REVISED

Hydrogeological Assessment

70 Pioneer Trail

Barrie, Ontario

Prepared for:
Fernbrook Homes (Parkside) Limited

Prepared by:
Azimuth Environmental
Consulting, Inc.

August 2022

AEC 15-010

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

August 15th, 2022 AEC 15-010

Fernbrook Homes (Parkside) Limited
c/o Mike Riccardi
2220 Highway 7 West, Unit 5
Concord, ON L4K 1W7

Re: **REVISED Hydrogeological Assessment**
70 Pioneer Trail, City of Barrie, ON

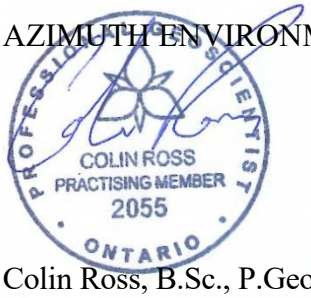
Dear Mr. Riccardi:

Azimuth Environmental Consulting, Inc. (Azimuth) is pleased to provide our Revised Hydrogeological Assessment for the property located at 70 Pioneer Trail within the City of Barrie, ON (the "Site"). This evaluation focused on the existing soil and ground water regime underlying the Site and the potential for the proposed development to impact the existing conditions. A water balance was previously included as part of an Environmental Impact Study (EIS) completed by Azimuth for the site dated June 30th 2017. This current report includes an additional dewatering assessment and has been updated to include the revised Site Plan. This report also includes revisions based on Lake Simcoe Region Conservation Authority (LSRCA) review comments (March 24, 2022) from previous submissions.

Should you have any questions or wish to discuss the report in greater detail, please do not hesitate to contact the undersigned.

Yours truly,

AZIMUTH ENVIRONMENTAL CONSULTING, INC.



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1.0 INTRODUCTION

Azimuth Environmental Consulting Inc. (Azimuth) has been retained by Fernbrook Homes (Parkside) Limited C/O Mike Riccardi to conduct a Revised Hydrogeological Assessment for the property located at 70 Pioneer Trail within the City of Barrie, Ontario (the "Site")(Figure 1). The Site is irregular in shape and is approximately 28,858 square meters (m^2) in size. The Site is located at the eastern terminus of Pioneer Drive, and represents the eastern extent of the City of Barrie. Land immediately east is located within the Town of Innisfil.

Access to the study area from Pioneer Trail is currently possible by a single lane private driveway with no visible culvert or crossing structures. The Site previously contained a house and shed structure; however theses were both demolished in 2015 due to safety and vandalism concerns. A limited section of meadow is located adjacent to the former house structure, assumed to have once been a maintained lawn. The north extent of the Site is a composed of the shore of Lake Simcoe (Figure 2). A small portion of the shoreline has been historically cleared for an apparent boat launch, with the remaining shoreline unused.

It is our understanding that the Site will be developed into eighteen (18) single lot residential homes within a Common Element Condominium development. The Site will contain amenity space and a storm water management block (Site Plan - Appendix B / Figure 4). The purpose of this assessment is to characterize the existing hydrogeological conditions at the Site and the potential for the proposed development to impact the existing environmental conditions.

2.0 ENVIRONMENTAL SETTING

2.1 Soil

The soil map of Simcoe County (Soil Survey Report No. 29, Scale 1:63,360) shows the uppermost soil to be composed of Sargent gravelly sandy loam. This soil is described as pale brown, calcareous outwash gravel with good drainage and is stone free (Hoffman & Richards, 1962). Sargent gravelly sandy loam is classified within hydrologic soil group "A". Group A represent soils which have low runoff potential and high infiltration rates even when thoroughly wet. They consist of deep, well to excessively drained sand or gravel and have a high rate of water transmission.

2.2 Physiography

The Ontario Geological Survey (Chapman & Putnam, 1984) describes the study area as being located in the Simcoe Lowlands physiographic region, which lies around the east side of Lake Simcoe, through the shores of Kempenfelt Bay, and up toward Georgian Bay. The Simcoe Lowlands represent the area previously flooded by Lake Algonquin and are bordered by shore cliffs, beaches, and boulder terraces.

2.3 Topography and Drainage

According to regional contour mapping, the study area varies in elevation between about 232 metres above sea level (masl) along the southern property line and 219 masl along the shore of Lake Simcoe to the north. Topography of the study area therefore displays a continuous slope toward the north, however a steeper slope is observed immediately adjacent to the shoreline. Drainage from the pre-development site is expected to follow the local topography, and drain north by sheet flow into Lake Simcoe. Pre-development drainage is also expected to include runoff from the Algonquin Ridge to the south, which is a steeply sloped forest sloping north toward the site and Lake Simcoe. According to the Pre-Development Storm Drainage Plan (Jones, 2022) about 0.80 ha of the up-gradient land area drains through the Site via an existing channel along the eastern Site boundary, which will be maintained as part of the proposed development. The remaining 5.56 ha of up-gradient land area flows north into the Site until the existing gravel driveway, at which point it flows west and collects near the western Site boundary. Runoff is assumed to seep through the gravel driveway toward Lake Simcoe. There is a slight depression existing as a vegetated swale along the western EP lands boundary which may convey flow from the western woodland feature toward the Lake during periods of high flow. It is noted that this external flow will also be maintained post development as per the Jones, 2022 storm water plans.

The City collects raw water from Lake Simcoe for use as a potable water supply after treatment. The intake is located approximately 600 m east of the Site (SGBLS, 2015). The site is located within the Intake Protection Zone (IPZ-1), which is defined as a 1 km radius and/or a 120 m setback from the shoreline from the surface water intake.

2.3.1 Regional Geology

The regional geology reportedly consists of sand, gravel, with minor silt and clay associated with littoral deposits. The study area is intersected by a beach ridge which transverses the study area in an east to west direction, roughly parallel to the Lake Simcoe shoreline. A second, more prominent shore bluff is located immediately south of the Site and is locally referred to as the Algonquin Ridge. The Ontario Geological Survey (OGS) Earth Database shows that the uppermost bedrock at the study area consists of limestone and shale of the Simcoe Group and the Verulam Unit (OGS, 2021).

2.4 Hydrogeology

The Ontario Ministry of Environment, Conservation, and Parks (MECP) Water Well Records were referenced for any recorded well information within the vicinity of the Site (approximately 300 m)(GIN, 2021). The well records found in the vicinity of the Site are summarized in Table 1 and are shown on Figure 3:

Table 1: MECP Water Well Database Summary[1]

Well No.	Distance from site[2] (m)	Direction from site[2]	Elevation (masl)	Date Drilled	Static Water Level (mbgs)	Total Depth (m)	Well Type	Primary Use
5716766	35	E	236	1980-03-06	0.3	84.4	Overburden	Observation
5716044	65	E	229	1978-09-29	6.4	22.6	Overburden	Domestic
5719214	170	E	229	1983-05-14	1.8	23.8	Overburden	Domestic
5701627	195	SE	244	1966-02-28	15.2	36.0	Overburden	Domestic
5701626	195	SE	251	1966-02-28	15.2	36.0	Overburden	Domestic
5708962	260	E	232	1972-06-13	4.8	24.4	Overburden	Domestic
5706083	280	E	232	1968-12-21	9.1	21.6	Overburden	Domestic
5717366	240	W	229	1980-11-03	0.3	20.4	Overburden	Domestic
5701624	190	W	219	1967-11-25	0.3	27.7	Overburden	Domestic
5716767	275	SW	236	1980-03-19	1.2	73.2	Overburden	Observation
5705726	245	SW	233	1968-08023	0.6	45.7	Overburden	Domestic

Notes: [1] - values rounded for presentation purposes

[2] – values measured based on latitude and longitude recorded within the well record as displayed on Google Earth Pro (2015)

The surrounding wells in the MECP database were drilled primarily for domestic use, and ranged in depth between 20.4 m and 45.7 m. Two additional wells were drilled for observation use, and were 84.4 m and 73.2 m deep. None of the wells encountered bedrock, so the depth to bedrock is assumed to be greater than 84 meters below ground surface (mbgs). Further OGS bedrock mapping indicates it is approximately 125 m from surface. The static water levels ranged between 0.3 mbgs and 15.2 mbgs, however was typically less than 5 mbgs. The wells were drilled primarily into surficial sand, overlying clay, overlying a second sand unit. All of the wells obtained water from a confined sand unit. The observation wells were advanced through interbedded layers of sand and clay, representing the multiple aquifer units present in the overburden in the Barrie area. Well records for the immediate area are included in Appendix E.

3.0 SOURCE WATER PROTECTION

A review of the Source Water Protection Areas as identified on the MECP Source Protection Information Atlas website indicates the Site is considered a Significant Ground Water Recharge Area (SGRA); however it is not considered a Highly Vulnerable Aquifer (HVA). It is not located within a Wellhead Protection Area (WHPA) Q1 or Q2.

The site is located within the Intake Protection Zone (IPZ-1), which is defined as a 1 km radius and/or a 120 m setback from the shoreline from the surface water intake. The mapping is illustrated in Appendix K

4.0 MONITORING

4.1 Geotechnical

A geotechnical investigation was completed at the study in August of 2015 (Terraprobe, 2015). The scope of this investigation included advancing nine (9) boreholes across the study area to a maximum depth of 6.6 mbgs. Each borehole was also instrumented with a piezometer for ground water measurement.

In general, the subsurface conditions included 0.1 to 2.4 m of surficial organics and/or silty sand fill. Beneath this was a native layer of primarily loose to dense sand to silty sand with trace to some gravel and trace clay. Three boreholes (one at the north east corner of the Site and two at the south east corner) encountered very stiff to hard clayey silt to silt and clay below 2.8 m to a depth of 5.5 m. Occasional cobbles/boulders were also noted. This description of the shallow overburden is consistent with regional geologic mapping.

4.2 Ground Water Monitoring

Ground water was measured as part of the geotechnical program in each of the nine piezometers on a monthly basis between February, 2015 and August, 2016 (Terraprobe, 2016), while additional monitoring was also completed by GEI Consultants (2021). The water levels at the site varied seasonally, displaying the highest elevation in the spring (April 2016), at which point the water table elevation ranged between 0 –5 mbgs. This is expected to represent the high water table for the Site, and should be considered in the detailed design of basements, utilities, and any stormwater low impact design (LID). The complete record of ground water monitoring is provided in Appendix E. The high ground water condition is shown on Figure 4. It is noted that the ground water elevations from the February 2022 submission have been updated as it was noted that the reference elevations for the historical Terraprobe, 2016 dataset were incorrect. Ground surface was resurveyed in 2022 and the values have been updated based on the Terraprobe water levels relative to ground surface.

4.3 Infiltration Testing

The current Infiltration Assessment focused on the proposed subsurface infiltration chamber is sized to capture up to the 25 mm rainfall event runoff from the entire 201 catchment area (SWM-2, Appendix B). The purpose of this assessment was to assess the

existing soil beneath the proposed LID location, and determine a suitable infiltration rate for use in detailed design.

4.3.1 Methodology

A field program was conducted by Azimuth staff on June 23rd, 2022 between the hours of 8:00 am and 4:30 pm during which the weather was 25°C and overcast. Two test pits were advanced at the Site, at the eastern and western ends of the proposed the proposed LID system as tree cover limited access to the centre area. The test pits were advanced using a backhoe excavator contracted through Fernbrook Homes. The location of the test pit was marked in the field and located via a hand held GPS device. The test pit base elevation was therefore determined based on the ground elevation and test pit depth.

The Infiltration Assessment was completed in accordance with Appendix C of the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA 7 CVC, 2010). The test pits were advanced to an elevation approximately 0.2-0.3 m above the base of the LID. A hand auger was then used within the test pit to remove approximately 0.2-0.3 m of additional soil. The infiltration assessment was therefore completed at the base of the proposed LID. Information on the proposed LID design in included in Appendix B. The test pits were approximately about 3 m wide and 6 m long. An additional 1.5 m was excavated after the testing was complete to confirm the underlying material for each test pit.

The Guelph Permeameter Model 2800K1 (Soil Moisture Equipment Corp.) was used to measure the in-situ hydraulic conductivity as per the *Guelph Permeameter Operating Instructions* (Soil Moisture, 2012). Due to the dominance of granular material encountered, the single head method using the combined reservoir was utilized. Two tests were completed within each end at the base of the TP-1 due to variability in the soils (sand and clayey silt) for a total of four tests, while TP-1 had two tests completed. Each test was within an independent augered holes with varying well head heights for each of the three testing locations. The geometric mean from each of the two tests for each location were averaged to determine a representative value for the soil type.

Table 2: Summary of Test Pit Location Details

Test Pit ID (masl) [1]	Base of Test Pit Elevation (masl)[1]	Depth (mbgs)[2]	Approximate Coordinates[3]	
			Easting	Northing
TP-1 (226.5)	225.1	1.4	609643	4914043
TP-1A (226.5)	225.1	1.4		
TP-2 (226.5)	225.1	1.4	609631	4914019

NOTES:

[1] Ground surface elevation taken from site survey information and includes the depth of the augered holes
[2] Depth below surface level is the target depth of proposed LID systems at the location of each test pit.
[3] +/- 5 m accuracy based on tree cover

Soil samples were collected from the test pits at the approximate LID base elevation of infiltration testing for laboratory grain size and T-Time analysis. Three samples were completed representing each soil type (medium to coarse sand, medium to find sand and clayey silt). The soil sample analysis was used to confirm the in-situ results. After the infiltration tests were completed, the test pits were advanced an additional 1.5 m to confirm the underlying material, and then backfilled with the original soil material.

4.3.2 Test Results

The material encountered within the test pits was composed of 1.1 m of fill in TP-1 underlain by clayey silt in one section of the pit and medium to find sand in the other up to a depth of 2.9 mbgs. This variance is likely attributed to the shoreline terrace in close proximity to this location. This test pit was located at the northeastern end of the LID area. TP-2, which is located at the southwestern end of the LID area was comprised of native medium to coarse sand to a depth of 2.7 m. Ground water was not encountered in TP-1, but was noted at a depth of 2.4 mbgs in TP-2, 1 m below the base of the proposed LID. The complete test pit logs, grain size analysis and infiltration testing summary tables have been included in Appendix I.

The Guelph Permeameter generates a result as a hydraulic conductivity (K_{fs}) value. As per Table C1 from CVC & TRCA (2010), the K_{fs} values from the Guelph Permeameter and percolation rate (T-Time) values from the grain size analysis have been converted to an infiltration rate (1/T).

Based on the information provided in Table 3, the measured in-situ infiltration rate at the Site ranged between 29 and 219 mm/hr. These rates are consistent with values expected from a silt or clayey silt and granular sand material. The in-situ testing results and the estimate based on the grain size analysis appear to be generally correlated.

Table 3: Results of Infiltration Assessment

Test Pit ID	Soil Type at Depth[1]	Guelph Permeameter Results			Estimated Infiltration Rate from Soil Sample [1,3] (mm/hr)
		Test # 1 Infiltration Rate[2] (mm/hr)	Test # 2 Infiltration Rate[2] (mm/hr)	Geometric Mean Infiltration Rate (mm/hr)	
TP-1	Clayey Silt	27	30	29	<12
TP-1A	Medium to Fine Sand, Trace silt & Gravel	154	121	137	75
TP-2	Medium to Coarse Sand, Trace silt & Gravel	223	215	219	200
Geometric Mean (all tested soils)				95	56

NOTES:

1 As per Central Earth Engineering Letter Report dated June 30th, 2022 titled T-Time Analyses, Ref. No. 15-010

2 Guelph Permeameter results are converted from K_{fs} to 1/T according to Table C1 from TRCA & CVC (2010)

3 Soil sample collection results are converted from T-Time to 1/T according to Table C1 from TRCA & CVC (2010)

4.3.3 Recommendations

As per TRCA & CVC (2010), the infiltration rate used to design infiltration LIDs must incorporate a safety correction factor that compensates for potential reductions in soil permeability due to compaction or smearing during construction, gradual accumulation of fine sediments over the lifespan of the LID, and an uncertainty in measured values when less permeable soil horizons exist. A safety correction factor of 2.5 was used along with the geometric mean for infiltration rate as per TRCA & CVC (2010). Table 4 summarizes the recommended design infiltration rate for the location investigated:

Table 4: Summary of Design Infiltration Rate

Geometric Mean Infiltration Rate* (mm/hr)	Safety Correction Factor	Design Infiltration Rate (mm/hr)
95	2.5	38

* - geometric mean of three tested soil types beneath the LID facility

After applying a correction factor of 2.5, the design infiltration rate for the LID area is 38 mm/hr. The results for the Site indicate that the infiltration rate for the material at the base of the LID is variable but feasible given the mean infiltration values.

5.0 WATER BALANCE

In order to determine the potential changes to the natural ground water recharge conditions, a pre- and post-development water balance assessment has been completed using the Thornthwaite and Mather method (1957). This method evaluates evapotranspiration based on precipitation and temperature. Residual soil saturation is a function of topography and soil type. Monthly data are tabulated from daily average temperature and precipitation, and the water budget is a continuous calculation over the period of record. To clarify, the method and the approach used by many individuals in examining infiltration resets annual conditions (moisture deficit, snow storage, etc) over the winter months because of the general lack of infiltration during the frost period. However, we maintain those records and carry them forward from month to month during the entire period of record.

Values were determined on a monthly basis, compiled from daily Environment Canada meteorological data station located in Barrie, Ontario between 1970 and 2020 (Barrie Climate Station – Station ID 6110557 / 6110556). The calculations are based on the average conditions during this period. The average precipitation was 909 millimeters (mm), rainfall was 655 mm, evapotranspiration was 479 mm, and the surplus was 430 mm per year.

5.1 Land Use

5.1.1 Pre-Development

The pre-development Site area was classified according to land use/vegetation type. Land within the pre-development area is provided in Table 5.

Table 5: Pre Development Area Classification

Land Use	Land Area (m^2)
Forest	21,929
Bare Ground	6,940
TOTAL	28,869

Land within the pre-development scenario is considered 0% impervious. The pre-development areas are shown on Figure 2.

5.1.2 Post-Development

The land classification in the post-development scenario was classified based on the Site Plan (Appendix B / Figure 4). Land within the post-development Site is summarized in the below Table 6:

Table 6: Post Development Area Classification

Land Use	Land Area (m^2)
Forest	4,746
Landscaped Grass	9,386
Landscaped Grass (LID)	2,014
Road / Driveway / Sidewalk	315
Road / Driveway / Sidewalk (LID)	4,466
Rooftop	5,618
Rooftop (LID)	2,324
TOTAL	**28,869**

(LID) – areas represent catchment 201 (including all 201 subcatchments), which is being directed into LID infiltration gallery

Land within the post-development scenario is considered 42% impervious.

5.2 Infiltration

Infiltration is generated one of two ways: (1) directly from rainfall impact or snowmelt on pervious surfaces; and (2) indirectly when runoff from impervious surfaces is diverted into adjacent naturalized areas.

Infiltration factors for the Site were estimated based on the underlying soil, local topography, and ground cover as per Table 2 of the Ministry of Environment and Energy (MOEE) Hydrogeological Technical Information Requirements for Land Development Applications (1995).

The soil variable factor was determined by taking into account information obtained from the regional geologic mapping and the geotechnical program completed for the Site. This information suggests that the surficial material at the Site is primarily composed of silty sand to sand, however some areas with surficial silt to silt and clay was noted. The infiltration factors utilized in the water balance assessment are summarized in Table 7 below.

Table 7: Summary of Pervious Land Infiltration Factor

Scenario	Land Use	Infiltration Factor	Assumption
Pre-Development	Forest	0.70	Rolling land (0.2), sandy soil (0.3), woodland vegetation (0.2)
Post-Development	Landscaped / Grassed	0.60	Rolling land (0.2), sandy soil (0.3), lawn (0.1)

5.2.1 Pre-Development Infiltration

Pre-development direct infiltration was determined by multiplying the annual average surplus amount, the area of each land use, and the infiltration factor for each land use. The pre-development annual infiltration is therefore 8,391 m^3/year (Appendix F).

5.2.2 Post-Development Infiltration

Post-development infiltration (without mitigation) was determined by multiplying the annual average surplus amount, the area of each land use, and the infiltration factor for each land use. The post-development annual direct infiltration is therefore 4,370 m^3/year. There is therefore a decrease in infiltration of 4,021 m^3/year from pre- to post-development without mitigation measures employed.

The post-development drainage plan includes low impact development (LID) to promote infiltration. An infiltration gallery will be included in the storm water design to collect runoff from the entire 201 catchment (including all subcatchments) area (SWM-2, Appendix B). The details for this feature are outlined in the Jones, 2022 Storm Water Management Plan Report, which indicate it is designed for capture of a 25 mm rainfall event. In order to correlate event based rainfall data, for which the LID's are designed (i.e. 25 mm rainfall event), to annual averages, as is what is utilized in water balances, an event based assessment has been completed for the Barrie Climate station. Rainfall events over an 8 year period (2012-2019) were broken down by event size, such that total volumes for each of these events could be calculated for capture from hard surface area (road, rooftop). These totals were then related to the total volume over the same period to obtain a percentage. This percentage is then multiplied by the annual average value (655 mm) utilized in the overall water balance to obtain an annual average amount / depth for the various intervals. It was determined that an event rainfall depth of 25 mm represented an average annual rainfall total of 614 mm or 94% of the rainfall events over this period of record. It is noted that these represent cumulative amounts for all rainfall amounts less than the stated event size. In order to quantify the annual infiltration volumes for the LID, the annual rainfall depth (event equivalent) discussed above is multiplied by the areas within catchment 201, which have the "LID" designation in water balance summary table (Appendix F). Similarly, this designation is used for pervious (landscaped) areas as well. These areas will have infiltration such that the difference between the surplus and infiltration volumes was utilized for contribution into the LID for catchment 201. This results in an overall increase in infiltration of 3,612 m^2.

