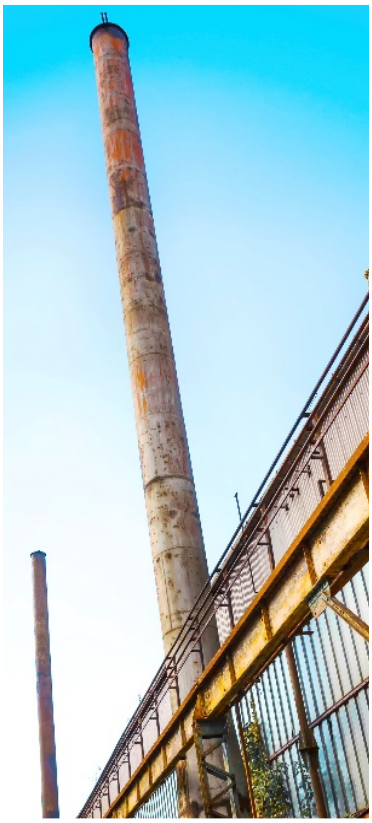
Geotechnical Investigation Report

Proposed Residential Development
Turner Street
Millbrook, Ontario

Report for
Veltri and Son Limited



Executive Summary

This report presents the results of a geotechnical investigation that was conducted in support of the design and construction of a planned residential development being considered for a site situated at the north end of Turner Street in Millbrook, Ontario (herein referred to as “the Property” and “the Site”). The Site encompasses an area of approximately 11.062 hectare (27.3 acres) and is currently undeveloped. The planned development will consist of seventy-five (75) individual lots that will support either single detached residential homes or semi-detached residential buildings and paved access roads. The development will be municipally serviced with piped potable water (water main) and sanitary sewer. GHD Limited (GHD) was retained by Veltri and Son Limited (the Client) to complete this geotechnical and hydrogeologic investigation.

The study has included a site inspection, advancement of test holes (boreholes and test pits), soil sampling, water level monitoring, a well survey to compliment a review of available Ministry of the Environment and Climate Change (now known as Ministry of the Environment, Conservation and Parks (MOECP)) well records, hydraulic conductivity testing and a water balance evaluation based upon preliminary conceptual information.

In summary, the Site is generally underlain by topsoil and then silty sand and sandy silt till. A permanent shallow groundwater table was not observed. It is our opinion that there will not be significant constraints for the proposed residential development from the seasonal variations of groundwater as the water can be handled with appropriate engineering techniques. It is expected that groundwater will generally be below the depth of the future development, although seepage may be encountered in deeper excavations or foundations. Seepage is expected to be seasonal in nature. If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000L/day is required during the construction stage, the Environmental Activity Sector Registry (EASR) must be completed. In summary, the proposed residential development is suitable from a hydrogeologic perspective.

There were no drinking water wells located within 250m of the Site from the MOECP well records or from the supplemental well survey conducted by GHD. There are minor impacts expected to groundwater and surface water as a result of the future development provided that appropriate planning (i.e. incorporation of LIDs as supported by the water balance calculations), mitigation measures and proper construction techniques are considered.

From a geotechnical perspective, the Site is suitable for construction of the proposed development including one to two-storey residential buildings, associated servicing and paved roadways. Detailed recommendations are provided in subsequent sections of this report.

The general location of the Site is illustrated on the Vicinity Plan, Figure 1. The location with respect to surrounding roads and watercourses is illustrated on the Property Plan, Figure 2. Specific details of the Site and surrounding properties can be reviewed on the Plot Plan, Figure 3. A preliminary plan of the proposed development is provided on the Concept Plan, Figure 4. The borehole and test pit locations are illustrated on the Test Hole Plan, Figure 5. These plans and other figures can be reviewed in the Enclosures section.

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1. Introduction

This report presents the results of a geotechnical investigation that was conducted in support of the a proposed residential development being considered for a site situated at the north end of Turner Street in Millbrook, Ontario (herein referred to as “the Property” and “the Site”). Geographically, the Site is located on Part Lot 11, Concession 5 in the former Township of Cavan, now Township of Cavan Monaghan, County of Peterborough. The Property encompasses an area of approximately 11.062 hectare (27.3 acres) and is currently undeveloped. The planned development will consist of seventy-five (75) individual lots that will support either single detached residential homes or semi-detached residential buildings and paved access roads. The development will be municipally serviced with piped potable water (water main) and sanitary sewer. GHD Limited (GHD) was retained by Veltri and Son Limited (the Client) to complete this geotechnical investigation which includes a hydrogeologic component.

The general location of the Site is illustrated on the Vicinity Plan, Figure 1. The location with respect to surrounding roads and land use is depicted on the Property Plan, Figure 2. Specific details of the Site and surrounding properties based on recent aerial photography is presented on the Plot Plan, Figure 3. A preliminary plan of the proposed development is provided on the Concept Plan, Figure 4. The borehole and test pit locations are illustrated on the Test Hole Plan, Figure 5. These plans and other figures can be reviewed in the Enclosures section.

2. Scope of Investigation

The purpose of the investigation was to define the prevailing hydrogeologic and geotechnical conditions at the Site. The hydrogeologic aspects of the study were completed to investigate the subsurface soil stratigraphy, groundwater movement, to assess groundwater supplies and evaluate potential impacts from the proposed development and related construction. The geotechnical investigation was conducted to provide recommendations relevant to earthwork construction, dewatering, foundation and slab on grade design, buried service installation and pavement structure. The following scope of work was performed to accomplish the foregoing purposes.

1. Reviewed available background information relevant to the Site such as geologic, physiographic and water resources reports and maps.
2. Carried out an inventory of available well record data on file with the Ministry of the Environment and Climate Change (MOECC), now known as the Ministry of the Environment, Conservation and Parks (MOECP) for the immediate area to evaluate the physical characteristics of the aquifer complexes that underlie the region. A field survey of the general area was carried out to supplement the MOECP data.
3. A walkover inspection was conducted to review surficial ground characteristics.

4. The subsurface conditions were explored by advancing, sampling and logging a total of ten (10) boreholes and ten (10) test pits. The subsurface conditions were recorded and are summarized in detail in Appendix A. The boreholes were advanced to depths ranging from 4.1 to 9.6m. The test pits were excavated to depths that varied from 2.7 to 3.7m. A monitoring well was installed in three (3) of the boreholes to facilitate water level measurements and further soil testing. Two (2) shallow standpipes were installed to explore for the presence of a shallow water table.
5. Falling head (slug) tests were completed at all three (3) monitoring well and two (2) standpipe locations to evaluate hydraulic conductivity of the subsoils. The infiltration rate of the upper vadose zone was evaluated based on the soil type observed and in-situ testing.
6. Carried out laboratory analyses of materials encountered including grain size testing and moisture content determinations of representative soil samples.
7. Obtained representative groundwater samples that were submitted for chemical testing to determine background chemistry.
8. Completed a water balance that considers pre- and post-development conditions and evaluates groundwater baseflow conditions based on a preliminary conceptual plan.
9. Prepared a detailed report using engineering analyses of the acquired data outlining our conclusions and recommendations presented herein.

The boreholes were advanced using a track mounted drill rig equipped with continuous flight, solid stem power augers. Representative, disturbed samples of the strata penetrated were obtained using a split-barrel, 50mm outer-diameter (OD) sampler advanced by a 63.5 kg hammer dropping approximately 760 mm. The results of these standard penetration tests (SPT's) are reported as "N" values on the borehole logs at the corresponding depths. Samples were also obtained directly form augers cuttings. The test pits were conducted using a track mounted excavator.

Soil samples obtained from the test holes were inspected in the field immediately upon retrieval for type, texture, and colour. All test holes were backfilled following completion of the fieldwork. All samples were sealed in clean plastic containers and transported to the GHD laboratory for further visual-tactile examination, and to select appropriate samples for laboratory analysis.

