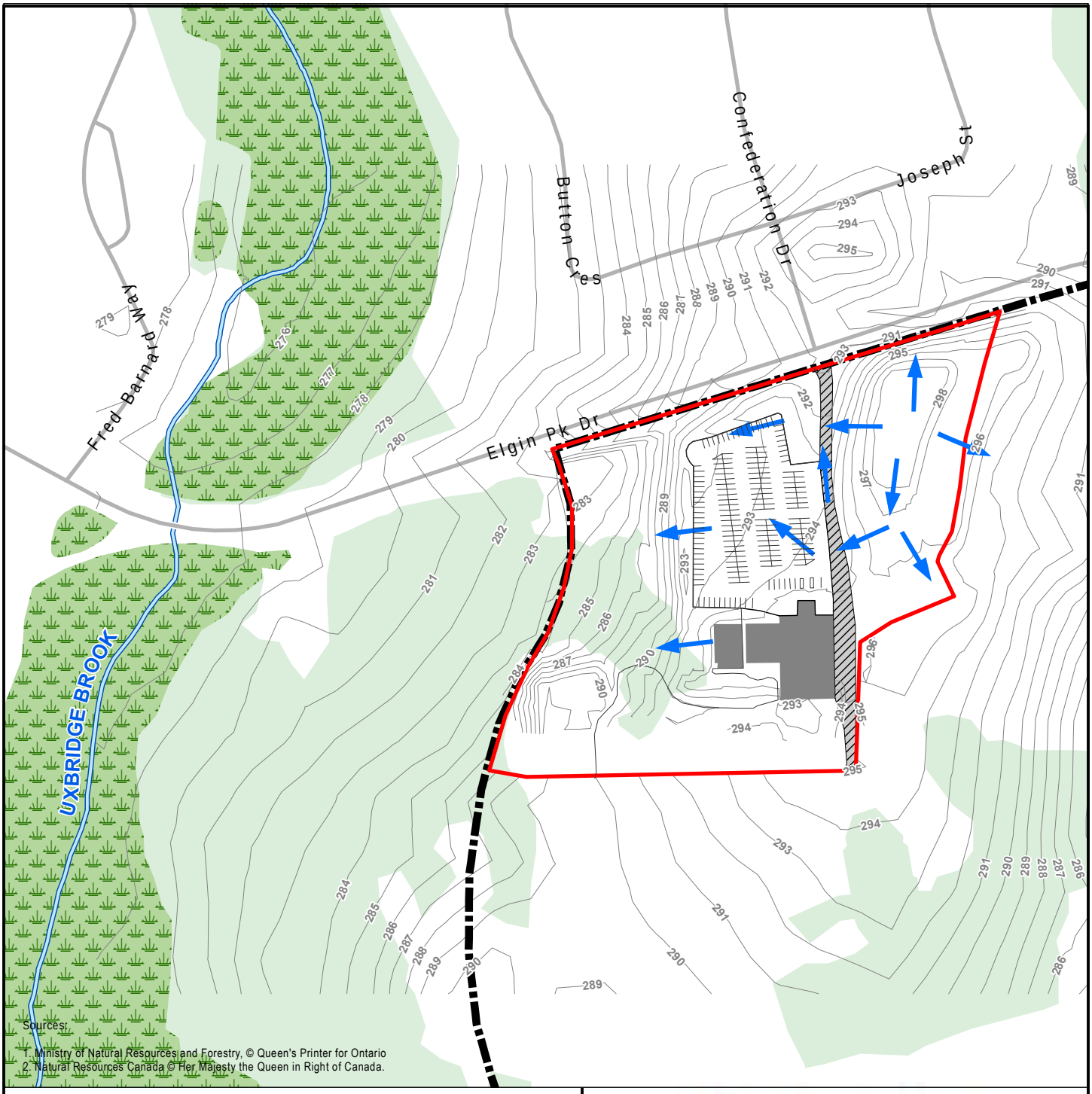
The subject property is located along the northern border of the Oak Ridges Moraine (ORM) physiographic region (Chapman and Putnam, 1984). This physiographic region lies between the Peterborough Drumlin Field and Till Plains (drumlinized) physiographic regions to the north and Till Plains (drumlinized) physiographic unit to the south. The ORM physiographic region is characterized as kame moraines formed during the Late Wisconsin glaciation period. The kames were formed from subglacial outlet drainage and subaqueous deposition adjacent to the ice mass and bedrock surface. Kames are generally irregular in slope with flat tops indicating the former position of the melting ice boundary. The ORM generally rises in elevation from the east to the west, peaking near the Town of Uxbridge, as such the western portion received earlier and more frequent sedimentary deposits.

The high point in the study area is located along an interpreted kame in the northeastern portion, which reaches an elevation of 298 metres above sea level (masl) (Figure 2). The ground surface slopes down in all directions from the crest of the kame. The portion of the study area west of the existing driveway slopes downward from the southeast to the northwest and the lowest elevation in the study area (about 283 masl) occurs at the northwestern boundary of the study area at Elgin Park Drive.

2.2 Drainage

The subject property is located in the Uxbridge Brook subwatershed of the Lake Simcoe Watershed. Drainage from the portion of the study area west of the existing driveway is towards the west, to the west wooded area, eventually draining northwest towards Elgin Park Drive (Figure 2). The portion of the study area east of the existing driveway

ultimately drains to the east, either by direct overland flow to the east, or along the existing driveway and Elgin Park Road ditches, which flow to the east. There are no watercourses or wetlands in the study area.



LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- ROADWAY
- WATERCOURSE
- CONTOUR (1m intervals - masl)
- WETLAND (EVALUATED - PSW)
- WETLAND (NON-EVALUATED)
- WOODED AREA
- INFERRED SURFACE WATER FLOW DIRECTION
- CLUB HOUSE
- DRIVEWAY
- PARKING

0 25 50 100 150 200
Metres

N

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Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

TOPOGRPHY AND DRAINAGE

Drawn	Checked	Date	Figure No.
SK	MM	NOVEMBER 2022	2
Scale		Project No.	
1:3,000		300050985	

File Path:Nigel/Shared Work Areas/ A:\050985 Wooden Sticks\06_GIS\050985 Topography & Drainage.mxd Print Date: 2022/11/04 Time: 11:57 AM

2.3 Geology

2.3.1 Bedrock Geology

The bedrock beneath the subject property consists of dark blue-grey to brown to black shale of the Blue Mountain Formation (OGS, 2003). Review of the Oak Ridges Groundwater Program (2022) mapping indicates that the bedrock is generally found at an elevation of approximately 178 masl near the subject property (i.e., approximately 66 m below ground surface). No MECP well records reviewed near the subject property extended to the bedrock (Appendix A).

2.3.2 Surficial Geology

Surficial geology mapping published by the Ontario Geological Survey (OGS, 2003) shows that the study area is covered by glaciofluvial ice-contact stratified deposits with hummocky topography (Figure 3), which generally consist of coarse textured soils (i.e., sand and gravel, minor silt and clay). The mapping shows there is a terrace with older alluvial deposits at the northwest corner of the study area, as well as south of the study area in the centre of the subject property.

Drilling completed in the study area by GHD (2021) included the drilling of seven boreholes up to 18.7 m in depth. Borehole locations are shown on Figure 4 and borehole logs are provided in Appendix B.

The results of the drilling investigation confirm that the study area is covered by coarse textured silty sand with trace gravel, that are indicative of glaciofluvial ice-contact stratified deposits. Additionally, asphalt and fill were found at several boreholes (BH-1, BH-2, BH-5, and BH-7) to a maximum depth of 3.8 m and correspond to the existing infrastructure (i.e., parking lot) in the study area. A borehole was not drilled in the northwestern portion of the study area to confirm the OGS (2003) mapping of the alluvial deposits.

2.3.3 Hydrostratigraphy

The regional hydrostratigraphy in the vicinity of the study area has been reviewed using the Oak Ridges Moraine Groundwater Program (ORMP, 2022). Starting from the ground surface (youngest sediments) and in order of increasing depth and age, the main stratigraphic layers are interpreted to be:

1. Undifferentiated Upper Sediments;
2. Oak Ridges Moraine;
3. Channel Silt Aquitard;
4. Channel Sand Aquifer;
5. Thorncliffe Formation;
6. Sunnybrook Drift;

7. Scarborough Formation; and
8. Blue Mountain Bedrock.

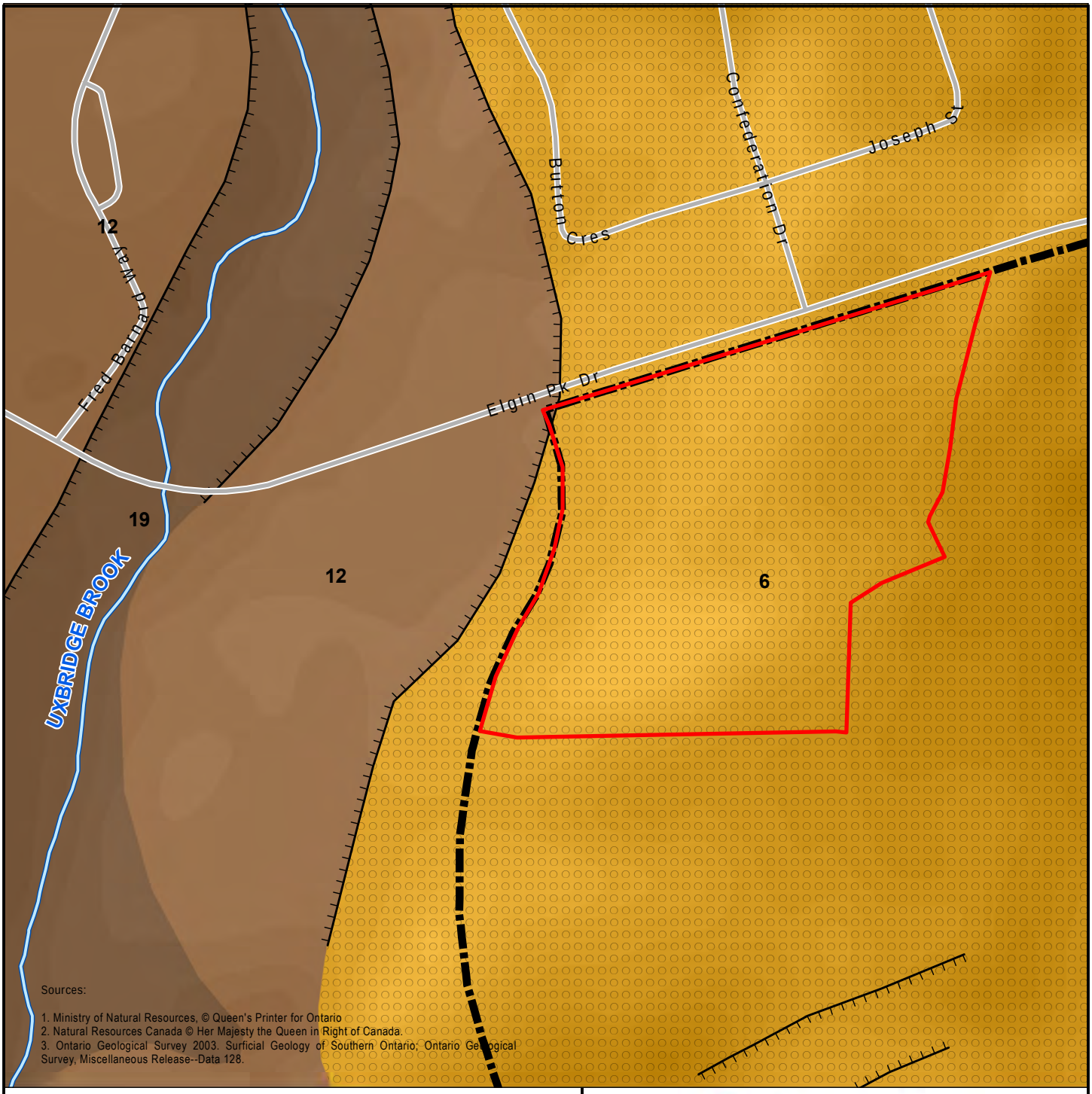
The Oak Ridges Moraine deposits form a regional aquifer referred to as the Oak Ridges Aquifer Complex (ORAC). The Thorncliffe Formation and Scarborough Formation are also regional aquifers, while the Sunnybrook Drift is a regional aquitard that generally restrict groundwater flow. Two regional unconformities consisting of tunnel channels were identified in the regional hydrostratigraphy. The tunnels are large-scale subglacial events that have eroded through the regional Newmarket till aquitard and possibly into the deeper geological units Oak Ridges Moraine Groundwater Program (ORMGP, 2022). The infill deposits of these tunnels have formed an upper Channel Silt Aquitard and a lower Channel Sand Aquifer. The hydraulic gradients of the tunnel channels influence the leakage between the shallow aquifer system and the deeper aquifer systems.

Based on the site-specific geological information obtained from the boreholes and monitoring wells drilled in the study area (Appendix B), a schematic cross-section through the study area has been prepared to illustrate the subsurface soil conditions. The cross-section location is shown on Figure 4 and the interpreted cross-section is shown on Figure 5.

The cross-section shows that the study area is underlain by a fill layer, which is underlain by a thick layer of coarse sand/ silt/ gravel and an interpreted till layer (Figure 5). Fill on the study area was found up to 3.8 m thick, within an underlying silty sand layer approximately 16 m thick (291 masl to 275 masl). This sand layer is interpreted to be part of the ORAC based on regional mapping. One MECP water well (4606611) located approximately 450 m from the subject property suggests the completion of the ORAC at about 25 m below ground surface (bgs). This is similar to regional mapping provided by the (ORMGP, 2022) which suggest the ORAC in the vicinity of the study area is completed at approximately 16 mbgs. As such, it is interpreted that the bottom of the ORAC is at an elevation of approximately 275 masl (Figure 5).

2.3.4 Soil Hydraulic Conductivity

Various methods can be used to evaluate soil hydraulic conductivity (K), i.e., the ease at which water can move through soil. Soil characteristics and grainsize data provide a general estimate of bulk hydraulic conductivity, whereas single well response tests are used to assess in situ conditions at specific locations. Both methods were used to estimate the K of the soils underlying the study area.



LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- ROADWAY
- WATERCOURSE
- Terrace
- Hummocky Topography
- 6: Ice-contact stratified deposits
- 12: Older alluvial deposits
- 19: Modern alluvial deposits

0 25 50 100 150 200
Metres

N

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Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO

HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

SURFICIAL GEOLOGY

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LEGEND

- STUDY AREA
- SUBJECT PROPERTY
- MONITORING WELL (GHD, 2021)
- BOREHOLE (GHD, 2021)
- A A' CROSS-SECTION LOCATION KEY

0 40 80 120 160
Metres

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BURNSIDE

Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO

HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title

BOREHOLE, WELL AND CROSS-SECTION LOCATIONS

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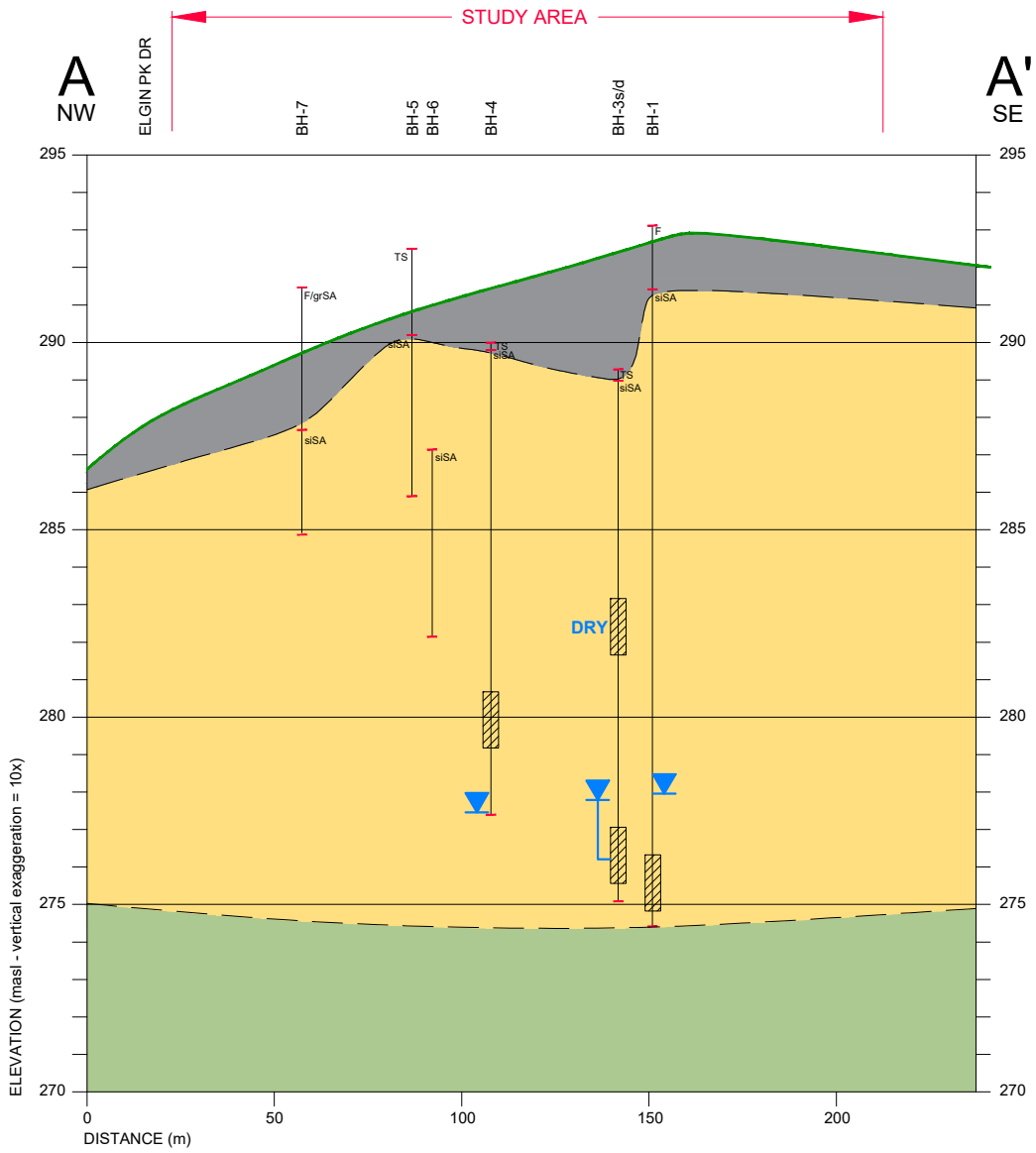

LEGEND

BH1 — WELL NUMBER / ID

EXISTING GROUND PROFILE

GEOLOGICAL CONTACT

MEASURED WATER LEVEL (MARCH, 2022)

WELL SCREEN

INTERPRETED STRATIGRAPHY

FILL

SAND / SILT / GRAVEL

SILT CLAY TILL

NOTE: TILL ELEVATION BASED ON ORMGP MAPPING

si	SILTY
sa	SANDY
cl	CLAYEY
F	FILL
T	TILL
GR	GRAVEL
SA	SAND
Si	SILT
CL	CLAY

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WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO

HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title

INTERPRETED GEOLOGICAL CROSS-SECTION A-A'

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File: Nigel/Shared Work Area/ A:\050985 Wooden Sticks\02_Production\050985 Cross-Section.DWG Date Plotted: November 1, 2022 - 10:25 AM

2.3.4.1 Grainsize Estimates of Hydraulic Conductivity

A summary of the hydraulic conductivity values estimated from the individual grainsize analyses and soil type using the Hazen approximation method is presented below in Table 1. The Hazen method is most reliable when used to approximate the hydraulic conductivity of coarse grained sediments; however, it is still considered useful for providing a general indication of the hydraulic conductivity of finer grained soil. The grainsize analyses are provided in Appendix C.

Table 1: Hydraulic Conductivity Calculations – Grainsize Analyses

Test Location	Sample Depth (m)	Sample Description	D_{10} (mm)	Hydraulic Conductivity (cm/s) Hazen Estimation
BH-3	6.3 – 6.6	Clay & Silt	0.02	4.0×10^{-4}
BH-7	3.0 – 3.5	Fill – Sand with Silt	0.05	2.5×10^{-3}
BH-2	0.8 – 1.2	Fill – Silty Sand	0.002	4.0×10^{-6}
BH-4	9.2 – 9.8	Silty Sand	0.015	2.2×10^{-4}
BH-1	2.3 – 2.7	Sand with Silt	0.07	4.9×10^{-3}

Based on grainsize results, four sample descriptions were identified, consisting of fill, clay and silt, sand with silt and silty sand. The estimated K of the soils in the study area is moderate and ranges from the order of magnitude of 10^{-4} cm/s to 10^{-3} cm/s. The shallow fill material at BH-2 had the lowest estimated K of 4.0×10^{-6} cm/s and the sand with silt at BH-1 had the highest estimated K of 4.9×10^{-3} cm/s.

2.3.4.2 In Situ Estimates of Hydraulic Conductivity

To assess the in situ hydraulic conductivity of the soils across the study area, falling head in situ well tests were completed at all four monitoring wells (refer to Figure 4 for monitoring well locations and Appendix B for borehole logs). The results of these tests are presented in Table 2 and provided in Appendix D.

Table 2: In Situ Falling Head Hydraulic Conductivity Estimates

Test Location	Screen Depth (m)	Screen Material	Hydraulic Conductivity (K) (cm/s)
BH-1	16.7 to 18.3	Silty Sand	2.0×10^{-3}
BH-3d	12.2 to 13.7		2.3×10^{-3}
BH-4	9.3 to 10.8		5.6×10^{-3}

All four monitoring wells are screened in silty sand at depths ranging from 6.1 mbgs to 18.3 mbgs. The hydraulic conductivity values are moderate and are within the same order of magnitude and range from 2.0 x 10^{-3} cm/s to 5.6 x 10^{-3} cm/s. These results are consistent with the hydraulic conductivity rates calculated through the Hazen estimation method.