Additional infiltration will be gained by directing rooftop runoff outside of the LID capture area toward the adjacent grass surface, which essentially encompasses the rear of residential lots. There is approximately 5,618 m^2 of rooftop area which will contribute to indirect infiltration. The infiltration volume for rooftop downspouts is determined by

multiplying the area (5,618 m^2) by the annual rainfall (655 mm) by the by 50% as per the CVC LID Manual for HSG A & B soils and by 80% to account for a 20% evapotranspiration factor. The total infiltration gained through this method is 1,472 m^3/year.

It is noted that added conservancy is reflected in these numbers through discounting of snow melt. Although difficult to quantify due to seasonal storage and movement (i.e. snow banks, snow dumps), it can provide a potential meaningful contribution as it represents ~28% of total precipitation.

5.3 Water Balance Summary

Using the climate model data and calculations mentioned above, the water balance was completed for pre-development, post-development, and post-development with mitigation (Appendix F).

The pre-development infiltration volume is 8,391 m^3/year. This assumes the Site is composed of forested and grassed areas. The post-development without mitigation infiltration volume is 4,370 m^3/year, which is a deficit of 4,021 m^3/year. This assumes the Site is composed of the above noted residential development. An additional 3,612 m^3/year of infiltration can be obtained through LID capture (infiltration gallery), as well as 1,472 m^3/year from downspout disconnection on the rear roof components outside of the LID capture area. As a result of these mitigation measures, the post-development with mitigation volume is therefore 9,454 m^3/year which represents an increase of 1,063 m^3/year (+13%) from the pre-development configuration.

6.0 DEWATERING AND IMPACT ASSESSMENT

The proposed development will include the construction of 18 residential lots, which will be serviced with municipal water and sanitary services. This servicing will be connected to existing municipal infrastructure at the west end of the Site at the current terminus of Pioneer Trail and will extend along the proposed road alignment. Due to the presence of shallow ground water at the Site, dewatering will likely be required to maintain dry conditions during construction.

Shallow excavations into the ground water table can typically be controlled by conventional sump pump technologies and will likely be appropriate for use at the Site. If the required drawdown is greater than 1.5m, or the servicing alignments are in close proximity to surface water bodies, the use of shallow well points or eductor systems may be required. The exact dewatering methodology will depend on Site specific conditions and will be determined by a specialist contractor.

The Site is within a relatively rural environmental setting surrounding by naturalized areas such that dewatering effluent will be discharged to the natural environment, existing drainage channels, or new storm water controls if constructed prior to servicing. It is noted that all Site drainage extends north into Lake Simcoe such that dewatering discharge will not encroach on adjacent properties.

6.1 Drawdown Conditions

Servicing drawings provided by Jones Consulting Group (PP-1 – Appendix G) were reviewed to determine the maximum potential drawdown required for construction if dry working conditions are required. The alignment followed the road alignment, while ground water levels in this area were determined through the high water table conditions illustrated in Figure 4. Review of the servicing depths, which focused on the sanitary servicing which were the deepest relative to the water servicing indicated required drawdown ranging between 1.3 and 1.7 m between the western property extent for approximately 140 m along the new roadway. The remaining eastern extent of the servicing alignment indicates seasonal water table depths above or 0.1 m below servicing depths. Based on this, the dewatering assessment was separated into these two sections, with the western extent assuming a consistent drawdown depth of 2.2 m and the eastern extent assuming a consistent drawdown depth of 0.5 m was used along the entire alignment. This assumed the ground water table will need to be lowered 0.5 m below the lowest servicing elevations to maintain dry conditions. The total length of servicing is 340 m, which was divided into the western section (140 m) and the eastern section (200 m) for the purposes of this assessment; however, could be done in more incremental stages to limit the instantaneous dewatering volumes / rates.

The actual drawdown will depend on construction timing. It is therefore recommended that dewatering could be completed in the dry summer months to minimize dewatering requirements from what is calculated in this report based on the seasonally high water table condition.

6.2 Approximate Dewatering Volumes

As the on-site monitoring wells were constructed in a manner which did not allow for hydraulic (slug) testing to be completed (i.e. ¾ inch diameter with unknown well screen details) an assumption was made with respect to hydraulic conductivity of the shallow aquifer. A value of 5×10^{-4} m/sec was utilized based on the fact the shallow profile along the alignment was documented (Appendix D) to be dominated by a medium to fine sand. The assumed value is considered conservative based on the range outlined in Freeze and Cherry, 1979 for a clean sand.

For trench dewatering, the steady state method from Powers *et al*. (2007) for estimating flow from a line source from an unconfined aquifer was utilized. This method assumes since the excavation is long and narrow, equivalent slot plane flow is the dominant flow regime, and radial flow from the side of the excavation is considered negligible.

The following equation was used:

$$Q = 2*[a*K*(H^2-h^2)/(2R_o)]* 86400*1000$$

(Ref: Powers *et al*. (2007)

The full dewatering assessment can be found in Appendix G, while a summary is provided in the table below. It should be noted that a total servicing length of 340 m with the maximum drawdown is not anticipated during construction dewatering as sections will have more limited saturated thicknesses or could be completed in sections. This example was utilized to convey the maximum dewatering anticipated if the full length of trench was under construction at the Site at any one time with conservative saturated thicknesses.

Based on the information provided in Table 8, the dewatering volume for the western servicing section with a maximum drawdown of 2.2 m is 198,000 L/day. A 3x safety factor can then be applied for a conservative estimate of 594,000 L/day. The dewatering volume for the eastern servicing section with a maximum drawdown of 0.5 m is 64,000 L/day. A 3x safety factor can then be applied for a conservative estimate of 192,000 L/day. The cumulative volumes are 262,000 L/day or 786,000 L/day with a 3X safety factor (Table 8). These values are based on worst case spring season ground water values.

Any construction dewatering between 50,000 L/day and 400,000 L/day can be completed after registration under the Environmental Activity and Sector Registry (EASR). Any active construction dewatering above 400,000 L/day requires a Permit To Take Water (PTTW). As noted above, the magnitude of dewatering required will vary on the timing of construction and less dewatering could be needed in the summer drought conditions or if completed in smaller sections. Peak ground water elevation typically occurs between mid March and the end of May. Based on the volumes in Table 8 dewatering will likely require a PTTW as it is above 400,000 L/day if completed during high water table conditions and the entire servicing length is dewatered.

Table 8: Summary of Dewatering Conditions

Variable	Western Servicing Section	Eastern Servicing Section
Estimate of Equivalent Radius **[r_e]** (m)	1	1
Hydraulic Conductivity **[K]** (m/s)	5×10^{-4}	5×10^{-4}
Maximum Required Drawdown **[H-h]** (m)	2.0	0.5
Saturated Thickness Before Pumping **[H]** (m)	2.2	0.5
Depth of Water During Pumping **[h]** (m)	0	0
length of excavation **[a]** (m)	140	200
width of excavation **[b]** (m)	2	2
Radius of Influence **[R]** (m)	148	34
Discharge **[Q]** (L/day)	198,000	64,000
Discharge [Q] (L/day) 3 X Safety Factor Applied	**594,000**	**192,000**
Combined Discharge **[Q]** (L/day)	262,000	
Combined Discharge [Q] (L/day) 3 X Safety Factor Applied	**786,000**	

6.3 Impact Assessment

Based on the information provided in Table 8, the largest zone of influence is 148 m from the dewatering zone; however this is the maximum distance where any measurable water table decline is observed (~1-5 cm). In reality, more significant decline in ground water levels (0.5-1 m) will be contained within or a short distance from the dewatering trench (40 m).

The well record review completed in Section 2.4 and identification of developed properties adjacent to the Site indicated the closest property which could be serviced by a well is approximately 80 m northwest of the dewatering alignment; however, this part of Pioneer Trail has municipal water connections available such that it is uncertain as to whether this property is still reliant on a private well. It would be recommended that presence of active private domestic wells on the adjacent properties to the east and west would be recommended prior to any dewatering activities being undertaken and could be completed as part of the PTTW application / issuance.

As noted previously, there are no surface features on or immediately surrounding the Site aside from Lake Simcoe, which is more than 100 m from the dewatering alignment and not expected to be influenced by the proposed dewatering activities.

7.0 SUMMARY AND CONCLUSIONS

Azimuth was retained by Fernbrook Homes (Parkside) Limited C/O Mike Riccardi to conduct a Hydrogeological Assessment for the property located at 70 Pioneer Trail within the City of Barrie, Ontario. The Site is irregular in shape and is approximately

2.8 hectares (ha) in size. The Site is located at the eastern terminus of Pioneer Drive, and represents the eastern extent of the City of Barrie. The Site is currently vacant land but historically housed a single residential dwelling. The purpose of this assessment is to characterize the existing hydrogeological conditions at the Site and the potential for the proposed development to impact the existing environmental conditions.

The Site is found at an elevation between 219 – 232 masl, sloping from the south down towards Lake Simcoe which bounds the north end of the Site. There is currently no storm water infrastructure at the Site, so existing runoff is expected to follow the local topography and flow via sheet flow and small channelized areas on the site. Borehole logs from the Site show the subsurface is composed of topsoil overlying a thin silty sand fill underlain by a native medium to fine sand unit. A lower clayey silt unit is present at depth in a few logs. The inferred ground water flow direction is north toward Lake Simcoe, which follows the local topographic surface. Ground water at the Site was measured at between 219 and 228.7 masl.

The pre-development infiltration volume is 8,391 m^3/year. This assumes the Site is composed of forest and grassed areas. The post-development without mitigation infiltration volume is 4,370 m^3/year, which is a deficit of 4,021 m^3/year. This assumes the Site is composed of an 18 lot residential development with areas of landscaped grass and remaining forest cover. An additional 3,612 m^3/year of infiltration can be obtained through the inclusion of the infiltration gallery which will capture all runoff from catchment 201 (including subcatchments) (Jones, 2022), while approximately 1,472 m^3/year will be gained by diverting the runoff (outside of catchment 201) from the remaining rooftop area. The post-development with mitigation volume is therefore 9,454m^3/year which represents a gain of 1,063 m^3 or an increase of 13% from the predevelopment configuration. Given the match that is achieved, no water balance off-setting payments are required for the proposed development as per the Lake Simcoe Protection Plan (DP-4.8).

The proposed development will include connection to municipal water and sewer servicing, which will be extended from the current terminus of Pioneer Trail. Due to the elevation of proposed servicing, some level of dewatering will be required to maintain dry conditions during construction. Based on the information provided in Table 8, the dewatering volume for the servicing trench, which will require an approximate lowering between 0 and 2.0 m is anticipated to be 262,000 L/day, while applying a 3X safety factor would create an estimated daily volume of 786,000 L/day. If dewatering operations were done in more limited servicing lengths or during summer when water table conditions were lower, more limited dewatering volumes could be realized which would fall below the 4000,000 L/day threshold such that they could be completed within

an EASR. However, if completed in the spring and for the entire extent of servicing, a PTTW would be recommended to be obtained.

Azimuth completed in-situ percolation testing at the site in July 2022 targeting the proposed LID location. The assessment was focused on the existing soil beneath the previously proposed LID locations to determine suitable infiltration rate for use in detailed design. The geometric mean infiltration rate for the Site is 95 mm/hr. After applying a correction factor of 2.5, the design infiltration rates for the Site is 38 mm/hr. The results for the Site indicate that the infiltration rate for the material at the base of the LID is considered moderate.

8.0 REFERENCES

Barnett, P.J., Cowan, W.R. and Henry, A.P. 1991. Quaternary Geology of Ontario, Ontario Geological Survey, Map 2556, Scale 1:1,000,000.

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Hoffman, D.W. & N.R. Richards, 1962. Soil Survey of Simcoe County. Report No. 29 of the Ontario Soil Survey.

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Ontario Geological Survey (OGS) 2021. OGS Earth Mapping. Obtained from: https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

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Thornthwaite, C.W., and Mather, J.R., 1957. Instructions and tables for computing potential evapotranspiration and the water balance. Climatology, vol. 10.

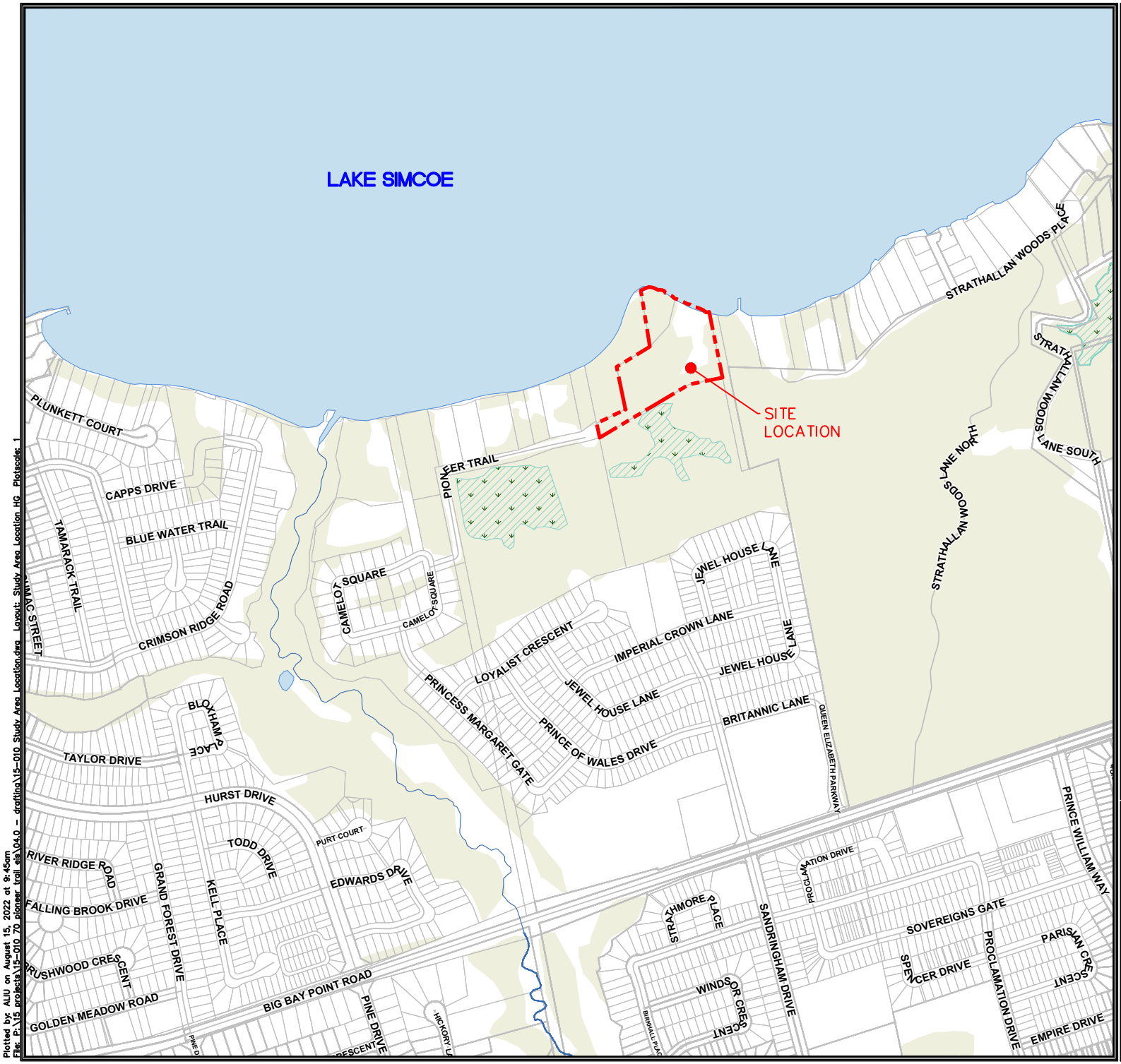
Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC). 2010. Low Impact Development Stormwater Management Planning And Design Guide. Version 1.

APPENDICES

Appendix A: **Figures**
Appendix B: **Site Plan**
Appendix C: **MECP Well Records**
Appendix D: **Borehole Logs**
Appendix E: **Ground Water Elevation Data**
Appendix F: **Water Balance Information**
Appendix G: **Dewatering Details**
Appendix H: **Source Water Protection Mapping**
Appendix I: **Infiltration Testing Data**

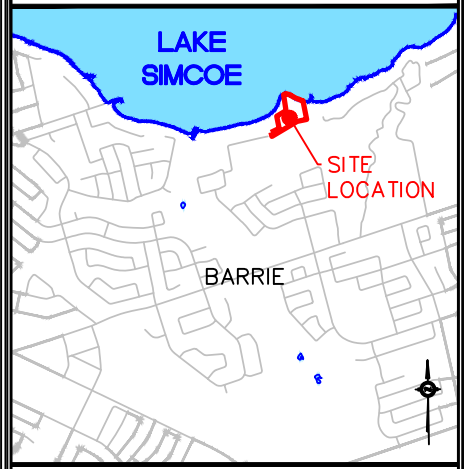
APPENDIX A

Figures



LEGEND:

APPROX. PROPERTY BOUNDARY



REGIONAL MAP

SCALE 1:50000

0 250 500

HORIZONTAL SCALE 1:10000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

ENVIRONMENTAL ASSESSMENTS & APPROVALS

STUDY AREA LOCATION

70 PIONEER TRAIL
BARRIE, ON

DATE ISSUED: *AUGUST 2022*	Figure No.
CREATED BY: *A.L.*	
PROJECT NO.: *15-010*	1
REFERENCE: *SIMCOE COUNTY*	

Plotted by: ALIU on August 15, 2022 at 9:45am
File: P:\15 projects\15-010 70 pioneer trail sla\04.0 - drafting\15-010 Study Area Location.dwg Layout: Study Area Location HG Plotscale: 1

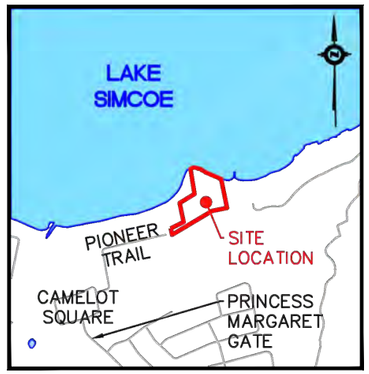
LAKE SIMCOE

PIONEER TRAIL

LEGEND:

APPROX. PROPERTY BOUNDARY

186.00 1m CONTOURS (ONTARIO DEM, 2013)



LOCATION PLAN

0 25.00 50.0

HORIZONTAL SCALE 1:1000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

ENVIRONMENTAL ASSESSMENTS & APPROVALS

SITE LAYOUT & EXISTING CONDITIONS

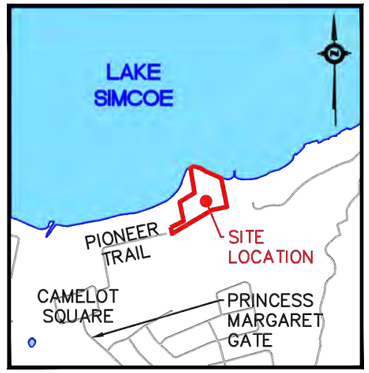
70 PIONEER TRAIL
BARRIE, ON

DATE ISSUED:	*AUGUST 2022*	Figure No.
CREATED BY:	*A.L.*	2
PROJECT NO.:	*15-010*	
REFERENCE:	*SIMCOE COUNTY*	

Plotted by: ALIU on August 15, 2022 at 8:45am
File: P:\15 projects\15-010_70 pioneer trail eis\04.0 - drafting\15-010_Site Layout.dwg Layout: Site Layout Plotscale: 1

LEGEND:

- APPROX. PROPERTY BOUNDARY
- 300m RADIUS STUDY AREA
- WATER WELL LOCATIONS / I.D.