3. Project Details

The preliminary conceptual plan is provided as Figure 4 (based on a Concept Grading Plan prepared by D.G. Biddle & Associates Limited (Drawing No.CGP-1). Other information from D.G. Biddle & Associates Limited indicate that the overall area of the Site is 11.062 ha (27.3 acres). It is GHD's understanding that the proposed development will consist of seventy-five (75) individual lots that will support either single detached residential homes or semi-detached residential buildings and paved access roads. GHD has assumed that the structures will have one-level basements. The development will be municipally serviced for potable water and sanitary sewers.

4. Site Conditions

4.1 General

The field program consisted of a site inspection, soils investigation, hydraulic testing, and measurement of water levels in the monitoring wells and standpipes. The boreholes were drilled on July 17 and 18, 2018. The test pits were excavated on August 14, 2018. Borehole and test pit records and physical test results of representative soil samples are presented in Appendix A. A site reconnaissance was conducted by GHD prior to the subsurface investigation to observe the general surficial characteristics of the Site. The southern, eastern and part of the northern portions of the Site was noted to be covered with a dense growth of trees and bush.

The Property is irregular in shape and is bounded by existing residential lots to the south and vacant, bush covered land to the east and north. A former Provincial penitentiary occupies lands to the west. As depicted by Figures 2 and 4, the topography in the area is influenced by a hill that occurs in the neighbouring property to the west. The ground surface across the Site is sloping towards the east/southeast. Local relief across the Site is on the order of 20m. Small tributaries to Baxter Creek occur in the lowland areas east of the Site. Baxter Creek exists approximately 1km further east. There are no structures present on the Property.

4.2 Subsurface

4.2.1 Regional Physiography and Geology

The Property is situated in the physiographic region known as the Peterborough Drumlin Field (Chapman and Putnam, 1984) just north of the Oak Ridges Moraine. As illustrated on the Figure 7, the Site exists within a sand plain with drumlinized till plains to the northwest and southeast. The Ontario Geological Survey information (Figure 9) indicates that the Quaternary geology for the area is glaciofluvial ice-contact deposits. The surficial geology (Figure 8) is comprised of foreshore-basinal deposits exist over the majority of the Site. An exception is the southeast corner which is described as older alluvial deposits.

A review of available MOECP well records identified two (2) well records on the Site (near the southeast corner which were not observed during our field activities) and an additional twenty-one (21) well records within 0.25km (including three (3) abandonment records and nine (9) records for monitoring wells). The well records indicate the presence of sandy clay with variable amounts of gravel which is interpreted to be glacial till. An occasional well reported sand and gravel. The well records considered are provided and shown in Appendix B. Physical and hydraulic data are presented on some of the MOECP well records. The water well information is discussed in further detail in Section 5.1.

4.2.2 Local Geology

The subsurface stratigraphy was investigated by drilling ten (10) boreholes on July 17 and 18, 2018. Monitoring wells were installed in three (3) of these boreholes to facilitate water level measurements and testing. Ten (10) shallow test pits were excavated on August 14, 2018 in areas between the boreholes. The locations of the test holes are illustrated on the Test Hole Plan, Figure 5. Details of the subsurface conditions encountered are graphically presented in Appendix A. It should be noted that the boundaries between the strata have been inferred from the test hole observations and non-continuous samples. They generally represent a transition from one soil type to another, and should not be inferred to represent an exact plane of geological change. Further, conditions may vary between and beyond the test holes.

The soils encountered generally consisted of topsoil underlain by silty sand and then glacial till. Isolated layers and sand and gravel were encountered sporadically throughout the Site. The surficial layer of topsoil was encountered in all twenty (20) test holes and ranged in thickness from 180 to 380mm. This soil was observed to be in a damp, loose state, with a silty, highly organic content. As such, it is expected to be devoid of any structural engineering properties.

A thin layer of sand and gravel was found exist beneath the topsoil in BH-1. A similar deposit was encountered at depth in borehole BH-4 and test pit TP-7. The sand and gravel layer was found to vary in thickness from 0.5m (BH-1) to 3.2m (BH-4). At TP-7, the layer also contained occasional cobbles and boulders. The sand and gravel was light brown to brown in colour and existed in a damp to moist state based on in-situ moisture contents that ranged from 1 to 2% by weight. SPT N values obtained from within the sand and gravel layer varied from 16 to over 100 blows/300mm indicating a compact to very dense in-situ state of relative density.

Silty sand was encountered below the topsoil in remaining nineteen (19) test holes. Where penetrated, the silty sand was found to range in thickness from 0.3 to 4.7m. The sandy silt was not penetrated in test pits TP-1, TP-3, TP-TP-7, TP-9, and TP-10. The silty sand graded to sandy silt in TP-4. A grain size distribution analysis was conducted on a representative sample of the silty sand. The results are presented in Appendix A and summarized in Table 4.1. The results suggests the following composition: 0% gravel, 83 % sand, and 17 % silt and clay-sized particles (Unified Soil Classification System (USCS)). Moisture content tests conducted on samples of the sandy silt yielded values ranging from approximately 1 to 23 % moisture by weight indicating that exists in a damp to wet state. SPT N values obtained from within the silty sand layer varied from 1 to over 100 blows/300mm, indicating a variable, very loose to very dense in-situ state of relative density.

Glacial till was encountered in fourteen (14) of the twenty (20) test holes. The till was found to exist beneath the sand and gravel in BH-1 and beneath the silty sand. The till was not encountered in test pits TP-1, TP-3, TP-4, TP-7, TP-9 or TP-10. The till was brown to grey in color and generally consisted of sandy silt containing varying amounts of gravel and clay. Occasional cobbles were encountered in the till at some borehole locations. The till exists in a generally moist to wet condition as indicated by moisture contents ranging from approximately 1 to 22% moisture by weight. The relative density of the till is described as very loose to very dense based on SPT N values that ranged from 3 blows/300mm to over 100 blows/300mm. GHD notes that the N-value of 3 blows/300mm was only recorded for one (1) sample obtained in BH-5. The remaining samples yielded N-values of 10 blows/300mm or greater.

Grain size distribution analyses conducted on three (3) representative samples of the till suggests the following compositional ranges: 2 to 9% gravel, 16 to 53% sand, and 45 to 82% silt and clay-sized particles (USCS). Hydrometer analyses conducted on two (2) of these samples suggest that the till contains 43 to 64% particles between 5 and 75 μm in size.

Intermittent layers of sand were found to exist in five (5) of the test holes, i.e. BH-1, BH-4, BH-5, TP-7, and TP-10. Where penetrated, the sand varied in thickness from 0.3m (BH-1) to 2.3m (BH-4). The SPT N values in the sand varied from 45 blows/300mm to in excess of 100 blows/300mm indicating a dense to very dense in-situ state of relative density. Moisture content tests conducted on samples of the sand yielded values ranging from 2 to 18% moisture by weight. The sand was observed to be wet in BH-1, BH-4, and BH-7.

Table 4.1 Grain Size Distribution Summary

Location	Depth (m)	Grain Size Distribution				Observed Soil Unit
		%Gravel	%Sand	%Fines		
				%Silt	%Clay	
BH-2, SS-4	2.3 – 2.7	2	16	64	18	Sandy Silt Till
BH-3, SS-2	0.8 – 1.2	0	83	9	8	Silty Sand
BH-4, SS-2	0.8 – 1.2	9	21	43	27	Sandy Silt Till
BH-10, SS-4	2.3 – 2.7	2	53	45		Sandy Silt Till

Notes: %Fines indicates silt and clay particles; grain size distribution based on Unified Soil Classification System.