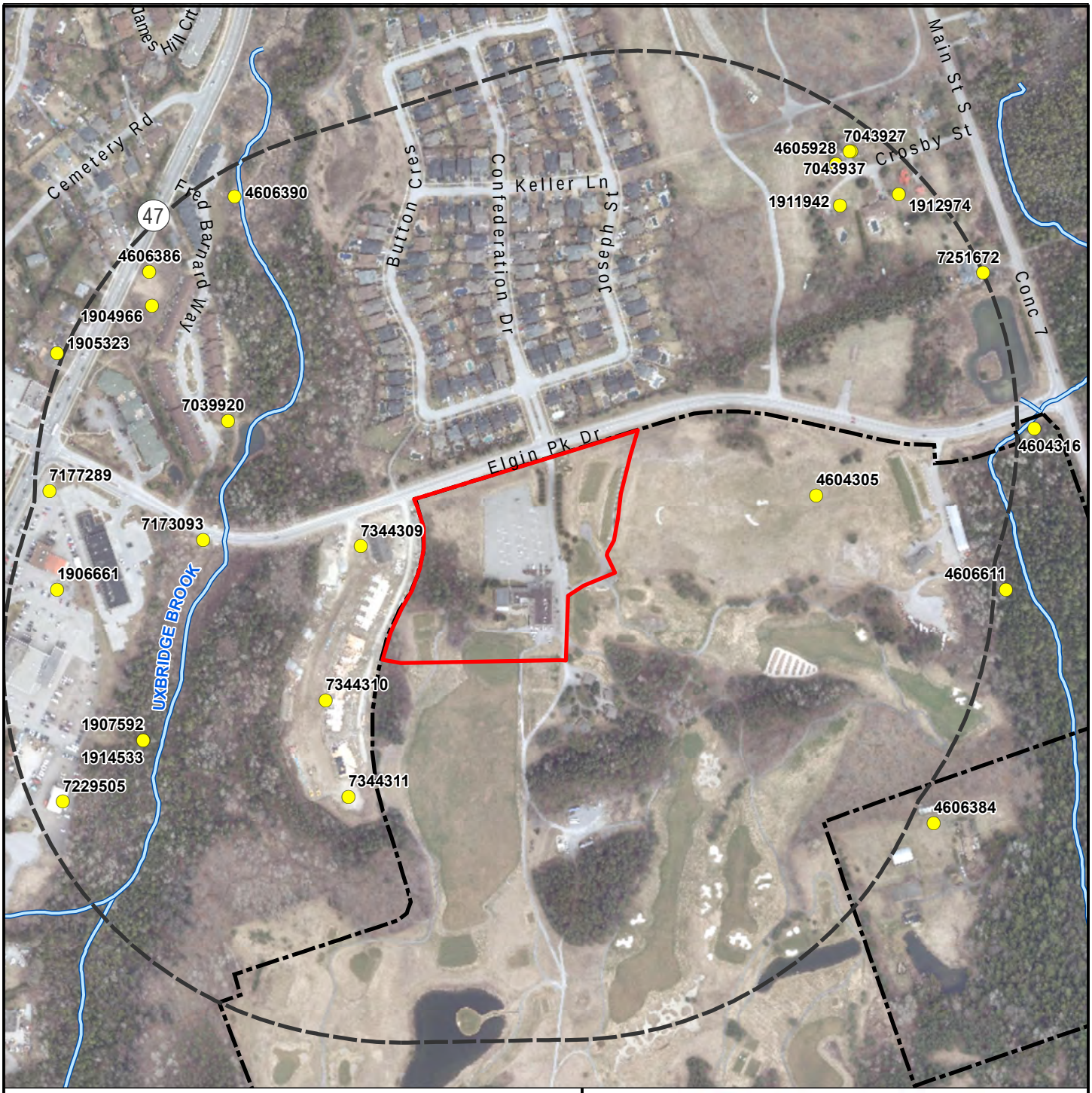
The hydraulic conductivity value of BH3-s is approximately 3.7 cm/s. The high K value is interpreted to be a result of the falling-head water saturating the dry screened soils and not typical saturated hydraulic conductivity conditions. As such the rate is not representative of the hydraulic potential of the silty sand.

3.0 Hydrogeology

3.1 Local Groundwater Use

The Town of Uxbridge as well as the existing clubhouse on the subject property are serviced by municipal water and sewer. It is expected that the proposed hotel expansion will also be municipally serviced. There is no proposed on-site groundwater taking planned for the new expansion. The surrounding properties are currently residential subdivisions to the north and west, and mixed residential/agricultural and woodlots to the east and south. The residential areas to the east and south are assumed to be serviced by private wells or cisterns, and septic systems.

A review of MECP water well records within 500 m of the study area (Figure 6) indicates a total of 58 well records, which includes 24 domestic supply wells (one abandoned), eight monitoring/test hole wells, five wells which are identified as “not used” (four of which are identified as abandoned), two industrial wells, one commercial well, one livestock supply well, one municipal well, and 16 well records with no information (15 wells abandoned) (Appendix A). The supply wells were constructed between 1961 and 2014 and range from about 11 mbgs to 61 mbgs in depth. Of the wells where stratigraphy is provided (43 wells), approximately 93% (40 wells) are screened in the upper sands and gravels (interpreted to be the ORAC or Channel Sand Aquifer) at depths ranging between about 11 mbgs to 28 mbgs. Approximately 7% (three wells) are screened in a deeper confined aquifer (interpreted to be the Thorncliffe aquifer) between about 28 mbgs to 61 mbgs.



LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- BUFFER (500m)
- MECP WELL RECORD LOCATION

0 50 100 200 300 400
Metres

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BURNSIDE

Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO

HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

MECP WELL LOCATIONS

Drawn	Checked	Date	Figure No.
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File Path:Nigel/Shared Work Areas/ A:\050985 Wooden Sticks\06_GIS\050985 MECP Well Locations.mxd Print Date: 2022/11/01 Time: 10:44 AM

3.2 Groundwater Levels

Four monitoring wells (BH-1, BH-3s/d and BH-4) including one well nest (e.g., wells located adjacent to each other but completed at different depths (BH-3s/d)) were installed in April 2021 as part of the geotechnical investigation completed by GHD to facilitate measurement of the groundwater levels across the study area. Refer to Figure 2 for well locations and Appendix B for borehole logs. Dataloggers were installed in two of these monitoring well locations (BH-1 and BH-3d) to record continuous groundwater levels. The groundwater monitoring data tables and hydrographs are provided in Figure E-1 to Figure E-3 in Appendix E.

The groundwater monitoring data from the monitoring wells show the following:

- The schematic cross-section (Figure 5) shows that the monitoring wells are screened in the shallow ORAC. The groundwater levels did not exhibit typical seasonal fluctuations (i.e., highest elevations generally observed in the spring and the lowest elevations observed in the summer months) and fluctuated 0.2 m to 0.3 m throughout the monitoring period. Datalogger data suggest that the groundwater table minimally responds to precipitation events.

- The groundwater levels across the study area generally range from 277.3 masl to 278 masl. Seasonally high groundwater levels were recorded in March 2022 and range from 277.6 masl (9.8 mbgs) at BH-4 to 278 masl at BH-1 (16.1 mbgs) and BH-3d (11.3 mbgs). Seasonally low groundwater levels were recorded in September 2021 and range from dry at BH-3s and 277.3 masl (BH-4, 10.0 mbgs) to 277.7 masl (BH-1, 16.3 mbgs and BH-3d, 11.5 mbgs).

- A monitoring well nest (BH-3s/d) was installed at one location; BH-3s/d is located in the southwest portion of the study area. The shallow well (BH-3s) is completed at 7.4 mbgs and the deep well (BH-3d) is completed to 13.5 mbgs. Both monitoring wells are screened in silty sand. The shallow well was generally dry (<281.9 masl) throughout the monitoring period, whereas the deep well had groundwater levels around 278 masl (Figure E-2, Appendix E). These data suggest there is a downward hydraulic gradient with groundwater recharge conditions.

3.3 Groundwater Flow Conditions

As discussed in Section 3.2 and interpreted on the cross-section (Figure 5), the groundwater levels in the study are found at depths greater than 10 mbgs, approximately at an elevation of 277 masl to 278 masl, in the interpreted ORAC. The groundwater levels across the study area are relatively flat, showing little horizontal gradient across the study area. Data published by LSRCA (2015) suggests the regional groundwater flow of the ORAC in vicinity of the subject property, is to the north towards Lake Simcoe.

3.4 Recharge and Discharge Conditions

Areas where groundwater moves upward are points of discharge and generally occur in areas of relatively lower topographic elevation, such as along watercourses. Areas where groundwater moves downward into deeper aquifers are called recharge areas. Recharge and discharge areas may occur as a result of regional and/or local flow system conditions. As discussed in Section 3.2, downward gradients are observed in the monitoring well nest (BH-3s/d) installed on the study area, indicating groundwater recharge conditions.

Ecologically Significant Groundwater Recharge Areas (ESGRAs) are areas that are interpreted to support groundwater discharge to watercourses and wetlands and are delineated by LSRCA. The purpose of the mapping is to identify potential linkages between groundwater recharge areas and ecological features (i.e., wetlands, watercourses, etc.). ESGRAs have not been mapped in the study area.

4.0 Water Quality

4.1 Groundwater Quality

On October 14, 2021, groundwater samples were collected from two monitoring wells in the study area (BH-1 and BH-4, Figure 4). Both monitoring wells are screened in silty sand. BH-1 is completed at an elevation of 276.0 masl and BH-4 is completed at an elevation of 276.5 masl. The purpose of the sampling was to assess the baseline shallow groundwater quality. The samples were submitted to AGAT Laboratory for analysis of general quality indicators (e.g., pH, hardness, and conductivity), basic ions (including chloride and nitrate) and selected metals. The results of the analyses were compared to the Ontario Drinking Water Quality Standards (ODWQS) and are presented in Table F-1, Appendix F.

As is typical for shallow groundwater conditions in this area, the results show that groundwater is hard, with high turbidity. Hardness at BH-1 (302 mg/L) and BH-4 (298 mg/L) were reported above the ODWQS operational guideline of 80 mg/L to 100 mg/L and is related to the overburden sediment chemistry in Southern Ontario. Similarly, turbidity at BH-1 (5400 NTU) and BH-4 (2410 NTU) were reported above the ODWQS aesthetic objective of 5 NTU and is related to suspended sediments. There were no other exceedances of the ODWQS reported.

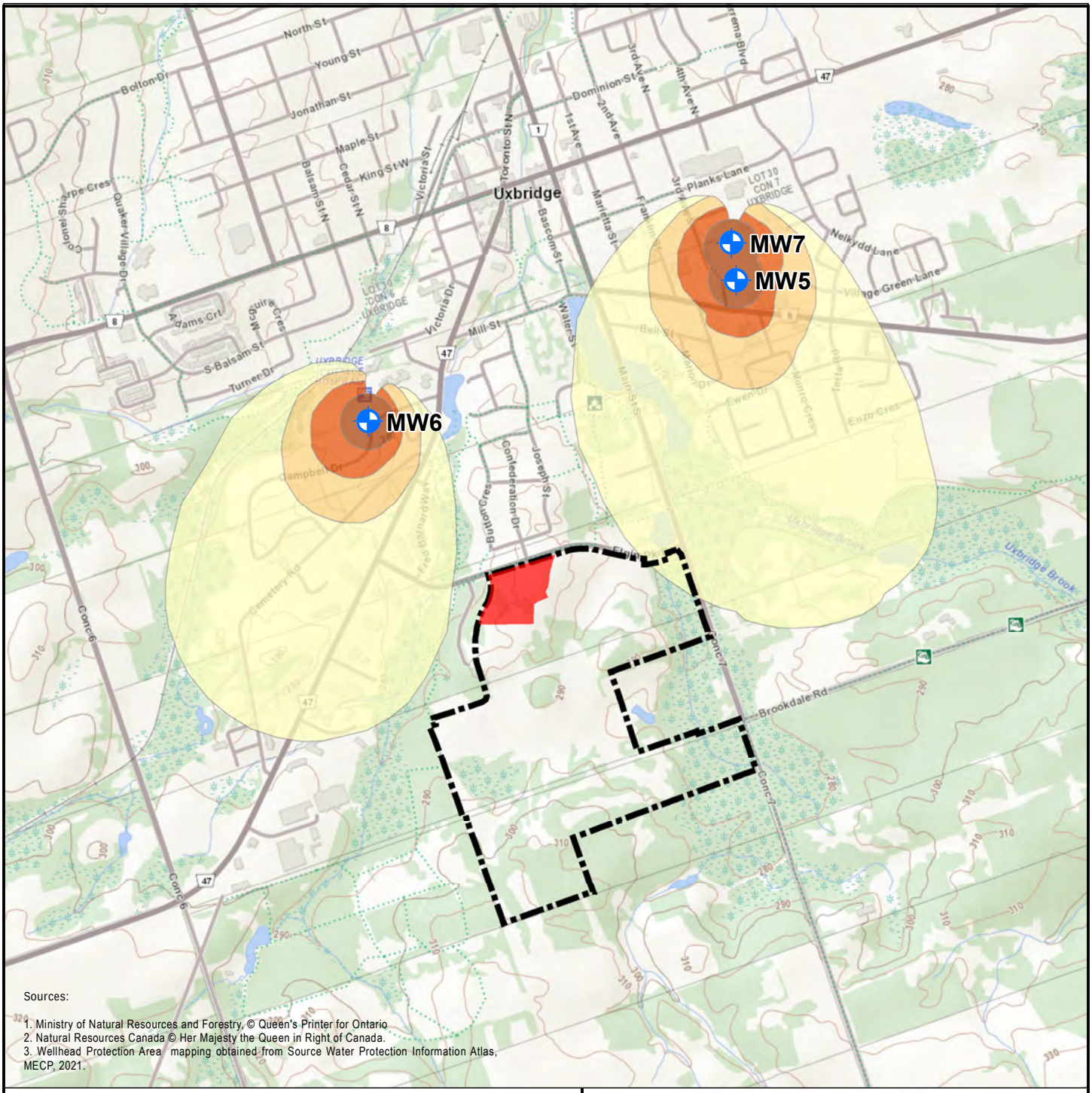
5.0 Source Water Protection

5.1 Wellhead Protection Areas

Wellhead Protection Areas (WHPAs) are zones around municipal water supply wells where land uses must be carefully planned and restricted to protect the quality and quantity of the water supply.

The Town of Uxbridge is serviced by three municipal water supply wells (MW5, MW6 and MW7) within two WHPA zones. Municipal water supply well MW6 corresponds to one WHPA and municipal water supply wells MW5 and MW7 correspond to a second WHPA. The study area is located south of these wells and is approximately 800 m southeast from MW6 and approximately 1.4 km southwest of MW7 and MW5. The municipal water supply wells are identified as semi-contained and are not classified as groundwater under direct influence (GUDI) of surface water (LSRCA, 2015). Municipal water supply wells MW5 (76.5 m deep) and MW7 (66.5 m deep) are screened at an elevation of 201 masl and are installed where the Thorncliffe Aquifer Complex (TAC) is connected to the intermediate and shallow aquifers (ORAC) via a tunnel that breached the Newmarket till (LSRCA, 2015). Municipal well MW6 (58.2 m deep) is screened at an elevation of 220 m and installed in the TAC where it is confined by Newmarket Till, thus suggesting the tunnel channel is not present (LSRCA, 2015).

Based on our review of WHPA mapping available from Durham Region, the study area is located between the two Town of Uxbridge municipal water supply WHPAs and does not fall within any WHPA for water quality (Figure 7). The subject property is, however, mapped within a WHPA-Q zone for water quantity. WHPA-Q designation is applied to lands where it has been determined that a reduction in recharge may have a measurable impact on municipal well supplies. It is recommended that the development incorporates LID best management practices to promote recharge, and targets are provided for stormwater capture rates to maintain groundwater conditions and sustainability of the municipal wells supplies.



LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- WHPA: A
- WHPA: B
- WHPA: C
- WHPA: D
- MUNICIPAL SUPPLY WELL

0 250 500 1,000
Metres

N

BURNSIDE

Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

WELLHEAD PROTECTION AREAS

Drawn	Checked	Date	Figure No.
SK	MM	NOVEMBER 2022	7
Scale		Project No.	
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5.2 Aquifer Vulnerability

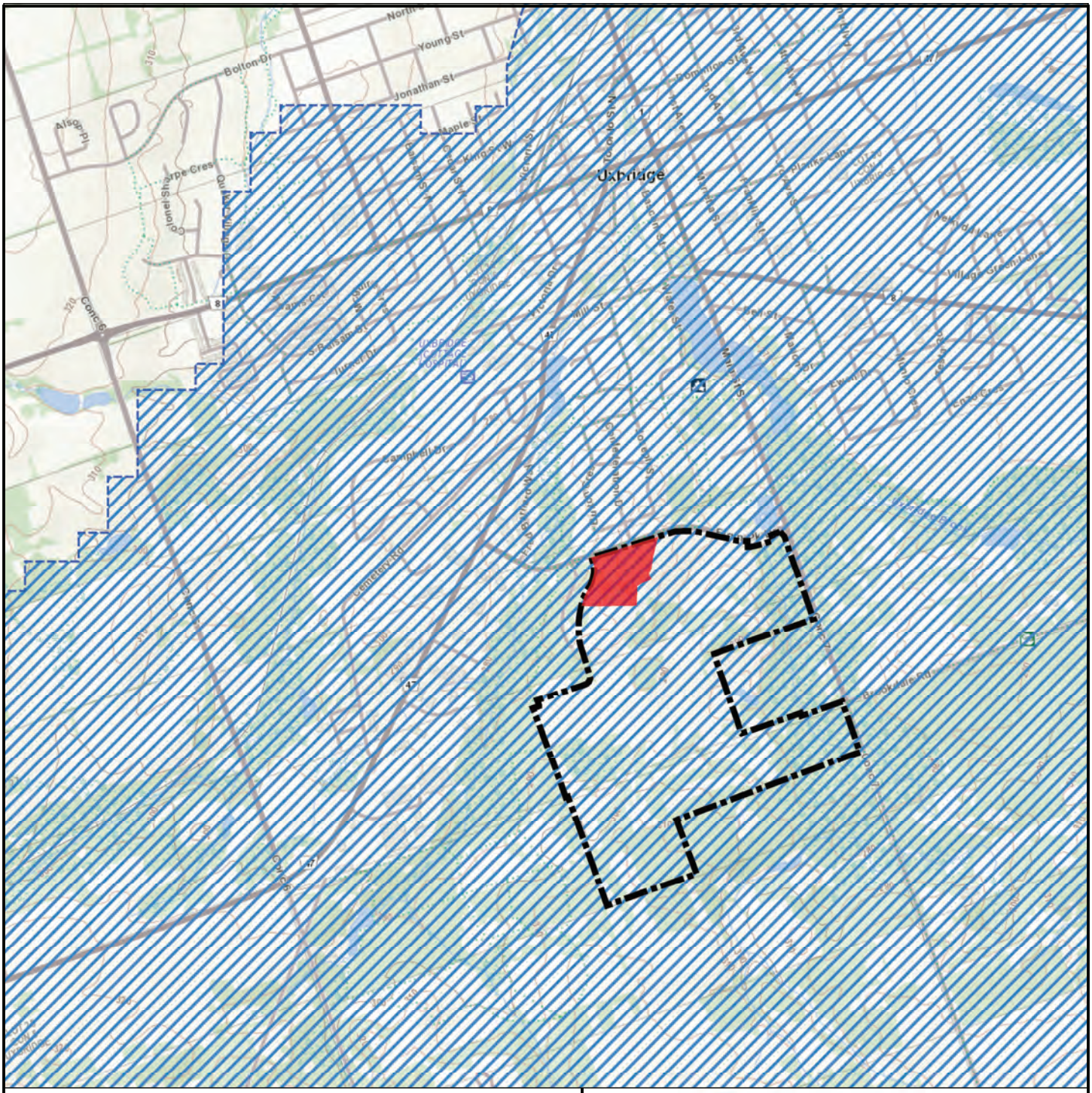
The Aquifer Vulnerability mapping available from the MECP Source Protection Information Atlas shows the subject property and study area are within a high aquifer vulnerability area (HVA) (Figure 8). Aquifer vulnerability refers to the susceptibility of an aquifer to potential contamination. Some degree of protection for groundwater quality from natural and human impacts is provided by the soil above the water table. The degree of protection is dependent upon the depth to the water table (for unconfined aquifers) or the depth of the aquifer (for confined aquifers) and the type of soil above the water table or aquifer. As these two properties vary over any given area, the degree of protection or vulnerability of the groundwater to contamination also varies. The subject property is considered to have a high risk aquifer vulnerability (score 6) as the surficial coarse grained soils generally have a moderate hydraulic conductivity and the ORAC is interpreted to be unconfined near ground surface. All HVAs have a vulnerability score of 6 (high risk) and are typically located in areas with sandy soils and/or a high groundwater table where surface contaminants can be readily transported into the shallow aquifer system.

The classification of high aquifer vulnerability does not restrict the proposed hotel expansion on the subject property. The classification is restrictive for potentially contaminating land uses that involve more industrial land uses, for example the generation or storage of hazardous and industrial wastes. The proposed hotel expansion does not include any of the restricted land uses considered high risk for areas of high aquifer vulnerability, and as such does not pose a threat to the groundwater quality of the underlying aquifers.

5.3 Significant Groundwater Recharge Areas

Areas where water from precipitation percolates or infiltrates into the ground and moves downward from the water table are known as recharge areas and occur as a result of regional and/or local flow systems.

Significant Groundwater Recharge Areas (SGRAs) are areas where precipitation more readily recharges aquifers. As such, they can be sensitive to land use changes that impact infiltration from precipitation sources. It is noted that SGRAs that intersect HVAs are designated as high risk (score 6), while other SGRAs are designated as low risk (score 2 or 4). MECP mapping shows that the study area is located within an SGRA and is designated as high risk (score 6) (Figure 9). This is consistent with the findings of the surficial geology where coarse textured (silty sand) kame moraine deposits were mapped at surface (Section 2.3.2 and Figure 3). Due to the coarse textured soils at surface, the hydraulic conductivity of the soils is moderate, and as such, recharge to the underlying aquifer (ORAC) is moderate. As discussed below in Section 7.7, LID measures, including LID/stormwater management practices will be incorporated into the development to offset any loss in recharge associated with the proposed development.



LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- AREA OF HIGH AQUIFER VULNERABILITY

0 250 500 1,000
Metres

N

BURNSIDE

Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

AQUIFER VULNERABILITY

Drawn	Checked	Date	Figure No.
SK	MM	NOVEMBER 2022	8
Scale		Project No.	
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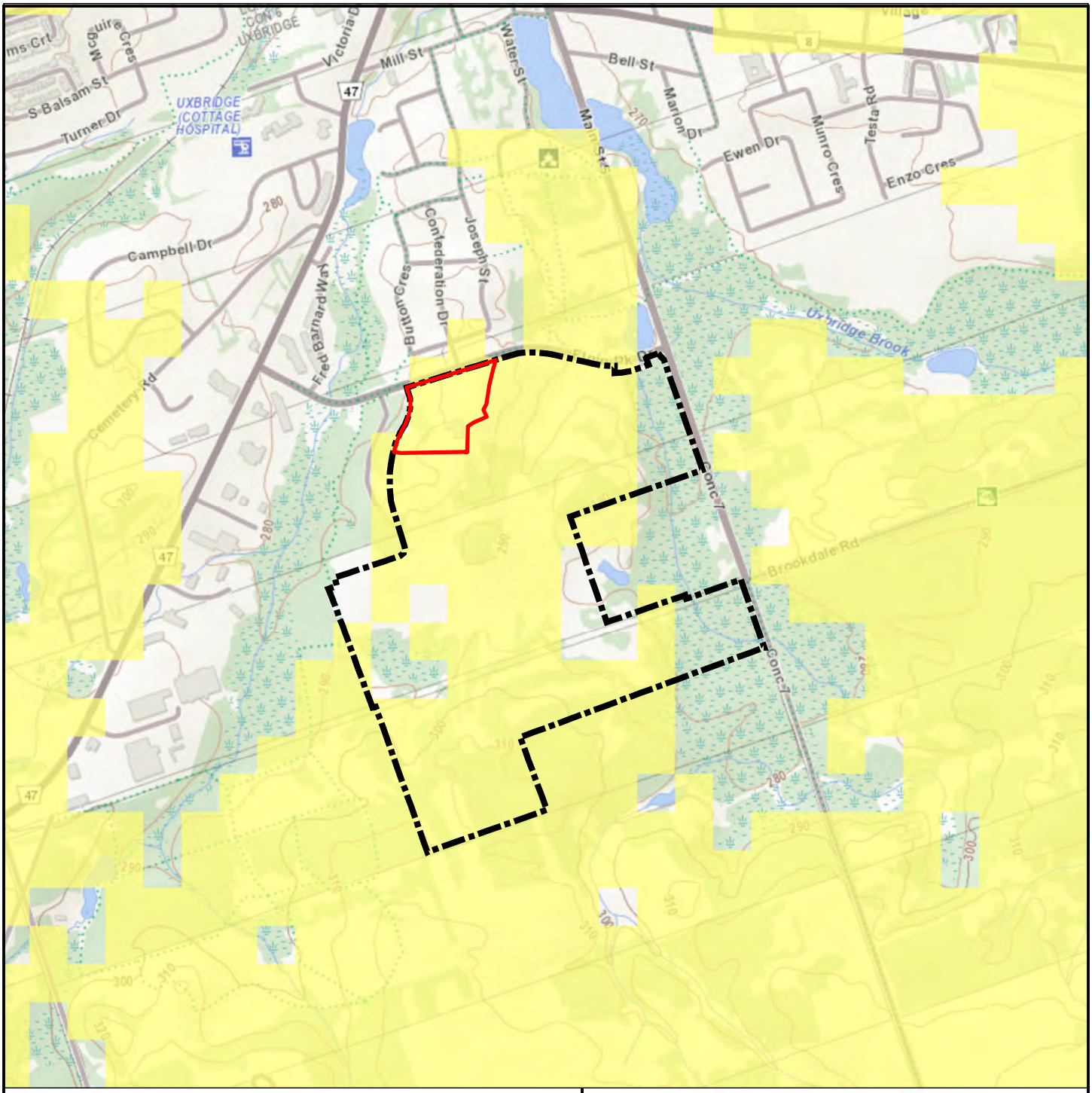

LEGEND

- APPROXIMATE STUDY AREA
- SUBJECT PROPERTY
- SIGNIFICANT GROUNDWATER RECHARGE AREAS (SGRA)

Sources:

1. Ministry of Natural Resources and Forestry, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.
3. SGRA mapping obtained from Source Water Protection Information Atlas, MECP, 2021.

0 250 500 1,000
Metres

N

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Client / Report

WOODEN STICKS GOLF COURSE
UXBRIDGE, ONTARIO
HYDROGEOLOGICAL ASSESSMENT AND WATER BALANCE

Figure Title:

RECHARGE AREAS

Drawn	Checked	Date	Figure No.
SK	MM	NOVEMBER 2022	9
Scale		Project No.	
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File Path:Nigel/Shared Work Areas/ A:\050985 Wooden Sticks\06_GIS\050985 SGRA.mxd Print Date: 2022/11/01 Time: 10:11 AM

6.0 Conformity with the Oak Ridges Moraine Conservation Plan

In 2001, the Province released a comprehensive strategy for the ORM, which included the Oak Ridges Moraine Conservation Act, 2001 and the regulations of the Oak Ridges Moraine Conservation Plan (ORMCP).

The ORMCP was established to provide land use and resource management direction for the ORM's ecological and hydrogeological features and functions. It identifies key natural heritage features (e.g., wetlands, woodlands, etc.) and hydrologically sensitive features (e.g., kettle lakes and springs). Decisions regarding land use planning that affect the ORM, whether made at the provincial or municipal level, must conform to the specific provisions of the ORMCP.

The ORMCP classifies the ORM into four land use designations:

- Natural Core Areas
- Natural Linkage Areas
- Countryside Areas
- Settlement Areas

The study area is located within the Countryside Area land use designation. Countryside Areas are defined as rural land use such as agriculture, recreation, residential development, rural settlements, mineral aggregate operations, parks and open space. Specific policies have been established in the ORMCP based on the land use designation, and with respect to hydrogeology, comments on relevant sections of the ORMCP are provided below.

Sections 24 and 25 – Watershed Plans, and Water Budgets and Conservation Plans

As the ground floor area of the proposed hotel expansion is greater than 500 m^2, the proposed development is considered a major development according to the definition in the ORMCP. In fulfillment of Sections 24 and 25, a subwatershed plan has been prepared by the LSRCA for the Pefferlaw River, which includes Uxbridge Brook (Pefferlaw River Subwatershed Plan (LSRCA, 2012)). The subwatershed plan includes a water budget and conservation plan for the subwatershed.

Section 26 – Hydrologically Sensitive Features

The ORMCP identifies permanent and intermittent streams, wetlands, kettle lakes and seepage areas and springs as key hydrologic features. Development and site alteration are prohibited in these areas, with some exceptions. No key hydrologic features have been identified within the study area.

Section 27 – Subwatersheds

Section 27 of the ORMCP states:

"…all development and site alteration with respect to land in a subwatershed are prohibited if they would cause the total percentage of the area of the subwatershed that has impervious surfaces to exceed,"

(a) 10 per cent; or

(b) Any lower percentage specified in the application watershed plan or subwatershed plan

The Pefferlaw River Subwatershed Plan (LSRCA, 2012) notes that the impervious cover for the subwatershed (which includes wetland and waterbodies) is 7.8%. The proposed hotel expansion will include the addition of approximately 6,300 m^2 of impervious areas, which is only approximately 0.001% of the total subwatershed area of 446.3 km^2 and will have a negligible impact on the overall imperviousness of the subwatershed.

Section 28 – Wellhead Protection Areas

As discussed in Section 4.1.1 of this report, the study area is not located within a WHPA for water quality. As such, the restrictions noted in Section 28 of the ORMCP do not apply.

Section 29 – Areas of High Aquifer Vulnerability

As discussed in Section 4.1.2 of this report, the study area has been mapped as an area of high aquifer vulnerability (Figure 8). Certain land uses are prohibited on lands that have been identified as areas of high aquifer vulnerability, including generation and storage of hazardous waste or liquid industrial waste; water disposal sites and facilities, organic soil conditioning sites, and snow storage and disposal facilities underground and above-ground storage tanks that are not equipped with an approved secondary containment device; and storage of severely toxic contaminants, as specified in the plan. None of the prohibited land uses are proposed for the study area.

7.0 Water Balance

To assess potential land development impacts on the local groundwater conditions, a detailed water balance analysis has been completed to determine the pre-development infiltration volumes (based on existing land use conditions) and the post-development infiltration volumes that would be expected based on the proposed land use plan. The water balance calculations are provided in Appendix G and discussed below.

7.1 Water Balance Components

A water balance is an accounting of the water resources within a given area. As a concept, the water balance is relatively simple and may be estimated from the following equation:

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

where:
- P = precipitation
- S = change in groundwater storage
- ET = evapotranspiration/evaporation
- R = surface water runoff
- I = infiltration

The components of the water balance vary in space and time and depend on climatic, soil, and land cover conditions (i.e., rainfall intensity, land slope, soil hydraulic conductivity and vegetation). Accurate measurement of the water balance components is difficult; consequently, approximations and simplifications are made to characterize the study area. Field observations of the drainage conditions, land cover and soil types, groundwater levels, and local climate records are important inputs to the water balance calculations. The groundwater balance components for the Study Area are discussed below.

Precipitation (P)

The long-term average annual precipitation for the area is 886 mm based on data from the Environment Canada UDORA climate station (Station 6119055, 44°15' N, 79°09' W, elevation 262 masl) for the period between 1981 and 2010. The UDORA climate station is located approximately 19 km north of the study area. Average monthly records of precipitation and temperature from this station have been used for the water balance component calculations in this study (Table G-1, Appendix G).

Storage (S)

Although there are groundwater storage gains and losses on a short-term basis, the net change in groundwater storage on a long-term basis is assumed to be zero so this term is dropped from the equation.

Evapotranspiration (ET)/Evaporation (E)

Evapotranspiration and evaporation components vary based on the characteristics of the land surface cover (i.e., type of vegetation, soil moisture conditions, perviousness of surfaces, etc.). Potential evapotranspiration (PET) refers to the water loss from a vegetated surface to the atmosphere under conditions of an unlimited water supply. The actual rate of evapotranspiration (AET) is often less than the PET under dry conditions

(i.e., during the summer when there is a soil moisture deficit). In this report, the monthly PET and AET have been calculated based on a soil-moisture balance approach using average temperature data and climate information adjusted to the local latitude (refer to Tables G-1 and G-2 in Appendix G).

Water Surplus (R + I)

The difference between the mean annual P and the mean annual ET is referred to as the water surplus. Part of the water surplus travels across the surface of the soil as surface or overland runoff and the remainder infiltrates the surficial soil.

Infiltrating precipitation either moves vertically downward to the groundwater table or laterally through the shallow soils as interflow that re-emerges locally to surface (i.e., as runoff). Compared to the “direct” component of surface runoff that occurs as overland flow, shallow interflow becomes an “indirect” component of runoff. The interflow component of surface water runoff is not accounted for separately in the water balance equation cited above since it is difficult to distinguish between interflow and direct (overland) runoff. Both interflow and direct runoff contribute to the overall surface water runoff component.

7.2 Approach and Methodology

The analytical approach to calculate a water balance for the study area involved monthly soil-moisture balance calculations to determine the pre-development (based on existing land use conditions) and post-development (based on the proposed development concept plan) infiltration volumes. A soil-moisture balance approach assumes that soils do not release water as “potential infiltration” while a soil moisture deficit exists. During wetter periods, any excess of precipitation over evapotranspiration first goes to restore soil moisture. Once the soil moisture deficit is overcome, excess water can then pass through the soil as infiltration and either become interflow (indirect runoff) or recharge (deeper infiltration).

The surficial soils across the study area consist silty sand deposits. Given the predominance of sand in the soils across the site, a soil moisture storage capacity of 75 mm was used for the urban lawn/grassed areas (i.e., urban lawns/shallow rooted crops in fine sandy loam soils) and a soil moisture storage capacity of 300 mm was used for wooded areas (i.e., mature forests in fine sandy loam soils) in both the pre- and post-development calculations. Tables G-1 and G-2 (Appendix G) detail the monthly potential evapotranspiration calculations for each land use type and soil type accounting for latitude and climate, and the actual evapotranspiration and water surplus components of the water balance based on the monthly precipitation and soil moisture conditions.

The SWM Planning and Design Manual (2003) methodology for calculating total infiltration based on topography, soil type and land cover was used, and a corresponding

runoff component was calculated for the soil moisture storage conditions (Tables G-1 and G-2, Appendix G).

The calculated water balance components are used to assess the pre-development infiltration volumes based on the existing land use and a post-development water balance is calculated for the study area based on the proposed land development plan.

7.3 Component Values

The detailed monthly calculations show that a water surplus is generally available from November to May (Tables G-1 and G-2, Appendix G). Infiltration occurs during periods when there is sufficient water available to overcome the soil moisture storage requirements. In winter climates, frozen conditions affect when the actual infiltration will occur; however, the monthly balance calculations show the potential volumes available for these water balance components.

The monthly calculations are summed to provide estimates of the annual water balance component values (Table G-1 and G-2, Appendix G). A summary of these values for existing conditions is provided in Table 3.

Table 3: Existing Conditions Water Balance Components

Water Balance Component	Urban Lawns (sandy loam)	Wooded Areas (sandy loam)
Average Precipitation	886 mm/year	886 mm/year
Actual Evapotranspiration	570 mm/year	587 mm/year
Water Surplus	316 mm/year	299 mm/year
Infiltration	205 mm/year	224 mm/year
Runoff	111 mm/year	75 mm/year

7.4 Pre-Development Infiltration (Existing Conditions)

The pre-development water balance calculations for the study area are presented in Table G-3 in Appendix G. The total area of the study area is about 40,900 m^2. The current land use is predominantly urban grassed areas, parking/paved areas and an existing clubhouse, banquet hall and shed. Runoff from the existing clubhouse and parking area is directed to the storm sewer. In the areas where select roof areas (i.e., the banquet hall roof and shed roof) are directed to pervious areas (grass), it has been assumed in the calculations that 50% of the roof runoff will infiltrate, as per the estimation provided in the Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA, 2010). In summary from Table G-3 (Appendix G), the total calculated pre-development infiltration volume is about 6,000 m^3/year. It is acknowledged that infiltration rates depend on the hydraulic conductivity of soils and that

hydraulic conductivity may naturally vary over several orders of magnitude, so the margins of error on the calculations are high. As such the calculated volumes are considered as general estimates only.

7.5 Potential Urban Development Impacts to Water Balance

Development of an area affects the natural water balance. The most significant difference is the addition of impervious surfaces as a type of surface cover (i.e., roads, parking lots, driveways, and rooftops). Impervious surfaces prevent infiltration of water into the soils and the removal of the vegetation removes the evapotranspiration component of the natural water balance. The evaporation component from impervious surfaces is relatively minor (estimated to be 10% to 20% of precipitation) compared to the evapotranspiration component that occurs with a healthy vegetation cover (about 64 % to 66% of precipitation in the study area). So, the net effect of the development of the property is expected to be an increase in the water surplus resulting in a decrease in infiltration and an increase in runoff.

The calculated potential water surplus for impervious areas is shown at the bottom of Tables G-1 and G-2 in Appendix G. For the purposes of the calculations in this study, the evaporation has been estimated to be 15% of precipitation. The remaining 85% of the precipitation that falls on impervious surfaces is assumed to become runoff. Therefore, there is a potential post-development water surplus from impervious areas of about 753 mm/year.

It is noted that the proposed development will be serviced by municipal water supply and wastewater services. Therefore, there will be no impact on the water balance and local groundwater or surface water quantity and quality conditions related to any on-site groundwater taking or from septic effluent.

7.6 Post-Development Water Balance With No Mitigation

To assess the potential development impact on infiltration, the post-development infiltration volume was calculated for the study area based on the proposed development plan. These calculations assume no mitigation is in place, resulting in quantification of an infiltration target for the design of a Low Impact Development (LID) strategy for stormwater management.

The land areas for each proposed land use on the study area was estimated based on the functional servicing and grading plan provided by GHD and the proposed development plan provided by Marc J. Riva Architect. Copies of these plan are provided in Appendix G. The infiltration and runoff components for the post-development land uses were calculated using the SWM Planning and Design Manual (2003) methodology based on topography, soil type and land cover as shown on Tables G-1 and G-2, Appendix G. The total calculated post-development infiltration and runoff volumes

(without mitigation) are presented in Table G-3, Appendix G. The estimated annual infiltration volume is about 4,800 m^3/year.

Comparing the existing (pre-development) and post-development values in Table G-3, Appendix G, the water balance calculations show that development has the potential to reduce the natural infiltration across the study area by about 21% (1,300 m^3/year).

LID measures for stormwater management are recommended to try to promote infiltration and make up the difference between these pre- and post-development infiltration conditions to the extent practical. As noted above, with the wide margins of error associated with this type of analysis, the infiltration deficit volume is considered as a reasonable estimate that is suitable as a target or guide for LID strategy design.

7.7 Low Impact Development Measures for Infiltration

There are various LID techniques that may be used to increase the post-development infiltration in a newly urbanized area. The proposed LID measures for the study area were developed in conjunction with GHD and are indicated in the Functional Servicing and Stormwater Management Report for the proposed development and shown on GHD Drawing No. 11225804-FSGP provided in Appendix G. Based on preliminary design information from GHD, it is our understanding that the proposed LID measures will include:

- Infiltration of the 25 mm storm event from the new hotel roof via infiltration swales.
- Infiltration of the 25 mm storm event from the new parking lot (in the east portion of the study area) via infiltration swales.

Calculations have been completed to assess the effects of these LID measures as shown on Table G-4, Appendix G. Quantification of these LID techniques is challenging and there are no widely accepted quantification standards. To calculate the annual infiltration volume for runoff from areas directed to infiltration swales, the Toronto Wet Weather Flow Management Guidelines (City of Toronto, 2006) were used to correlate the storm event size these facilities are designed to infiltrate to a percentage of the average annual rainfall depth, which was then applied to the impervious area directed to these trenches to calculate an infiltration volume, as shown in Table G-4 (Appendix G). It is reported in these Guidelines, based on the review of rainfall data from 16 rainfall stations across Toronto, the 25 mm storm accounts for approximately 95% of the annual rainfall volume (78% of annual precipitation).

Recalculation of the water balance for the study area with these LID measures in place demonstrates that there would be a 40% increase in infiltration compared to pre-development volumes (Table G-4, Appendix G). This shows the significant benefit of the proposed LID strategy in increasing recharge volumes in the developed area.

8.0 Construction Considerations

8.1 Construction Below Water Table

The construction of buried services below the water table, particularly in lower hydraulic conductivity soils, has the potential to capture and redirect groundwater flow through permeable fill materials typically placed in the base of excavated trenches. Over the long-term, these impacts can lower the local groundwater table. To mitigate this effect, if any services are to be installed below the water table, appropriate best management techniques to prevent redirection of groundwater flow (e.g., the use of cut-off collars and/or trench plugs in service trenches) should be used.

8.2 Dewatering Requirements

The water table has been identified in the study area at depths greater than 10 mbgs. All sewer trenches and excavations are expected to be above the water table, and it is not anticipated that groundwater will be encountered during the construction of the development.

8.3 Private Water Wells

The proposed development will be municipally serviced. However, surrounding rural properties may still use private water supply wells. As noted in Section 8.2 above, dewatering during construction is not anticipated due to the depth to water table in the study area. As such, no impacts to the private wells in the vicinity of the study area are anticipated as a result of construction.

8.4 Well Decommissioning

In accordance with the Ontario Water Resource Act, Regulation 903 as amended (Wells Regulation), all inactive wells (water supply and monitoring wells) on the subject property must be located and properly decommissioned by a licensed water well contractor once they are no longer needed.

Four monitoring wells are located within the study area and should be decommissioned by a licensed water well contractor in accordance with the Wells Regulation and best management practices.

9.0 References

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BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

MECP Water Well Records

Water Well Records

Thursday, October 13, 2022
11:39:35 AM

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
GEORGINA TOWNSHIP (N CON 09 012	17 649806 4884447 W	2007/06 1413	36		2///:			7046906 (Z57510) A	
UXBRIDGE TOWN	17 649731 4884280 W	2007/12 7230	1.97			NU	0015 10	7101858 (Z70160) A	BRWN SAND SILT LOOS 0015 BRWN SAND SILT DNSE 0026
UXBRIDGE TOWN	17 649740 4884286 W	2008/02 5459	2	FR 0087	///:	NU		7103265 (Z75624) A063140	BRWN FSND PCKD 0080 BRWN MSND FSND LOOS 0087 GREY CLAY STNS HARD 0088
UXBRIDGE TOWN	17 649715 4884203 W	2009/04 6370		FR 0010		NU		7123913 (Z48973) A043801	BRWN SAND SAND 0026
UXBRIDGE TOWN	17 649733 4884271 W	2008/02 5459	0.79		///:			7103266 (Z75648) A063131 A	
UXBRIDGE TOWNSHIP (U	17 649777 4884009 W	2014/06 6946						7237175 (C23647) A159021 P	
UXBRIDGE TOWNSHIP (U	17 649673 4884237 W	2013/11 7383	2	0018			0017 10	7219037 (Z185300) A151226	BLCK 0000 BRWN SAND 0027
UXBRIDGE TOWNSHIP (U	17 649693 4884234 W	2013/11 7383	2			MO MO	0018 10	7214689 (Z166148) A151144	
UXBRIDGE TOWNSHIP (U	17 649704 4884197 W	2013/11 7383	2			MO	0018 10	7214688 (Z166147) A151275	
UXBRIDGE TOWNSHIP (U	17 649730 4884191 W	2013/11 7383	2	0023		MO	0018 10	7214687 (Z166149) A151272	
UXBRIDGE TOWNSHIP (U	17 649807 4884327 W	2012/01 7247	2	UT 0010		MT	0010 10	7177289 (Z140548) A124053	0001 BRWN SAND SILT FILL 0002 BRWN SAND SILT 0020
UXBRIDGE TOWNSHIP (U	17 649969 4884276 W	2011/08 7247	2	UT		MT	0018 5	7173093 (Z136620) A119021	BLCK PEAT WDFR LOOS 0012 BRWN SAND SILT LOOS 0017 GREY SILT CLAY DNSE 0022 GREY SILT SAND DNSE 0025
UXBRIDGE TOWNSHIP (U 06 028	17 649995 4884401 W	2006/12 3108				NU		7039920 (Z30636) A	0013
UXBRIDGE TOWNSHIP (U 06 028	17 650650 4884685 W	2007/05 4743						7043937 (Z51609) A047014 A	0081