LOCATION PLAN

0 75.00 150.0

HORIZONTAL SCALE 1:3000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

SURROUNDING WELL RECORDS

70 PIONEER TRAIL
BARRIE, ON

DATE ISSUED:	*AUGUST 2022*	Figure No. 3
CREATED BY:	*A.L.*	
PROJECT NO.:	*15-010*	
REFERENCE:	*SIMCOE COUNTY*	

Plotted by: ALU on August 15, 2022 at 8:50am
File: P:\15 projects\15-010_70 pioneer trail eis\04.0 - drafting\15-010_Well Locations.dwg Layout: Site Layout Plotscale: 1

LAKE SIMCOE

PIONEER TRAIL

GROUND WATER INFILTRATION LID

4m WIDE ACCESS ROAD

BH208 226.57

BH209 226.50

BH107 223.30

BH201 221.50

BH202 219.30

BH207 227.09

BH203 226.68

BH205 227.29

BH204 227.08

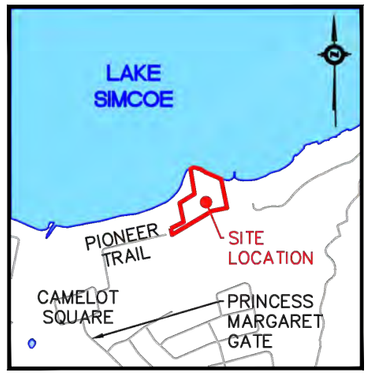
BH206 228.81

BH106 228.88

220.00 220.50 221.00 221.50 222.00 222.50 223.00 223.50 224.00 224.50 225.00 225.50 226.00 226.50 227.00 227.50 228.00 228.50

LEGEND:

- APPROX. PROPERTY BOUNDARY
- APPROX. BOREHOLE /MONITORING WELL LOCATION
- 186.00 — GROUND WATER CONTOURS (masl; BASED ON DATA PROVIDED BY TERRAPROBE, APRIL 2016)
- INFERRED DIRECTION OF GROUND WATER FLOW



LOCATION PLAN

0 25.00 50.0

HORIZONTAL SCALE 1:1000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

GROUND WATER INFORMATION

70 PIONEER TRAIL BARRIE, ON

DATE ISSUED:	*AUGUST 2022*	Figure No.
CREATED BY:	*A.L.*	4
PROJECT NO.:	*15-010*	
REFERENCE:	*SIMCOE COUNTY*	

Plotted by: ALU on August 15, 2022 at 10:37am
File: P:\15 projects\15-010_70 pioneer trail sp\04.0 - drafting\15-010_Site Layout.dwg Layout: Groundwater Information Plotscale: 1

APPENDIX B

Site Plan

LEGEND

- STM 01 — PROP. STM MH
- STM DCBMH — PROP. STM DCBMH
- CB — PROP. STM CATCHBASIN
- DCB — PROP. STM DOUBLE CATCHBASIN
- PROP. STORM SEWER PIPE AND FLOW DIRECTION
- LIMIT OF DEVELOPMENT
- TREE PRESERVATION LIMIT
- 5m BUFFER
- LIMIT OF EASEMENT
- 260.00 — EX. CONTOUR
- DIRECTION OF OVERLAND FLOW
- DIRECTION OF EXISTING EXTERNAL OVERLAND FLOW
- 101 / 0.13 / 0.60 — CATCHMENT AREA ID NUMBER, RUN-OFF COEFFICIENT, AREA (ha.)
- CATCHMENT BOUNDARY
- CATCHMENT AREA ID NUMBER
- 301 / 33 / 5.56 — CURVE NUMBER OR % IMPERVIOUS, AREA (ha.)
- CATCHMENT BOUNDARY
- BOREHOLE ID AND ELEV.

KEMPENFELT BAY

ENVIRONMENTAL PROTECTION
PREVIOUSLY DEDICATED TO CITY OF BARRIE
(Block 116 on 51M986)

END PROPERTY BOUNDARY C.L. FENCE AT TOP OF BANK LIMIT. LIMIT TO BE STAKED IN THE FIELD.

205 — 0.42 / 0.08 — OPEN SPACE

204 — 0.21 / 0.19 — OPEN SPACE

203 — 0.13 / 0.20

201B — 0.11 / 0.76

206 — 0.50 / 0.57

208 — 0.03 / 0.10

207 — 0.09 / 0.10

201A — 0.11 / 0.87

201C — 0.14 / 0.76

201D — 0.52 / 0.73

202 — 0.63 / 0.47

303 / 25 / 0.33

301 / 29 / 6.32

302 / 27 / 1.68

STREET 'A'

EXISTING MUNICIPAL CUL-DE-SAC

EX. PIONEER TRAIL

HSE. #56 · HSE. #60 · HSE. #68

EXISTING RESIDENTIAL LOT 9 · EXISTING RESIDENTIAL LOT 10

LOT 8 · 70 - 1

END CHAIN LINK FENCE AT TOP OF BANK LIMIT TO BE STAKED OUT ONSITE.

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 200mm ON CITY PROPERTY.

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

END CHAINLINK FENCE (TRANSITION)

SLOPE STABILITY PLUS 15m EROSION SETBACK AT TOE

PROP. TREE PRESERVATION FENCE

LIMIT OF GRADING

PROPERTY LINE

PROPOSED OVERLAND FLOW

PROPOSED BERM WITH REMEDIATION PLANTING. REFER TO L.S.A. DESIGN

EXISTING INTERMITTENT WATER COURSE

300mm DEEP, 100-150mm Dia. RIVER RUN STONE EROSION MATTRESS (TYP.) OVER FILTER CLOTH.

HEADWALLS AS PER OPSD 804.030

HANDRAIL AS PER OPSD 980.101 (TYP.)

START C.L. FENCE

PROP. WOOD BOLLARDS SPACED 1.0m O.C.

EX POWER POLE TO BE REMOVED

EX HP & BPED TO BE REMOVED

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

3-TWN 15.8m- 375mmø CONC. PIPE @ 0.50%
S INV 228.93
N INV 228.85
HEADWALL AS PER OPSD 804.030

STM 01 (1200mmø)

STM 02 (1200mmø)

STM 03 (1200mmø)

STM 04 (1500mmø)

25.8m-375mmø PVC STM @ 0.50%

42.7m-300mmø PVC STM @ 0.50%

61.7m-375mmø PVC STM @ 0.50%

24.7m-375mmø PVC STM @ 3.35%

UNDERGROUND INFILTRATION GALLERY (ADS STORMTECH DC-780)

2.5m-375mmø PVC STM @ 2.00% CONTROL-MH1 (1200mmø)

4.6m-375mmø PVC STM @ 3.50%

17.3m-375mmø PVC STM @ 4.00%

3.9m-375mmø PVC STM @ 2.00% CONTROL-MH2 (1200mmø)

UFF-9

1.5m SIDEWALK

DROPPED CURB

30m BUFFER

40 MILE/HOUR ROAD

7m-WIDE ACCESS ROAD

OVERLAND FLOW ROUTE 0.5m FLAT BOTTOM, 3:1 SIDE SLOPES & 0.3m MIN. DEPTH SWALE. 200mm TOPSOIL AND SEED WITH SIMCOE COUNTY NATIVE SEED MIXTURE
22.1m-375mmø PVC STM @ 2.00%

TERRAFIX FM200 - TURF REINFORCEMENT MATTING VEGETATED WITH SIMCOE COUNTY NATIVE SEED MIXTURE
1.0m WIDE BERM MIN. 0.3 ABOVE SWALE

150mmø SUBDRAIN TO DAYLIGHT INTO SWALE WITH 2.5m CSP c/w RODENT GRATE

OVERLAND FLOW ROUTE 0.5m FLAT BOTTOM, 3:1 SIDE SLOPES & 0.3m MIN. DEPTH SWALE

EX WELL TO BE DECOMMISSIONED

ACTIVE WELL

EXISTING ROCK REVETMENT

PROP. TREE PRESERVATION FENCE

CHAINLINK FENCE AS PER BSD-1210 INSTALLED ON PROPERTY LINE ENDS.

MATCH EXISTING DRAINAGE COURSE

PRIVATE PROPERTY

PROP. 200mm TOPSOIL AND SEED WITH SIMCOE COUNTY NATIVE SEED MIXTURE

CHAINLINK FENCE AS PER BSD-1210 INSTALLED ON PROPERTY LINE

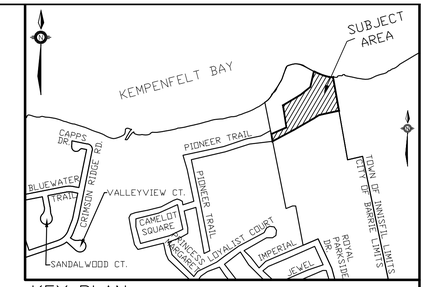
MATCHING EXISTING GROUND

PROP. SWALE c/w FRENCH DRAIN 0.3m MIN. DEPTH WITH 3:1 SIDE SLOPE REFER TO DWG. DET-10

EX. BARN TO BE REMOVED

ENVIRONMENTAL PROTECTION
PREVIOUSLY DEDICATED TO CITY OF BARRIE
(Block 115 on 51M986)

KEY PLAN
NTS



BENCHMARK:
ELEVATION 243.842 CULVERT HEADWALL TO DETENTION POND APRX. 0.6 km SOUTH OF BIG BAY POINT ROAD AND 60 m SOUTHWEST OF CENTRE LINE OF ROAD OF SANDRINGHAM DRIVE. THE VERTICAL CONTROL MONUMENT IS SET FLUSH IN THE SOUTH FACE AT THE SOUTHEAST CORNER OF THE HEAD WALL. THE TABLET IS 240 mm BELOW THE TOP OF THE HEAD WALL AND 100 mm WEST OF THE EASTSIDE OF HEAD WALL.
MONUMENT # 03120030028

ELEVATION 264.989 BRIDGE OVER ALLANDALE COMMUNITY DEVELOPMENT CORPORATION - NEWMARKET SUBDIVISION RAILWAY ON BIG BAY POINT ROAD 0.7 km EAST OF YOUNGE STREET. THE VERTICAL CONTROL MONUMENT OS SET FLUSH IN THE NORTH FACE OF THE CONCRETE ABUTMENT, AT THE SOUTHWEST CORNER OF THE BRIDGE. THE TABLET IS LOCATED 1 m WEST OF THE EAST END OF THE BRIDGE AND 46 cm BELOW THE TOP OF THE BRIDGE. MONUMENT # 03120030004

NO.	REVISIONS	DATE	INITIAL
2.	SECOND SUBMISSION	AUG 2022	JWI
1.	FIRST SUBMISSION	FEB 2022	JWI

FERNBROOK LTD. - PARKSIDE
WATERFRONT CONDOMINIUM
70 PIONEER TRAIL

STORM DRAINAGE PLAN

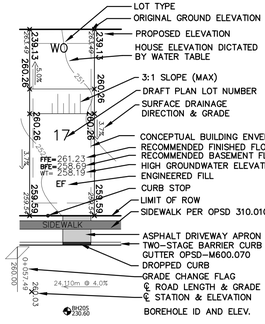
JONES CONSULTING GROUP LTD.
PLANNERS & ENGINEERS
229 Mapleview Dr. E, Unit 1
Barrie, ON L4N 0W5
P. 705.734.2538
F. 705.734.1056

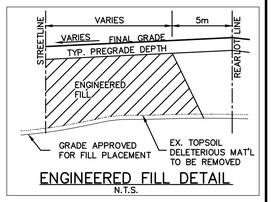
DESIGN	VBS	SCALE: 1:500	DATE APRIL 2021
DRAWN	VBS	PROJECT FER-15101	DWG. Nº STM-1
CHECKED	JWI		

G:\Eng_3D\FER-15101-01\Production DWGS\FER-15101_STORM-DRAINAGE.dwg Layout:STM-1 Plotted Aug 09, 2022 @ 4:42pm by mpotinet The Jones Consulting Group Ltd.

LEGEND

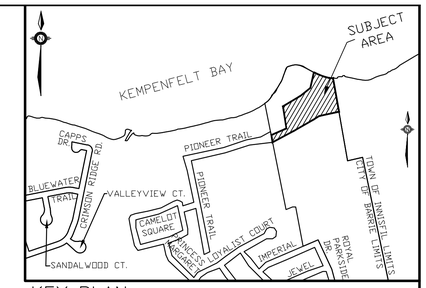
- EX. SAN0,5052 — EX. SANITARY MAINTENANCE HOLE
- V — EX. VALVE & BOX
- H&V — EX. HYDRANT & VALVE
- CS — EX. CURB STOP
- EX. BELL PEDESTAL
- EX. HYDRO POLE
- SL — EX./PROP. STREETLIGHT
- PROP. STREETLIGHT CONTROL
- FLUSHING STATION — PROP. SAN MH FLUSHING STATION
- PROP. 32mmø SANITARY BALL/CHECK VALVE
- STM 01 — PROP. STM MH
- STM DCBMH — PROP. STM DCBMH
- CB — PROP. STM CATCHBASIN
- DCB — PROP. STM DOUBLE CATCHBASIN
- VB — PROP. VALVE & BOX
- H&V — PROP. HYDRANT & VALVE
- CS — PROP. CURB STOP
- LIMIT OF DEVELOPMENT
- TREE PRESERVATION LIMIT
- 5m BUFFER
- LIMIT OF EASEMENT
- 260.00 — EX. CONTOUR
- MAJOR OVERLAND FLOW ROUTE
- SD — SPLIT DRAINAGE LOT
- WO — WALK OUT LOT
- LO — LOOK OUT LOT
- FD — FRONT DRAINING LOT
- TR — TRANSITION LOT
- R=3 — NUMBER OF RISERS





ENGINEERED FILL DETAIL
N.T.S.

FINISHED FLOOR ELEVATION DICTATED BY WATER TABLE AND APPROXIMATED BUILDING ENVELOPE. GROUND WATER AND FINIHSED FLOOR ELEVATION TO BE CONFIRMED PRIOR TO ISSUANCE OF BUILDING PERMIT



KEY PLAN
NTS

KEMPENFELT BAY

ENVIRONMENTAL PROTECTION
PREVIOUSLY DEDICATED TO CITY OF BARRIE
(Block 116 on 51M986)

OPEN SPACE

OPEN SPACE

END PROPERTY BOUNDARY C.L. FENCE AT TOP OF BANK LIMIT. LIMIT TO BE STAKED IN THE FIELD.

END CHAIN LINK FENCE AT TOP OF BANK LIMIT TO BE STAKED OUT ONSITE.

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 200mm ON CITY PROPERTY.

SLOPE STABILITY PLUS 15m EROSION SETBACK AT TOE

PROP. TREE PRESERVATION FENCE

END CHAINLINK FENCE (TRANSITION)

LIMIT OF GRADING

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

PROPERTY LINE

PROPOSED OVERLAND FLOW

PROPOSED BERM WITH REMEDIATION PLANTING. REFER TO L.S.A. DESIGN

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

PROP. TREE PRESERVATION FENCE

DIRECTION OF OVERLAND FLOW

300mm DEEP, 100-150mm Dia. RIVER RUN STONE EROSION MATTRESS (TYP.) OVER FILTER CLOTH.

HEADWALLS AS PER OPSD-804.030

HANDRAIL AS PER OPSD 980.101 (TYP.)

STORM DRAINAGE EASEMENT IN FAVOUR OF THE CITY OF BARRIE

START C.L. FENCE - PROP. WOOD BOLLARDS SPACED 1.0m O.C.

EX. POWER POLE TO BE REMOVED

EX HP & BPED TO BE REMOVED

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

EX. PIONEER TRAIL

EXISTING MUNICIPAL CUL-DE-SAC

EXISTING HYDRANT H.3038 TO BE RELOCATED

3-TWIN 15.8m- 375mmø CONC. PIPE @ 0.50% S INV 228.93 N INV 228.85 HEADWALL AS PER OPSD 804.030

CHAINLINK FENCE AS PER BSD-1210 INSTALLED 150mm ON CITY PROPERTY.

PROP. TREE PRESERVATION FENCE

PROP. FLUSHING MH STATION #2

PROP. FLUSHING MH STATION #1

3.0m SERVICING EASEMENT

CONTROL-MH1

CONTROL-MH2

4m WIDE ACCESS ROAD

EXISTING ROCK REVETMENT

30m BUFFER

CHAINLINK FENCE AS PER BSD-1210 INSTALLED ON PROPERTY LINE ENDS.

MATCH EXISTING DRAINAGE COURSE

TERRAFIX FM200 -TURF REINFORCEMENT MATTING VEGETATED WITH SIMCOE COUNTY NATIVE SEED MIXTURE

OVERLAND FLOW ROUTE 0.5m FLAT BOTTOM, 3:1 SIDE SLOPES & 0.3m MIN. DEPTH SWALE. 200mm TOPSOIL AND SEED WITH SIMCOE COUNTY NATIVE SEED MIXTURE

1.0m WIDE BERM MIN. 0.3 ABOVE SWALE

STORM DRAINAGE EASEMENT IN FAVOUR OF THE CITY OF BARRIE

150mmø SUBDRAIN TO DAYLIGHT INTO SWALE WITH 2.5m CSP c/w RODENT GRATE

OVERLAND FLOW ROUTE 0.5m FLAT BOTTOM, 3:1 SIDE SLOPES & 0.3m MIN. DEPTH SWALE

PROP. TREE PRESERVATION FENCE

PROP. 200mm TOPSOIL AND SEED WITH SIMCOE COUNTY NATIVE SEED MIXTURE

PROP. TREE PRESERVATION FENCE

CHAINLINK FENCE AS PER BSD-1210 INSTALLED ON PROPERTY LINE

STORM DRAINAGE EASEMENT IN FAVOUR OF THE CITY OF BARRIE

PROP. TREE PRESERVATION FENCE

PROP. SWALE c/w FRENCH DRAIN 0.3m MIN. DEPTH WITH 3:1 SIDE SLOPE REFER TO DWG. DET-10

MATCHING EXISTING GROUND

EASEMENT LIMIT

EX. BARN TO BE REMOVED

PROP. TREE PRESERVATION FENCE

ENVIRONMENTAL PROTECTION
PREVIOUSLY DEDICATED TO CITY OF BARRIE
(Block 115 on 51M986)

EXISTING RESIDENTIAL LOT 9

EXISTING RESIDENTIAL LOT 10

LOT 8 710 - 1

HSE. #68

HSE. #56

HSE. #60

STREET 'A'

CONCEPTUAL: NOT FOR CONSTRUCTION

BENCHMARK:
ELEVATION 243.642 CULVERT HEADWALL TO DETENTION POND APRX. 0.6 km SOUTH OF BIG BAY POINT ROAD AND 60 m SOUTHWEST OF CENTRE LINE OF ROAD OF SANDRINGHAM DRIVE. THE VERTICAL CONTROL MONUMENT IS SET FLUSH IN THE SOUTH FACE AT THE SOUTHEAST CORNER OF THE HEAD WALL. THE TABLET IS 240 mm BELOW THE TOP OF THE HEAD WALL AND 100 mm WEST OF THE EASTSIDE OF HEAD WALL.
MONUMENT # 03120030028

ELEVATION 264.989 BRIDGE OVER ALLANDALE COMMUNITY DEVELOPMENT CORPORATION - NEWMARKET SUBDIVISION RAILWAY ON BIG BAY POINT ROAD 0.7 km EAST OF YOUNGE STREET. THE VERTICAL CONTROL MONUMENT OS SET FLUSH IN THE NORTH FACE OF THE CONCRETE ABUTMENT, AT THE SOUTHWEST CORNER OF THE BRIDGE. THE TABLET IS LOCATED 1 m WEST OF THE EAST END OF THE BRIDGE AND 46 cm BELOW THE TOP OF THE BRIDGE. MONUMENT # 03120030004

NO.	REVISIONS	DATE	INITIAL
1.	FIRST SUBMISSION	FEB 2022	JWI

FERNBROOK LTD. – PARKSIDE
WATERFRONT CONDOMINIUM
70 PIONEER TRAIL

GRADING PLAN

JONES CONSULTING GROUP LTD.
PLANNERS & ENGINEERS
229 Mapleview Dr. E, Unit 1
Barrie, ON L4N 0W5
P. 705.734.2538
F. 705.734.1056

DESIGN	VBS	SCALE: 1:500	DATE APRIL 2021
DRAWN	VBS	PROJECT FER-15101	DWG. Nº GP-1
CHECKED	JWI		

C:\Eng_3D\FER-15101-01\Production DWGS\FER-15101_GRADING-PLAN.dwg Layout:GP-1 Plotted: Aug 11, 2022 @ 2:41pm by Ihrmann The Jones Consulting Group Ltd

APPENDIX C

MECP Well Records

B

UTM | 1 | Z | 609268 | E
| | R | 4944712 | N
Elev. | S | R | 07206

57 . Nº 1624

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin | 2 | 2 | 1 | 5 | SIMCOE
County or District

Township, ~~Village, Town or City~~ INNISFIL

Con. XIII 13 Lot 16

Date completed 25 (day) NOV (month) 1967 (year)

[redacted] dress 29 HIGHVIEW TORONTO ONT

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 87 FT

Type of screen JOHNSON S.S. SLOT 6

Length of screen 3 FT

Depth to top of screen 87

Diameter of finished hole 5"

Pumping Test

Static level 1 FT

Test-pumping rate 5 G.P.M.