4.2.3 Groundwater

Groundwater seepage was observed in seven (7) boreholes (BH-1, BH-4, BH-6, BH-7, BH-8, BH-9, and BH-10) at depths ranging from 1.4 to 7.6m during drilling operations. When encountered, seepage was generally noted either within or above the till. GHD notes that artesian groundwater conditions were not encountered in any of the test holes. In addition, seepage was not encountered in any of the ten (10) test pits. Monitoring wells were installed in three (3) boreholes (BH-1, BH-4, and BH-8) in order to facilitate monitoring of groundwater levels. In addition, a standpipe piezometer was installed adjacent to BH-4 and BH-8 to determine if a shallow water table is present beneath the Site. The standpipes remained dry during the course of the investigation. A summary of the monitoring well details is provided in Table 4.2.

Table 4.2 Summary of Monitoring Well/Piezometer Information

Location	Depth of Well (m)	Pipe Stick-Up (m)	Effective Well Screen Interval (m)	Water Seepage Depth (m)
BH-1	4.6	0.64	3.1 – 4.6	4.6
BH-4	8.4	0.66	8.4 – 6.9	7.6
BH-4 standpipe	1.4	0.71	0.6 – 1.4	Not observed
BH-8	4.5	0.69	3.0 – 4.5	1.4
BH-8 standpipe	1.5	0.79	3.1 – 4.6	1.4

Groundwater potentiometric levels were measured on August 22, 2018 in the installed monitoring wells. The data has been plotted on Figure 6 and summarized in Table 4.3.

Table 4.3 Potentiometric Water Level Summary

Location	Ground Elevation (m)*	Water Level (m) August 22, 2018	GW Elevation (m) August 22, 2018
BH-1	246.0	4.5	241.5
BH-4	250.9	7.9	243.0
BH-8	241.5	2.1	239.4

Notes: m = metres; GW = groundwater; (*) Elevations interpreted from contours on Drawing CGP-1 by D.G. Biddle & Associates Limited. The elevations provided are for the purposes of evaluating groundwater elevation and flow direction and should not be relied upon as a legal survey or topographic elevation survey.

The potentiometric elevations range from approximately 250.9 to 241.5m indicating a moderate horizontal gradient. Based on the water level data collected and the surrounding topography, the overall shallow groundwater flow direction is to the southeast towards Baxter Creek. The direction of shallow groundwater movement is illustrated on the Groundwater Elevation plan, Figure 6. It is expected that groundwater seepage will be encountered intermittently at depths ranging from 1.4 to 7.6m (similar to what encountered during the subsurface explorations). It should be noted that groundwater levels are transient and tend to fluctuate with the seasons, periods of precipitation and temperature.

4.2.4 Water Quality

Groundwater samples were collected from monitoring wells installed in BH-4 and BH-8 for the purpose of determining background water quality. Certificates of chemical analyses are presented in Appendix D. The water quality data are summarized and compared with the Ontario Drinking Water Standards (ODWS) in Table 4.4.

Table 4.4 Water Quality Summary

PARAMETER	Monitoring Well		ODWS		
	BH-4	BH-8	MAC	IMAC	AO/OG
Alkalinity (as $CaCO_3$)	163	174	--	--	30 to 500
Ammonia - Total	0.06	0.01	--	--	--
Calcium	56.9	50.1	--	--	--
Chloride	18.3	<0.5	--	--	250
Colour (T.C.U.)	<2	<2	--	--	5
Conductivity (mS/cm)	367	394	--	--	--
Copper	0.008	0.009	--	--	1.0
Fluoride	0.3	<0.1	1.5	--	--
Hardness (as $CaCO_3$)	**170**	**203**	--	--	80 to 100
Iron	<0.005	<0.005	--	--	0.3
Magnesium	6.71	18.9	--	--	--
Manganese	0.025	0.152	--	--	0.05
Nitrite (N)	<0.1	<0.1	1.0	--	--
Nitrate (N)	<0.1	<0.1	10	--	--
pH (units)	7.78	7.96	--	--	6.5 to 8.5
Potassium	3.8	2.8	--	--	--
Sodium	9.9	6.9	--	--	200
Sulphate	15	23	--	--	500
Turbidity (N.T.U.)	**624**	**20.7**	1	--	5
Zinc	<0.005	0.010	--	--	5.0

Notes: All units in mg/L (i.e. parts per million) unless otherwise noted. MAC = maximum acceptable concentration (health related); IMAC = Interim MAC (insufficient data to establish MAC or not feasible to establish MAC to desired level); AO/OG = aesthetic objective or operational guideline (not health related). **Bolded value** exceeds ODWS.

The groundwater beneath the Site is relatively hard which is common in Southern Ontario due to overburden materials containing calcium. Turbidity is related to the monitoring wells which may require further development to lower this parameter. In general, the water quality is relatively good with no indication of organic pollution.

4.2.5 Hydraulic Conductivity

Hydraulic conductivity (K) testing was completed at monitoring wells installed in boreholes BH-1 BH-4, and BH-8 and the standpipes constructed adjacent to BH-4 and BH-8 on August 14, 2018. The testing consisted of falling head testing by adding a measured quantity of water within the well/standpipe, and then measuring the water levels using a data logger programmed to record readings at three (3) or one (1) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each falling head test (see Appendix C for solution data).

The K values for the hydraulic conductivity testing range from on the order of 10^{-4} to 10^{-6} cm/sec. The K values from the test data indicate that the monitoring wells were screened within medium (sand) to low (till) hydraulic conductivity units. The hydraulic conductivity testing suggests that excavations within these soils are expected to yield low to little water. However, increased amounts of water may be expected when pockets or layer of sand and gravel are intersected.

For purposes of Low Impact Development strategies (Section 6.1.1), infiltration considerations of the shallow site soils is presented in this section. The evaluation was based on field observations, grain size testing data and experience. Based upon evaluation, the upper vadose zone would exhibit a field saturated hydraulic conductivity on the order of 10^{-4} cm/sec. The hydraulic conductivity value for the Site is indicative of silty sand / sandy silt material. Although LIDs can be applied to any soil type, additional testing should be considered at the detailed design stage when infiltration areas are known.

Based on the Supplementary Guidelines to the Ontario Building Code 2012, this correlates to an infiltration rate in the order of 50mm/hr and percolation times (T) on the order of 12 min/cm. It is noted, however, that slight variations in the soil stratigraphy may cause variations in the permeability of the soil in both vertical and horizontal orientations.

5. Hydrogeology

The hydrogeology of the area is characterized by rolling topography of soils that generally consisted of silty sand and sandy silt till with intermittent layers of sand and gravelly sand. Seasonal water is expected to flow within the sandy layers. Limited vertical migration is expected within the till. Only a minor portion of the existing infiltration is expected to recharge the deeper aquifers that are confined below the till. Information regarding groundwater characteristics of the immediate area was obtained from an inventory of well records. A total of fifteen (15) well records were found to be available within 0.25km of the Site. The well records indicate the presence of clay with sand, gravel and stones (inferred to be till of low permeability) as the predominant shallow soil. Bedrock was not encountered in any of the local wells. The well records considered are provided and shown in Appendix B. Physical and hydraulic data are presented on the MOECP well records. The records include one (1) dug/bored well twenty-two (22) drilled overburden wells.

5.1 Existing Local Water Supplies

Nearby surrounding lands are generally undeveloped treed areas or residential properties. The existing residential lands are municipally serviced. In addition, the proposed development will be municipally serviced. The compiled MOECP data included twenty-three (23) well records within 0.25km of the Site. The information included three (3) abandonment records and nine (9) records for monitoring wells with a lack of detailed information. The well records considered are provided and shown in Appendix B. Physical and hydraulic data are presented on some of the MOECP well records.

The well records indicate the presence of sandy clay with variable amounts of gravel which is interpreted to be glacial till. An occasional well reported sand and gravel. The information indicates the presence of two (2) principal aquifer systems:

1. An unconfined shallow water table system within the shallow sand/till tapped by a shallow dug/bored well; and
2. Deeper overburden of sand and gravel within the till tapped by the majority of the drilled wells.