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
UXBRIDGE TOWNSHIP (U 06 029	17 649705 4884041 W	2007/10 5459	6		///:			7052120 (Z61039) A064976 A	
UXBRIDGE TOWNSHIP (U CON 06 026	17 650739 4883977 W	1975/11 4743	6	FR 0040	7/30/12/2:0	ST DO	0042 8	4606384 ()	BRWN SAND 0007 YLLW CLAY 0040 BRWN SAND 0050
UXBRIDGE TOWNSHIP (U CON 06 027	17 649739 4883944 W	2017/08 7241	2			TH MO	0007 10	7295897 (Z268111) A221813	BLCK 0003 BRWN SAND 0017
UXBRIDGE TOWNSHIP (U CON 06 027	17 649733 4883943 W	2017/08 7241	2			TH MO	0010 10	7295898 (Z268110) A208702	BLCK 0003 BRWN SAND 0020
UXBRIDGE TOWNSHIP (U CON 06 027	17 649805 4884596 W	1995/11 3136	8 6	FR 0028	8/43/10/1:0	DO	0046 8	1912654 (165154)	BRWN LOAM 0001 BRWN CLAY SNDY PCKD 0018 BRWN SAND SLTY 0028 BRWN FSND 0055
UXBRIDGE TOWNSHIP (U CON 06 027	17 649735 4883951 W	2017/08 7241	2			TH MO	0010 10	7295899 (Z268109) A233972	BLCK 0003 BRWN SAND 0020
UXBRIDGE TOWNSHIP (U CON 06 027	17 649905 4884065 L	2000/04 1413	6	FR 0102	30/92/10/1:	DO	0094 8	1914533 (214724)	BRWN SAND PCKD 0027 BRWN SAND CLAY SOFT 0050 BRWN FSND 0075 GREY FSND 0102
UXBRIDGE TOWNSHIP (U CON 06 027	17 650815 4884223 W	1976/08 1413	6	FR 0125	28/73/12/2:30	DO	0117 8	4606611 ()	BRWN SAND DRY 0026 BRWN CLAY SAND DNSE 0083 BLUE SILT CLAY SOFT 0106 RED FSND CLN 0125
UXBRIDGE TOWNSHIP (U CON 06 027	17 649906 4884065 L	1985/11 1672	6	FR 0060	18/44/10/0:0	DO	0053 4	1907592 ()	LOAM 0002 SAND GRVL 0010 SAND 0056 SAND FGVL 0060
UXBRIDGE TOWNSHIP (U CON 06 027	17 650615 4884323 W	1969/04 2104	6	UK 0051	10/40/7/3:0	DO		4604305 ()	PRDG 0012 GREY CLAY STNS 0015 BRWN MSND GRVL 0025 BRWN CLAY MSND 0045 BRWN CSND 0055
UXBRIDGE TOWNSHIP (U CON 06 027	17 649821 4884000 W	2014/08 1413	6.25	FR 0051	12/40/15/1:	IN	0046 5	7229505 (Z180161) A156474	BRWN SAND PCKD 0038 GREY SAND FSND 0051
UXBRIDGE TOWNSHIP (U CON 06 028	17 650640 4884628 W	1994/05 4743	6	FR 0072	19/45/12/2:0	DO	0074 6	1911942 (139869)	BLCK LOAM 0002 BRWN CLAY SAND 0017 BRWN SAND WBRG 0019 BRWN CLAY SAND LYRD 0072 BRWN SAND CLN 0080
UXBRIDGE TOWNSHIP (U CON 06 028	17 649778 4884521 W	1991/05 4743	6	FR 0066	7/50/10/2:0	DO	0066 3	1911068 (73178)	BRWN LOAM BLDR LOOS 0003 BRWN CLAY SOFT 0015 GREY CLAY HARD 0027 GREY SAND LOOS 0032 BRWN SAND 0069
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1995/02 5459				DO		1912335 (141584) A	PGVL 0120
UXBRIDGE TOWNSHIP (U CON 06 028	17 649815 4884473 W	1979/04 4743	6	FR 0063	23/60/6/2:0	DO	0066 4	1905323 ()	BRWN SAND LOOS 0023 YLLW CLAY 0047 GREY CLAY SOFT 0063 GREY SAND CLAY 0066 GREY FSND 0070
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1995/01 5459	6	FR 0201	18/201/2/5:0	DO	0201 3	1912334 (141583)	BRWN CLAY SNDY 0016 GREY CLAY STNS 0022 BRWN SAND SILT 0031 GREY CLAY STNS ROCK 0189 GREY SAND SILT 0195 GREY CLAY SILT 0201 GREY SAND CLN 0206
UXBRIDGE TOWNSHIP (U CON 06 028	17 649933 4884732 W	1988/07 4743	6	FR 0069	4/50/10/2:30	DO	0069 4	1909390 (31453)	BRWN LOAM SOFT 0002 BRWN SAND SOFT 0027 GREY CLAY GRVL SAND 0068 BRWN CSND LOOS LOOS 0073

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
UXBRIDGE TOWNSHIP (U CON 06 028	17 649815 4884223 W	1983/04 4738	6	FR 0040	10/41/12/3:0	CO	0059 3	1906661 ()	BRWN SAND LOOS 0040 GREY FSND VERY 0056 GREY FSND 0062
UXBRIDGE TOWNSHIP (U CON 06 028	17 649915 4884523 W	1978/01 4743	6	FR 0040	12/35/8/1:0	DO	0042 4	1904966 ()	BRWN SAND 0040 BRWN SAND WBRG 0046
UXBRIDGE TOWNSHIP (U CON 06 028	17 649765 4884573 W	1976/09 2407	6	FR 0069	22/72/5/1:0	DO	0069 6	1904518 ()	BLUE LOAM 0001 BLUE CLAY 0032 BLUE SAND QSND 0060 BLUE CLAY 0062 BLUE SAND 0075
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1999/07 5459						1914209 (195550) A	BRWN SAND SLTY 0062 BRWN SAND SILT STNS 0089 GREY CLAY STNS 0117 GREY SAND STNS 0127 GREY CLAY SAND STNS 0158
UXBRIDGE TOWNSHIP (U CON 06 028	17 649826 4884585 W	1961/08 1415	6	FR 0106	6/40/20/0:30	DO		4602989 ()	GRVL MSND 0004 FSND 0090 MSND CLAY 0100 MSND GRVL 0106 GRVL 0107
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1986/02 4743	6 5	FR 0047	15/40/8/1:30	DO	0050 7	1907591 ()	BRWN CLAY SAND 0015 YLLW CLAY SAND PCKD 0047 BRWN FSND 0057 BRWN CLAY SAND LYRD 0064 GREY CLAY STNS HPAN 0077
UXBRIDGE TOWNSHIP (U CON 06 028	17 649804 4884140 W	2006/06 5459	6					1918347 (Z35910) A016067 A	
UXBRIDGE TOWNSHIP (U CON 06 028	17 650652 4884685 W	2007/05 4743	6.09 5	FR 0069	13///:	DO	0071 4	7043927 (Z51608) A045900	BLCK LOAM 0002 BRWN CLAY SAND LOAM 0019 GREY CLAY 0061 GREY SILT CLAY LYRD 0067 BRWN SAND GRVL 0075
UXBRIDGE TOWNSHIP (U CON 06 028	17 649988 4884419 W	2006/12 3108				NU		7039921 (Z30635) A	
UXBRIDGE TOWNSHIP (U CON 06 028	17 650002 4884638 W	1975/12 4743	6	FR 0056	3/20/15/3:0	DO	0057 3	4606390 ()	BLCK LOAM 0001 GREY CLAY GRVL 0020 BRWN CLAY SAND 0038 GREY FSND 0046 GREY GRVL 0060
UXBRIDGE TOWNSHIP (U CON 06 028	17 649912 4884558 W	1975/12 4743	6	FR 0040	8/35/15/1:0	DO	0040 8	4606386 ()	BLCK LOAM 0001 GREY CLAY SAND 0040 GREY SAND 0048 GREY FSND CLAY 0052 GREY GRVL 0054 BLUE CLAY GRVL 0062
UXBRIDGE TOWNSHIP (U CON 06 028	17 649728 4884329 W	1975/02 1413	5	FR 0072	33/50/7/2:30	IN	0064 8	4606180 ()	BRWN SAND 0033 BLUE SAND SILT 0057 RED FSND 0072
UXBRIDGE TOWNSHIP (U CON 06 028	17 649839 4884623 W	1974/07 1350	6	FR 0035	10/35/6/2:0	DO	0037 5	4605933 ()	SAND CLAY 0012 CLAY 0017 SILT CLAY SAND 0035 SAND 0045
UXBRIDGE TOWNSHIP (U CON 06 028	17 649675 4884583 W	1973/04 1413	5	FR 0061	12/25/9/1:30	DO	0045 8	4605428 ()	PRDG 0019 BRWN SAND SILT 0050 GREY SAND 0061
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1999/08 5459						1914210 (195536) A	BRWN SAND SILT 0062 BRWN SAND STNS SILT 0089 GREY SAND STNS 0117 GREY SAND STNS 0123
UXBRIDGE TOWNSHIP (U CON 06 028	17 649776 4884444 L	2000/10 6874	30	FR 0020	17/26/25/2:	DO		1914838 (222356)	UNKN CMTD 0012 BRWN SAND 0026
UXBRIDGE TOWNSHIP (U CON 06 028	17 649776 4884444 L	2000/08 5459						1914799 (221528) A	GREY GRVL FILL 0001 BRWN CLAY SLTY STNS 0022 GREY CLAY SILT 0075 GREY CLAY SAND DNSE 0150 GREY CLAY STNS SILT 0367 BLCK SHLE HARD 0370

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION
UXBRIDGE TOWNSHIP (U CON 06 028	17 649776 4884444 L	2000/08 5459						1914797 (221525) A	BRWN LOAM SOFT 0003 BRWN FSND SOFT 0075 GREY CLAY STNS HARD 0080 GREY CLAY STNS HARD 0280 GREY CLAY SILT STNS 0360 BLCK SHLE HARD 0370
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	2000/03 5459	6	FR 0055	8/35/30/1:30	DO	0052 3	1914417 (211656)	BRWN CLAY SNDY 0026 BRWN FSND 0055 BRWN MSND 0060
UXBRIDGE TOWNSHIP (U CON 06 028	17 649779 4884443 L	1999/10 5459	6	UK 0048			0054 3	1914300 (211615)	BRWN CLAY 0028 BRWN SAND CLAY 0043 BRWN CLAY 0048 BRWN SAND SILT 0057
UXBRIDGE TOWNSHIP (U CON 06 029	17 649735 4884259 W	2004/05 7154	6.21 0.27	FR 0080 UK 0090 FR 0280		MN	0080 10	1917061 (Z06854) A006823	BRWN MSND 0089 GREY MSND 0105 GREY CLAY SLTY STNS 0212 GREY CLAY STNS SLTY 0300
UXBRIDGE TOWNSHIP (U CON 06 029	17 649805 4884622 W	1995/12 3136	8 6	FR 0029	14/64/6/1:0	DO	0063 5	1912655 (165176)	BRWN LOAM 0003 BRWN CLAY SNDY 0027 BRWN FSND 0047 GREY FSND 0069 GREY CLAY 0069
UXBRIDGE TOWNSHIP (U CON 06 029	17 650702 4884640 W	1996/09 1910	8	FR 0087	10/16/25/3:30	DO	0084 3	1912974 (160850)	BLCK LOAM 0001 BRWN CLAY GVLY 0004 BRWN CLAY SNDY 0084 BRWN FGVL 0087
UXBRIDGE TOWNSHIP (U CON 06 029	17 650777 4884578 W	2015/09 1413	36		6///:			7253515 (Z215514) A	
UXBRIDGE TOWNSHIP (U CON 06 030	17 649769 4884388 W	2007/06 1413	32		2///:			7046900 (Z57504) A	
UXBRIDGE TOWNSHIP (U CON 06 030	17 649805 4884447 W	2007/06 1413	42		4///:			7046902 (Z57506) A	
UXBRIDGE TOWNSHIP (U CON 06 030	17 649772 4884378 W	2007/06 1413	6.25					7046901 (Z57505) A	

TOWNSHIP CON LOT	UTM	DATE CNTR	CASING DIA	WATER	PUMP TEST	WELL USE	SCREEN	WELL	FORMATION

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

1. Core Material and Descriptive terms

Code	Description	Code	Description	Code	Description	Code	Description	Code	Description
BLDR	BOULDERS	FCRD	FRACTURED	IRFM	IRON FORMATION	PORS	POROUS	SOFT	SOFT
BSLT	BASALT	FGRD	FINE-GRAINED	LIMY	LIMY	PRDG	PREVIOUSLY DUG	SPST	SOAPSTONE
CGRD	COARSE-GRAINED	FGVL	FINE GRAVEL	LMSN	LIMESTONE	PRDR	PREV. DRILLED	STKY	STICKY
CGVL	COARSE GRAVEL	FILL	FILL	LOAM	TOPSOIL	QRTZ	QUARTZITE	STNS	STONES
CHRT	CHERT	FLDS	FELDSPAR	LOOS	LOOSE	QSND	QUICKSAND	STNY	STONEY
CLAY	CLAY	FLNT	FLINT	LTCL	LIGHT-COLOURED	QTZ	QUARTZ	THIK	THICK
CLN	CLEAN	FOSS	FOSILIFEROUS	LYRD	LAYERED	ROCK	ROCK	THIN	THIN
CLYY	CLAYEY	FSND	FINE SAND	MARL	MARL	SAND	SAND	TILL	TILL
CMTD	CEMENTED	GNIS	GNEISS	MGRD	MEDIUM-GRAINED	SHLE	SHALE	UNKN	UNKNOWN TYPE
CONG	CONGLOMERATE	GRNT	GRANITE	MGVL	MEDIUM GRAVEL	SHLY	SHALY	VERY	VERY
CRYS	CRYSTALLINE	GRSN	GREENSTONE	MRBL	MARBLE	SHRP	SHARP	WBRG	WATER-BEARING
CSND	COARSE SAND	GRVL	GRAVEL	MSND	MEDIUM SAND	SHST	SCHIST	WDFR	WOOD FRAGMENTS
DKCL	DARK-COLOURED	GRWK	GREYWACKE	MUCK	MUCK	SILT	SILT	WTHD	WEATHERED
DLMT	DOLOMITE	GVLY	GRAVELLY	OBDN	OVERBURDEN	SLTE	SLATE		
DNSE	DENSE	GYPS	GYPSUM	PCKD	PACKED	SLTY	SILTY		
DRTY	DIRTY	HARD	HARD	PEAT	PEAT	SNDS	SANDSTONE		
DRY	DRY	HPAN	HARDPAN	PGVL	PEA GRAVEL	SNDY	SANDYOAPSTONE		

2. Core Color

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

3. Well Use

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

4. Water Detail

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

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Borehole and Monitoring Well Logs

REFERENCE No.: 11225419 ENCLOSURE No.: 1

GHD

BOREHOLE No.: MW-1
ELEVATION: 294.08 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 13 April 2021 DATE (FINISH): 13 April 2021

NORTHING: 4884211 EASTING: 650271.13

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet / Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
Feet / Metres	294.08		GROUND SURFACE						
0	293.98		**TOPSOIL** (100mm)						
1			**FILL**: SILTY SAND, fine grained, loose, light brown, moist		SS-1	63	12	0-3-2-3	5
2									
3 / 1.0					SS-2	100	13	2-2-1	3
4									
5	292.41		Brown		SS-3a	100	14	3-3-6	9
6			**NATIVE**:		SS-3b		3	--	--
7 / 2.0			SM - SILTY SAND, fine grained, poorly graded, loose, light brown, moist						
8			Medium grained, compact		SS-4	100	4	6-7-9	16
9			Gravel: 1%, Sand: 90%, Silt: 6%, Clay: 3%						
10 / 3.0			Brown to light brown, fine grainded		SS-5	100	3	10-10-18	28
11									
12									
13 / 4.0									
14									
15			Trace Gravel, dense		SS-6	100	3	18-22-22	44
16			Laminated						
17 / 5.0									
18									
19									
20 / 6.0					SS-7	100	4	13-18-25	43
21									
22									
23 / 7.0									
24									
25			Very dense		SS-8	100	4	18-24-36	60
26 / 8.0									
27									
28									
29 / 9.0									
30			Medium grained, dense		SS-9	100	4	9-15-23	38
31			Fine grained						
32									
33 / 10.0									
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 1

BOREHOLE No.: MW-1
ELEVATION: 294.08 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 13 April 2021 DATE (FINISH): 13 April 2021

NORTHING: 4884211 EASTING: 650271.13

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		294.08		GROUND SURFACE				%		
36	11.0					SS-10	100	2	24-25-29	54
37										
38										
39	12.0									
40						SS-11a	100	7	16-21-26	47
41				Moist to wet		SS-11b		16	--	--
42										
43	13.0									
44										
45				Moist						
46	14.0					SS-12	100	6	19-27-42	69
47										
48										
49	15.0									
50				Medium grained						
51						SS-13	100	4	17-21-26	47
52										
53	16.0									
54										
55				Wet						
56	17.0					SS-14	100	18	4-16-31	52
57										
58										
59	18.0									
60										
61						SS-15	100	16	14-26-39	65
		275.34								
62	19.0			**END OF BOREHOLE :**						
63										
64				**NOTE :**						
65				- End of Borehole at 18.7 m bgs						
66	20.0			- Borehole open upon completion of drilling						
67				- Water level in borehole upon completion 16.1 m bgs						
68				- Water level at 16.22 m bgs on 2021/04/14						
69	21.0			- Water level at 16.22 m bgs on 2021/05/05						
				- bgs denotes 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

16.15 m
16.76 m
18.29 m

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 2

GHD

BOREHOLE No.: BH-2

ELEVATION: 294.10 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Wooden Sticks Golf Course

PROJECT: Geotechnical Investigation

LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario

DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos

DATE (START): 12 April 2021 DATE (FINISH): 12 April 2021

NORTHING: 4884232.62 EASTING: 650284.76

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		294.10		GROUND SURFACE						
0		293.95		**TOPSOIL** (150mm)						
1				**FILL**: SILTY SAND with gravel, fine grained, compact, light brown, moist		SS-1	83	15	6-8-12-10	20
2										
3	1.0			Gravel: 6%, Sand: 55%, Silt: 29%, Clay: 10%		SS-2	100	8	4-13-8	21
4										
5		292.57		**NATIVE**: SM - SILTY SAND, fine to medium grained, poorly graded, loose, light brown, moist		SS-3	100	8	4-3-3	6
6	2.0									
7				Trace gravel, compact		SS-4	100	8	6-4-8-4	12
8										
9										
10	3.0			Stratified layers, loose		SS-5	94	14	3-3-3	6
11				Brown						
12										
13	4.0									
14										
15				Medium grained, Compact light brown		SS-6	100	5	3-2-14	16
16	5.0									
17										
18										
19										
20	6.0			Fine to medium grained, Dense		SS-7	100	5	12-20-30	50
21										
22										
23	7.0									
24										
25				Very dense		SS-8	100	4	19-28-32	60
26	8.0									
27										
28										
29										
30	9.0			Fine grained, dense		SS-9	100	4	14-16-22	38
31										
32										
33	10.0									
34										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 2

BOREHOLE No.: BH-2
ELEVATION: 294.10 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 12 April 2021 DATE (FINISH): 12 April 2021

NORTHING: 4884232.62 EASTING: 650284.76

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		294.10		GROUND SURFACE				%		
36	11.0					SS-10	100	5	15-22-26	48
39	12.0			Very dense		SS-11	100	5	16-26-30	56
		281.45		**END OF BOREHOLE :**						
				NOTE : - End of Borehole at 12.6 m bgs - Borehole caving to 11.2 m bgs - No water accumulated in borehole upon completion - bgs denotes 'below ground surface'						

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11225419 ENCLOSURE No.: 3

BOREHOLE No.: MW-3(D)
ELEVATION: 289.26 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 12 April 2021 DATE (FINISH): 12 April 2021

NORTHING: 4884209 EASTING: 650229

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		289.26		GROUND SURFACE				%		
0		289.01		**TOPSOIL** (100mm)						
1				**NATIVE**: SM - SILTY SAND, very loose, brown, moist		SS-1	79	11	0-0-1-2	1
2										
3	1.0			Fine grained, poorly graded, compact, light brown Compact		SS-2	100	10	6-8-10	18
4										
5				Moist to wet		SS-3	100	14	7-9-12	21
6				Moist						
7	2.0									
8				Dense		SS-4	100	9	12-14-20	34
9										
10	3.0					SS-5	100	6	13-18-19	37
11										
12										
13	4.0									
14										
15										
16						SS-6	100	5	7-9-19	28
17	5.0									
18										
19										
20	6.0			Wet		SS-7a	100	15	14-18-30	48
21				Moist Gravel: 0%, Sand: 77%, Silt: 19%, Clay: 4%		SS-7b		4	--	--
22										
23	7.0									
24										
25										
26	8.0					SS-8	100	6	14-16-20	36
27										
28										
29	9.0									
30										
31						SS-9	100	6	13-17-26	43
32										
33	10.0									
34										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

m
m

REFERENCE No.: 11225419 ENCLOSURE No.: 3

BOREHOLE No.: MW-3(D)
ELEVATION: 289.26 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 12 April 2021 DATE (FINISH): 12 April 2021

NORTHING: 4884209 EASTING: 650229

LEGEND

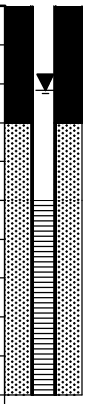
- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		289.26		GROUND SURFACE				%		
36	11.0			Very dense		SS-10	100	5	26-28-32	60
40	12.0			Dense, wet		SS-11	100	22	17-23-21	44
45	13.0			Compact		SS-12	100	23	12-11-14	25
46	14.0	275.09		**END OF BOREHOLE :**						
49	15.0			**NOTE :** - End of Borehole at 14.2 m bgs - Borehole caving to 12.8 m bgs - Water level at 11.33 m bgs on 2021/04/14 - Water level at 11.33 m bgs on 2021/05/05 - bgs denotes 'below ground surface'						
52	16.0									
56	17.0									
59	18.0									
62	19.0									
66	20.0									
69	21.0									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

11.58 m
12.19 m
13.72 m



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REFERENCE No.: 11225419 ENCLOSURE No.: 4

BOREHOLE No.: MW-3(S)
ELEVATION: 289.26 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 12 April 2021 DATE (FINISH): 12 April 2021

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

NORTHING: 4884207 EASTING: 650229

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		289.26		GROUND SURFACE				%		
0		289.01		**TOPSOIL** (100mm)						
1				**NATIVE**: SM - SILTY SAND, very loose, brown, moist						
2				Fine grained, poorly graded, compact, light brown						
3	1.0			Compact						
4				Moist to wet						
5				Moist						
6										
7	2.0			Dense						
8										
9										
10	3.0									
11										
12										
13	4.0									
14										
15										
16	5.0									
17										
18										
19										
20	6.0			Wet						
21				Moist						
22										
23	7.0									
24										
25		281.64		**END OF BOREHOLE :**						
26	8.0			**NOTE :**						
27				- End of Borehole at 7.6 m bgs						
28				- Monitoring well measured to be dry on 2021/04/14						
29	9.0			- Monitoring well measured to be dry on 2021/05/05						
30				- bgs denotes 'below ground surface'						
31										
32										
33	10.0									
34										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

m
m
m
5.49 m
6.10 m
7.62 m

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 5

BOREHOLE No.: MW-4
ELEVATION: 287.40 m

BOREHOLE REPORT

Page: 1 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 13 April 2021 DATE (FINISH): 13 April 2021