Pumping level 80 FT

Duration of test pumping 2 HRS

Water clear or cloudy at end of test CLEAR

Recommended pumping rate 5 G.P.M.

with pump setting of 85 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
TOPSOIL	0	1		
SAND YELLOW	1	19		
CLAY & SAND GREY	19	29		
CLAY "	29	70	70 - 90	FRESH ON TESTED
YELLOW SAND	70	90		
CLAY GREY	90	—		

For what purpose(s) is the water to be used? HOUSE

Is well on upland, in valley, or on hillside? HILLSIDE

Drilling or Boring Firm KNELSEN WATER WELLS

R.R. # 1

Address BARRIE ONT

Licence Number 2500

Name of Driller or Borer ANDREAS KNELSEN

Address SAME

Date Nov 25 1967

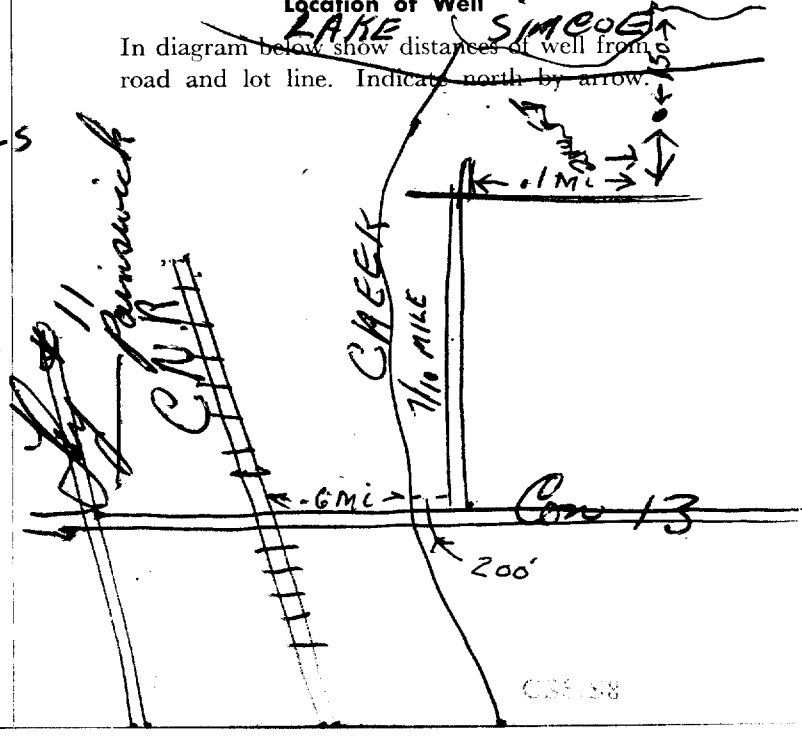
Andy Knelsen
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



UTM 17 z 609872 E

Con R 131587 N

Elev R 0825

Basin 1V

The Ontario Water Resources Commission Act

WATER WELL RECORD

57 № 1626

B

County or District Simcoe

Township, Village, Town or City Innisfil Twsp.

Con. X111 Lot 17 H3

Date completed 28 (day) Feb. (month) 1966 (year)

[redacted]dress Caretaker's Cottage R.R.4 BARRIE

Casing and Screen Record

Inside diameter of casing 6"

Total length of casing 114'

Type of screen Cook Red Bra ss

Length of screen 5'

Depth to top of screen 113'

Diameter of finished hole 6"

Pumping Test

Static level 50'

Test-pumping rate 8 G.P.M.

Pumping level 95'

Duration of test pumping 2 Hrs.

Water clear or cloudy at end of test Clear

Recommended pumping rate 6 G.P.M.

with pump setting of 95' feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Sand	0	47	110'	Fresh
Gravel & small boulders	47	68		
Aternate layers of sand & clay	68	110		
Medium sand	110	118		

For what purpose(s) is the water to be used? Domestic (JEWISH CAMP) CARETAKER'S COTTAGE

Is well on upland, in valley, or on hillside? Upland

Drilling or Boring Firm Coup land Drilling

Address Barrie R.R.#2

Licence Number 2123

Name of Driller or Borer Merlin Coup land

Address Barrie RR #2

Date March 4/66

Merlin Coupland

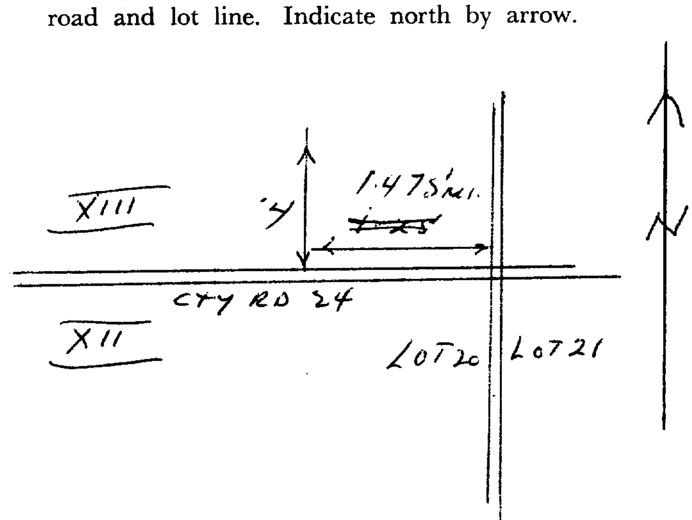
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

UTM 17 Z 609852 E

JP

5 R 4913621 N

Elev. 5 R 10800

Basin 2 1

B

WATER RESOURCES DIVISION 57 № 1627

JUL 4 1966

ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Simcoe Township, Village, Town or ~~City~~ Innisfil

Con. X111 Lot 17 ~~16~~ Date completed 28 (day) Feb. (month) 1966 (year)

[redacted]dress Caretaker's Cottage

Casing and Screen Record		Pumping Test	
Inside diameter of casing	6"	Static level	50'
Total length of casing	114'	Test-pumping rate	8 G.P.M.
Type of screen	Cook Red Stra iner	Pumping level	95'
Length of screen	5'	Duration of test pumping	2 hrs.
Depth to top of screen	113'	Water clear or cloudy at end of test	Clear
Diameter of finished hole	6"	Recommended pumping rate	6 G.P.M.
		with pump setting of	95' feet below ground surface

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Sand	0	47	110'	Fresh
Gravel & small boulders	47	68		
Alternate layers of sand & clay	68	110		
Medium sand	110	118'		

For what purpose(s) is the water to be used? Domestic

Is well on upland, in valley, or on hillside? Upland

Drilling or Boring Firm Coup land Drilling

Address Barrie R.R.#2

Licence Number 2123

Name of Driller or Borer Merlin Coup la nd

Address Barrie RR#2

Date March 4/66

Merlin Coupland

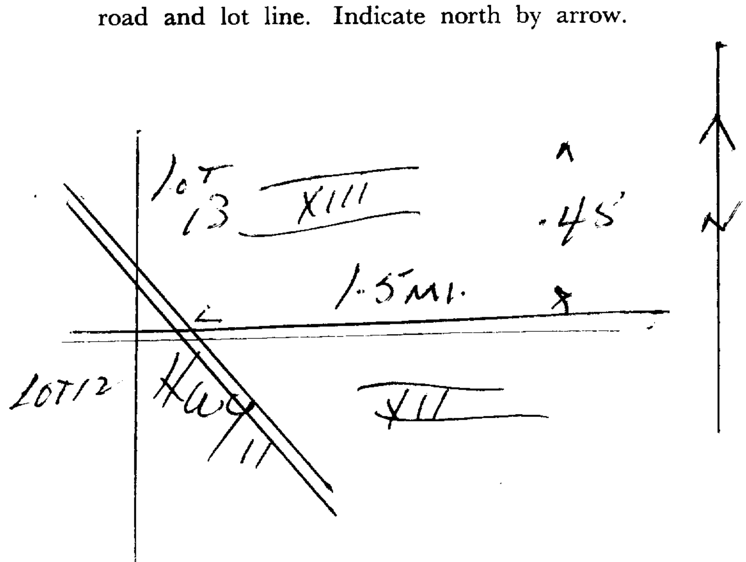
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

17 609230
45 49135010
6 0765
22

Con X III Lot 16
CODED

5705726
3 9

DIVISION OF W. R.
WATER RESOURCES
JAN 6 1969
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Simcoe Township, Village, Town or City Innisfil Twp.

Con. ~~13 or XIV~~ 13 Lot ~~17~~ 16 Date completed 23 (day) Aug. (month) 1968 (year)

[redacted] dress 214 Cedar Triangle, Tottendale

Casing and Screen Record

Inside diameter of casing 4"

Total length of casing ~~150~~ 150'

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 4"

Pumping Test

Static level 2'

Test-pumping rate 10' G.P.M.

Pumping level 12'

Duration of test pumping 2 hrs

Water clear or cloudy at end of test clear

Recommended pumping rate 10' G.P.M.

with pump setting of 15' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Clay, brown	0	110	~~18~~ 8	Fresh
Muddy sand	110	114		
Blue clay	114	136		
Muddy sand	136	144		
Blue clay	144	148'		
Coarse gravel	148	150'		

For what purpose(s) is the water to be used?
Domestic

Is well on upland, in valley, or on hillside? Level land.

Drilling or Boring Firm
Copland Drilling

Address R.R. #2
Barrie

Licence Number 2982

Name of Driller or Borer Merlin Copland

Address R.R. #2 Barrie

Date Dec 19/68

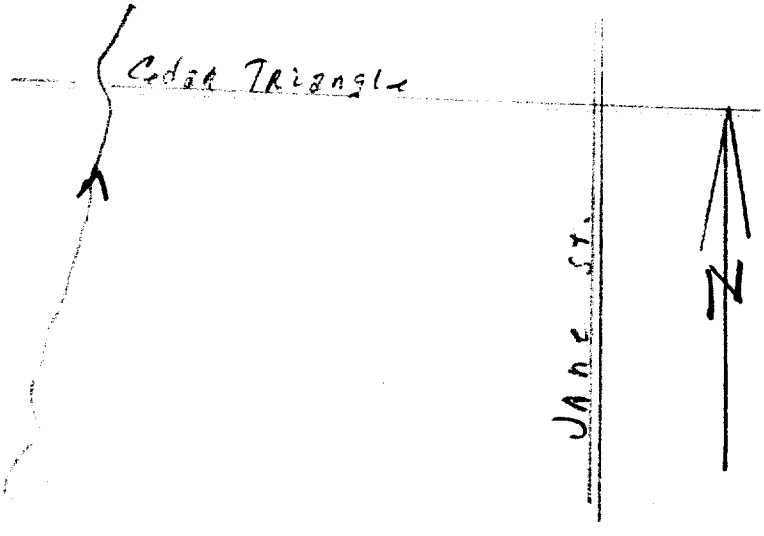
Merlin Copland
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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C.B.

Con XIII Lot 17 CODED

5706083

DIVISION OF WATER RESOURCES
FEB 11 1969
ONTARIO WATER RESOURCES COMMISSION

Water management in Ontario

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District SIMCOE Township, Village, Town or City INNISFIL

Con. 13 Lot 17 Date completed 21 (day) Dec. (month) 1968 (year)

Address Strathallan Woods

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 64 FT

Type of screen JOHNSON S.S. SLOT 6 - SLOT 8

Length of screen 3 FT 8 SLOT (B) 3 FT 6 SLOT (T)

Depth to top of screen 64 FT

Diameter of finished hole 5"

Pumping Test

Static level 30 FT

Test-pumping rate 10 G.P.M.

Pumping level 50 FT

Duration of test pumping 1 HR

Water clear or cloudy at end of test CLEAR

Recommended pumping rate 10 G.P.M.

with pump setting of 60 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
FILL	0	2		
SAND	2	16		
CLAY	16	24		
SILT	24	30		
CLAY	30	42		
SILT	42	50		
CLAY	50	60	60 - 70	FRESH UNTESTED
SAND FINE	60	70		
SAND CLAY	70			

For what purpose(s) is the water to be used? HOUSE

Is well on upland, in valley, or on hillside? HILLSIDE

Drilling or Boring Firm NIELSEN WATER WELLS

Address R.R. #1 BARRIE ONT

Licence Number 2986

Name of Driller or Borer ANDREAS NIELSEN

Address SAME

Date Dec 24 1968

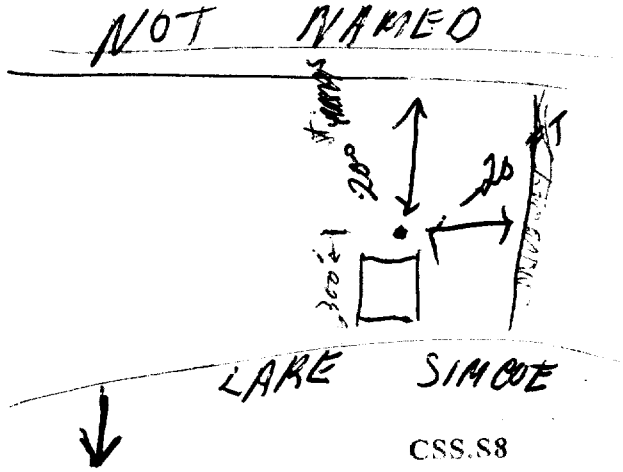
(Signature of Licensed Drilling or Boring Contractor)

Form 7

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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The Ontario Water Resources Commission Act

WATER WELL RECORD

310/8E

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5708962 | MUNICIP. 57005T | CON. GDN | 13

COUNTY OR DISTRICT: SIMCOE
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: INNISFIL
CON., BLOCK, TRACT, SURVEY, ETC.: XIII 13
LOT: 011
[redacted] +4 BARRIE ONT
DATE COMPLETED: DAY 13 MO 06 YR 72
A38170 | RC 4 | ELEVATION 07610 | RC 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	Clay	Sand, Stones		0	9
Grey	"	Stones		9	27
"	"	Sand		27	39
"	"			39	57
"	"	layers Sand		57	62
Brown	Sand		Dead.	62	68
"	"		loose Wet	68	80
Grey	Clay			80	—

31 | 00096 05T 28 12 | 00271 05 12 | 00392 05T 28 | 00512 05T | 00622 05T 28 | 00800 28
32

41 WATER RECORD

WATER FOUND – FEET	KIND OF WATER
64	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0080	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
06	1 ☐ STEEL 2 ☒ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	74
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
006	06.000 INCHES	3 FEET

MATERIAL AND TYPE: Johnson SS
DEPTH TO TOP OF SCREEN: 74 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
		rubber packer

PUMPING TEST

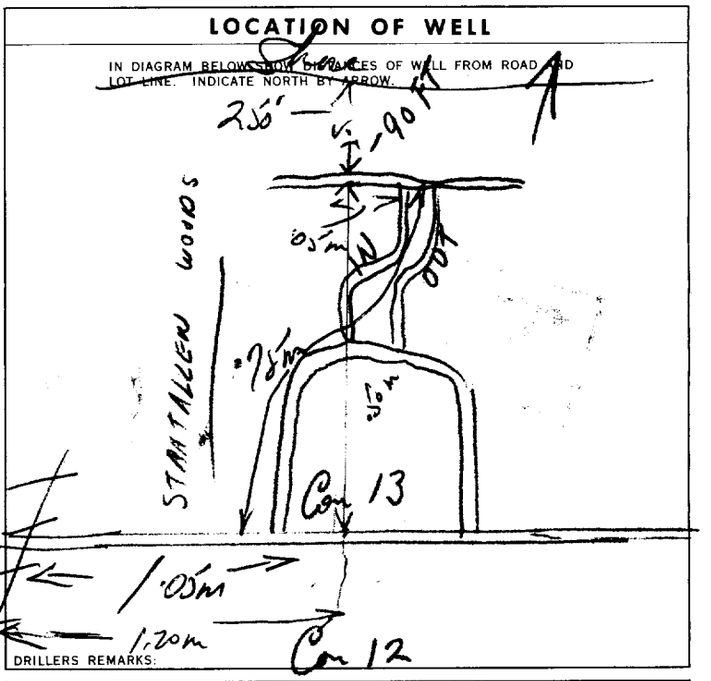
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0016 GPM.
DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
016 FEET	042 FEET	042 FEET	042 FEET	042 FEET	042 FEET

IF FLOWING, GIVE RATE: GPM.
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 060 FEET
RECOMMENDED PUMPING RATE: 0016 GPM.
0006 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

54 | 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE

55-56 | 01 | 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING

57 | 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: NIELSEN WATER WELLS | LICENCE NUMBER: 3203
ADDRESS: RR#1 BARRIE ONT
NAME OF DRILLER OR BORER: GORD KENT | LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Gord Kent | SUBMISSION DATE: DAY MO YR

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 59-62: 3203 | DATE RECEIVED 63-68: 030872
DATE OF INSPECTION | INSPECTOR
REMARKS:
P
WI

OWRC COPY

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31055

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5716044 | MUNICIP 57005 | CON. CON 13

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	INNISFIL	CON 13	017

[redacted] P04 Barrie Ont

DATE COMPLETED: DAY 29 MO 09 YR 78

NORTHING 913800 | RC 5 | ELEVATION 0750 | RC 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	SAND			0	5
GREY	CLAY			5	54
GREY	SAND			54	74

P1028 ... 224

31 | 0005628 | 0054205 | 0074228

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
054	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		0	0065
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
006 2-3' 6 SLOT	05000 INCHES	06 FEET

MATERIAL AND TYPE: S.S — DEPTH TO TOP OF SCREEN: 0065 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
2 FT		HEADER
RUBBER		PACKER
SAW		SEAL

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0010 GPM
DURATION OF PUMPING: 01 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
021 FEET	045 FEET	045 FEET	045 FEET	045 FEET	045 FEET

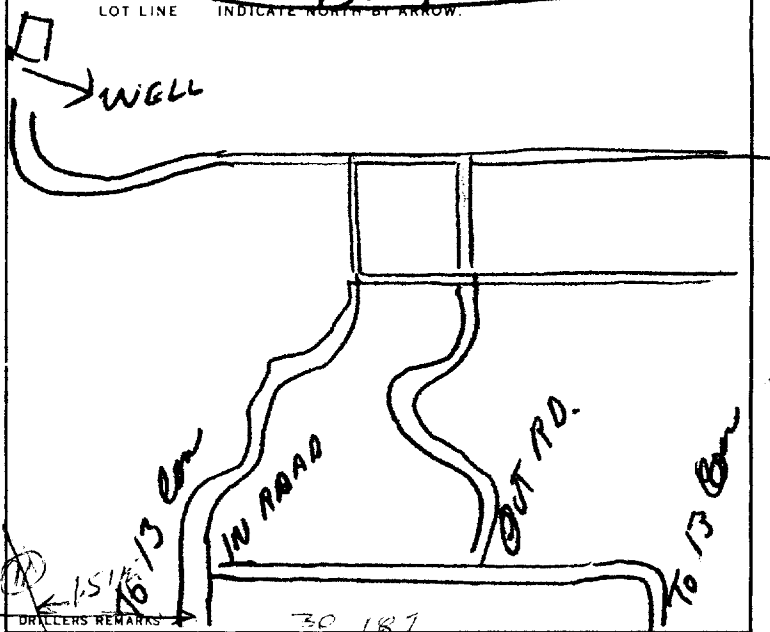
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 060 FEET
RECOMMENDED PUMPING RATE: 0010 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 30 187

FINAL STATUS OF WELL	1
	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE	01
	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING	1
	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: KNELSEN WATER WELL — LICENCE NUMBER: 3203
ADDRESS: RR#1 BARRIE ONT
NAME OF DRILLER OR BORER: WALLY KNELSEN — LICENCE NUMBER: 3213
SIGNATURE OF CONTRACTOR: [signature]
SUBMISSION DATE: DAY 3 MO 10 YR 78

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 3203 | DATE RECEIVED: 250679
DATE OF INSPECTION: | INSPECTOR:
REMARKS:

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31053

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11) 5716766 MUNICIP 57005 CON. CON 13

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
Simcoe	Innisfil	XIII	016

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Barrie P.U.C.		DAY 06 MO 03 YR 80

(21) UTM ZONE 17 EASTING 609700 NORTHING 4913700 RC 5 ELEVATION 0775 RC 5 BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Black	top soil			0	1
Brown	sand	gravel and boulders	loose	1	3
Brown	sand	gravel	loose	3	25
Grey	clay		stiff	25	31
Brown	sand	gravel	loose	31	34
Grey	clay		stiff	34	55
Brown	sand	silt	packed	55	72
Grey	clay	sand	soft	72	97
Grey	sand		packed	97	101
Grey	clay	sand	soft	101	110
Grey	clay		stiff	110	132
Grey	sand	silt	packed	132	177

(31) 0001802 | 0003628111 3 | 0025628111 77 | 0031205 73 | 0034628111 77 | 0055205 73 | 1
(32) 0072628067 9 | 0097205 2885 | 0101228 79 | 0110205 2885 | 0132205 73 | 0177228067 9 | 1

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
189	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
220	
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
08	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		0	0030
02	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		0	0193
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
020	02000 INCHES	20 FEET

MATERIAL AND TYPE: SS-WR
DEPTH TO TOP OF SCREEN: 0193 FEET

(61) PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

(71) PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER
PUMPING RATE: 00 40 GPM
DURATION OF PUMPING: 04 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING		45 MINUTES	
001 1.35 FEET	005 4.65 FEET	004 4.15 FEET	005 4.41 FEET	- FEET	005 4.61 FEET