The groundwater was generally described as "fresh" in the well records reviewed. The drilled overburden wells comprised 96% of the well records reviewed and extend to an average depth of 28.1m (92.4 feet). The average depth at which groundwater was encountered was 16.0m (52.5 feet). The drilled overburden wells reportedly produce test yields that averaged in excess of 454 L/min (100 igpm). Artesian (flowing) conditions were reported in one (1) of the drilled wells situated approximately 0.2km south of the Site. The MOECP well data has been summarized in Table 5.1.

Table 5.1 Summary of MOECP Water Well Data

Total Number of Wells Inventoried:	23
Dug/Bored Wells:	1 (4%)
Drilled Wells (Overburden):	22 (96%)
Drilled Wells (Bedrock):	0 (0%)

Parameters	Statistical Summary		Statistical Summary	
	Dug / Bored Wells		Drilled – Overburden	
WELL YIELDS				
Range	N/A	N/A	11.4 to 1321.1 L/min	2.5 to 291 Igpm
Average	N/A	N/A	664.1 L/min	146.3 Igpm
REPORTED YIELDS	Frequency		Frequency	
Not Reported	1	100%	12	55%
Dry	0	0%	0	0%
0 to 1 Igpm	0	0%	0	0%
2 to 4 Igpm	0	0%	1	5%
5 to 9 Igpm	0	0%	2	9%
≥10 Igpm	0	0%	7	31%
STATIC WATER LEVELS				
Range	N/A	N/A	0.0 to 7.0 m	0.0 to 23.0 ft
Average	N/A	N/A	3.7 m	12.1 ft
WATER ENCOUNTERED				
Range	N/A	N/A	4.6 to 27.1 m	15.0 to 89.0 ft
Average	N/A	N/A	16.0 m	52.5 ft
WELL DEPTH				
Range	8.8 m	29.0 ft	6.1 to 44.8 m	20.0 to 147.0 ft
Average	8.8 m	29.0 ft	28.1 m	92.4 ft

Notes: Data based on MOECP well record information (see Appendix B). L/m represents litres per minute, Igpm indicates Imperial gallons per minute and m is metres.

The well records indicate that the overburden soils are generally comprised of till with varying amounts of clay, sand, gravel. To supplement the MOECP well records reviewed, GHD staff conducted a well survey of the area to investigate where private wells may still be in use (Appendix B). Seven (7) locations were surveyed as outlined in Appendix B.2. There were no drinking water wells identified in the survey of the area. Hydrogeological concerns are not anticipated based on the review of MOECP water well records and the supplemental well survey.

5.2 Source Water Protection Considerations

Where proposed developments are being planned, it is important to determine the presence of Significant Groundwater Recharge Areas (SGRAs) and Highly Vulnerable Aquifers (HVAs) in the area. These areas are protected under the Clean Water Act (2006). In general, SGRAs are defined as areas where water seeps into an aquifer from rain and melting snow, supplying water to the underlying aquifer. An HVA aquifer occurs where the subsurface material offers limited protection from contamination resulting from surface activities.

GHD considered the potential for SGRAs and HVAs by reviewing the "Source Protection Information Atlas" that is currently available through the MECP website. The published information is dated March, 2018. In general, there are no HVAs in close proximity to the Site (see Figure 10). Further, the subsurface investigation by GHD has indicated that the existing glacial till exhibits low hydraulic conductivity indicating that it has a relative lower contribution to underlying aquifer complexes.

As defined in the Clean Water Act (2006), an area is a significant groundwater recharge area if,

- the area annually recharges water to the underlying aquifer at a rate that is greater than the rate of recharge across the whole of the related groundwater recharge area by a factor of 1.15 or more; or,
- the area annually recharges a volume of water to the underlying aquifer that is 55% or more of the volume determined by subtracting the annual evapotranspiration for the whole of the related groundwater recharge area from the annual precipitation for the whole of the related groundwater recharge area.

The majority of the Site is within a SGRA with a vulnerability score of 4 (moderate) as shown on Figure 10. Exceptions include the northeast corner of the Property which is outside the SGRA. Conversely, a small portion of the south end has a vulnerability score of 6 (high). GHD notes that the planned development will not extend fully to the eastern Site limit. In addition, it is GHD's opinion that based upon the low permeability of the glacial till found at the Site, it should not be a moderate or high SGRA. Nevertheless, the development will consider maintaining pre-development infiltration. Therefore, no impacts are expected to the SGRA.

6. Conclusions and Recommendations

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered at the Site and assume that they are representative of the overall site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like.

Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor. Based on the results of the geotechnical investigation, it is our professional opinion that the Site is suitable for the proposed residential development and there is low potential for groundwater impact as a result of developing the Site. It is recommended that good construction and mitigation techniques must be used to minimize the potential for impact. Detailed conclusions and recommendations are presented in the following sections regarding the water balance and potential impacts to groundwater and surface water resources.

6.1 Hydrogeology

6.1.1 Water Balance Evaluation

An evaluation of the water balance was completed to compute the potential impacts that may occur in the recharge/discharge characteristics related to the proposed development. This evaluation is based upon a preliminary conceptual plan. The objective of the water balance is to illustrate that post-development infiltration within the developable area can meet or be close to pre-development values. The computations have used detailed parameters such as precipitation (Peterborough), regional evapotranspiration, infiltration and runoff. Weather data from Peterborough A was selected as it was the closest weather station to the Site (11.8km to the northeast). The detailed calculations can be reviewed in Appendix E. The total Site area is 11.062ha based on information provided. The following is a summary of the expected pre-development water balance values for the proposed residential development based on the current information.

Pre development Water Balance

The pre-development water balance incorporated the existing soils, slope and ground cover areas. The infiltration factor for the area was calculated from the table of values presented in the "Land Development Guidelines" (MOEE, 1995). It is based on three sub-factors which are:

- Topography sub-factor;
- Soil sub-factor; and
- Cover sub-factor.

The slope of the untried area will be considered as "rolling" (slope of 2.8 to 3.8m per km). In comparison, the treed areas were considered as "hilly" (slope of 28m to 47m per km). The soils are generally comprised of silty sand / sandy silt till material and will be considered a medium clay and loam as per the water balance calculations. Table 6.1 summarizes the expected pre-development water balance values for the Site.

Table 6.1 Pre Development Summary

Total Precipitation (Peterborough A):	- 855 mm/year
Regional Evapotranspiration:	- 561 mm/year
Recharge Available:	- 294 mm/year
Area of Recharge Available (Site):	- 110,620 m^2
Total Water Surplus:	- 32,536 m^3/year
Total Estimated Infiltration:	- 16,268 m^3/year
Total Estimated Runoff:	- 16,268 m^3/year

Based upon these values, the Site infiltrates on the order of 16,268m^3 per year (147 mm/year).

Post Development Water Balance (No Enhancements)

The computation of the water budget was repeated for the proposed development assuming no mitigation techniques, that is, runoff from impervious surfaces is unrecoverable and not infiltrated into the ground. The anticipated impact of the development is related to increased runoff from imperious surfaces, such as asphalt surface for the proposed access roads and the building rooftops. These are assumed to be impervious surfaces with zero infiltration capacity in this model. A summary of the computations is provided in Table 6.2.

Table 6.2 Post Development Summary (No Enhancements)

Area of Site:	- 110,620 m^2
Impervious Surfaces:	- 29,855 m^2
Area Available for Infiltration:	- 80,765 m^2
Total Water Surplus:	- 44,185 m^3/year
Total Estimated Infiltration:	- 11,605 m^3/year
Infiltration % Difference (pre- vs. post-):	- (-29%) (decrease)
Total Estimated Runoff:	- 32,580 m^3/year
Runoff % Difference (pre- vs. post-):	- 100% (increase)

The impermeable surface area of proposed paved areas and building rooftops was estimated based on the concept plan presented in Figure 4. Under this scenario, the total infiltration volume decreased by 29% and runoff volume increased by 100%. Within the areas evaluated, the infiltration has reduced and the runoff increased versus the pre-development values. Groundwater base flow would be expected to decrease over time in this scenario. However, recharge via infiltration through the underlying till to the lower aquifer from these lands is expected to be minor. Based upon this scenario, mitigative strategies are required to minimize infiltration losses and reduce storm water runoff. The following section discusses the water balance after considering enhanced infiltration options.