NORTHING: 4884246.14 EASTING: 650238.66

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		287.40		GROUND SURFACE						
0		287.30		**TOPSOIL** (100mm)						
1				**NATIVE**: SM - SILTY SAND, trace organics, very loose, dark brown, moist		SS-1	92	21	0-1-1-1	2
3	1.0			Reddish brown Compact, light brown		SS-2	92	12	1-1-1-1	2
5				Loose, reddish brown		SS-3	100	12	2-2-5	7
7	2.0			Fine grained, poorly graded, compact, light brown		SS-4	100	8	4-5-7	12
10	3.0					SS-5	100	4	8-11-12	23
13	4.0									
15				Medium grained, dense		SS-6	100	7	11-18-24	46
17	5.0									
20	6.0			Compact		SS-7	100	5	10-12-14	26
23	7.0									
25						SS-8	100	5	9-11-15	26
26	8.0									
28										
30	9.0			Gravel: 2%, Sand: 52%, Silt: 46%, Clay: 6% Brown, wet		SS-9	100	22	10-12-18	30
33	10.0									

Shear test (Cu) △ Field ☐ Lab
Sensitivity (S)
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

m
m
m
8.69 m
9.30 m

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 5

BOREHOLE No.: MW-4
ELEVATION: 287.40 m

BOREHOLE REPORT

Page: 2 of 2

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 13 April 2021 DATE (FINISH): 13 April 2021

NORTHING: 4884246.14 EASTING: 650238.66

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth Feet	Depth Metres	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
		287.40		GROUND SURFACE				%		
36	11.0					SS-10	100	20	3-5-15	20
37										
38										
39	12.0									
40				Dense		SS-11	100	17	6-16-27	43
41		274.75								
42				**END OF BOREHOLE :**						
43	13.0			**NOTE :** - End of Borehole at 12.6 m bgs - Borehole caving to 10.2 m bgs - Water level in borehole upon completion 10.1 m bgs - Water level at 9.88 m bgs on 2021/04/14 - Water level at 9.85 m bgs on 2021/05/05 - bgs denotes 'below ground surface'						
44										
45										
46	14.0									
47										
48										
49	15.0									
50										
51										
52	16.0									
53										
54										
55	17.0									
56										
57										
58	18.0									
59										
60										
61	19.0									
62										
63										
64	20.0									
65										
66										
67	21.0									
68										
69										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

10.82 m

File: G:\11225419\WORKSHARE\DESIGN\GINT\11225419 - GINT BOREHOLE LOGS.GPJ Library File: GHD_GEOTECH_V05.GLB Report: SOIL LOG WITH GRAPH+WELL Date: 4/6/21

REFERENCE No.: 11225419 ENCLOSURE No.: 6

BOREHOLE No.: BH-5
ELEVATION: 292.51 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 14 April 2021 DATE (FINISH): 14 April 2021

NORTHING: 4884265.52 EASTING: 650266.65

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet / Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0 /	292.51		GROUND SURFACE						
0 /	292.46		**ASPHALT** (50mm)						
1 /			**FILL**: SM - SILTY SAND, with gravel, compact, brown, moist to wet		SS-1	78	6	6-6-8-10	14
2 /			Trace clay						
3 / 1.0			Brown, moist		SS-2	100	7	7-6-10	16
4 /									
5 /					SS-3	100	9	6-5-6	11
6 /									
7 / 2.0									
8 /	290.22		**NATIVE**: SM - SILTY SAND, loose, fine grained, reddish brown, moist		SS-4a	100	9	1-2-4	6
9 /			Trace gravel, brown		SS-4b		5	--	--
10 / 3.0			Moist to wet		SS-5	100	15	3-3-4	7
11 /									
12 /									
13 / 4.0			Compact		SS-6	100	6	5-6-9	15
14 /									
15 /					SS-7	100	4	8-9-14	23
16 / 5.0									
17 /									
18 /									
19 /									
20 / 6.0					SS-8	100	3	13-13-16	29
21 /									
22 /	285.96		**END OF BOREHOLE :**						
23 / 7.0			**NOTE :**						
24 /			- End of Borehole at 6.6 m bgs						
25 /			- Borehole open upon completion						
26 / 8.0			- No water accumulated in borehole upon completion						
27 /			- bgs denotes 'below ground surface'						
28 /									
29 /									
30 / 9.0									
31 /									
32 /									
33 / 10.0									
34 /									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11225419 ENCLOSURE No.: 7

BOREHOLE No.: BH-6
ELEVATION: 287.14 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 14 April 2021 DATE (FINISH): 14 April 2021

NORTHING: 4884264.21 EASTING: 650243.01

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet)	Depth (Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0		287.14		GROUND SURFACE						
0		287.09		**TOPSOIL** (100mm)		SS-1a	92	4	0-3-2-4	5
1				**NATIVE**:		SS-1b		9	--	--
2				SM - SILTY SAND, trace gravel, loose, brown, moist						
3	1.0			Fine grained, poorly graded, light brown Compact		SS-2	94	4	7-8-10	18
4										
5						SS-3	100	4	7-8-11	19
6	2.0									
7						SS-4	100	5	9-12-14	26
8										
9	3.0					SS-5	100	3	9-11-17	28
10										
11										
12	4.0									
13										
14				Dense, moist to wet		SS-6	100	6	12-15-17	32
15	5.0	282.11		**END OF BOREHOLE :**						
16										
17				**NOTE :**						
18				- End of Borehole at 5.0 m bgs						
19	6.0			- Borehole open upon completion						
20				- No water accumulated in borehole upon completion						
21				- bgs denotes 'below ground surface'						
22	7.0									
23										
24										
25	8.0									
26										
27										
28	9.0									
29										
30										
31	10.0									
32										
33										
34										

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11225419 ENCLOSURE No.: 8

BOREHOLE No.: BH-7
ELEVATION: 291.50 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 14 April 2021 DATE (FINISH): 14 April 2021

NORTHING: 4884306.25 EASTING: 650266.7

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet / Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
	291.50		GROUND SURFACE				%		
0	291.45		**ASPHALT** (50mm)		SS-1a	92	1	8-7-7-5	14
1			**FILL**: GRAVELLY SAND, compact, light brown, moist		SS-1b		6	--	--
2			Silty Sand, medium grained, trace gravel, brown		SS-2	100	5	2-3-5	8
3	1.0		Trace clay Loose, brown, moist						
4			Compact		SS-3	100	7	5-6-6	12
5									
6	2.0								
7			Very Loose		SS-4	89	10	2-1-1-2	2
8									
9									
10	3.0		Gravel: 0%, Sand 87%, Silt 9%, Clay 4%		SS-5	100	10	1-1-1	2
11									
12									
13	4.0		**NATIVE**: SM - SILTY SAND, very loose, dark brown, moist to wet		SS-6	100	16	0-1-1	2
14									
15			Organics (roots)						
16			Brown		SS-7	100	11	0-0-1-0	1
17	5.0								
18			Compact		SS-8	100	6	7-11-15	26
19									
20	6.0								
21			Trace gravel Light brown, moist		SS-9	100	3	10-14-16	30
22	284.95		**END OF BOREHOLE :**						
23	7.0		**NOTE :** - End of Borehole at 6.6 m bgs - Borehole open upon completion - No water accumulated in borehole upon completion - bgs denotes 'below ground surface'						
24									
25									
26	8.0								
27									
28									
29									
30	9.0								
31									
32									
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
Atterberg limits (%) W_p W_l
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90

REFERENCE No.: 11225419 ENCLOSURE No.: 9

GHD

BOREHOLE No.: BH-8
ELEVATION: 283.81 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Wooden Sticks Golf Course
PROJECT: Geotechnical Investigation
LOCATION: 40 Elgin Park Drive, Uxbridge, Ontario
DESCRIBED BY: J. McEachern CHECKED BY: L. Ramos
DATE (START): 14 April 2021 DATE (FINISH): 14 April 2021

NORTHING: 4884296.63 EASTING: 650225.52

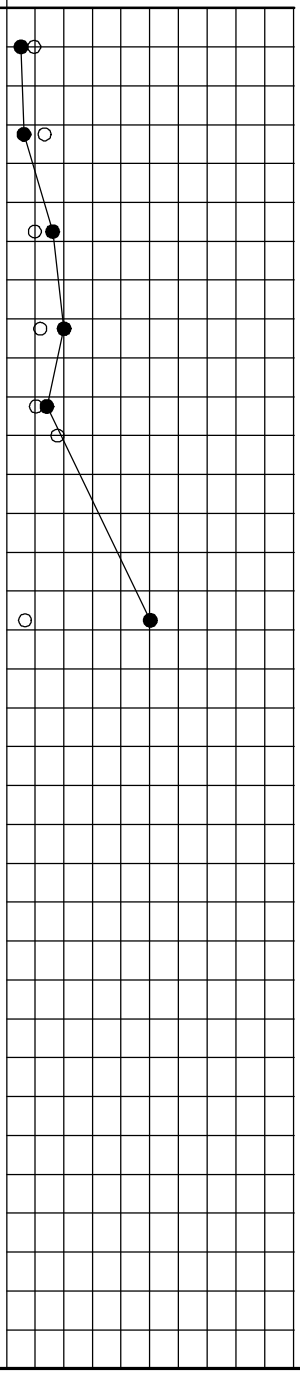
LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- AU - AUGER PROBE
- ▼ - WATER LEVEL

Depth (Feet / Metres)	Elevation (m) BGS	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	State	Type and Number	Recovery/ TCR(%)	Moisture Content %	Blows per 15cm/ RQD(%)	'N' Value/ SCR(%)
0	283.81		GROUND SURFACE						
0	283.76		**TOPSOIL** (100mm)						
1			**NATIVE**: SM - SILTY SAND, trace organics, loose, brown, moist		SS-1	79	10	1-2-3-3	5
2									
3	1.0		Fine grained, reddish brown Light brown		SS-2	100	13	2-2-4	6
4									
5			Compact, moist to wet		SS-3	100	10	6-7-9	16
6	2.0								
7									
8			Moist		SS-4	100	12	7-8-12	20
9			Moist to wet						
10	3.0				SS-5a	100	10	10-7-7	14
11			Wet		SS-5b		18	--	--
12									
13	4.0								
14									
15			With gravel, dense, moist to wet		SS-6	100	6	9-17-33	50
16	5.0		Approximate 50 mm Sandy Silt seam, moist to wet						
16	278.78		Moist						
17			**END OF BOREHOLE :**						
18									
19			**NOTE :**						
20	6.0		- End of Borehole at 5.0 m bgs						
21			- Borehole open upon completion						
22			- No water accumulated in borehole upon completion						
23	7.0		- bgs denotes 'below ground surface'						
24									
25									
26	8.0								
27									
28									
29	9.0								
30									
31									
32									
33	10.0								
34									

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows / 12 in.-30 cm)

10 20 30 40 50 60 70 80 90



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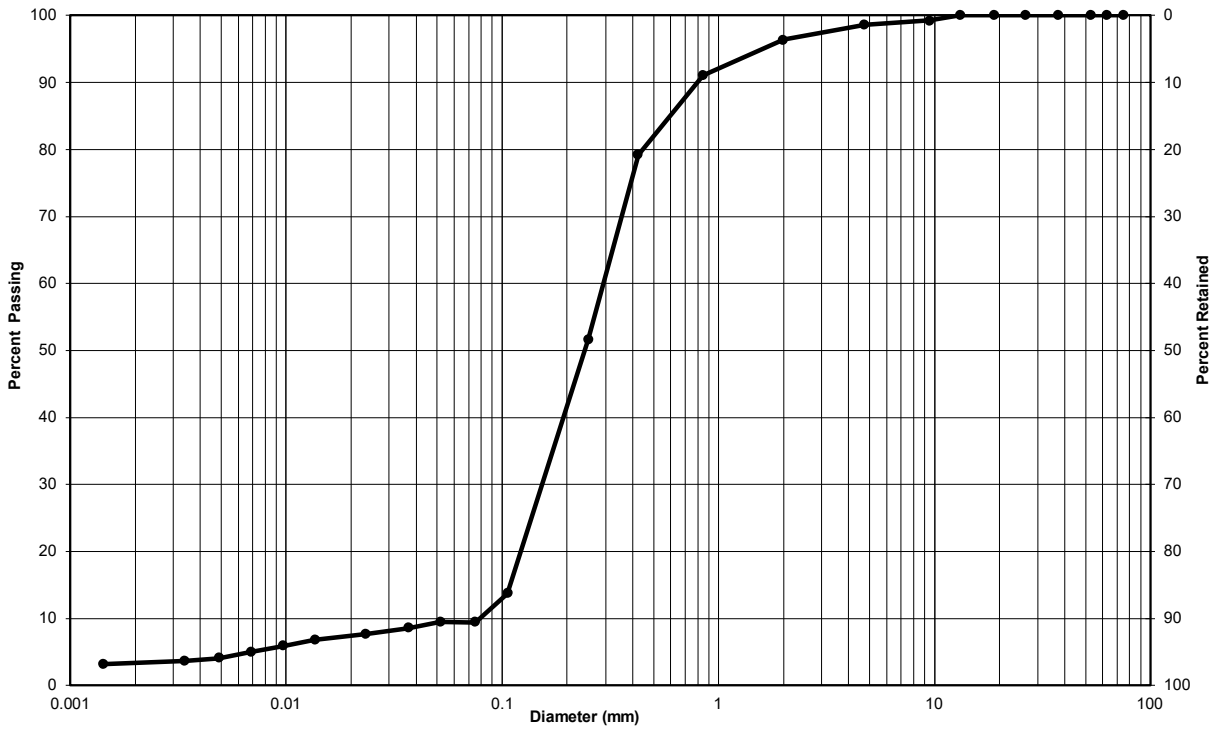
Appendix C

Grainsize Analysis

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Golf Course	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin Street, Uxbridge	**Project No.:**	11225419-01
Borehole no.:	BH1	Sample no.:	SS4
Depth:	2.3 to 2.7m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

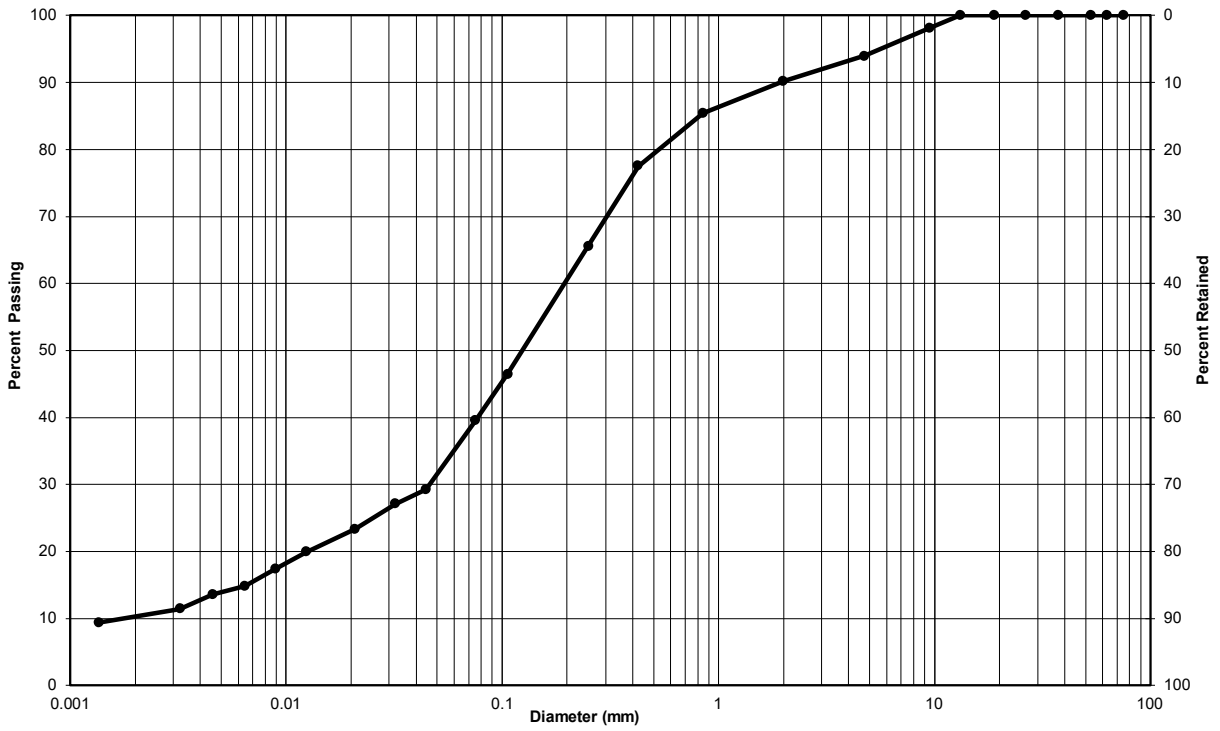
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand with Silt	1	90	9
Silt-size particles (%):	6		
Clay-size particles (%) (<0.002mm):	3		

Remarks:

Performed by:	Alex Fawcett	**Date:**	May 5, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Golf Course	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin Street, Uxbridge	**Project No.:**	11225419-01
Borehole no.:	BH2	Sample no.:	SS2
Depth:	0.8 to 1.2m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

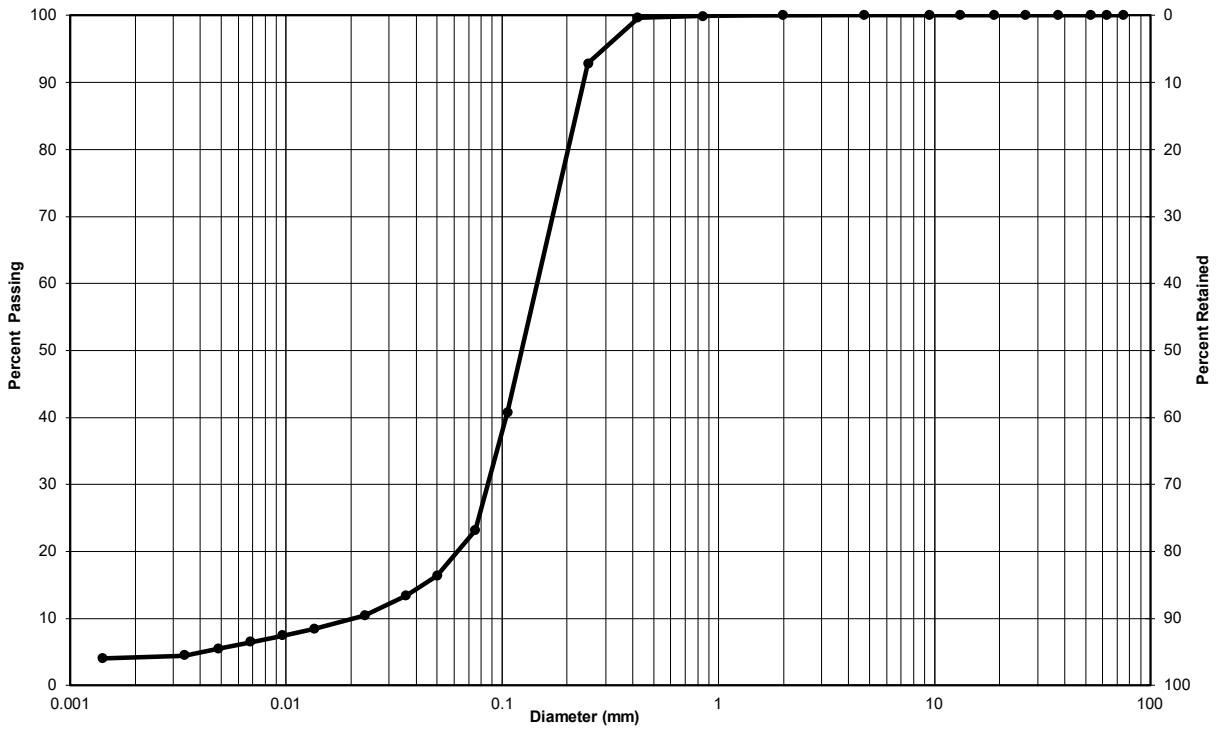
Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand Fill	6	55	39
Silt-size particles (%):	29		
Clay-size particles (%) (<0.002mm):	10		

Remarks:

Performed by:	Alex Fawcett	**Date:**	May 5, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Golf Course	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin Street, Uxbridge	**Project No.:**	11225419-01
Borehole no.:	BH3	Sample no.:	SS7B
Depth:	6.3 to 6.6m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand	0	77	23
Silt-size particles (%):	19		
Clay-size particles (%) (<0.002mm):	4		

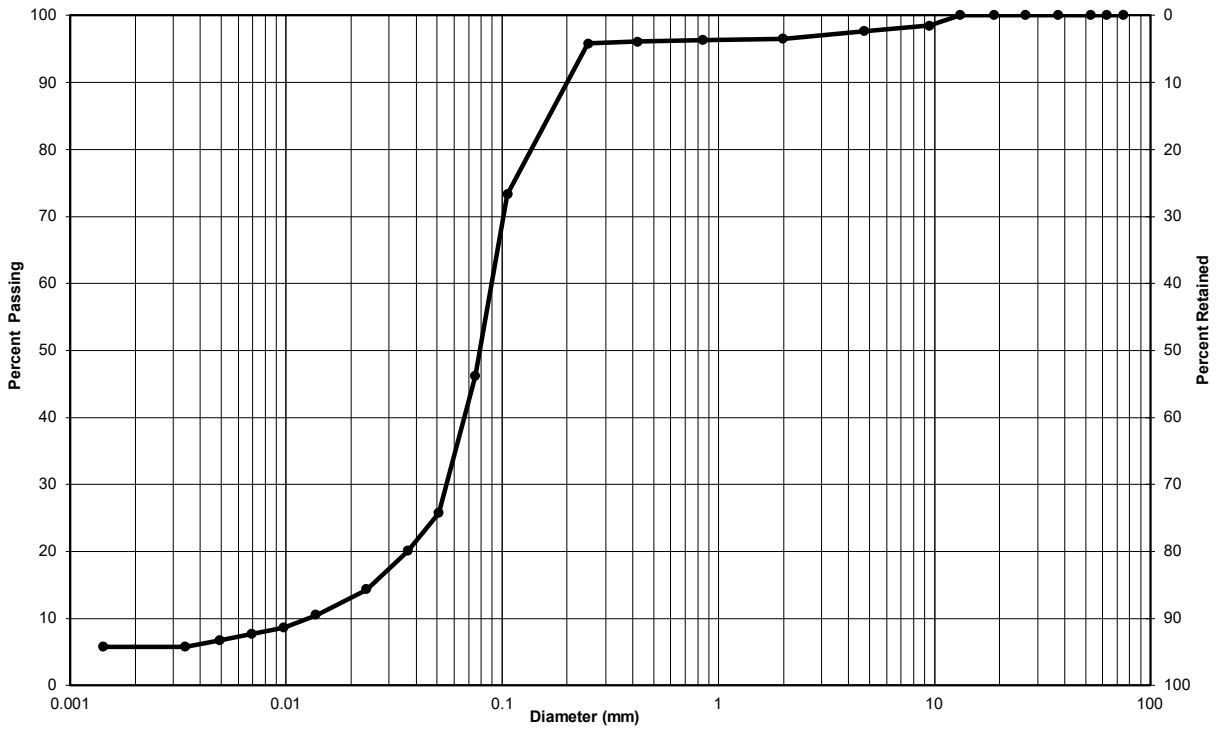
Remarks:

Performed by:	Alex Fawcett	**Date:**	May 5, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Golf Course	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin Street, Uxbridge	**Project No.:**	11225419-01

Borehole no.:	BH4	Sample no.:	SS9
Depth:	9.2 to 9.8m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty Sand	2	52	46
Silt-size particles (%):	40		
Clay-size particles (%) (<0.002mm):	6		

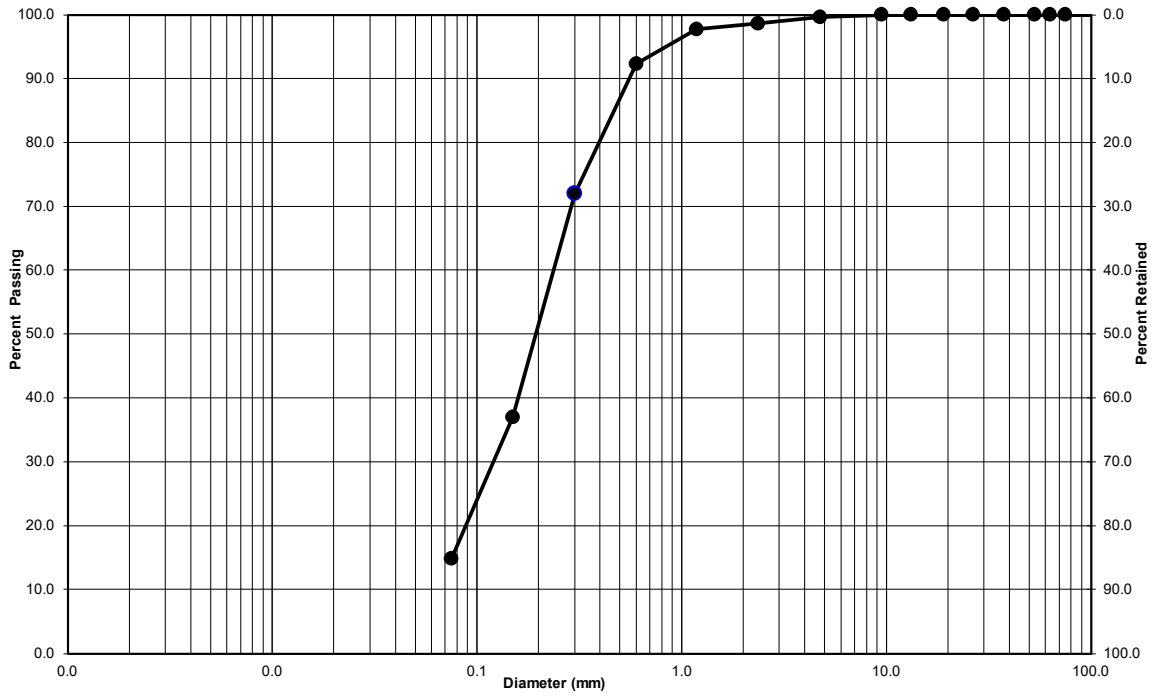
Remarks:

Performed by:	Alex Fawcett	**Date:**	May 5, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Golf Course	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin St, Uxbridge	**Project No.:**	11225419-01

Soil Type:	Native Soil	Sample Source:	BH7 SS1B
Type of Material:	Native Soil	Sample Location:	N/A
Proposed Use:	N/A	Depth:	0.13 to 0.6m
Sampled By:	N/A	Sample Date:	16-Apr-21
Sample Location Remarks:	N/A		



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand with Silt Fill	0	85	15

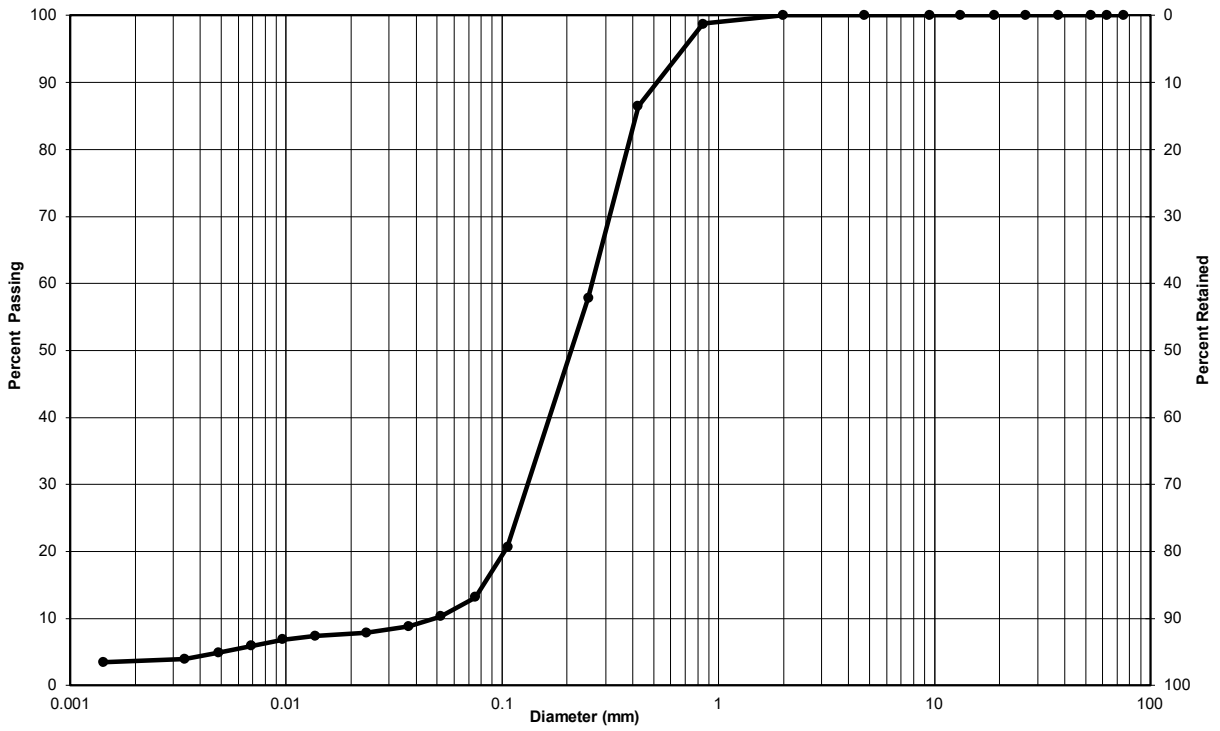
Remarks:

Performed by:	Alex Fawcett	**Date:**	May 3, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

Particle-Size Analysis of Soils (Geotechnical) (USCS) (ASTM D422)

Client:	Wooden Sticks Gold Inc.	**Lab No.:**	SS-21-31
Project/Site:	40 Elgin Street, Uxbridge	**Project No.:**	11225419-01

Borehole no.:	BH7	Sample no.:	SS5
Depth:	3.0 to 3.5m	Enclosure:	



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sand with Silt Fill	0	87	13
Silt-size particles (%):	9		
Clay-size particles (%) (<0.002mm):	4		

Remarks:

Performed by:	Alex Fawcett	**Date:**	May 5, 2021
Verified by:	Joe Sullivan	**Date:**	May 5, 2021

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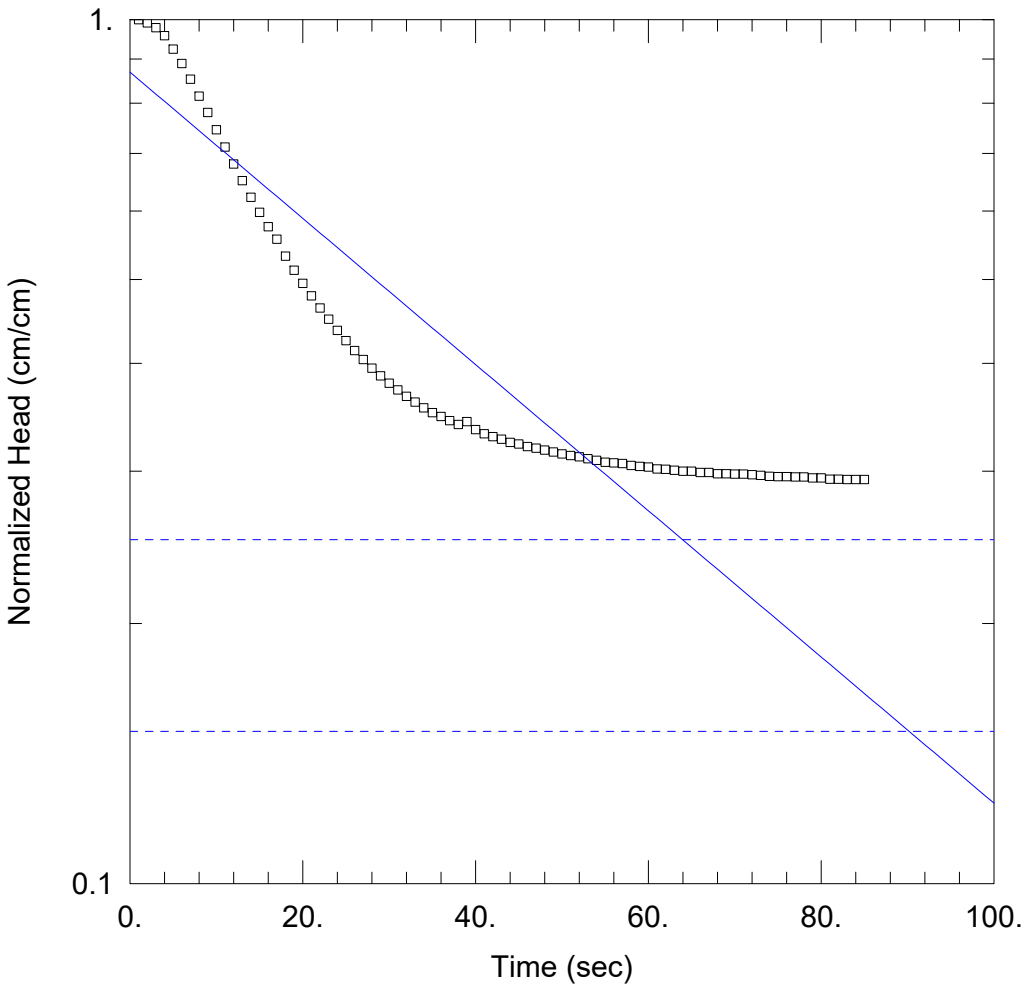
Appendix D

Hydraulic Conductivity Tests



HYDRAULIC CONDUCTIVITY TEST AT BH-1- SCREENED IN SILTY SAND

PROJECT INFORMATION

Company: R.J. Burnside & Associates
Project: 300050985
Location: Uxbridge, ON
Test Well: BH1
Test Date: October 14, 2021

AQUIFER DATA

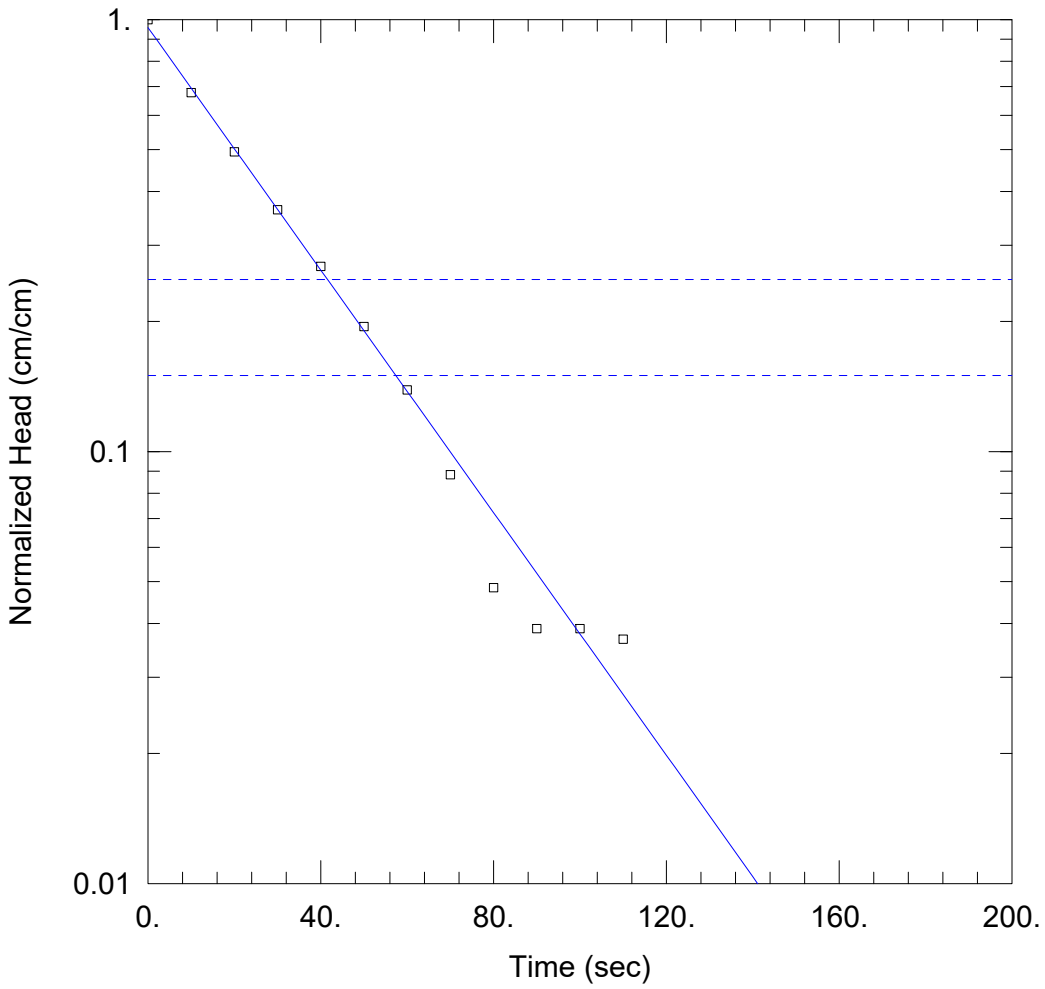
Saturated Thickness: 208. cm
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH1)

Initial Displacement: -310.7 cm
Total Well Penetration Depth: 1824. cm
Casing Radius: 2.54 cm
Static Water Column Height: 208. cm
Screen Length: 152. cm
Well Radius: 7.62 cm

SOLUTION

Aquifer Model: Unconfined
K = 0.002 cm/sec
Solution Method: Hvorslev
y0 = -270. cm



HYDRAULIC CONDUCTIVITY TEST AT BH-3S- SCREENED IN SILTY SAND

PROJECT INFORMATION

Company: R.J. Burnside & Associates
Project: 300050985
Location: Uxbridge, ON
Test Well: BH3s
Test Date: October 14, 2021

AQUIFER DATA

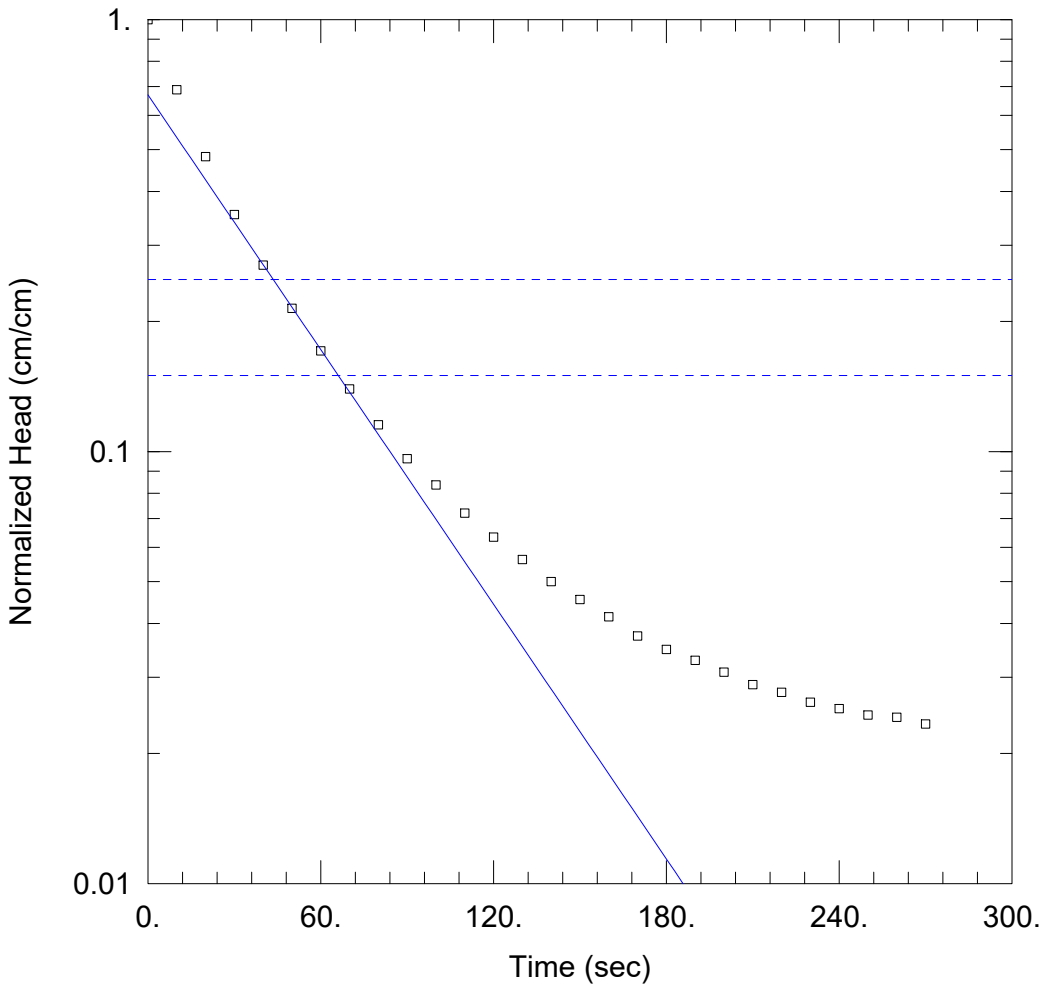
Saturated Thickness: 0.5 cm
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH3s)

Initial Displacement: -95.1 cm
Total Well Penetration Depth: 821. cm
Casing Radius: 2.54 cm
Static Water Column Height: 0.5 cm
Screen Length: 152. cm
Well Radius: 7.62 cm
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 3.757 cm/sec
y0 = -91.13 cm



HYDRAULIC CONDUCTIVITY TEST AT BH-3D - SCREENED IN SILTY SAND

PROJECT INFORMATION

Company: R.J. Burnside & Associates
Project: 300050985
Location: Uxbridge, ON
Test Well: BH3d
Test Date: October 14, 2021

AQUIFER DATA

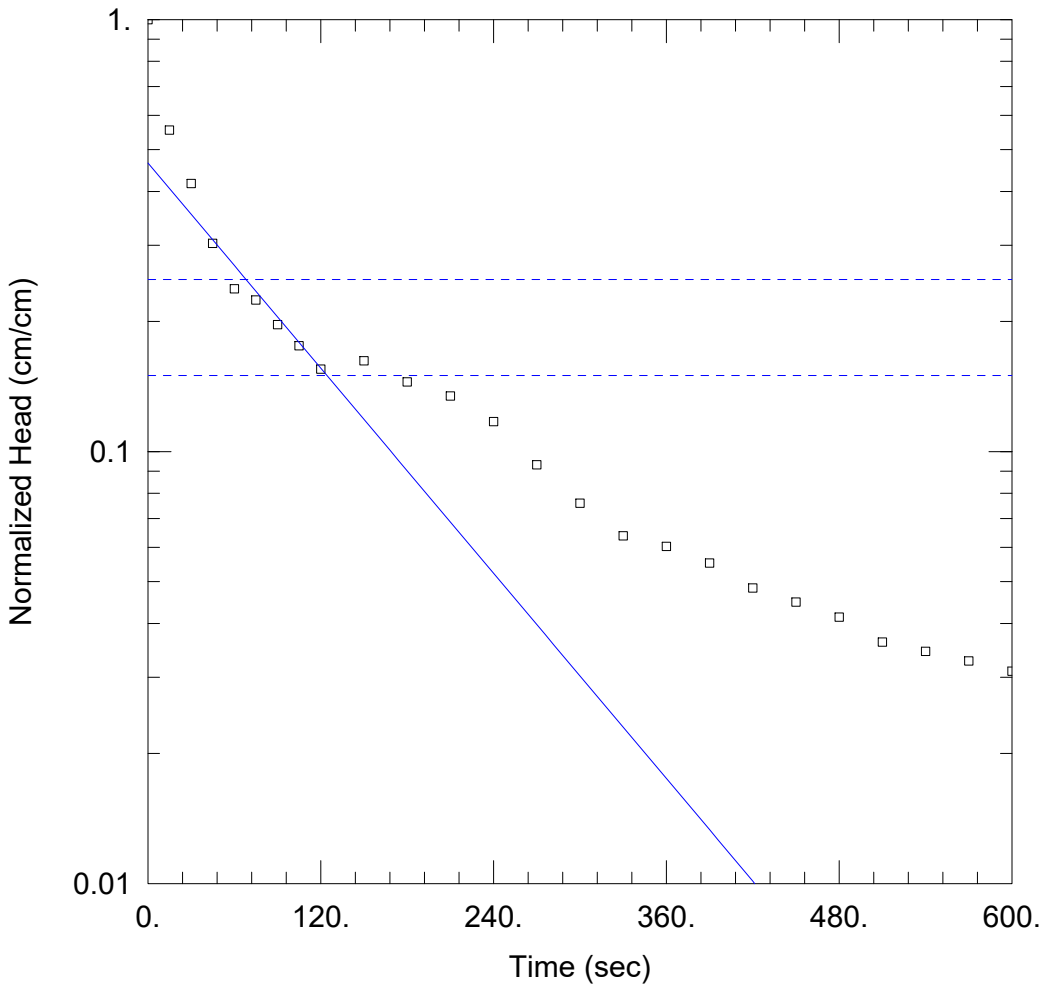
Saturated Thickness: 220. cm
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH3d)