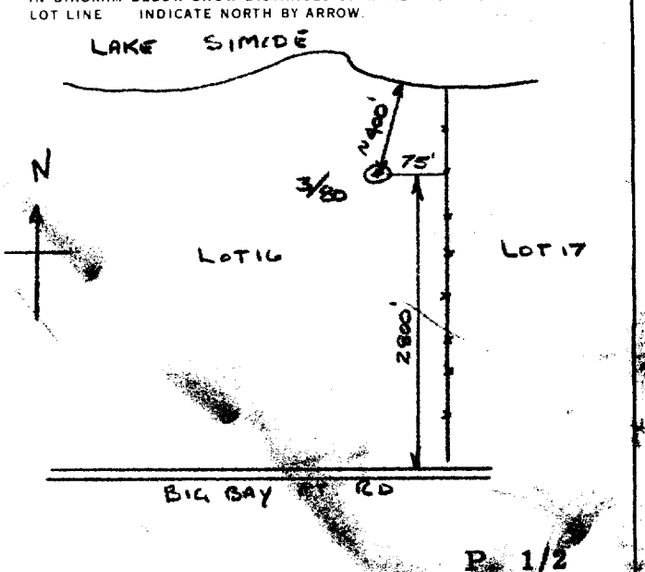
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☐ DEEP	FEET	GPM

LOCATION OF WELL 3/80

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

P. 1/2

FINAL STATUS OF WELL 2	1 ☐ WATER SUPPLY 2 ☒ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 09	1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☒ NOT USED
METHOD OF DRILLING 2	1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: International Water Supply Ltd., — LICENCE NUMBER: 2801
ADDRESS: Box 310, Barrie, Ontario.
NAME OF DRILLER OR BORER: Howard Peterman — LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: H. Hodgins
SUBMISSION DATE: DAY 16 MO 6 YR 80

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2801 | DATE RECEIVED 200680
DATE OF INSPECTION | INSPECTOR
REMARKS: CSS.ES

1/2 MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

31052

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11 | 5716767 | MUNICIP. 57005 | CON. Con | 13

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Innisfil	XIII	016

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Barrie P.U.C.		DAY 19 MO 3 YR 80

21 | UTM ZONE 17 | EASTING 609200 | NORTHING 4913500 | RC 5 | ELEVATION 0775 | RC 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Black	top soil			0	1
Brown	sand	clay and gravel	packed	1	10
Grey	clay		stiff	10	13
Grey	clay	sand, gravel	soft	13	44
Grey	clay		stiff	44	67
Grey	sand	silt, clay	packed	67	105
Grey	clay		stiff	105	138
Grey	sand		packed	138	181
Grey	clay		stiff	181	187
Grey	sand	clay	packed	187	207
Grey	sand	gravel	packed	207	221
Grey	clay	sand	stiff	221	238
Grey	gravel	clay and mud	cemented	238	240

31

32 CODED

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
193-215	1 ☒ FRESH 3 ☐ SULPHUR / 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR / 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR / 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR / 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR / 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
2	☒ 1 STEEL / 2 ☐ GALVANIZED / 3 ☐ CONCRETE / 4 ☐ OPEN HOLE		0	196
8	☒ 1 STEEL / 2 ☐ GALVANIZED / 3 ☐ CONCRETE / 4 ☐ OPEN HOLE		0	12
	☐ 1 STEEL / 2 ☐ GALVANIZED / 3 ☐ CONCRETE / 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
#20	2 INCHES	20 FEET

MATERIAL AND TYPE: SS-WR
DEPTH TO TOP OF SCREEN: 196 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☒ 1 PUMP ☐ 2 BAILER
PUMPING RATE: 40 GPM
DURATION OF PUMPING: 5 HOURS ___ MINS

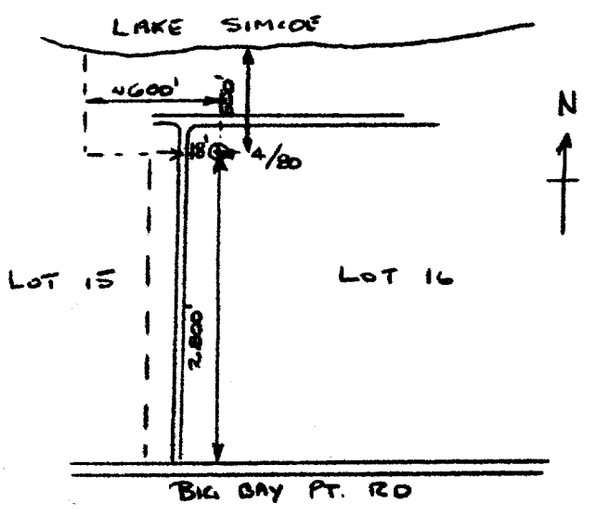
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: ☒ 1 PUMPING ☐ 2 RECOVERY			
MP+4.10 / 1.42 FEET	9.52 FEET	15 MINUTES: 9.86 FEET	30 MINUTES: 9.75 FEET	45 MINUTES: - FEET	60 MINUTES: 9.78 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	☒ 1 CLEAR ☐ 2 CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☐ DEEP	FEET	GPM

LOCATION OF WELL 4/80

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

FINAL STATUS OF WELL

☐ 1 WATER SUPPLY ☐ 5 ABANDONED, INSUFFICIENT SUPPLY
☒ 2 OBSERVATION WELL ☐ 6 ABANDONED, POOR QUALITY
☐ 3 TEST HOLE ☐ 7 UNFINISHED
☐ 4 RECHARGE WELL

WATER USE

☐ 1 DOMESTIC ☐ 5 COMMERCIAL
☐ 2 STOCK ☐ 6 MUNICIPAL
☐ 3 IRRIGATION ☐ 7 PUBLIC SUPPLY
☐ 4 INDUSTRIAL ☐ 8 COOLING OR AIR CONDITIONING
☐ OTHER ☒ 9 NOT USED

METHOD OF DRILLING

☐ 1 CABLE TOOL ☐ 6 BORING
☒ 2 ROTARY (CONVENTIONAL) ☐ 7 DIAMOND
☐ 3 ROTARY (REVERSE) ☐ 8 JETTING
☐ 4 ROTARY (AIR) ☐ 9 DRIVING
☐ 5 AIR PERCUSSION

CONTRACTOR

NAME OF WELL CONTRACTOR: International Water Supply, Ltd.
LICENCE NUMBER: 2801
ADDRESS: Box 310, Barrie, Ontario. L4M 4T5
NAME OF DRILLER OR BORER: Howard Peterman
LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: H. Hodgins
SUBMISSION DATE: DAY 16 MO 6 80

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED 20680
DATE OF INSPECTION | INSPECTOR
REMARKS

CSS.ES

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Ministry of the Environment

Ontario

The Ontario Water Resources Act 3105E.

WATER WELL RECORD

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11 5717366 MUNICIP. 57005 CON. CON 13

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
[redacted]	INNISFIL	13	016

[redacted] R #4 BARRIE ONT

DATE COMPLETED: DAY 03 MO 11 YR 80

[redacted] 913700 | RC. 5 | ELEVATION 0750 | RC 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
	/		DUGWELL	0	26
GREY	CLAY			26	32
"	SAND	CLAY		32	51
"	CLAY			51	60
"	SAND		WET	60	65
"	CLAY			65	67+

31 | 0026 23 | 0032205 | 0051122805 | 0060205 | 0065228 | 0067205

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0065	1 ☑ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
05	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0061
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
006	05000 INCHES	04 FEET

MATERIAL AND TYPE: STAINLESS STEEL — DEPTH TO TOP OF SCREEN: 0061 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
		RUBBER PACKER
		2 FT HEADER

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER — PUMPING RATE 0010 GPM — DURATION OF PUMPING 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
001 FEET	038 FEET	038 FEET	038 FEET	038 FEET	038 FEET

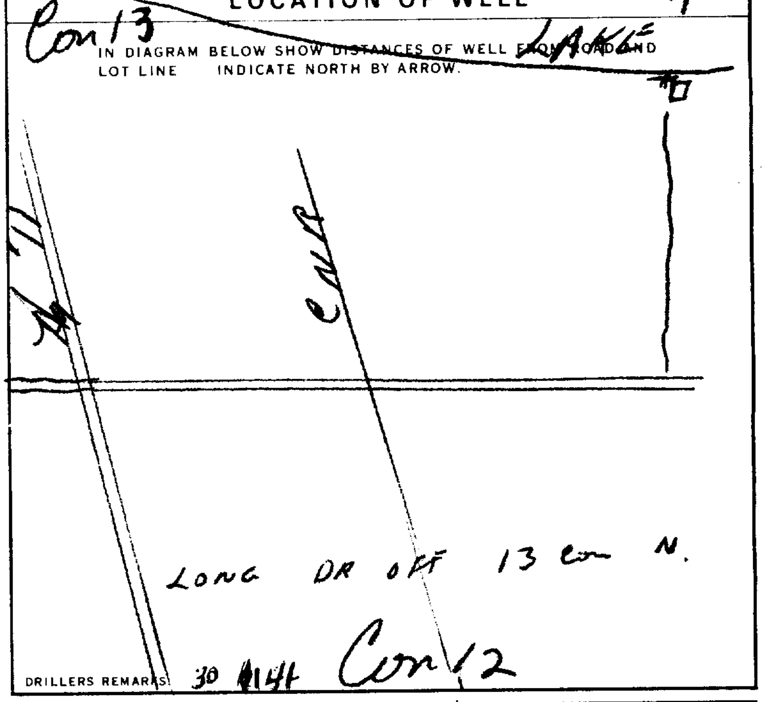
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☑ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP — RECOMMENDED PUMP SETTING 050 FEET — RECOMMENDED PUMPING RATE 0010 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



FINAL STATUS OF WELL 1

1 ☑ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 0

1 ☑ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 1

1 ☑ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

DRILLERS REMARKS: 30 1141

CONTRACTOR

NAME OF WELL CONTRACTOR: ANELSEN WATER WELLS — LICENCE NUMBER 3203

ADDRESS: RR 1 BARRIE

NAME OF DRILLER OR BORER: ANDY ANELSEN — LICENCE NUMBER

SIGNATURE OF CONTRACTOR: [signature] — SUBMISSION DATE DAY 3 MO 11 YR 80

OFFICE USE ONLY

DATA SOURCE 1 — CONTRACTOR 3203 — DATE RECEIVED 210481

DATE OF INSPECTION — INSPECTOR

REMARKS: CSS.ES

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FORM NO. 0506-4-77

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Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

5719214

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11

MUNICIP. 57005 CON. CON 13

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Simcoe	Innisfil	~~13~~ XIII	017 / 17

[redacted] R #4 BARRIE

DATE COMPLETED: DAY 14 MO 05 YR 83

[redacted] 13700 | 5 | ELEVATION 0750 | 5 | BASIN CODE 22

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
BLACK		TOPSOIL		0	2
BROWN	SAND	CLAY		2	16
GREY	CLAY		ROCKS	16	56
"	SAND			56	78
"	CLAY			78	—

FEB 18 1987

054 018 ? plan 1028 sub 17/18 20

040 1028 sub 1-2

043 lot 17-18

31 0002802 | 0016628051 | 005620512 | 0078228 | 0078205

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0056 ~~0074~~	☒ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL
	☐ FRESH ☐ SULPHUR ☐ SALTY ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
05	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	0	0072
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
006 ~~6 + 4~~	05000 INCHES	06 FEET

MATERIAL AND TYPE: STAINLESS STEEL — DEPTH TO TOP OF SCREEN: 0072 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
2 FT HEADER		
RUBBER PACKER		
SAN SEAL		

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER — PUMPING RATE 0015 GPM — DURATION OF PUMPING: HOURS, MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
006 FEET	059 FEET	~~067~~ FEET	059 FEET	059 FEET	059 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP — RECOMMENDED PUMP SETTING 070 FEET — RECOMMENDED PUMPING RATE 0015 GPM

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

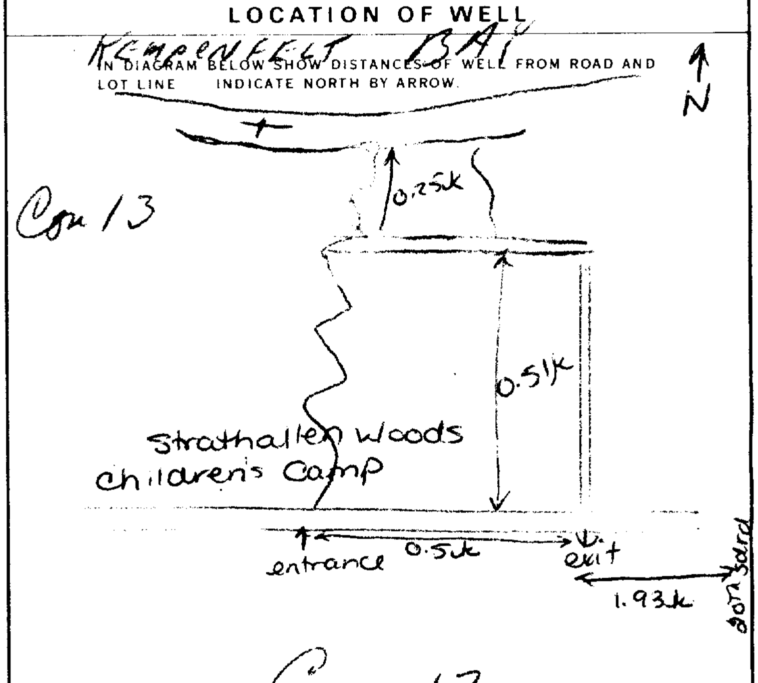
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 1

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: KNELSEN WATER WELLS — LICENCE NUMBER: 3203

ADDRESS: RR #1 BARRIE

NAME OF DRILLER OR BORER: Andy KNELSEN — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: [signature] — SUBMISSION DATE: DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE 1 — CONTRACTOR 3203 — DATE RECEIVED 030784

DATE OF INSPECTION — INSPECTOR

REMARKS: located only 11/85 PK

CSS.ES

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APPENDIX D

Borehole Logs

Terraprobe

ABBREVIATIONS, TERMINOLOGY, GENERAL INFORMATION

BOREHOLE LOGS

SAMPLING METHOD

SS	split spoon
ST	Shelby tube
AS	auger sample
WS	wash sample
RC	rock core
WH	weight of hammer
PH	pressure, hydraulic

PENETRATION RESISTANCE

Standard Penetration Test (SPT) resistance ('N' values) is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a standard 50 mm (2 in.) diameter split spoon sampler for a distance of 0.3 m (12 in.).

Dynamic Cone Test (DCT) resistance is defined as the number of blows by a hammer weighing 63.6 kg (140 lb.) falling freely for a distance of 0.76 m (30 in.) required to advance a conical steel point of 50 mm (2 in.) diameter and with 60° sides on 'A' size drill rods for a distance of 0.3 m (12 in.).

SOIL DESCRIPTION - COHESIONLESS SOILS

Relative Density	'N' value
very loose	< 4
loose	4 - 10
compact	10 - 30
dense	30 - 50
very dense	> 50

SOIL DESCRIPTION - COHESIVE SOILS

Consistency	Undrained Shear Strength, kPa	'N' value
very soft	< 12	< 2
soft	12 - 25	2 - 4
firm	25 - 50	4 - 8
stiff	50 - 100	8 - 16
very stiff	100 - 200	16 - 32
hard	> 200	> 32

SOIL COMPOSITION

	% by weight
'trace' (e.g. trace silt)	< 10
'some' (e.g. some gravel)	10 - 20
adjective (e.g. sandy)	20 - 35
'and' (e.g. sand and gravel)	35 - 50

TESTS, SYMBOLS

MH	mechanical sieve and hydrometer analysis
w, w_c	water content
w_l	liquid limit
w_p	plastic limit
I_p	plasticity index
k	coefficient of permeability
γ	soil unit weight, bulk
ϕ'	angle of internal friction
c'	cohesion shear strength
C_c	compression index

GENERAL INFORMATION, LIMITATIONS

The conclusions and recommendations provided in this report are based on the factual information obtained from the boreholes and/or test pits. Subsurface conditions between the test holes may vary.

The engineering interpretation and report recommendations are given only for the specific project detailed within, and only for the original client. Any third party decision, reliance, or use of this report is the sole and exclusive responsibility of such third party. The number and siting of boreholes and/or test pits may not be sufficient to determine all factors required for different purposes.

It is recommended Terraprobe be retained to review the project final design and to provide construction inspection and testing.

Terraprobe

LOG OF BOREHOLE ..201..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 24, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
GROUND SURFACE		226.5			
175mm – TOPSOIL 500mm – SILTY SAND FILL, trace organics Brown Compact Moist		0.0	1	SS	24
			2	SS	14
SAND, trace to some silt, trace gravel			3	SS	22
			4	SS	15
		223.5			
Grey Hard Moist		3.0	5	SS	33
SILT & CLAY, to clayey, trace sand			6	SS	36
			7	SS	37
		219.9			
End of Borehole		6.6			

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION

1. Borehole remained open and dry upon completion of drilling.

2. Water level on March 10, 2015 measured dry to 6.5m.

Terraprobe

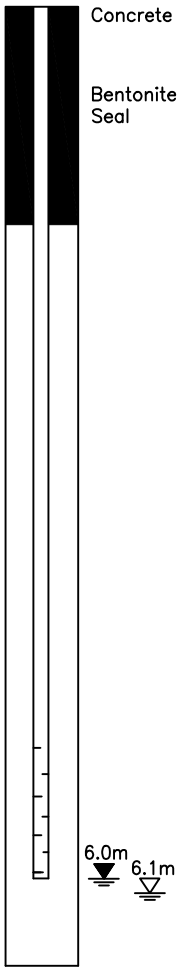
LOG OF BOREHOLE ..202..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 24, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	WATER CONTENT (%)	INSTALLATION INFORMATION
DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	20 40 60 80 SHEAR STRENGTH kPa; nat.V - +; rem.V - ⊕; Q - ●; U - ○	wP w wL; 10 20 30	
GROUND SURFACE		224.9						
100mm - TOPSOIL		0.0						
Brown Compact to Very Dense Moist to Wet			1	SS	36			
SAND, trace to some silt, trace gravel, medium to fine			2	SS	22			
			3	SS	31			
			4	SS	43			
			5	SS	36			
			6	SS	42			
			7	SS	52			
		218.3						
End of Borehole		6.6						



1. Borehole caved and water level noted at 6.1m upon completion of drilling.

2. Water level on March 10, 2015 measured at 6.0m (elev. 218.9m).

Terraprobe

LOG OF BOREHOLE ..203..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 24, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○)	WATER CONTENT (%) (WP, W, WL)	INSTALLATION INFORMATION
0	GROUND SURFACE		229.3						
	175mm - TOPSOIL		0.0						
	Brown Loose to Dense Moist to Wet			1	SS	54			
1	SAND, trace to some silt, trace gravel			2	SS	6			
2				3	SS	6			
				4	SS	6			
3				5	SS	25			
4									
				6	SS	37			
5									
6				7	SS	29			
			222.7						
	End of Borehole		6.6						
7									
8									
9									

Concrete
Bentonite Seal
3.3m
3.4m

1. Borehole caved and water level noted at 3.3m upon completion of drilling.

2. Water level on March 10, 2015 measured at 3.4m (elev. 225.9m).

Terraprobe

LOG OF BOREHOLE ..204..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 24, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

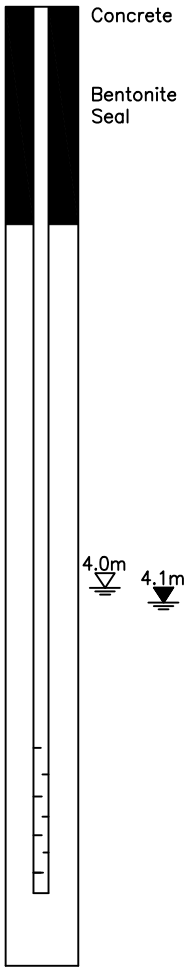
BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUE
0	GROUND SURFACE		230.3			
0	Dark Brown Compact Moist SAND, some silt to silty, some organics, trace gravel, FILL		0.0	1	SS	17
1				2	SS	15
1			229.0			
1	Dark Brown Loose Moist ORGANIC PEAT, FILL		1.3	3	SS	6
2			227.9			
2	Brown Loose to Very Loose Moist to Wet SAND, trace to some silt, trace gravel		2.4	4	SS	5
3				5	SS	4
4						
5				6	SS	2
6				7	SS	2
6			223.7			
7	End of Borehole		6.6			
8						
9						

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved and water level noted at 4m upon completion of drilling.