Post Development Water Balance (Enhanced Infiltration)

The post-construction water budget computations were repeated considering enhanced infiltration options which are also known as Low Impact Development (LID) technologies. These technologies include and are not restricted to rainwater harvesting, downspout disconnection, infiltration trenches, vegetated filter strips, bioretention, permeable pavement, enhanced grass swales, dry swales and perforated pipe systems in order to balance the water budget and maintain any wetland features including nearby creeks. The shallow subsurface soils are topsoil underlain by silty sand / sandy silt till material. It is noted that LIDs can work in any soil type. The primary enhancement for this Site is to promote infiltration and to move water from impervious surfaces to areas where infiltration can occur.

The post-development water balance was modelled to include the disconnection of downspouts from storm sewers and directing water from the buildings roof top to sodded areas or undeveloped grass areas which can be enhanced with increased topsoil depths. A summary of the post-construction water budget with enhancements for infiltration is presented in Table 6.3.

Table 6.3 Post Development Summary (With Enhanced Infiltration)

Area of Site:	- 110,620 m^2
Total Water Surplus:	- 44,185 m^3/year
Total Estimated Infiltration:	- 16,268 m^3/year
Infiltration % Difference (pre- vs. post-):	- (0%) (nil)
Total Estimated Runoff:	- 27,917 m^3/year
Runoff % Difference (pre- vs. post-):	- 72% (increase)

Under this scenario, the total infiltration volume is maintained and runoff volume increased by 72% compared to pre development values. Within the areas evaluated, the infiltration and runoff amounts have improved compared to post development (no mitigation) numbers. However, a runoff volume increase of 72% is still present. Runoff increase compared with the pre-development conditions will need to be managed as per the storm water management plan.

It is expected that recharge via infiltration through the till to the lower aquifers is a small component and impacts to the groundwater aquifer are expected to be insignificant. It is our professional opinion that there would be minimal impact to the local groundwater regime and minimal impact to the down-gradient surface water regime from a quantity perspective.

6.1.2 Impact on Groundwater Baseflow

The importance of the groundwater baseflow is that it provides discharge to water bodies, wells and may have some hydraulic functionality with the on-site features. Water balance calculations suggest that the infiltration to the subsurface can be kept near pre-development values if appropriate LID technologies are used. It is GHD's professional opinion that there is not expected to be a significant impact to the shallow groundwater baseflow that may be supplying baseflow to the down-gradient Baxter Creek.

6.1.3 Impact on Surface Water Bodies

The impacts to surface water bodies are related to the reduction of the groundwater baseflow and water quality concerns related to human activities such as salting of paved areas, minor fuel and oil leaks, fertilizer application, etc. It is expected that there will be minor impacts to groundwater and neighbouring surface water bodies. Runoff from the development will be collected by an internal storm sewer system and treated using a stormwater management pond or other LID strategies. Further details are provided within the Functional Servicing Report regarding the stormwater management.

6.1.4 Mitigation Measures

Several mitigative techniques have been recommended in order to address concerns relating to the potential for impact to the base flow. The impact and mitigation measures can be arranged into two (2) distinct categories: construction phase and operational phase. Prior to construction, storm water management techniques should be incorporated to control additional surface water runoff and permit enhanced infiltration into the surrounding ground. Storm water management techniques will minimize the potential for groundwater impact and also minimize the amount of silt or other fine-grained soil particles becoming mobile and entering into down-gradient areas.

The installation of strategically placed silt fences will filter any excess storm water runoff prior to entering the infiltration areas.

During the operational phase of the development, it is expected that storm water excess will be controlled as indicated in the Functional Servicing Report. It is recommended that all roof leader drains of the future residential buildings be allowed to drain onto the ground surface for infiltration. Swales may be required in some areas to divert the runoff water where required. Other LIDs will be required to reduce storm water runoff and will be evaluated by the detailed design.

6.1.5 Servicing

Private services for water and septic disposal are not considered as the Site will be connected to municipal services. However, any wells at the Site (including monitoring wells) are recommended to be decommissioned in accordance with Ontario Regulation 903 prior to development of the Site.

6.1.6 Dewatering for Construction

Based on groundwater-related observations and the depth of excavations expected for this development, it is generally anticipated that groundwater seepage will be encountered. It is expected that pumping from collection sumps to an acceptable outlet will control this expected groundwater infiltration. However, should any excavations require more intensive dewatering or groundwater control, the use of filtered sumps, or other suitable method of dewatering and/or sheet piling is recommended.

For dewatering purposes, hydraulic conductivities on the order of about 10^{-4} to 10^{-6} cm/sec may be expected for the subgrade soils encountered in our boreholes. It should be noted that hydraulic conductivities can vary over a vertical and horizontal extent, and may be outside the stated range if pockets or seams of soils with different grain size (e.g. sand seams) are encountered.

If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000 L/day is required during the construction stage, the Environmental Activity Sector Registry (EASR) must be completed. The EASR streamlines the process and water pumping may begin once the EASR registration is completed, the fee paid and supporting document prepared. If water taking in excess of 400,000 litres/day is required, a Permit to Take Water (PTTW) must be obtained in advance. PTTW applications may take up to 90 working days for the MOECP to review and approve. The actual rate of groundwater taking performed during construction will be a function of the final design, time of year, and the contractor's schedule, equipment, and techniques.

6.2 Geotechnical

Supporting data upon which our recommendations are based have been presented in the foregoing sections of this report. The following recommendations are governed by the physical properties of the subsurface materials that were encountered and assume that they are representative of the overall Site conditions. It should be noted that these conclusions and recommendations are intended for use by the designers only. Contractors bidding on or undertaking any work at the Site should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of this factual data as it affects their proposed construction techniques, equipment capabilities, costs, sequencing, and the like.

Comments, techniques, or recommendations pertaining to construction should not be construed as instructions to the contractor. It should be noted that where the Municipality has design standards that apply to specific aspects of this project, such standards shall take precedence over any corresponding dissimilar recommendations contained herein.

The soils encountered generally consisted of topsoil over silty sand and then glacial till. Groundwater seepage was reported in seven (7) boreholes (BH-1, BH-4, BH-6, BH-7, BH-8, BH-9, and BH-10) at depths ranging from 1.4 to 7.6m during drilling operations. When encountered, seepage was generally noted either within or above the till. Ground water level measurements obtained from the installed monitoring wells on August 22, 2018, ranged from 2.1 to 7.9m.

6.2.1 Site Preparation and Excavation

Any and all topsoil, vegetation, fill, disturbed earth, organic and organic-bearing material is to be stripped and removed from the access roads and building envelope areas (including floor slab areas) prior to commencing earthwork construction. Overly loose, organic, or otherwise deleterious materials will require removal and replacement with an approved backfill material. The subexcavated surface must be proof rolled and/or approved by a member of GHD prior to placement of fill or foundations. Excavations should be carried out to conform to the manner specified in Ontario Regulation 213/91 and the Occupational Health and Safety Act and Regulations for Construction Projects (OHSA). All excavations above the water table not exceeding 1.2 m in depth may be constructed with vertical, unsupported slopes. The soils encountered during this investigation are generally classed by OHSA as Type 3. As such, unsupported / unshored walls of excavations in these soils must be sloped to the bottom of the excavation, with a slope having a gradient of 1 horizontal to 1 vertical (1H:1V) or flatter, or be retained using a suitably designed shoring system. The soils located beneath the groundwater table should be considered Type 4 soils, requiring unsupported / unshored walls of excavations to be sloped at 3H:1V or flatter to the base of the excavation.