Initial Displacement: -350.2 cm
Total Well Penetration Depth: 1435. cm
Casing Radius: 2.54 cm
Static Water Column Height: 220. cm
Screen Length: 152. cm
Well Radius: 7.62 cm

SOLUTION

Aquifer Model: Unconfined
K = 0.002322 cm/sec
Solution Method: Hvorslev
y0 = -234.2 cm



HYDRAULIC CONDUCTIVITY TEST AT BH-4 - SCREENED IN SILTY SAND

PROJECT INFORMATION

Company: R.J. Burnside & Associates
Project: 300050985
Location: Uxbridge, ON
Test Well: BH4
Test Date: October 14, 2021

AQUIFER DATA

Saturated Thickness: 95. cm
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (BH4)

Initial Displacement: -290. cm
Total Well Penetration Depth: 1175. cm
Casing Radius: 2.54 cm
Static Water Column Height: 95. cm
Screen Length: 152. cm
Well Radius: 7.62 cm
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 0.005574 cm/sec
y0 = -135. cm

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Appendix E

Groundwater Elevation Data

Table E-1
Groundwater Elevations - Monitoring Wells

Monitoring Well	Well Depth (mbgl)	Ground Elevation (masl)	13-Apr-21		19-May-21		16-Jun-21		13-Jul-21	
			Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)
BH-1	18.03	294.08	16.15	277.93	16.20	277.88	16.31	277.77	16.22	277.86
BH-3s	7.35	289.26	-	-	dry	dry	dry	dry	dry	dry
BH-3d	13.50	289.26	11.58	277.68	11.36	277.90	11.47	277.79	11.34	277.92
BH-4	10.84	287.40	9.50	277.90	9.90	277.50	10.02	277.38	9.91	277.49

mbgl - metres below ground level
masl - metres above sea level
'-' denotes data that is unavailable
Note: April 13, 2021 water levels are extracted from borehole log

Table E-1
Groundwater Elevations - Monitoring Wells

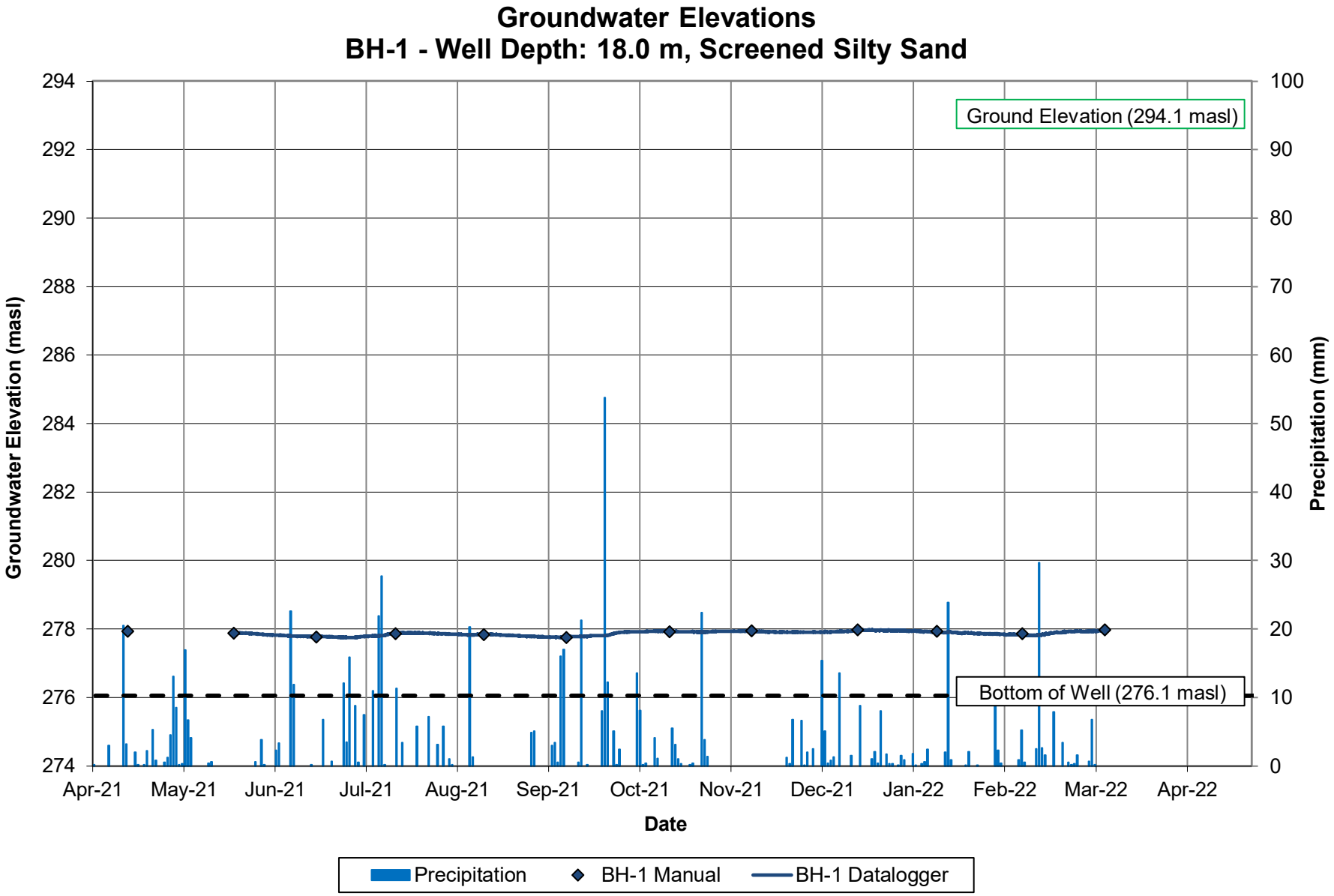
Monitoring Well	Well Depth (mbgl)	Ground Elevation (masl)	12-Aug-21		09-Sep-21		14-Oct-21		11-Nov-21	
			Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)
BH-1	18.03	294.08	16.24	277.84	16.33	277.75	16.16	277.92	16.13	277.95
BH-3s	7.35	289.26	dry	dry	dry	dry	dry	dry	dry	dry
BH-3d	13.50	289.26	11.42	277.84	11.50	277.76	11.29	277.97	11.27	277.99
BH-4	10.84	287.40	9.96	277.44	10.05	277.35	9.85	277.55	9.83	277.57

mbgl - metres below ground level
masl - metres above sea level
'-' denotes data that is unavailable
Note: April 13, 2021 water levels are extracted from borehole log

Table E-1
Groundwater Elevations - Monitoring Wells

Monitoring Well	Well Depth (mbgl)	Ground Elevation (masl)	17-Dec-21		13-Jan-22		11-Feb-22		11-Mar-22	
			Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)	Water Level (mbgl)	Water Elevation (masl)
BH-1	18.03	294.08	16.11	277.97	16.15	277.93	16.22	277.86	16.11	277.97
BH-3s	7.35	289.26	dry	dry	7.33	281.93	dry	dry	dry	dry
BH-3d	13.50	289.26	11.25	278.01	11.29	277.97	11.37	277.89	11.25	278.01
BH-4	10.84	287.40	9.84	277.56	9.88	277.52	9.96	277.44	9.82	277.58

mbgl - metres below ground level
masl - metres above sea level
'-' denotes data that is unavailable
Note: April 13, 2021 water levels are extracted from borehole log



R.J. Burnside & Associates Limited
300050985

Figure E-1

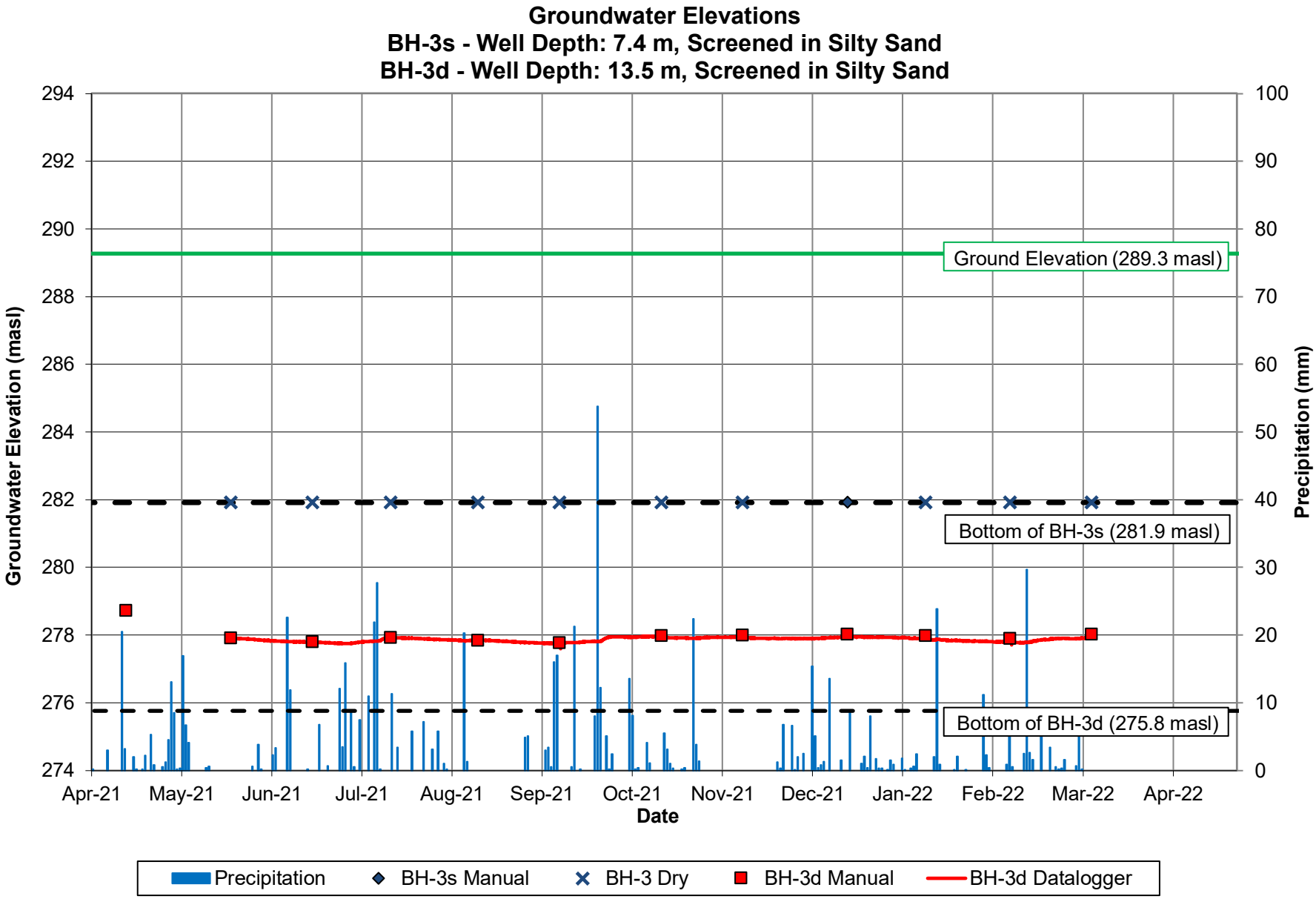


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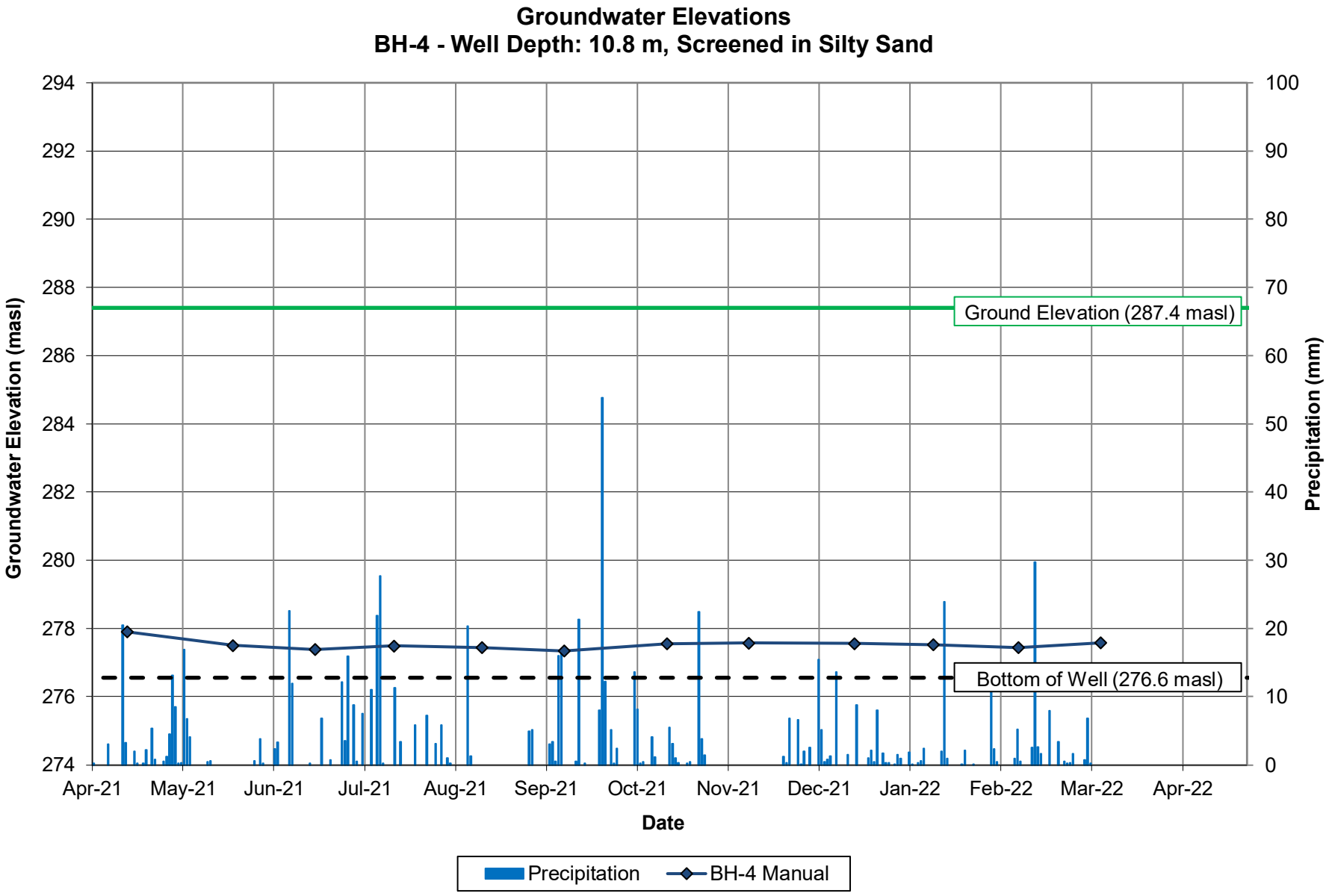
Figure E-2



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300050985

Figure E-3

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Appendix F

Water Quality Data

Table F-1
Groundwater Chemistry

				Sample Description	BH-1	BH-4
				Date Sampled	10/14/2021	10/14/2021
Parameter	**Unit**	**ODWQS**	**Type of Standard**			
Electrical Conductivity	µS/cm				537	547
pH	pH Units	6.5-8.5	OG		7.95	7.95
Saturation pH (Calculated)					6.97	6.94
Langelier Index (Calculated)					0.984	1.01
Hardness (as CaCO3) (Calculated)	mg/L	80-100	OG		**302**	**298**
Total Dissolved Solids	mg/L	500	AO		354	332
Alkalinity (as CaCO3)	mg/L	30-500	OG		259	278
Bicarbonate (as CaCO3)	mg/L				259	278
Carbonate (as CaCO3)	mg/L				<5	<5
Hydroxide (as CaCO3)	mg/L				<5	<5
Fluoride	mg/L	1.5	MAC		<0.05	<0.05
Chloride	mg/L	250	AO		1.92	8.49
Nitrate as N	mg/L	10.0	MAC		1.02	1.17
Nitrite as N	mg/L	1.0	MAC		<0.05	<0.05
Bromide	mg/L				<0.05	<0.05
Sulphate	mg/L	500	AO		42.9	23.2
Ortho Phosphate as P	mg/L				<0.10	<0.10
Ammonia as N	mg/L				<0.02	<0.02
Total Phosphorus	mg/L				0.17	0.12
Total Organic Carbon	mg/L				71.2	45.4
True Colour	TCU	5.0	AO		<5	<5
Turbidity	NTU	5.0	AO		**5400**	**2410**
Dissolved Calcium	mg/L				101	105
Dissolved Magnesium	mg/L				12.2	8.69
Dissolved Potassium	mg/L				0.83	1.01
Dissolved Sodium	mg/L	20	AO		2.75	8.14
Dissolved Aluminum	mg/L	0.1	OG		0.009	0.006
Dissolved Antimony	mg/L	0.006	IMAC		<0.001	<0.001
Dissolved Arsenic	mg/L	0.01	IMAC		<0.001	<0.001
Dissolved Barium	mg/L	1.0	MAC		0.024	0.022
Dissolved Beryllium	mg/L				<0.0005	<0.0005
Dissolved Boron	mg/L	5.0	IMAC		0.042	0.018
Dissolved Cadmium	mg/L	0.005	MAC		<0.0001	<0.0001
Dissolved Chromium	mg/L	0.05	MAC		<0.002	<0.002
Dissolved Cobalt	mg/L				<0.0005	<0.0005
Dissolved Copper	mg/L	1.0	AO		0.002	0.003
Dissolved Iron	mg/L	0.3	AO		<0.010	<0.010
Dissolved Lead	mg/L	0.010	MAC		<0.0005	<0.0005
Dissolved Manganese	mg/L	0.05	AO		<0.002	0.012
Dissolved Mercury	mg/L	0.001	MAC		<0.0001	<0.0001
Dissolved Molybdenum	mg/L				<0.002	<0.002
Dissolved Nickel	mg/L				<0.003	<0.003
Dissolved Selenium	mg/L	0.05	MAC		<0.001	0.001
Dissolved Silver	mg/L				<0.0001	<0.0001
Dissolved Strontium	mg/L				0.206	0.198
Dissolved Thallium	mg/L				<0.0003	<0.0003
Dissolved Tin	mg/L				<0.002	<0.002
Dissolved Titanium	mg/L				<0.002	<0.002
Dissolved Tungsten	mg/L				<0.010	<0.010
Dissolved Uranium	mg/L	0.02	MAC		<0.0005	<0.0005
Dissolved Vanadium	mg/L				<0.002	<0.002
Dissolved Zinc	mg/L	5.0	AO		<0.005	<0.005
Dissolved Zirconium	mg/L				<0.004	<0.004

ODWQS - Ontario Drinking Water Quality Standards
AO - Aesthetic Objective
OG - Operational Guideline
MAC - Maximum Allowable Concentration
IMAC - Interim Maximum Acceptable Concentration
Bold - Exceeds ODWQS

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Appendix G

Water Balance Calculations

WATER BALANCE CALCULATIONS
Wooden Sticks Golf Course
Uxbridge, Ontario
November-22
PROJECT No.300050985.0001

TABLE G-1

Pre- and Post-Development Monthly Water Balance Components

Based on Thornthwaite's Soil Moisture Balance Approach with a Soil Moisture Retention of 75 mm (urban lawns in fine sandy loam soils)

Precipitation data from UDORA Climate Station (1981 - 2010)

Potential Evapotranspiration Calculation	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average Temperature (Degree C)	-7.0	-6.6	-1.3	5.7	12.2	18.0	19.9	19.3	15.1	8.6	2.4	-4.0	**6.9**
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.22	3.86	6.95	8.10	7.73	5.33	2.27	0.33	0.00	**35.8**
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	26.24	58.89	89.03	99.05	95.88	73.87	40.62	10.46	0.00	**494**
Adjusting Factor for U (Latitude 43° 57' N)	0.81	0.82	1.02	1.13	1.27	1.29	1.3	1.2	1.04	0.95	0.8	0.76	
Adjusted Potential Evapotranspiration PET (mm)	0	0	0	30	75	115	129	115	77	39	8	0	**587**
COMPONENTS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)	64.9	45.9	53.1	67.9	82.1	106.6	86.4	73.9	87.3	74.9	83.2	60.0	**886**
Potential Evapotranspiration (PET)	0	0	0	30	75	115	129	115	77	39	8	0	**587**
P - PET	65	46	53	38	7	-8	-42	-41	10	36	75	60	**299**
Change in Soil Moisture Storage	0	0	0	0	0	-8	-42	-24	10	36	28	0	**0**
Soil Moisture Storage max 75 mm	75	75	75	75	75	67	24	0	10	47	75	75	
Actual Evapotranspiration (AET)	0	0	0	30	75	115	129	98	77	39	8	0	**570**
Soil Moisture Deficit max 75 mm	0	0	0	0	0	8	51	75	65	28	0	0	
Water Surplus - available for infiltration or runoff	65	46	53	38	7	0	0	0	0	0	47	60	**316**
Potential Infiltration (based on MOE metholodogy*; independent of temperature)	42	30	35	25	5	0	0	0	0	0	30	39	**205**
Potential Direct Surface Water Runoff (independent of temperature)	23	16	19	13	3	0	0	0	0	0	16	21	**111**
IMPERVIOUS AREA WATER SURPLUS													
Precipitation (P)	886	mm/year											
Potential Evaporation (PE) from impervious areas (assume 15%)	133	mm/year											
P-PE (surplus available for runoff from impervious areas)	753	mm/year											

Assume January storage is 100% of Soil Moisture Storage

Soil Moisture Storage - fine sandy loam, urban lawns/shallow rooted crops	75 mm	<-- See "Water Holding Capacity" values in Table 3.1, MOE SWMPDM, 2003
*MOE SWM infiltration calculations		
topography - rolling to hilly lands	0.15	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
soils - open sandy loam (native silty sand, sometimes overlain with silty sand fill)	0.4	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
cover - cultivated land (urban lawns)	0.1	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
Infiltration factor	**0.65**	
Latitude of site (or climate station)	44 ° N	