2. Water level on March 10, 2015 measured at 4.1m (elev. 226.2m).

Terraprobe

LOG OF BOREHOLE ..205..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 24, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
0	GROUND SURFACE		230.6			
0	Brown Compact Moist SAND, some gravel to gravelly, trace to some silt		0.0	1	SS	27
1				2	SS	14
2				3	SS	32
2			228.5			
2	Brown Dense to Very Dense Moist to Wet SAND, fine to medium, silty to trace silt, trace gravel		2.1	4	SS	33
3				5	SS	39
4						
5				6	SS	54
6						
6			224.0	7	SS	36
7	End of Borehole		6.6			

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – +
rem.V – ⊕
Q – ●
U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION

1. Borehole caved and water level noted at 4.2m upon completion of drilling.

2. Water level on March 10, 2015 measured at 4.6m (elev. 226.0m).

Terraprobe

LOG OF BOREHOLE ..206..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 25, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
0	GROUND SURFACE		229.5			
	500mm - Organic stained Sand		0.0			
	Brown Loose to Dense Moist to Wet			1	AS	
1	SAND, trace to some silt, trace gravel			2	SS	4
				3	SS	3
2				4	SS	4
3				5	SS	19
4						
				6	SS	44
5			224.0			
	Grey Very Stiff Moist		5.5			
6	SILT, some clay to clayey, trace sand			7	SS	18
			222.9			
	End of Borehole		6.6			
7						
8						
9						

PENETRATION RESISTANCE PLOT
SHEAR STRENGTH kPa
nat.V - + Q - ●
rem.V - ⊕ U - ○
20 40 60 80

WATER CONTENT (%)
WP W WL
10 20 30

INSTALLATION INFORMATION

1. Borehole caved and water level noted at 1.8m upon completion of drilling.

2. Water level on March 10, 2015 measured at 1.8m (elev. 227.7m).

Terraprobe

LOG OF BOREHOLE ..207..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 25, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

SOIL PROFILE

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)
GROUND SURFACE		228.7
Brown Compact Moist SAND, some organics, trace silt, trace gravel, FILL		0.0 228.0
Brown Compact Moist to Wet SAND, trace to some silt, trace gravel		0.7 225.9
Grey Very Stiff to Hard Moist SILT & CLAY to CLAYEY, trace sand		2.8 222.1
End of Borehole		6.6

SAMPLES

NUMBER	TYPE	"N" VALUE
1	SS	11
2	SS	16
3	SS	28
4	SS	28
5	SS	26
6	SS	40
7	SS	47

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V - + Q - ●
rem.V - ⊕ U - ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION

1. Borehole caved and water level noted at 1.2m upon completion of drilling.

2. Water level on March 10, 2015 measured at 1.6m (elev. 227.1m).

Terraprobe

LOG OF BOREHOLE ..208..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 25, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

SOIL PROFILE

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)
GROUND SURFACE		227.6
300mm - TOPSOIL		0.0
Brown to Grey; Compact to Very Dense; Moist to Wet		
SAND, trace to some silt, trace gravel		
Grey		
		221.0
End of Borehole		6.6

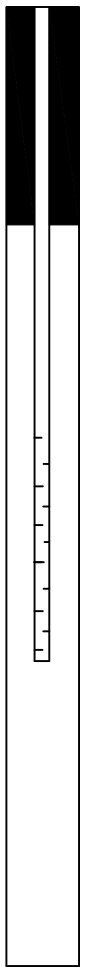
SAMPLES

NUMBER	TYPE	"N" VALUE
1	AS	
2	SS	22
3	SS	19
4	SS	22
5	SS	39
6	SS	52
7	SS	50/150mm

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V - +
rem.V - ⊕
Q - ●
U - ○
20 40 60 80

WATER CONTENT (%)
WP w WL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved and water level noted at 1.5m upon completion of drilling.

2. Water level on March 10, 2015 measured at 1.1m (elev. 226.5m).

Terraprobe

LOG OF BOREHOLE ..209..

PROJECT NAME: 70 Pioneer Trail Subdivision
PROJECT No.: 31-15-2003
CLIENT: Richwood Estates Inc.
BORING DATE: February 25, 2015
LOCATION: Barrie, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: D-50T Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT (20 40 60 80) / SHEAR STRENGTH kPa (nat.V - +, rem.V - ⊕, Q - ●, U - ○) (20 40 60 80)	WATER CONTENT (%) (WP, W, WL) (10 20 30)	INSTALLATION INFORMATION
GROUND SURFACE		226.6						
450mm - TOPSOIL		0.0						
Brown Compact to Dense Moist to Wet			1	AS				
SAND, medium to fine, trace to some silt, trace gravel			2	SS	11	x		
			3	SS	27	x		
			4	SS	35	x		
			5	SS	24	x		
			6	SS	46	x		
			7	SS	35	x		
		220.0						
End of Borehole		6.6						

1. Borehole caved and water level noted at 1.5m upon completion of drilling.

2. Water level on March 10, 2015 measured at 1.7m (elev. 224.9m).

APPENDIX E

Ground Water Elevation Data

Ground Water Level Data

Monitoring Well	Ground Surface Eelvation (masl)	Stickup (m)	Water Level (mbtop)																					
			25-Feb-15	10-Mar-15	16-Apr-15	14-May-15	10-Jun-15	14-Jul-15	24-Aug-15	15-Sep-15	16-Oct-15	16-Nov-15	11-Dec-15	04-Jan-16	11-Feb-16	10-Mar-16	08-Apr-16	24-May-16	17-Jun-16	19-Jul-16	16-Aug-16	31-Mar-22	29-Apr-22	31-May-22	23-Jun-22
BH201	226.50	0.75	5.75	5.75	5.75	5.25	5.45	5.55	5.55	-0.75	-0.75	5.55	5.65	5.65	5.65	5.65	4.25	3.95	4.45	5.55	5.55	6.65	6.09	6.10	6.31
BH202	225.00																					Obstructed			
BH203	228.38	0.65	2.65	2.75	1.65	1.85	2.35	2.35	2.85	2.85	3.25	3.15	2.95	2.75	2.15	2.05	1.05	1.85	2.35	2.75	3.05	2.76	3.02	4.28	3.63
BH204	229.28	0.81	3.19	3.29	1.89	2.29	2.99	2.89	3.49	3.49	3.79	3.49	3.19	2.89	2.29	2.19	1.39	2.19	2.89	3.39	3.59	3.22	3.57	4.67	NA
BH205	229.89	0.70	3.50	3.90	2.70	3.00	3.50	3.50	4.10	3.90	4.40	4.40	4.20	4.00	3.30	3.30	1.90	3.00	3.40	4.00	4.30	3.71	4.10	4.67	4.80
BH206	229.51	0.90	0.90	1.00	-0.30	0.30	0.90	0.40	1.10	1.10	1.50	1.20	0.80	0.30	-0.10	-0.20	-0.20	0.10	0.80	1.30	1.50	1.62	1.60	2.18	2.00
BH207	227.89	0.85	0.35	0.75	-0.05	0.15	0.45	0.45	0.75	0.75	1.05	0.95	0.75	0.45	0.05	-0.05	-0.05	0.05	0.55	0.95	0.65	1.52	1.53	1.77	1.71
BH208	226.57																					Destroyed			
BH209	226.70	1.09	0.41	0.61	-0.49	-0.29	0.21	0.21	0.71	0.71	1.11	1.11	0.81	0.71	0.01	-0.09	-0.89	-0.29	0.11	0.61	0.91	1.09	1.33	1.85	1.98
BH106	229.58																					Not Located			
BH107	226.90	0.90		3.70	3.70	3.70	3.70	3.70	3.70	3.60	-0.90	3.70	3.70	3.70	3.70	3.70	2.70	3.50	3.70	3.70	3.70	Obstructed	5.64	NA	NA

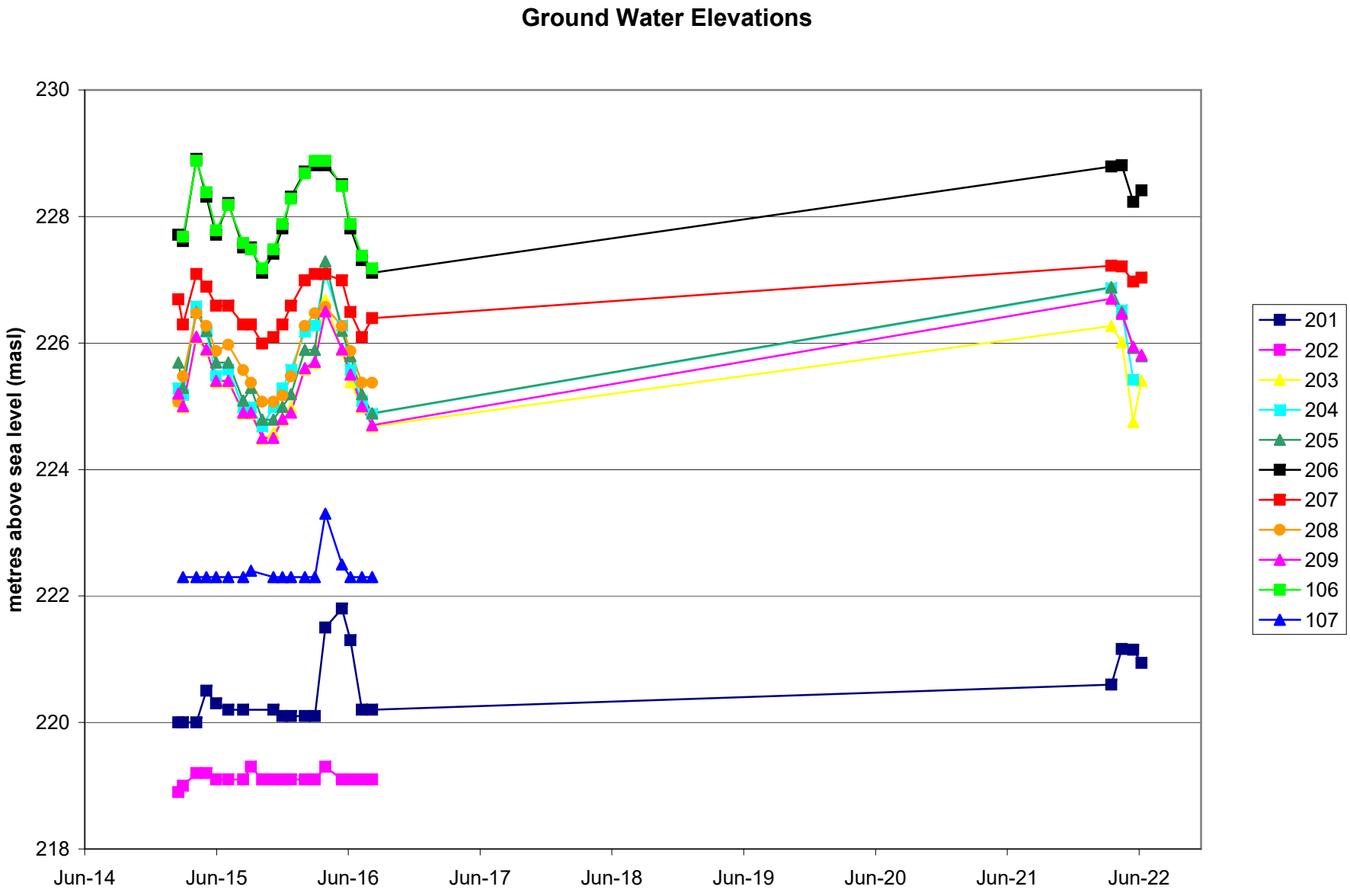
* - stickup values not available for wells which were not found in 2021 (assumed destroyed) so metres below top of pipe values not reported

Monitoring Well	Ground Surface Eelvation (masl)	Stickup (m)	Water Level (mbgs)																					
			25-Feb-15	10-Mar-15	16-Apr-15	14-May-15	10-Jun-15	14-Jul-15	24-Aug-15	15-Sep-15	16-Oct-15	16-Nov-15	11-Dec-15	04-Jan-16	11-Feb-16	10-Mar-16	08-Apr-16	24-May-16	17-Jun-16	19-Jul-16	16-Aug-16	31-Mar-22	29-Apr-22	31-May-22	23-Jun-22
BH201	226.50	0.75	6.50	6.50	6.50	6.00	6.20	6.30	6.30			6.30	6.40	6.40	6.40	6.40	5.00	4.70	5.20	6.30	6.30	5.90	5.34	5.35	5.56
BH202	225.00		6.10	6.00	5.80	5.80	5.90	5.90	5.90	5.70	5.90	5.90	5.90	5.90	5.90	5.90	5.70	5.90	5.90	5.90	5.90	Obstructed			
BH203	228.38	0.65	3.30	3.40	2.30	2.50	3.00	3.00	3.50	3.50	3.90	3.80	3.60	3.40	2.80	2.70	1.70	2.50	3.00	3.40	3.70	2.11	2.37	3.63	2.98
BH204	229.28	0.81	4.00	4.10	2.70	3.10	3.80	3.70	4.30	4.30	4.60	4.30	4.00	3.70	3.10	3.00	2.20	3.00	3.70	4.20	4.40	2.41	2.76	3.86	NA
BH205	229.89	0.70	4.20	4.60	3.40	3.70	4.20	4.20	4.80	4.60	5.10	5.10	4.90	4.70	4.00	4.00	2.60	3.70	4.10	4.70	5.00	3.01	3.40	3.97	4.10
BH206	229.51	0.90	1.80	1.90	0.60	1.20	1.80	1.30	2.00	2.00	2.40	2.10	1.70	1.20	0.80	0.70	0.70	1.00	1.70	2.20	2.40	0.72	0.70	1.28	1.10
BH207	227.89	0.85	1.20	1.60	0.80	1.00	1.30	1.30	1.60	1.60	1.90	1.80	1.60	1.30	0.90	0.80	0.80	0.90	1.40	1.80	1.50	0.67	0.68	0.92	0.86
BH208	226.57		1.50	1.10	0.10	0.30	0.70	0.60	1.00	1.20	1.50	1.50	1.40	1.10	0.30	0.10	0.00	0.30	0.70	1.20	1.20	Destroyed			
BH209	226.70	1.09	1.50	1.70	0.60	0.80	1.30	1.30	1.80	1.80	2.20	2.20	1.90	1.80	1.10	1.00	0.20	0.80	1.20	1.70	2.00	0.00	0.24	0.76	0.89
BH106	229.58			1.90	0.70	1.20	1.80	1.40	2.00	2.10	2.40	2.10	1.70	1.30	0.90	0.70	0.70	1.10	1.70	2.20	2.40	Not Located			
BH107	226.90	0.90		4.60	4.60	4.60	4.60	4.60	4.60	4.50		4.60	4.60	4.60	4.60	4.60	3.60	4.40	4.60	4.60	4.60	Obstructed	4.74	NA	NA

* - Water levels values from Terraprobe 2016 report.

Monitoring Well	Ground Surface Eelvation (masl)	Stickup (m)	Ground Water Elevation (masl)																					
			25-Feb-15	10-Mar-15	16-Apr-15	14-May-15	10-Jun-15	14-Jul-15	24-Aug-15	15-Sep-15	16-Oct-15	16-Nov-15	11-Dec-15	04-Jan-16	11-Feb-16	10-Mar-16	08-Apr-16	24-May-16	17-Jun-16	19-Jul-16	16-Aug-16	31-Mar-22	29-Apr-22	31-May-22	23-Jun-22
BH201	226.50	0.75	220.00	220.00	220.00	220.50	220.30	220.20	220.20			220.20	220.10	220.10	220.10	220.10	221.50	221.80	221.30	220.20	220.20	220.60	221.16	221.15	220.94
BH202	225.00		218.90	219.00	219.20	219.20	219.10	219.10	219.10	219.30	219.10	219.10	219.10	219.10	219.10	219.10	219.30	219.10	219.10	219.10	219.10	Obstructed			
BH203	228.38	0.65	225.08	224.98	226.08	225.88	225.38	225.38	224.88	224.88	224.48	224.58	224.78	224.98	225.58	225.68	226.68	225.88	225.38	224.98	224.68	226.27	226.01	224.75	225.40
BH204	229.28	0.81	225.28	225.18	226.58	226.18	225.48	225.58	224.98	224.98	224.68	224.98	225.28	225.58	226.18	226.28	227.08	226.28	225.58	225.08	224.88	226.87	226.52	225.42	NA
BH205	229.89	0.70	225.69	225.29	226.49	226.19	225.69	225.69	225.09	225.29	224.79	224.79	224.99	225.19	225.89	225.89	227.29	226.19	225.79	225.19	224.89	226.88	226.49	225.92	225.79
BH206	229.51	0.90	227.71	227.61	228.91	228.31	227.71	228.21	227.51	227.51	227.11	227.41	227.81	228.31	228.71	228.81	228.81	228.51	227.81	227.31	227.11	228.79	228.81	228.23	228.41
BH207	227.89	0.85	226.69	226.29	227.09	226.89	226.59	226.59	226.29	226.29	225.99	226.09	226.29	226.59	226.99	227.09	227.09	226.99	226.49	226.09	226.39	227.22	227.21	226.97	227.03
BH208	226.57		225.07	225.47	226.47	226.27	225.87	225.97	225.57	225.37	225.07	225.07	225.17	225.47	226.27	226.47	226.57	226.27	225.87	225.37	225.37	Destroyed			
BH209	226.70	1.09	225.20	225.00	226.10	225.90	225.40	225.40	224.90	224.90	224.50	224.50	224.80	224.90	225.60	225.70	226.50	225.90	225.50	225.00	224.70	226.70	226.46	225.94	225.81
BH106	229.58			227.68	228.88	228.38	227.78	228.18	227.58	227.48	227.18	227.48	227.88	228.28	228.68	228.88	228.88	228.48	227.88	227.38	227.18	Not Located			
BH107	226.90	0.90		222.30	222.30	222.30	222.30	222.30	222.30	222.40		222.30	222.30	222.30	222.30	222.30	223.30	222.50	222.30	222.30	222.30	Obstructed	222.16	NA	NA

* - Ground water elevations revised from 2016 Terraprobe report as reference ground elevations noted to be incorrect with recent site survey


Ground Water Elevations
metres above sea level (masl)
230
228
226
224
222
220
218
Jun-14
Jun-15
Jun-16
Jun-17
Jun-18
Jun-19
Jun-20
Jun-21
Jun-22
201
202
203
204
205
206
207
208
209
106
107

APPENDIX F

Water Balance Information

Table A: Pre-Development

Catchment Designation	Grassed	Forest	Total
Area (m^2)	6,940	21,929	28,869
Pervious Area (m^2)	6,940	21,929	28,869
Impervious Area (m^2)	0	0	0
Infiltration Factors			
Topography Infiltration Factor	0.2	0.2	
Soil Infiltration Factor	0.3	0.3	
Land Cover Infiltration Factor	0.1	0.2	
Infiltration Factor	0.6	0.7	
Run-Off Coefficient	0.4	0.3	
Run-Off From Impervious Surfaces	0.8	0.8	
Inputs (Per Unit Area)			
Precipitation (mm/yr)	909	909	909
Rainfall (mm/yr)	655	655	655
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	**909**	**909**	909
Outputs (Per Unit Area)			
Precipitation Surplus (mm/yr)	430	430	430
Net Surplus (mm/yr)	430	430	430
Evapotranspiration (mm/yr)	479	479	479
Infiltration (mm/yr)	258	301	291
Surplus Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	258	301	291
Run-Off Pervious Areas (mm/yr)	172	129	139
Run-Off Impervious Areas (mm/yr)	0	0	0
Total Run-Off (mm/yr)	172	129	139
Total Outputs (mm/yr)	**909**	**909**	**909**
Difference (Inputs - Outputs)	**0**	**0**	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	6,308	19,933	26,242
Run-On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	**6,308**	**19,933**	**26,242**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	2,984	9,429	12,414
Net Surplus (m^3/yr)	2,984	9,429	12,414
Evapotranspiration (m^3/yr)	3,324	10,504	13,828
Infiltration (m^3/yr)	1,791	6,601	8,391
Surplus Infiltration (m^3/yr)	0	0	0
Total Infiltration (m^3/yr)	**1,791**	**6,601**	**8,391**
Run-Off Pervious Areas (m^3/yr)	1,194	2,829	4,023
Run-Off Impervious Areas (m^3/yr)	0	0	0
Total Run-Off (m^3/yr)	1,194	2,829	4,023
Total Outputs (m^3/yr)	6,308	19,933	26,242
Difference (Inputs - Outputs)	**0**	**0**	**0**

Table B: Post-Development (no mit)

Catchment Designation	Forest	Landscaped Grass	Road / Driveway / Sidewalk	Rooftop	Total
Area (m^2)	4,746	11,400	4,781	7,942	28,869
Pervious Area (m^2)	4,746	11,400	0	0	16,146
Impervious Area (m^2)	0	0	4,781	7,942	12,723
Infiltration Factors					
Topography Infiltration Factor	0.2	0.2	0	0	
Soil Infiltration Factor	0.3	0.3	0	0	
Land Cover Infiltration Factor	0.2	0.1	0	0	
Infiltration Factor	0.7	0.6	0	0	
Run-Off Coefficient	0.3	0.4	1	1	
Run-Off From Impervious Surfaces	0.8	0.8	0.8	0.8	
Inputs (Per Unit Area)					
Precipitation (mm/yr)	909	909	909	909	909
Rainfall (mm/yr)	655	655	655	655	655
Run-On (mm/yr)	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0
Total Inputs (mm/yr)	**909**	**909**	**909**	**909**	909
Outputs (Per Unit Area)					
Precipitation Surplus (mm/yr)	430	430	727	727	561
Net Surplus (mm/yr)	430	430	727	727	561
Evapotranspiration (mm/yr)	479	479	182	182	348
Infiltration (mm/yr)	301	258	0	0	151
Surplus Infiltration (mm/yr)	0	0	0	0	0
Total Infiltration (mm/yr)	301	258	0	0	151
Run-Off Pervious Areas (mm/yr)	129	172	0	0	89
Run-Off Impervious Areas (mm/yr)	0	0	727	727	320
Total Run-Off (mm/yr)	129	172	727	727	410
Total Outputs (mm/yr)	**909**	**909**	**909**	**909**	**909**
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**	**0**
Inputs (Volumes)					
Precipitation (m^3/yr)	4,314	10,363	4,346	7,219	26,242
Run-On (m^3/yr)	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0
Total Inputs (m^3/yr)	**4,314**	**10,363**	**4,346**	**7,219**	**26,242**
Outputs (Volumes)					
Precipitation Surplus (m^3/yr)	2,041	4,902	3,477	5,775	16,195
Net Surplus (m^3/yr)	2,041	4,902	3,477	5,775	16,195
Evapotranspiration (m^3/yr)	2,273	5,461	869	1,444	10,047
Infiltration (m^3/yr)	1,429	2,941	0	0	4,370
Surplus Infiltration (m^3/yr)	0	0	0	0	0
Total Infiltration (m^3/yr)	**1,429**	**2,941**	**0**	**0**	**4,370**
Run-Off Pervious Areas (m^3/yr)	612	1,961	0	0	2,573
Run-Off Impervious Areas (m^3/yr)	0	0	3,477	5,775	9,252
Total Run-Off (m^3/yr)	612	1,961	3,477	5,775	11,825
Total Outputs (m^3/yr)	4,314	10,363	4,346	7,219	26,242
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**	**0**