It is expected that some of the excavation spoils may be suitable for reuse as trench and/or pavement subgrade backfill provided they are free of organics and at a moisture content that will permit adequate compaction (may require prior processing such as aeration to lower the moisture content). A final review and approval to reuse any soils should be made at the time of construction.

6.2.2 Service Installation

The materials encountered during this investigation at the anticipated service invert elevations (2 to 8.5m below existing ground surface) typically consists of either silty sand or glacial till material. As such, normal compacted bedding material, placed in the Class “B” or Class “C” arrangement, is recommended for all underground services. The recommended bedding material is Granular “A” or 19 mm crusher run (angular) stone, as per Ontario Provincial Standard Specifications (OPSS). The minimum recommended bedding thickness for the underground services is 150mm. All bedding materials should be compacted to 98% of their Standard Proctor Maximum Dry Density (SPMDD).

It is recommended that cover backfilling of the underground services be accomplished using Granular “A”, sand, or other suitable material as allowed by the Municipality’s standards, to a minimum of 300mm above the pipe.

Compaction of this material should attain 100% SPMDD. It is expected that some of the excavated soils may be suitable for reuse as trench backfill, conditional upon suitable moisture content (within 2% of optimum), final review and approval by an experienced geotechnical engineer at the time of construction, and regular monitoring and inspection of such reuse throughout construction. Compaction of any native soil in service trenches is recommended to be a minimum of 98% of its SPMDD. The soils observed may require processing (such as aeration) to lower the moisture content to appropriate levels prior to being considered as backfill material.

GHD notes that the deepest planned manhole for the servicing is related to the proposed sanitary sewer in the vicinity of BH-4 (target depth of installation is 8.5m). Groundwater was measured at 7.9m on August 22, 2018 at this location. As such, some dewatering should be planned for the services at this location. A test dig is recommended in this vicinity to simulate what would be encountered by the earthworks contractor. Further recommendations related to a test dig is presented in section 6.2.7.

Trench plugs are recommended to minimize the potential for drainage through the granular bedding materials and subsequent lowering of the water table. When the sewer profiles are completed, the most suitable areas for the trench plugs should be established.

6.2.3 Foundation Design

Relevant information for final design purposes including proposed final grades, finished floor elevations, and proposed underside of foundations were not available to GHD at the time of writing this report. As such, the recommendations contained in this Foundations section must be reviewed by GHD's geotechnical engineers once such development design parameters become available. Structural loading for the proposed residential dwellings may be supported on strip and spread footings. The footings should be placed on the undisturbed, compact to very dense native soils or on engineered fill place directly on the undisturbed, compact to very dense native soils. The following Table 6.4 summarizes the depths to suitably competent native soil encountered within each borehole.

Table 6.4 Depth to Competent Bearing Native Soil

Borehole ID	Depth (mbeg) to Competent Native Soil	Borehole ID	Depth (mbeg) to Competent Native Soil
BH-1	1.0	BH-6	2.5
BH-2	1.8	BH-7	2.5
BH-3	1.5	BH-8	2.5
BH-4	1.0	BH-9	1.0
BH-5	2.5	BH-10	1.0

For preliminary design purposes, it is recommended that footings constructed on compact to very dense native soils or engineered fill be proportioned and designed using the following bearing capacities:

Table 6.5 Preliminary Bearing Pressures for Foundation Design

Parameter	Bearing Pressure			
	Compact to Very Dense Undisturbed Native Soils	Engineering Fill		
		Rock-based Fill(2)	Granular Fill(3)	Earth Borrow Fill(3)
Factored Bearing Capacity at ULS (1)	210 kPa	215 kPa	170 kPa	135 kPa
Bearing Capacity at SLS	140 kPa	150 kPa	120 kPa	95 kPa

Notes:
(1) Resistance factor Φ =0.5 applied to the ULS bearing pressure for design purposes.
(2) At least 1m of Rock-based fill. Quality of material is to be approved prior to use as engineered fill.
(3) At least 0.3m of Granular or Earth Borrow fill. Quality of material is to be approved prior to use as engineered fill.

Any engineered fill upon which foundations are placed must be a minimum thickness corresponding to the notes that accompany the above table. Rock-based fill must be completely encapsulated with suitable filter fabric to minimize any migration of fine-grained particles from surrounding soils into the voids within the rock fill.

The following is recommended for the construction of any engineered fill for the foundations:

1. Remove any and all existing vegetation, topsoil, fill, organics, and organic-bearing soils to the competent, undisturbed native soil from within the area of the proposed engineered fill.
2. The area of the engineered fill should extend horizontally 1m beyond the outside edge of the building foundations and then extend downward at a 1:1 slope to the competent native soil.
3. The base of the engineered fill area must be approved by a member of GHD prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed, and that the subgrade is suitable for the engineered fill.
4. All engineered fill material is to be approved by GHD at the time of construction. Place approved engineered fill, in maximum 300 mm lifts, compacted to 100% of its SPMDD. Any fill material placed under sufficiently wet conditions should consist of an approved, rock-based fill, with the inclusion of appropriate geotextile fabric around the rock-based fill should the rock fill contain enough voids to warrant.
5. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

All exterior foundations and/or foundations in unheated areas, should be founded at least 1.2 m below the final adjacent grade for frost protection. Foundations and walls exposed to frost action should be backfilled with non-frost susceptible granular material, and positive drainage away from the structure should be ensured.

Under no circumstances should the foundations be placed above organic materials, loose, frozen subgrade, construction debris, or within ponded water. Prior to forming, all foundation excavations must be inspected and approved by a member of GHD's geotechnical group. This will ensure that the foundation bearing material has been prepared properly at the foundation subgrade level and that the soils exposed are similar to those encountered during this investigation.

For design purposes this site is conservatively classed as Site Class C for Seismic Site Response, in accordance with the Ontario Building Code.

For drainage purposes, it is recommended that perimeter drains be installed about the structures. The subdrains would serve to drain seepage water that infiltrates the backfill, intersect the groundwater, and help relieve hydrostatic pressures due to high groundwater levels. The drains should consist of a perforated pipe, at least 150 mm in diameter, surrounded by clear, crushed stone and suitable filter protection. The drain should discharge to a positive sump or other permanent frost free outlet.

For foundations constructed in accordance with the foregoing manner, total and differential settlements are estimated to be less than 25mm.

6.2.4 Slab on Grade

The ground floor of any proposed building may be constructed as a normal slab-on-grade, on clear stone fill over native, inorganic subsoils, prepared in accordance with Section 6.2.1 of this report. The floor slab of the basement should be formed over a base course consisting of at least 150mm of 19mm angular clear stone material, compacted to a minimum of 100 % of its SPMDD. All grade increases or infilling below the clear stone should be constructed in accordance with the engineered fill steps provided in Section 6.4.3 of this report. All clear stone must be surrounded on bottom and sides by appropriate filter fabric to control the migration of fine-grained particles from surrounding soils. All fill placed as engineered fill must be inspected, approved and compaction verified by personnel from GHD.

If basements are considered, it is recommended that under floor drains consisting of 100mm diameter, perforated, filter-wrapped pipe at maximum 3m centres be installed below the clear stone. These pipes should be led into a header placed in the middle of the drainage system. The header should consist of a 150mm diameter, filter-wrapped, perforated pipe. The drainage system should appropriately drain into a positive sump or other permanent frost free outlet.