WATER BALANCE CALCULATIONS
Wooden Sticks Golf Course
Uxbridge, Ontario
November-22
PROJECT No.300050985.0001

TABLE G-2

Pre- and Post-Development Monthly Water Balance Components

Based on Thornthwaite's Soil Moisture Balance Approach with a Soil Moisture Retention of 300 mm (mature forests in fine sandy loam soils)

Precipitation data from UDORA Climate Station (1981 - 2010)

Potential Evapotranspiration Calculation	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Average Temperature (Degree C)	-7.0	-6.6	-1.3	5.7	12.2	18.0	19.9	19.3	15.1	8.6	2.4	-4.0	**6.9**
Heat index: $i = (t/5)^{1.514}$	0.00	0.00	0.00	1.22	3.86	6.95	8.10	7.73	5.33	2.27	0.33	0.00	**35.8**
Unadjusted Daily Potential Evapotranspiration U (mm)	0.00	0.00	0.00	26.24	58.89	89.03	99.05	95.88	73.87	40.62	10.46	0.00	**494**
Adjusting Factor for U (Latitude 43° 57' N)	0.81	0.82	1.02	1.13	1.27	1.29	1.3	1.2	1.04	0.95	0.8	0.76	
Adjusted Potential Evapotranspiration PET (mm)	0	0	0	30	75	115	129	115	77	39	8	0	**587**
COMPONENTS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**YEAR**
Precipitation (P)	64.9	45.9	53.1	67.9	82.1	106.6	86.4	73.9	87.3	74.9	83.2	60.0	**886**
Potential Evapotranspiration (PET)	0	0	0	30	75	115	129	115	77	39	8	0	**587**
P - PET	65	46	53	38	7	-8	-42	-41	10	36	75	60	**299**
Change in Soil Moisture Storage	0	0	0	0	0	-8	-42	-41	10	36	45	0	**0**
Soil Moisture Storage max 300 mm	300	300	300	300	300	292	249	208	219	255	300	300	
Actual Evapotranspiration (AET)	0	0	0	30	75	115	129	115	77	39	8	0	**587**
Soil Moisture Deficit max 300 mm	0	0	0	0	0	8	51	92	81	45	0	0	
Water Surplus - available for infiltration or runoff	65	46	53	38	7	0	0	0	0	0	30	60	**299**
Potential Infiltration (based on MOE metholodogy*; independent of temperature)	49	34	40	29	5	0	0	0	0	0	22	45	**224**
Potential Direct Surface Water Runoff (independent of temperature)	16	11	13	10	2	0	0	0	0	0	7	15	**75**
IMPERVIOUS AREA WATER SURPLUS													
Precipitation (P)	886	mm/year											
Potential Evaporation (PE) from impervious areas (assume 15%)	133	mm/year											
P-PE (surplus available for runoff from impervious areas)	753	mm/year											

Assume January storage is 100% of Soil Moisture Storage

Soil Moisture Storage	300 mm	<-- See "Water Holding Capacity" values in Table 3.1, MOE SWMPDM, 2003
*MOE SWM infiltration calculations		
topography - rolling to hilly lands	0.15	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
soils - open sandy loam (native silty sand)	0.4	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
cover - woodland	0.2	<-- Infiltration Factors from the bottom section of Table 3.1, MOE SWMPDM, 2003
Infiltration factor	**0.75**	
Latitude of site (or climate station)	44 ° N	

WATER BALANCE CALCULATIONS
Wooden Sticks Golf Course
Uxbridge, Ontario
November-22
PROJECT No.300050985.0001

BURNSIDE

TABLE G-3

Water Balance - Existing Conditions and Post-Development with No Mitigation

Land Use	Approx. Land Area (m^2)	Estimated Impervious Fraction for Land Use	Estimated Impervious Area (m^2)	Runoff from Impervious Area* (m/a)	Runoff Volume from Impervious Area (m^3/a)	Estimated Pervious Area (m^2)	Runoff from Pervious Area* (m/a)	Runoff Volume from Pervious Area (m^3/a)	Infiltration from Pervious Area* (m/a)	Infiltration Volume from Pervious Area (m^3/a)	Total Runoff Volume (m^3/a)	Total Infiltration Volume (m^3/a)
Existing Land Use												
Grassed Lands	21,700	0.00	0	0.753	0	21,700	0.111	2,401	0.205	4,458	2,401	4,458
Wooded Lands	6,400	0.00	0	0.753	0	6,400	0.075	479	0.224	1,437	479	1,437
Clubhouse (Roof Areas) - runoff to storm sewer	1,700	1.00	1,700	0.753	1,281	0	0.111	0	0.205	0	1,281	0
Banquet Hall & Shed (Roof Areas) - runoff to pervious areas (assume 50% of runoff volume infiltrates; excess runoff to storm)[a]	400	1.00	400	0.753	301	0	0.111	0	0.205	0	151	151
Parking / Paved Areas - runoff to storm sewer	10,700	1.00	10,700	0.753	8,060	0	0.111	0	0.205	0	8,060	0
TOTAL PRE-DEVELOPMENT	**40,900**	**-**	**12,800**		**9,642**	**28,100**	**-**	**2,879**	**-**	**5,895**	**12,371**	**6,046**
Post-Development Land Use												
Grassed Lands	17,900	0.00	0	0.753	0	17,900	0.111	1,980	0.205	3,678	1,980	3,678
Wooded Lands	4,800	0.00	0	0.753	0	4,800	0.075	359	0.224	1,077	359	1,077
Clubhouse (Roof Areas) - runoff to storm sewer	1,700	1.00	1,700	0.753	1,281	0	0.111	0	0.205	0	1,281	0
Shed (Roof Areas) - runoff to pervious areas (assume 50% of runoff volume infiltrates; excess runoff to storm)[a]	50	1.00	50	0.753	38	0	0.111	0	0.205	0	19	19
New Hotel (Roof Areas) - assume runoff to storm sewer	1,250	1.00	1,250	0.753	942	0	0.111	0	0.205	0	942	0
Parking / Paved Areas - assume runoff to storm sewer	15,200	1.00	15,200	0.753	11,450	0	0.111	0	0.205	0	11,450	0
TOTAL POST-DEVELOPMENT	**40,900**	**-**	**18,200**	**-**	**13,710**	**22,700**	**-**	**2,339**	**-**	**4,755**	**16,030**	**4,774**
										% Change from Pre to Post	130	21
										Effect of development (with no mitigation)	1.3 times increase	21% reduction in infiltration

* figures from Tables G-1 & G-2

To balance pre- to post infiltration target (m^3/a)= **1,272**

[a] based on estimation in the LID SWM Planning and Design Guide (CVC & TRCA, 2010) for hydrologic groups A & B

WATER BALANCE CALCULATIONS
Wooden Sticks Golf Course
Uxbridge, Ontario
November-22
PROJECT No.300050985.0001

BURNSIDE

TABLE G-4

Water Balance - Existing Conditions and Post-Development with Mitigation

Land Use		Approx. Land Area (m^2)	Estimated Impervious Fraction for Land Use	Estimated Impervious Area (m^2)	Runoff from Impervious Area* (m/a)	Runoff Volume from Impervious Area (m^3/a)	Estimated Pervious Area (m^2)	Runoff from Pervious Area* (m/a)	Runoff Volume from Pervious Area (m^3/a)	Infiltration from Pervious Area* (m/a)	Infiltration Volume from Pervious Area (m^3/a)	Total Runoff Volume (m^3/a)	Total Infiltration Volume (m^3/a)
Existing Land Use													
Grassed Lands		21,700	0.00	0	0.753	0	21,700	0.111	2,401	0.205	4,458	2,401	4,458
Wooded Lands		6,400	0.00	0	0.753	0	6,400	0.075	479	0.224	1,437	479	1,437
Clubhouse (Roof Areas) - runoff to storm sewer		1,700	1.00	1,700	0.753	1,281	0	0.111	0	0.205	0	1,281	0
Banquet Hall & Shed (Roof Areas) - runoff to pervious areas (assume 50% of runoff volume infiltrates; excess runoff to storm)[a]		400	1.00	400	0.753	301	0	0.111	0	0.205	0	151	151
Parking / Paved Areas - runoff to storm sewer		10,700	1.00	10,700	0.753	8,060	0	0.111	0	0.205	0	8,060	0
TOTAL PRE-DEVELOPMENT		**40,900**	**-**	**12,800**		**9,642**	**28,100**	**-**	**2,879**	**-**	**5,895**	**12,371**	**6,046**
Post-Development Land Use													
Grassed Lands		17,900	0.00	0	0.753	0	17,900	0.111	1,980	0.205	3,678	1,980	3,678
Wooded Lands		4,800	0.00	0	0.753	0	4,800	0.075	359	0.224	1,077	359	1,077
Clubhouse (Roof Areas) - runoff to storm sewer		1,700	1.00	1,700	0.753	1,281	0	0.111	0	0.205	0	1,281	0
Shed (Roof Area) - runoff to pervious areas (assume 50% of runoff volume infiltrates; excess runoff to storm)[a]		50	1.00	50	0.753	38	0	0.111	0	0.205	0	19	19
New Hotel (Roof Areas) - runoff to swales	Roof runoff directed to LID (below)	1,250	1.00	1,250	0.753	942	0	0.111	0	0.205	0	207	0
	LID - swales designed to infiltrate 25 mm storm event; 25 mm storms account for approximatley 95% of total rainfall[b] (78% of total precipitation); so assume 78% of runoff directed to swales will infiltrate	NA	NA	NA	NA	NA	NA	NA	NA	NA	734	NA	734
Remaining Existing Parking / Paved Areas - runoff to storm sewer		10,200	1.00	10,200	0.753	7,683	0	0.111	0	0.205	0	7,683	0
New Parking / Paved Areas - runoff to swales	Surface runoff directed to LID (below)	5,000	1.00	5,000	0.753	3,766	0	0.111	0	0.205	0	829	0
	LID - swales designed to infiltrate 25 mm storm event; 25 mm storms account for approximatley 95% of total rainfall[b] (78% of total precipitation); so assume 78% of runoff directed to swales will infiltrate	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,938	NA	2,938
TOTAL POST-DEVELOPMENT		**40,900**	**-**	**18,200**	**-**	**13,710**	**22,700**	**-**	**2,339**	**-**	**8,427**	**12,358**	**8,446**
											% Change from Pre to Post	100	-40
											Effect of development (with mitigation)	No Change	40% increase in infiltration

* figures from Tables G-1 & G-2

To balance pre- to post infiltration target (m^3/a)= **-2,400**

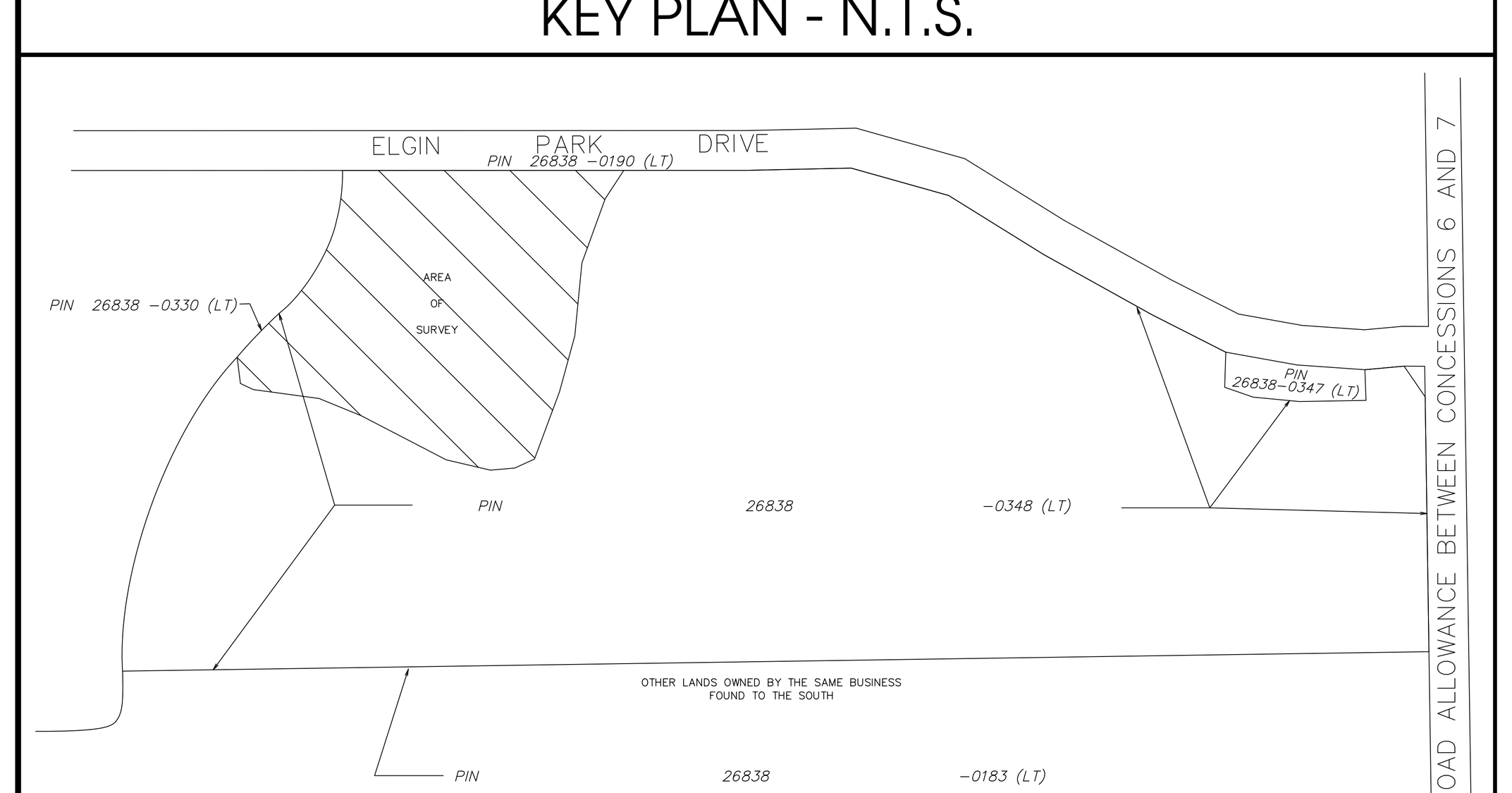
[a] based on estimation in the LID SWM Planning and Design Guide (CVC & TRCA, 2010) for hydrologic groups A & B

[b] based on the Toronto Wet Weather Flow Management Guidelines (City of Toronto, 2006)

SITE PLAN
SCALE - 1 :300

SITE DATA	EXISTING ZONING OS-11
EXISTING FACILITIES DATA	
GOLF COURSE	18 HOLE
CLUBHOUSE COVERAGE	1,126.1 m^2
CLUBHOUSE GROSS FLOOR AREA	2,252.2 m^2
CLUBHOUSE BUILDING HEIGHT	1 STOREY + BSMT
PARKING SPACES PROVIDED (EXISTING)	194
PROPOSED HOTEL DATA	
PROPOSED HOTEL COVERAGE	1,246.4 m^2
HOTEL GROSS FLOOR AREA (BSMT INCLUDED)	5,398.9 m^2
NUMBER OF HOTEL UNITS	79
HOTEL BUILDING HEIGHT	4 STOREY (17.2 m.)
LOADING SPACES	
LOADING SPACES REQ'D - SECT. 5OF ZONING BY-LAW	2 SPACES
LOADING SPACES PROVIDED	2 SPACES
REQUIRED PARKING CALCULATIONS	
GOLF COURSE	48 SPACES
CLUBHOUSE PRO SHOP	2 SPACES
CLUBHOUSE DINING AREA (148 SEATS/4)	37 SPACES
CLUBHOUSE BANQUET HALL (391 OCCUPANCY/4)	98 SPACES
CLUBHOUSE STEAM ROOM/LOCKERS	4 SPACES
CLUBHOUSE OFFICE SPACE	12 SPACES
HOTEL SUITES (79 x 1)	79 SPACES
TOTAL No. OF PARKING SPACES REQUIRED	280 SPACES
TOTAL No. OF PARKING SPACES PROVIDED	328 SPACES
BARRIER-FREE PARKING SPACES REQUIRED	4 SPACES
BARRIER-FREE PARKING SPACES PROVIDED	9 SPACES
TOTAL PAVED AREAS	11,848.7 m^2

KEY PLAN - N.T.S.



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PROJECT
PROPOSED RESORT HOTEL
40 ELGIN PARK DRIVE
UXBRIDGE, ON

CLIENT
WOODEN STICKS GOLF

REVISIONS

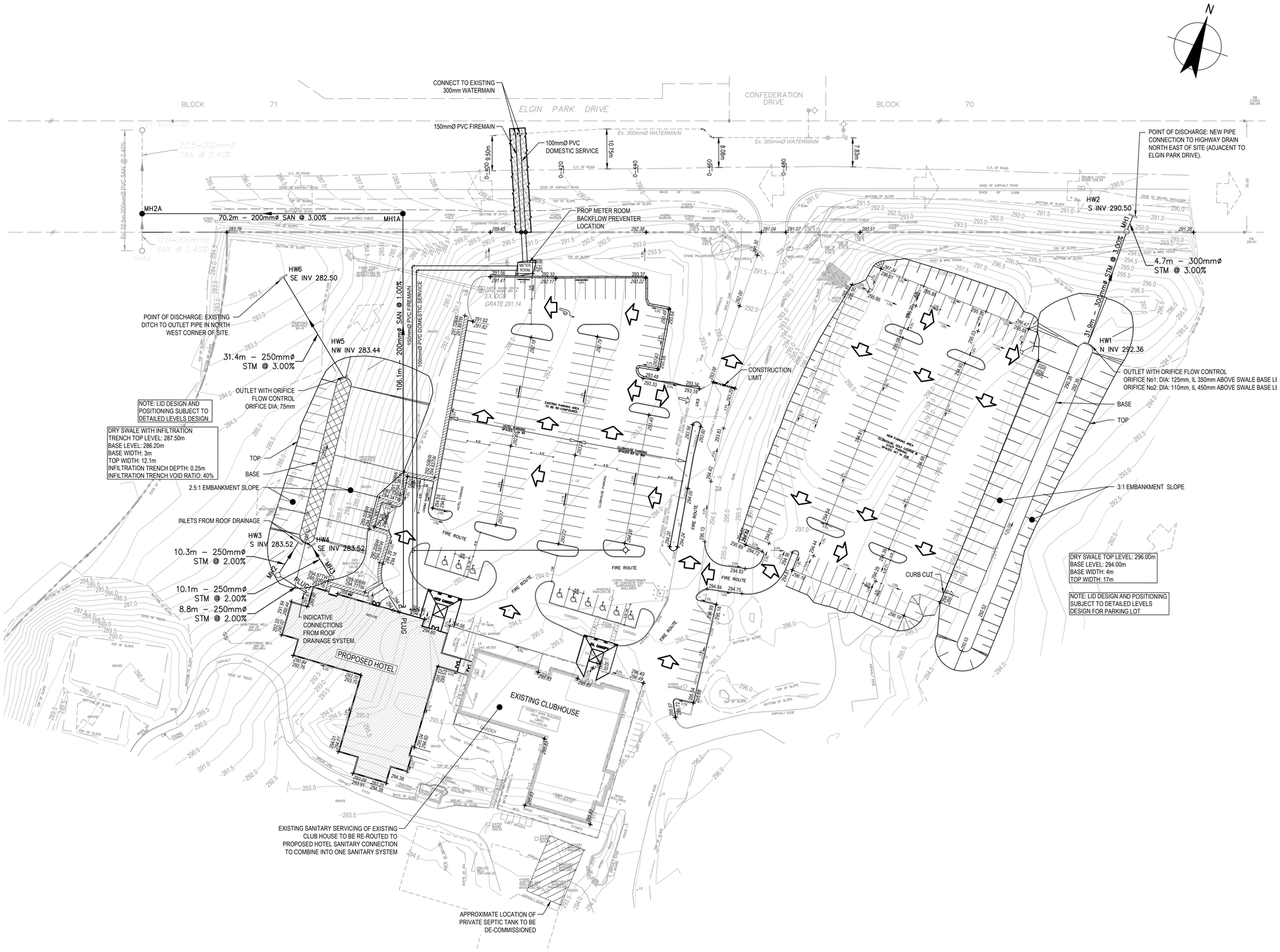
REVISIONS

REVISIONS
RELEASED FOR 1ST REVIEW — JUNE 23, 2022

JUNE 2022
PROJECT No. 2201
SITE PLAN

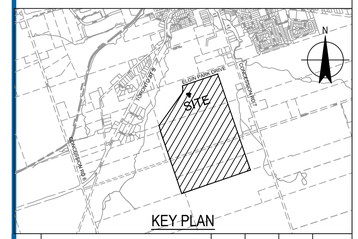
PRELIMINARY

A01



LEGEND

PROPOSED	EXISTING	
●	●	SANITARY MANHOLE
○	○	STORM MANHOLE
▭	▭	DOUBLE CATCHBASIN
✧	✧	FIRE HYDRANT
⊗	✖	WATER VALVE
Y	Y	SIAMESE CONNECTION
123.45	123.45	ELEVATION
2.2%		GRADE
87.0		EXISTING GROUND CONTOUR
		DEPRESSED CURB
		EXISTING OVERLAND FLOW ROUTE
		PROPOSED OVERLAND FLOW ROUTE
		3:1 SLOPING
		PROPOSED RETAINING WALL
		SAW-CUT TRENCHING



KEY PLAN

No.	Revision	Drawn	Job Manager	Project Director	Date

Drawing Revisions

Note: * indicates signatures on original issue of drawing or last revision of drawing

0 5 10 15 20 25m

SCALE 1:500 AT ORIGINAL SIZE

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Client **WOODEN STICKS GOLF**

Project **40 ELGIN PARK DRIVE**

Title **FUNCTIONAL SERVICING AND GRADING PLAN**

Scale 1:500m	**DO NOT SCALE**
Drawn A.DEB	
Designer A.DEB	
Drafting Check G.BECKER	
Design Check D.MARKS	
Approved (Project Director) D.MARKS	
Date OCTOBER 2022	

This Drawing must not be used for Construction unless signed as Approved

Drawing No. **11225804-FSGP**

Original Size **Arch D**

Rev. **1.0**

ISSUED FOR REVIEW

Plot Date: 9 October 2022 - 1:00 PM Plotted by: Ayesha Deb Cad File No: G:\662\11225804\Digital_Design\CI\sheet\Figures\11225804-FSGP.dwg

R.J. Burnside & Associates Limited