Table C: Post-Development (with mitigation)

Catchment Designation	Forest	Landscaped Grass	Landscaped Grass (LID)	Road / Driveway / Sidewalk	Road / Driveway / Sidewalk (LID)	Rooftop	Rooftop (LID)	Total
Area (m^2)	4,746	9,386	2,014	315	4,466	5,618	2,324	28,869
Pervious Area (m^2)	4,746	9,386	2,014	0	0	0	0	16,146
Impervious Area (m^2)	0	0	0	315	4,466	5,618	2,324	12,723
Infiltration Factors								
Topography Infiltration Factor	0.2	0.2	0.2	0	0	0	0	
Soil Infiltration Factor	0.3	0.3	0.3	0	0	0	0	
Land Cover Infiltration Factor	0.2	0.1	0.1	0	0	0	0	
Infiltration Factor	0.7	0.6	0.6	0	0	0	0	
Run-Off Coefficient	0.3	0.4	0.4	1	1	1	1	
Run-Off From Impervious Surfaces	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
Inputs (Per Unit Area)								
Precipitation (mm/yr)	909	909	909	909	909	909	909	909
Rainfall (mm/yr)	655	655	655	655	655	655	655	655
Run-On (mm/yr)	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	**909**	**909**	**909**	**909**	**909**	**909**	**909**	909
Outputs (Per Unit Area)								
Precipitation Surplus (mm/yr)	430	430	430	727	727	727	727	561
Net Surplus (mm/yr)	430	430	430	727	727	727	727	561
Evapotranspiration (mm/yr)	479	479	479	182	182	182	182	348
Infiltration (mm/yr)	301	258	258	0	0	0	0	151
Surplus Infiltration (mm/yr)	0	0	138	0	491	262	491	176
Total Infiltration (mm/yr)	301	258	396	0	491	262	491	327
Run-Off Pervious Areas (mm/yr)	129	172	34	0	0	0	0	80
Run-Off Impervious Areas (mm/yr)	0	0	0	727	236	465	236	154
Total Run-Off (mm/yr)	129	172	34	727	236	465	236	233
Total Outputs (mm/yr)	**909**	**909**	**909**	**909**	**909**	**909**	**909**	**909**
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Inputs (Volumes)								
Precipitation (m^3/yr)	4,314	8,532	1,831	286	4,060	5,107	2,113	26,242
Run-On (m^3/yr)	0	0	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0	0	0
Total Inputs (m^3/yr)	**4,314**	**8,532**	**1,831**	**286**	**4,060**	**5,107**	**2,113**	**26,242**
Outputs (Volumes)								
Precipitation Surplus (m^3/yr)	2,041	4,036	866	229	3,248	4,085	1,690	16,195
Net Surplus (m^3/yr)	2,041	4,036	866	229	3,248	4,085	1,690	16,195
Evapotranspiration (m^3/yr)	2,273	4,496	965	57	812	1,021	423	10,047
Infiltration (m^3/yr)	1,429	2,422	520	0	0	0	0	4,370
Surplus Infiltration (m^3/yr)	0	0	277	0	2,194	1,472	1,142	5,084
Total Infiltration (m^3/yr)	**1,429**	**2,422**	**797**	**0**	**2,194**	**1,472**	**1,142**	**9,454**
Run-Off Pervious Areas (m^3/yr)	612	1,614	69	0	0	0	0	2,296
Run-Off Impervious Areas (m^3/yr)	0	0	0	229	1,054	2,613	548	4,445
Total Run-Off (m^3/yr)	612	1,614	69	229	1,054	2,613	548	6,741
Total Outputs (m^3/yr)	4,314	8,532	1,831	286	4,060	5,107	2,113	26,242
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0

Table D: Water Balance Summary Table

Characteristic	Site						
	Pre-Development	Post-Development	Change (Pre to Post)		Post-Development with Mitigation	Change (Pre to Post with Mitigation)	
Inputs (Volume)							
Precipitation (m^3/yr)	26,242	26,242	0	0%	26,242	0	0%
Run-On (m^3/yr)	0	0	0	NA	0	0	NA
Other Inputs (m^3/yr)	0	0	0	NA	0	0	NA
Total Inputs (m^3/yr)	26,242	26,242	0	0%	26,242	0	0%
Outputs (Volume)							
Precipitation Surplus (m^3/yr)	12,414	16,195	3,781	30%	16,195	3,781	30%
Net Surplus (m3/yr)	12,414	16,195	3,781	30%	16,195	3,781	30%
Evapotranspiration (m^3/yr)	13,828	10,047	-3,781	-27%	10,047	-3,781	-27%
Infiltration (m^3/yr)	8,391	4,370	-4,021	-48%	4,370	-4,021	-48%
Rooftop Infiltration (m^3/yr)	0	0	0	NA	5,084	5,084	NA
Total Infiltration (m^3/yr)	**8,391**	**4,370**	**-4,021**	**-48%**	**9,454**	**1,063**	**13%**
Run-Off Pervious Areas (m^3/yr)	4,023	2,573	-1,449	-36%	2,296	-1,727	-43%
Run-Off Impervious Areas (m^3/yr)	0	9,252	9,252	NA	4,445	4,445	NA
Total Run-Off (m^3/yr)	4,023	11,825	7,803	194%	6,741	2,718	68%
Total Outputs (m^3/yr)	**26,242**	**26,242**	**0**	**0%**	**26,242**	**0**	**0%**

APPENDIX G

Dewatering Details

														Radial Flow	Plane Flow			
Type	**ID**	**Length (m)**	**Width (m)**	**Effecitve Radius[1] (m)**	**Hydraulic Conductivity (m/s)**	**Hydraulic Conductivity (m/day)**	**Initial Depth of Water (static head) prior to dewatering (m)**	**H^2**	**Depth of Water in the well while pumping (m)**	**h^2**	**H^2-h^2**	**Radius of Influence[2] (m)**	**Ro/r**	**Discharge Into Ends [3] (m^3/day)**	**Plane Discharge [4] (m^3/day)**	**Total Discharge (m^3/day)**	**Total Discharge (L/day)**	**Total Discharge x3 Safety Factor (L/day)**
		a	**b**	**re**	**k**	**k**	**H**		**h**			**Ro**		**Q**	**Q**	**Q**	**Q**	**Q**
MAX SERVICING DRAWDOWN (onsite)	Western Servicing Alignment	140	2	1	5.00E-04	4.32E+01	2.20	5	0	0	5	148	147.58	0	198	198	198,000	594,000
MAX SERVICING DRAWDOWN (onsite)	Eastern Servicing Alignment	200	2	1	5.00E-04	4.32E+01	0.50	0	0	0	0	34	33.54	0	64	64	64,000	192,000
Notes																total	262,000	786,000

[1] $r_e = (a+b) / \pi$ - assuming a/b >1.5, (Driscoll, 1986)

[2] $Ro = r_e + 3000 * (H-h) * Vk$ - Sichardts Formula, (Cashman and Preene, 2001)

[3] $Q = [(\pi * K) * (H^2 - h^2)] / [\ln(R_o/r)]$ (Powers et al., 2007)

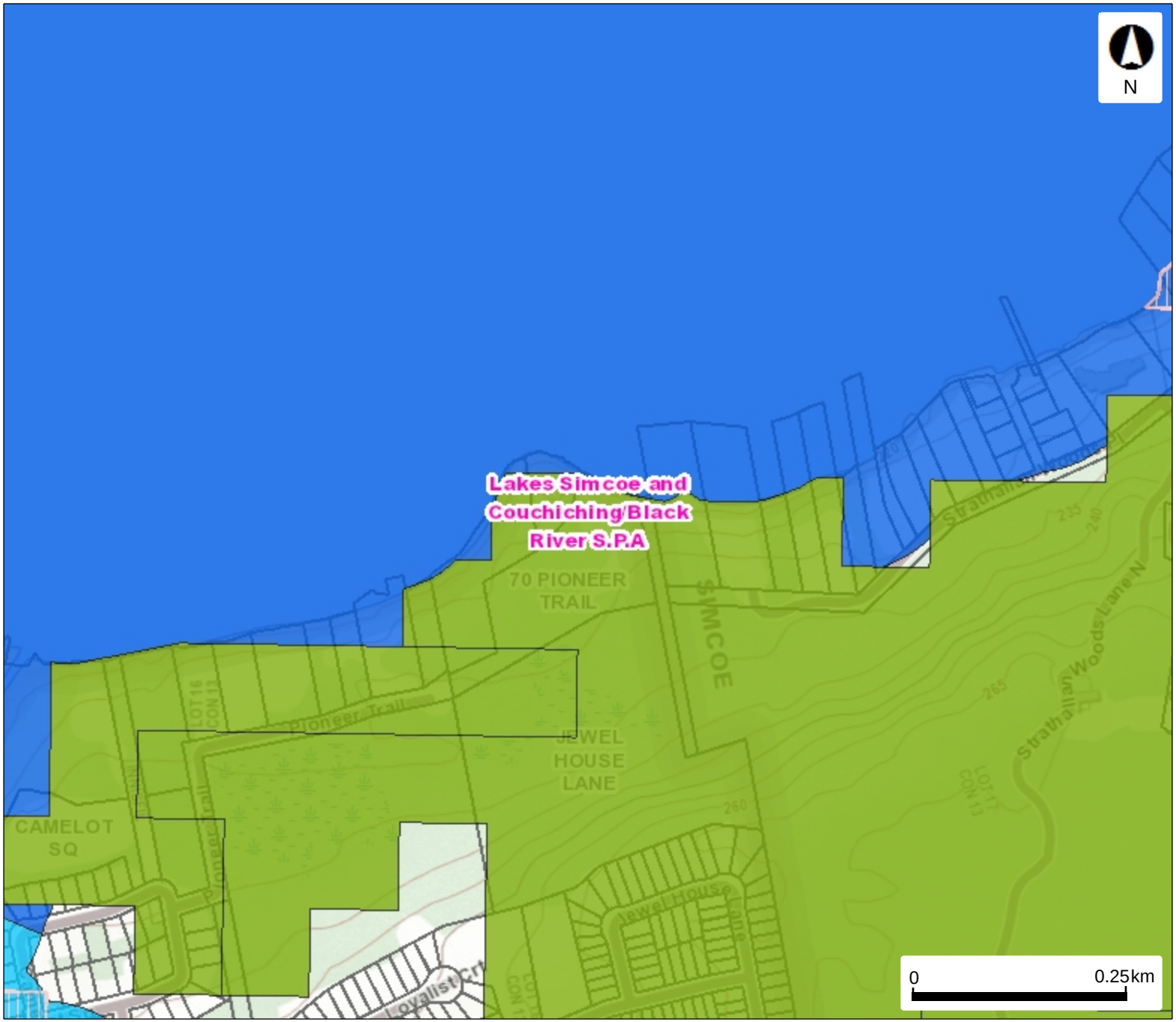
[4] $Q = 2*[a*K*(H^2 - h^2)/(2R_o)]$ (Powers et al., 2007)

**For trench dewatering, only plane discharge is counted since the trench is only 2m wide so in most cases a>>b.

APPENDIX H

Source Water Protection Mapping

70 Pioneer Trail



Legend

- Source Protection Areas
- Intake Protection Zone Q
- Wellhead Protection Area Q2
- Issue Contributing Areas
- Highly Vulnerable Aquifers
- Significant Groundwater Recharge Area
  - 0
  - 2
  - 4
  - 6
- WHPA Groundwater Under Direct Influence (WHPA-E)
- Wellhead Protection Area
  - A
  - B
  - C
  - C1
  - D
  - F
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Assessment Parcel with Addre

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Environment, Conservation and Parks (MECP) shall not be liable in any way for the use or any information on this map. of, or reliance upon, this map.

Ontario

Map Created: 1/13/2022
Map Center: 44.37152 N, -79.62425 W

APPENDIX I

Infiltration Testing Data

Guelph Pereameter Infiltration Test Results

Investigator:	Alan Turner & S. Yerbury
Date:	23-Jun-22
Location:	70 Pioneer Trail, City of Barrie
TP ID:	TP-1
Depth of Hole:	1.1m test pit, 30 cm auger hole
Radius:	3 cm
Reserviors used during test:	Combined
(Combined or Inner)	
Reservior constant used:	1
Ground Surface Elevation:	226.5

Water Level in Well: 10 cm

Time ***t*** (min)	**Δ*t*** (min)	Water level in Reservoir ***h*** (cm)	**Δ*h*** (cm)	Rate of Change **Δ*h*/ Δ*t*** (cm/ min)
0	--	21.3	--	--
0.5	0.5	30.7	9.4	18.800
1	0.5	30.8	0.1	0.200
1.5	0.5	30.8	0.0	0.000
2	0.5	30.8	0.0	0.000
7	5	30.9	0.1	0.020
12	5	30.9	0.0	0.000
17	5	31.0	0.1	0.020
22	5	31.1	0.1	0.020
32	10	31.3	0.2	0.020
42	10	31.5	0.2	0.020
52	10	31.7	0.2	0.020
62	10	31.9	0.2	0.020
			Steady rate for 3 consecutive readings ($\mathbf{R_1}$):	0.020

Water Level in Well: 20 cm

Time ***t*** (min)	**Δ*t*** (min)	Water level in Reservoir ***h*** (cm)	**Δ*h*** (cm)	Rate of Change **Δ*h*/ Δ*t*** (cm/ min)
0	--	35	--	--
0.5	0.5	37.7	2.7	5.40
1	0.5	37.8	0.1	0.20
6	5	37.7	-0.1	-0.02
11	5	38.1	0.4	0.08
16	5	38.4	0.3	0.06
21	5	38.8	0.4	0.08
26	5	39.1	0.3	0.06
31	5	39.4	0.3	0.06
36	5	39.7	0.3	0.06
			Steady rate for 3 consecutive readings ($\mathbf{R_2}$):	0.060

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured solls wlth large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.0200

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	0.020
Q	0.012
pi	3.142

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.287543

$Q =$ 0.01174

$K_{fs} =$	1.27E-05	cm/sec
	7.63E-04	cm/min
	1.27E-07	m/sec
	3.00E-04	inch/min
	5.01E-06	inch/sec

$\Phi_m =$ 1.06E-04 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	20
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.0600

Res Type	35.22
H	20
a	3
H/a	6.666667
a*	0.12
C0.01	1.754604
C0.04	1.903071
C0.12	1.980192
C0.36	1.980192
C	1.980192
R	0.060
Q	0.03522
pi	3.1415

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.980192

$Q =$ 0.03522

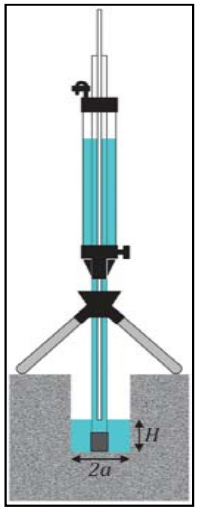
$K_{fs} =$	1.93E-05	cm/sec
	1.16E-03	cm/min
	1.93E-07	m/ses
	4.56E-04	inch/min
	7.59E-06	inch/sec

$\Phi_m =$ 1.61E-04 (cm^2/min)

Average

$K_{fs} =$	1.60E-05	cm/sec
	9.60E-04	cm/min
	1.60E-07	m/s
	3.78E-04	inch/min
	6.30E-06	inch/sec

$\Phi_m =$ 1.33E-04 (cm^2/min)



Guelph Pereameter Infiltration Test Results

Investigator:	Alan Turner & S. Yerbury
Date:	23-Jun-22
Location:	70 Pioneer Trail, City of Barrie
TP ID:	TP-1A
Depth of Hole:	1.2m test pit, 20 cm auger hole
Radius:	3 cm
Reserviors used during test:	Combined
(Combined or Inner)	
Reservior constant used:	1
Ground Surface Elevation:	226.5

Water Level in Well: 5 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	5.0	--	--
0.5	0.5	10.0	5.0	10.000
1	0.5	15.0	5.0	10.000
1.5	0.5	19.7	4.7	9.400
2	0.5	24.5	4.8	9.600
2.5	0.5	29.0	4.5	9.000
3	0.5	33.6	4.6	9.200
3.5	0.5	38.0	4.4	8.800
4	0.5	42.5	4.5	9.000
4.5	0.5	46.9	4.4	8.800
5	0.5	51.2	4.3	8.600
			Steady rate for 3 consecutive readings (R_1):	8.800

Water Level in Well: 7 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	1	--	--
0.5	0.5	9.5	8.5	17.00
1	0.5	12.0	2.5	5.00
1.5	0.5	14.9	2.9	5.80
2	0.5	17.1	2.2	4.40
2.5	0.5	19.8	2.7	5.40
3	0.5	22.0	2.2	4.40
3.5	0.5	24.5	2.5	5.00
4	0.5	26.9	2.4	4.80
4.5	0.5	29.0	2.1	4.20
5	0.5	31.6	2.6	5.20
5.5	0.5	34.0	2.4	4.80
6	0.5	36.1	2.1	4.20
6.5	0.5	38.5	2.4	4.80
7	0.5	40.9	2.4	4.80
7.5	0.5	43.0	2.1	4.20
8	0.5	45.1	2.1	4.20
8.5	0.5	47.6	2.5	5.00
9	0.5	50	2.4	4.80
9.5	0.5	52.1	2.1	4.20
10	0.5	54.1	2.0	4.00
10.5	0.5	56.8	2.7	5.40
11	0.5	58.9	2.1	4.20
11.5	0.5	61.1	2.2	4.40
12	0.5	63.5	2.4	4.80
12.5	0.5	65.6	2.1	4.20
13	0.5	67.6	2.0	4.00
13.5	0.5	69.8	2.2	4.40
14	0.5	72	2.2	4.40
14.5	0.5	74.2	2.2	4.40
			Steady rate for 3 consecutive readings (R_2):	4.400

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	5
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	8.8000

Res Type	35.22
H	5
a	3
H/a	1.667
a*	0.12
C0.01	0.809
C0.04	0.842
C0.12	0.803
C0.36	0.803
C	0.803
R	8.800
Q	5.166
pi	3.142

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 0.803154

$Q =$ 5.1656

$K_{fs} =$	9.40E-03	cm/sec
	5.64E-01	cm/min
	9.40E-05	m/sec
	2.22E-01	inch/min
	3.70E-03	inch/sec

$\Phi_m =$ 7.83E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	7
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	4.4000

Res Type	35.22
H	7
a	3
H/a	2.333333
a*	0.12
C0.01	0.991452
C0.04	1.039608
C0.12	1.013901
C0.36	1.013901
C	1.013901
R	4.400
Q	2.5828
pi	3.1415

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.013901

$Q =$ 2.5828

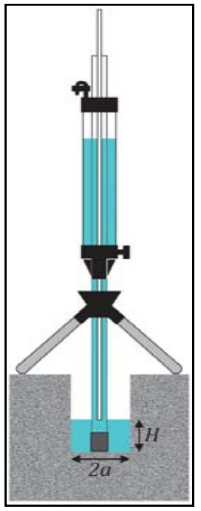
$K_{fs} =$	3.72E-03	cm/sec
	2.23E-01	cm/min
	3.72E-05	m/ses
	8.80E-02	inch/min
	1.47E-03	inch/sec

$\Phi_m =$ 3.10E-02 (cm^2/min)

Average

$K_{fs} =$	6.56E-03	cm/sec
	3.94E-01	cm/min
	6.56E-05	m/s
	1.55E-01	inch/min
	2.58E-03	inch/sec

$\Phi_m =$ 5.47E-02 (cm^2/min)



Guelph Pereameter Infiltration Test Results

Investigator:	Alan Turner & S. Yerbury
Date:	23-Jun-22
Location:	70 Pioneer Trail, City of Barrie
TP ID:	TP-2
Depth of Hole:	1.2m test pit, 25 cm auger hole
Radius:	3 cm
Reserviors used during test:	Combined
(Combined or Inner)	
Reservior constant used:	1
Ground Surface Elevation:	226.5