6.2.5 Basement Retaining Walls

It is recommended that free draining backfill to walls (basement) be provided. Such walls located above the groundwater table may be designed for lateral earth pressures using the following equation:

p = k (w h + q), where:

- the lateral earth pressure in kPa acting on the subsurface wall at depth h;
- k_a = the coefficient of active earth pressure;
  (= 0.3 for walls restrained from the bottom only);
  (= 0.5 for walls restrained at the top and bottom*);
- k_p = the coefficient of passive earth pressure, (= 3.0);
- w = the granular or native soil bulk density in kN/m^3;
  (= 21.0 kN/m^3 for well compacted, OPSS-approved Granular "B");
  (= 20.0 kN/m^3 for native soils);
- h = the depth (in metres) below the exterior grade at which the earth pressure is being calculated; and
- q = the equivalent value of any surcharge (in kN/m^3) acting adjacent to the walls.

  (*) This value is recommended for rigid walls retaining compacted backfill.

The recommended value for the coefficient for sliding friction between the soil and the concrete is 0.4. In addition to the above, hydrostatic forces must be taken into account in the design where the walls extend below the groundwater table. Also, any additional surcharge loading that will influence the wall must be taken into account in its design.

6.2.6 Pavement Design

As the preferred method, it is recommended that the existing fill be fully removed from beneath the proposed roadways, and replaced with an approved backfill material. This will maximize the long-term performance of the pavement structure throughout. As an alternative to this (to minimize the quantity of subexcavation and corresponding backfill), the Client may instead consider removing these materials to a minimum depth to allow for the new pavement structure at which point an assessment of the exposed soils by a member of GHD will deem whether further removal and/or placement of suitable geotextile material or other treatment is required. Overly loose, organic, or otherwise deleterious materials will require removal and replacement with an approved backfill material.

Based on the results of this investigation, we would recommend the following procedures be implemented to prepare the proposed asphalt paved access way and parking areas for its construction.

1. Remove all asphalt, topsoil, fill, organics, organic-bearing materials and other deleterious materials from the planned pavement areas either full depth (preferred), or alternatively to at least the subgrade required to allow the new pavement structure.
2. Inspect and proof roll the subgrade for the purpose of detecting possible zones of overly wet or soft subgrade. Any deleterious areas thus delineated should be replaced with approved granular material compacted to a minimum of 98 % of its SPMDD.

3. If further stabilization of the pavement subgrade is deemed necessary, either subexcavate to suitable soils and backfill with approved granular material compacted to 98% SPMDD, or place woven geotextile such as Terrafix 200W or Mirafi HP270 on the exposed pavement subgrade surface, after its approval and prior to placement of any subsequent fill.
4. Contour the subgrade surface to prevent ponding of water during the construction and to promote rapid drainage of the sub-base and base course materials.
5. To maximize drainage potential, 150 mm diameter perforated pipe subdrains should be installed below any curb lines. The pipe should be encased in filter fabric and surrounded by clear stone aggregate. It is recommended that the subdrains discharge to a suitable, frost-free outlet.
6. Construct transitions between varying depths of granular base materials at a rate of 1:25 minimum.

The subgrade materials in the proposed pavement areas will generally consist of silty sand or sandy silt till, depending on the preferred method of construction and corresponding depths of subexcavation. The frost susceptibility of these soils is assessed as being generally moderate to high. In this regard, the following minimum flexible pavement structures are recommended for the construction of the new roads.

Table 6.6 Pavement Structure

Profile	Material	Thickness (mm)		In Conformance with OPSS Form
		Light Duty	Heavy Duty	
Asphalt Surface	H.L.3	40	40	1150
Asphalt Base	H.L.8	50	50	
Granular Base	Granular “A”	150	150	1010
Granular Subbase	Granular “B”	300	450	

The following steps are recommended for optimum construction of paved areas:

1. The Granular “A” and “B” courses should be compacted to a minimum 100 percent of their respective SPMDD’s.
2. All asphaltic concrete courses should be placed, spread and compacted conforming to OPSS Form 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0 percent of their respective laboratory Maximum Relative Densities (MRD’s).
3. Adequate drainage should be provided to ensure satisfactory pavement performance.

It is recommended that all fill material be placed in uniform lifts not exceeding 200 mm in thickness before compaction. It is suggested that all granular material used as fill should have an in-situ moisture content within 2 percent of their optimum moisture content. All granular materials should be compacted to 100 percent SPMDD. Granular materials should consist of Granular “A” and “B” conforming to the requirements of OPSS Form 1010 or equivalent.

The performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible. It is noted that the above recommended pavement structures are for the end use of the project. The most severe loading conditions on pavement areas and the subgrade may occur during construction. As such, during construction of the project the recommended granular depths may not be sufficient to support loadings encountered. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavorable weather.

6.2.7 General Recommendations

Test Pit During Tendering

It is strongly recommended that test pits be excavated at representative locations of this Site during the tendering phase, with mandatory attendance of interested contractors. This will allow them to make their own assessments of the groundwater and soil conditions at the Site and how these will affect their proposed construction methods, techniques and schedules.

Subsoil Sensitivity

The native subsoils are susceptible to strength loss or deformation if saturated or disturbed by construction traffic. Therefore, where the subgrade consists of approved soil, care must be taken to protect the exposed subgrade from excess moisture and from construction traffic.

Winter Construction

The subsoils encountered across the site are frost-susceptible and freezing conditions could cause problems for the following reasons.

1. During winter construction, exposed surfaces intended to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.
2. Care must be exercised so that any sidewalks and/or asphalt pavements do not interfere with the opening of doors during the winter when the soils are subject to frost heave. This problem may be minimized by any one of several means, such as keeping the doors well above outside grade, installing structural slabs at the doors, and by using well-graded backfill and positive drainage, etc.
3. Because of the frost heave potential of the soils during winter, it is recommended that the trenches for exterior underground services be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively non-frost susceptible, and the more frost-susceptible native soils.

Design Review and Inspection

Due to the preliminary nature of the design details at the time of this report, we recommend that our firm be retained to review the foundation design and grading proposals when they are available. Geotechnical inspection and compaction testing must be carried out to ensure compliance with our recommendations.

6.3 Summary Conclusions

In summary, the proposed development area is generally comprised of topsoil underlain by silty sand and then sandy silt till. A permanent shallow groundwater table was not observed. It is our opinion that there will not be significant constraints for the proposed residential development area from the seasonal variations of groundwater as the water can be handled with appropriate engineering techniques.

It is expected that groundwater will generally be below the depth of the future development, although seepage may be encountered in deeper excavations or foundations. Seepage is expected to be seasonal in nature. If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000L/day is required during the construction stage, the EASR must be completed. In summary, the proposed residential development is suitable from both a hydrogeologic and geotechnical perspective.

There are minor impacts expected to groundwater and surface water as a result of the future development provided that appropriate planning (i.e. incorporation of LIDs as supported by the water balance calculations), mitigation measures and proper construction techniques are considered.

From a geotechnical perspective, the Site is suitable for construction of the proposed development including one to two-storey residential dwellings, associated servicing and paved roadways. Detailed recommendations are provided in previous sections of this report.

The following Statement of Limitations should be read carefully and is an integral part of this report. We trust this report meets your immediate needs. Should any questions arise regarding any aspect of our report, please contact our office.

Sincerely,

David Workman, P.Geo.

Nyle McIlveen, P.Eng.