Water Level in Well: 5 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	6.0	--	--
0.25	0.25	20.0	14.0	56.000
0.5	0.25	34.0	14.0	56.000
0.75	0.25	49.0	15.0	60.000
1	0.25	64.0	15.0	60.000
			Steady rate for 3 consecutive readings ($\mathbf{R_1}$):	60.000

Water Level in Well: 5 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	1	--	--
0.25	0.25	10	9.0	36.00
0.5	0.25	25.0	15.0	60.00
0.75	0.25	38.0	13.0	52.00
1	0.25	51.0	13.0	52.00
1.25	0.25	63.0	12.0	48.00
1.5	0.25	76.0	13.0	52.00
			Steady rate for 3 consecutive readings ($\mathbf{R_2}$):	52.000

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	60.0000

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	60.000
Q	35.22
pi	3.142

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.287543

$Q =$ 35.22

$K_{fs} =$	3.82E-02	cm/sec
	2.29E+00	cm/min
	3.82E-04	m/sec
	9.01E-01	inch/min
	1.50E-02	inch/sec

$\Phi_m =$ 3.18E-01 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	52.0000

Res Type	35.22
H	10
a	3
H/a	3.333333
a*	0.12
C0.01	1.21841
C0.04	1.290234
C0.12	1.287543
C0.36	1.287543
C	1.287543
R	52.000
Q	30.524
pi	3.1415

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.287543

$Q =$ 30.524

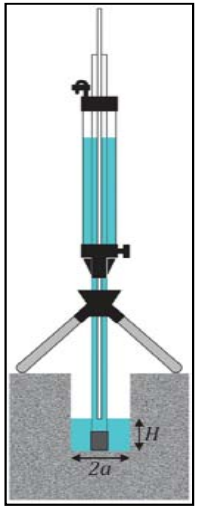
$K_{fs} =$	3.31E-02	cm/sec
	1.98E+00	cm/min
	3.31E-04	m/ses
	7.81E-01	inch/min
	1.30E-02	inch/sec

$\Phi_m =$ 2.76E-01 (cm^2/min)

Average

$K_{fs} =$	3.56E-02	cm/sec
	2.14E+00	cm/min
	3.56E-04	m/s
	8.41E-01	inch/min
	1.40E-02	inch/sec

$\Phi_m =$ 2.97E-01 (cm^2/min)



AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

TEST PIT LOG

Project Name/ Project Client	Pioneer Trail, Fernbrook Homes	**Project Address**	70 Pioneer Trail, City of Barrie, ON	**Date**	June 23, 2022
Test Pit Number	TP-1	**Contractor**	Ground Breakers Contracting	**Elevation**	226.5
Equipment	Excavator	**Test Pit Size**	6.0 x 3.0 (L x W)	**Datum**	Ground Surface
Temperature	25°C	**Weather**	Sunny	**Sample Type**	Soil

Depth		**Soil description**	**Samples**		**Screening Parameters**	**Remarks / Chemical Analysis**
From (m)	**To (m)**		**No.**	**Depth (mbgs)**		
0 (226.5)	0.3 (226.2)	Topsoil	NA			
0.3 (226.2)	1.1 (225.4)	Fill Dark grey to brown, silty sand, some gravel, moist	NA			
1.1 (225.4)	2.9 (223.6)	Clayey Silt Grey clayey silt, trace gravel, dry, compact (Southwest end of Test Pit)	NA			Sample collected at base for grain size analysis (TP-1). In-situ testing completed in auger hole advanced at 225.1 masl using a Guelph Permeameter.
1.1 (225.4)	2.9 (223.6)	Sand Brown medium to fine sane, trace silt and gravel, moist, loose (Northeast end of Test Pit)	NA			Sample collected at base for grain size analysis (TP-2). In-situ testing completed in auger hole advanced at 225.1 masl using a Guelph Permeameter.

Test Pit Terminated at 2.9 mbgs

Comments	***Water Conditions in Test Pit***	
Easting: 609643 Northing: 4914043	☐ Wet upon completion ☑ Dry upon completion	

JOB No.	15-010
TEST PIT No.	TP-1 / TP-1A
FIELD STAFF	A. Turner & S. Yerbury

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

TEST PIT LOG

Project Name/ Project Client	Pioneer Trail, Fernbrook Homes	**Project Address**	70 Pioneer Trail, City of Barrie, ON	**Date**	June 23, 2022
Test Pit Number	TP-2	**Contractor**	Ground Breakers Contracting	**Elevation**	226.5
Equipment	Excavator	**Test Pit Size**	6.0 x 3.0 (L x W)	**Datum**	Ground Surface
Temperature	25°C	**Weather**	Sunny	**Sample Type**	Soil

Depth		**Soil description**	**Samples**		**Screening Parameters**	**Remarks / Chemical Analysis**
From (m)	**To (m)**		**No.**	**Depth (mbgs)**		
0 (226.5)	0.4 (226.1)	Topsoil	NA			
0.4 (226.1)	2.7 (223.8)	Sand Brown medium to coarse sand, trace silt and gravel, moist	NA			Sample collected at base for grain size analysis (TP-3). In-situ testing completed in auger hole advanced at 225.1 masl using a Guelph Permeameter.

Test Pit Terminated at 2.7 mbgs

Comments	***Water Conditions in Test Pit***	
Easting: 609631 Northing: 4914019	☑ Wet upon completion ☐ Dry upon completion	saturated at 2.4 nbgs

JOB No.	15-010
TEST PIT No.	TP-2
FIELD STAFF	A. Turner & S. Yerbury

GEI Consultants

June 30, 2022

Azimuth Environmental Consulting Inc.
642 Welham Road
Barrie, Ontario
L4N 9A1

Attn: Colin Ross

RE: Ref. No 15-010
T-Time Analyses

Dear Mr. Ross,

GEI Consultants (GEI) was provided with three (3) soil samples on June 24, 2022 to conduct grain size analyses to determine the percolation rates of the tested soils (T-Time analysis).

The delivered samples were identified as follows;

- TP1 GS2, 1.1 – 1.4 m
- TP2 GS1, 1.2 – 1.4 m
- TP1 GS1, 1.2 – 1.4 m

Three grain size distribution curves were developed by testing the above referenced soil samples in accordance with applicable Ontario Laboratory Standards in reference to ASTM D6913 (sieve analysis) and ASTM D7928 (sedimentation / hydrometer analysis). The result of the laboratory test and graphical representation of the grain size analyses are enclosed.

Determination of percolation rate are based on the "*Ministry of Municipal Affairs and Housing (MMAH) Supplementary Guidelines SB-6, Percolation Time and Soil Descriptions, September 14, 2012*". Based on this document, a summary of the result and the estimated percolation rate of the soil is as follows:

Client ID	GEI Sample ID	Soil Description (MIT)	USCS Soil Classification	Estimated Percolation Rate or "*T-Time*" (mins/cm)	Estimated Infiltration Rate (mm/hr)
TP1 GS2, 1.1 – 1.4 m	4212	SILT AND CLAY, Trace Sand	C.L.	>50 mins/cm	<12 mm/hour
TP2 GS1, 1.2 – 1.4 m	4213	SAND, Trace Gravel, Trace Clay	S.P.	3 mins/cm	200 mm/hour

Client ID	GEI Sample ID	Soil Description (MIT)	USCS Soil Classification	Estimated Percolation Rate or "*T-Time*" (mins/cm)	Estimated Infiltration Rate (mm/hr)
TP1 GS1, 1.2 – 1.4 m	4214	SAND, Some Silt	S.P. - S.M.	8 mins/cm	75 mm/hour

It is noted that percolation time not only varies based on the grain size distribution but is also influenced by other soil characteristics such as the density of the soil, the structure of the soil, the percentage/mineralogy of clay, the plasticity of the soil, the organic content of the soil, and the groundwater table level which are not expressly calculated as part of a grain size analysis.

No field investigation was conducted by GEI in conjunction with the above testing and did not witness the depth or location in which these samples were obtained. GEI is providing the percolation rates as factual information, to be used in design by a qualified professional with due regard to the limitations as indicated above.

We trust this information is sufficient for your present purposes. Should you have any questions concerning the above, or can be of any further assistance, please do not hesitate to contact the undersigned.

Yours truly,
GEI Consultants

Alexander Winkelmann, P.Eng.
Geotechnical & Earth Sciences Manager
(705) 229-4298
awinkelmann@geiconsultants.com

Enclosures (3)

Grain Size Analysis (T-Time)

ENCLOSURE 1

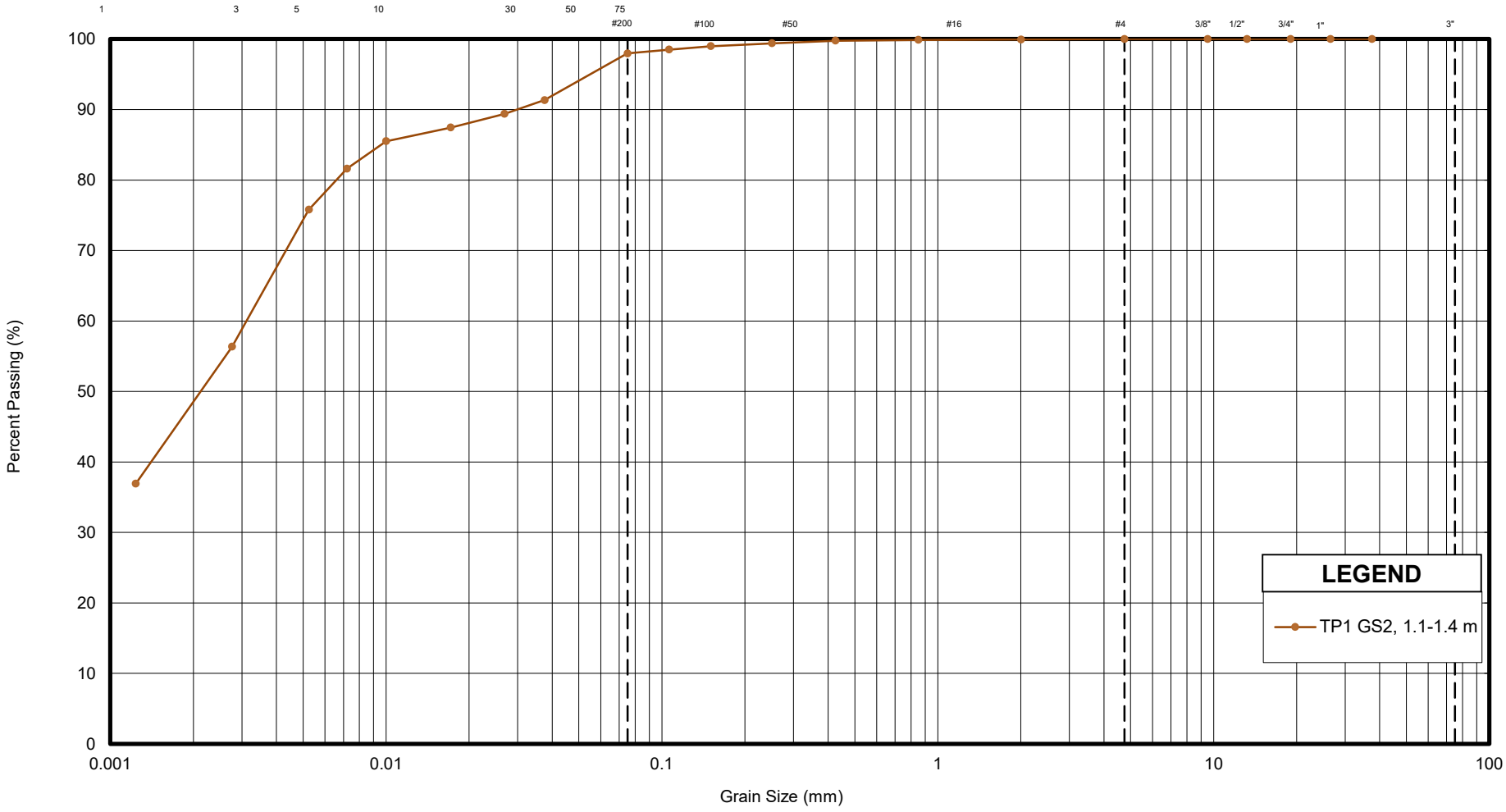
Grain Size Analysis (T-Time)

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

GRAIN SIZE IN MICROMETERS

SIEVE DESIGNATION (IMPERIAL)



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
TP1 GS2	SILT AND CLAY, Trace Sand (C.L.)	-	2	49	49	-	-	0.003	-	-

GEI Consultants

GRAIN SIZE DISTRIBUTION - Azimuth Environmental 15-010

SILT AND CLAY

FIGURE No.

REF. No. 2005133

DATE June 2022

ENCLOSURE 2

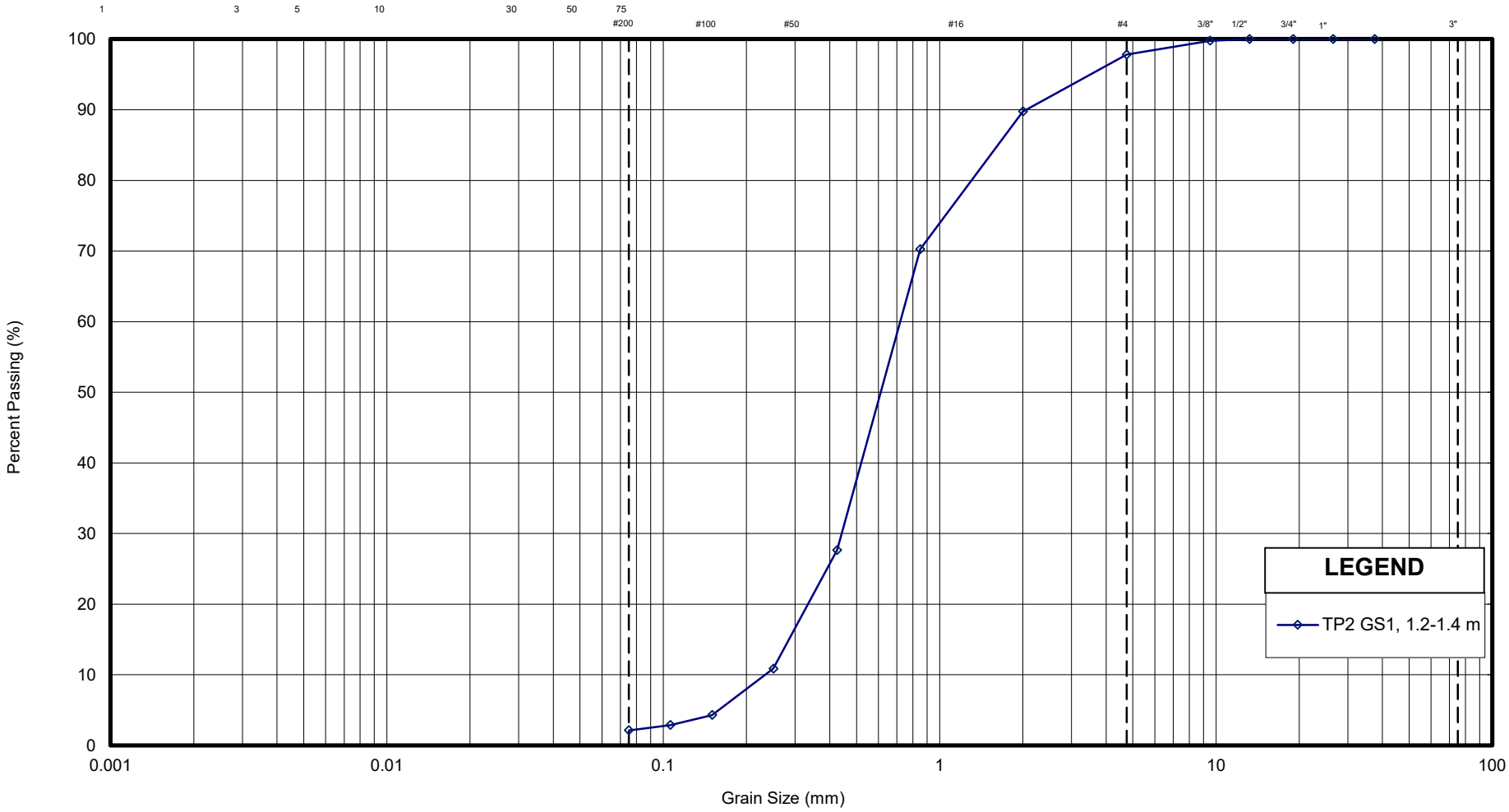
Grain Size Analysis (T-Time)

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

GRAIN SIZE IN MICROMETERS

SIEVE DESIGNATION (IMPERIAL)



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
TP2 GS1	SAND, Trace Gravel, Trace Clay (S.P.)	2	96	2	-	0.233	0.441	0.719	3.1	1.2

GEI Consultants

GRAIN SIZE DISTRIBUTION - Azimuth Environmental 15-010

SAND

FIGURE No.

REF. No. 2005133

DATE June 2022

ENCLOSURE 3

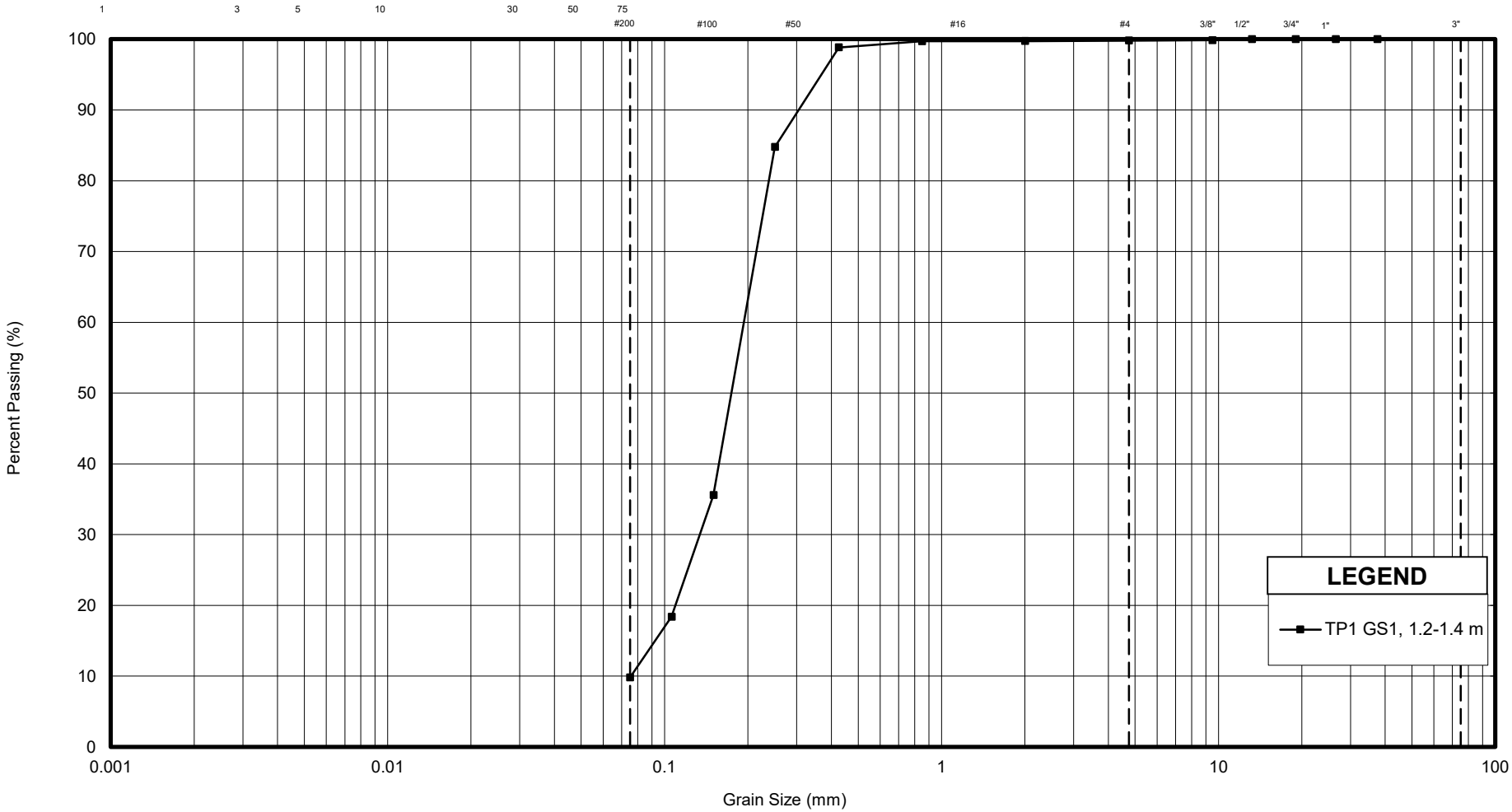
Grain Size Analysis (T-Time)

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse

GRAIN SIZE IN MICROMETERS

SIEVE DESIGNATION (IMPERIAL)



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
TP1 GS1	SAND, Some Silt (S.P. - S.M.)	-	90	10	-	0.075	0.134	0.193	2.6	1.2

GEI Consultants

GRAIN SIZE DISTRIBUTION - Azimuth Environmental 15-010

SAND

FIGURE No.

REF. No. 2005133

DATE June 2022