/dw/nm

7. References

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8. Statement of Limitations

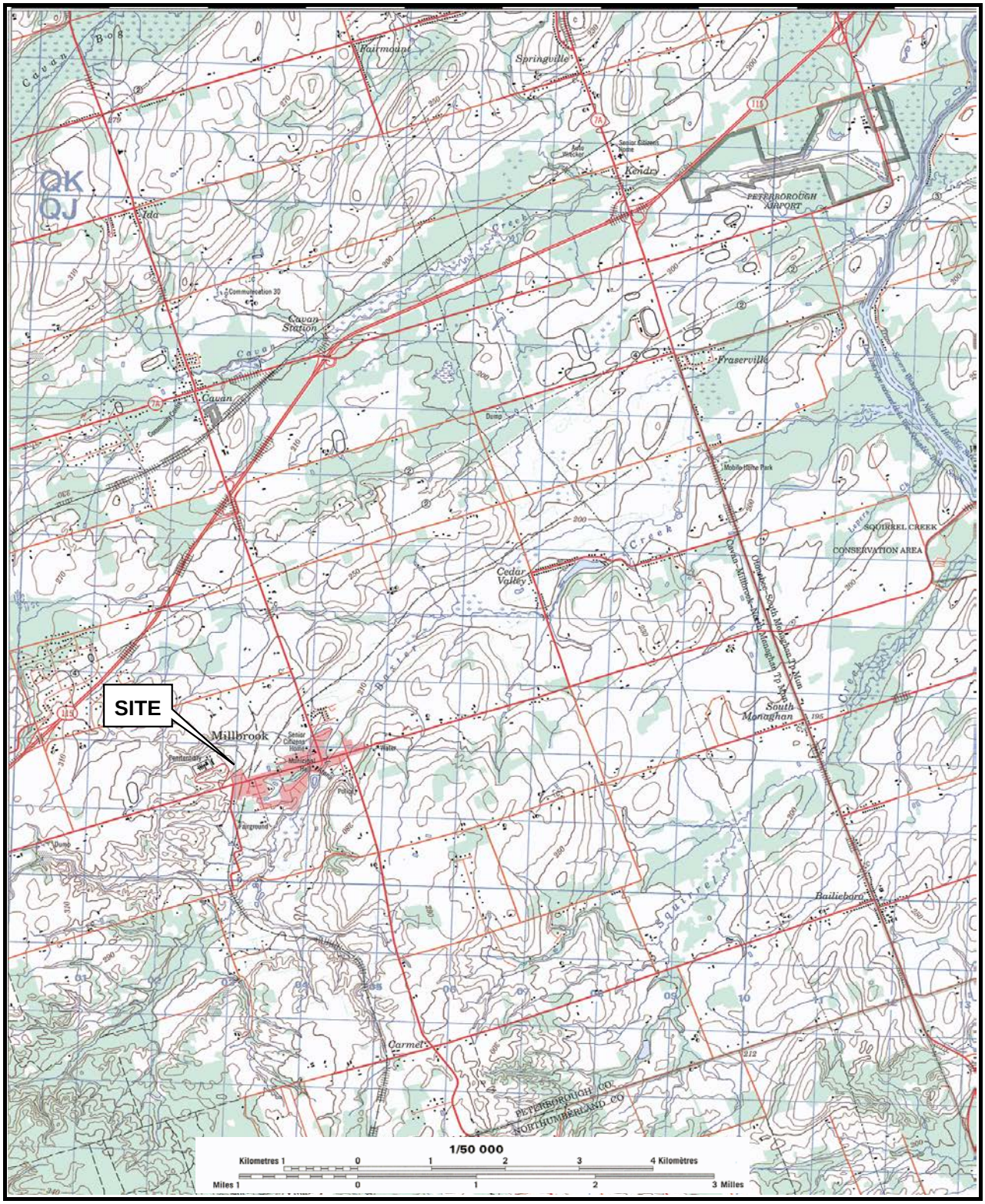
This report is intended solely for Veltri and Son Limited in assessing the geotechnical and hydrogeologic aspects of the lands situated at the north end of Turner Street in Millbrook, Ontario and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. Client shall defend, indemnify and hold GHD harmless from any liability arising from or related to Client's unauthorized distribution of the report. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevations and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of hydrogeological engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical or hydrogeological study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test hole locations only. The subsurface conditions confirmed at the test hole locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (ex. excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our assessment. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

Enclosures



Base map complied from Energy, Mines and Resources Canada Map 31D/1 published 1999. Air photography boundaries current as of 1996.

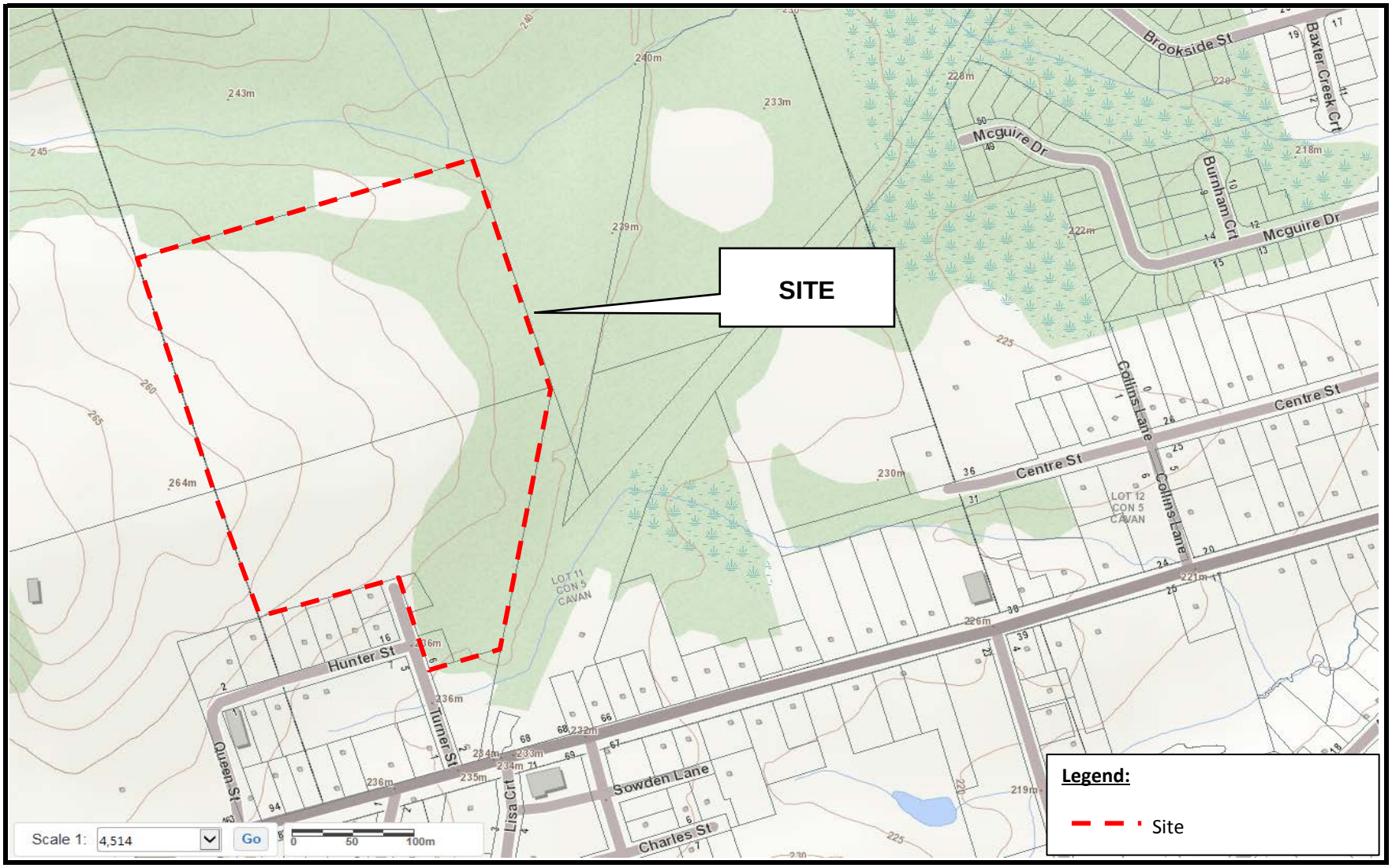
Scale:
1:50000
Coordinate System
NAD 1983 UTM
Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Vicinity Plan

FIGURE 1



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2018.

Scale:
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Coordinate System:
NAD 1983 UTM Zone 17

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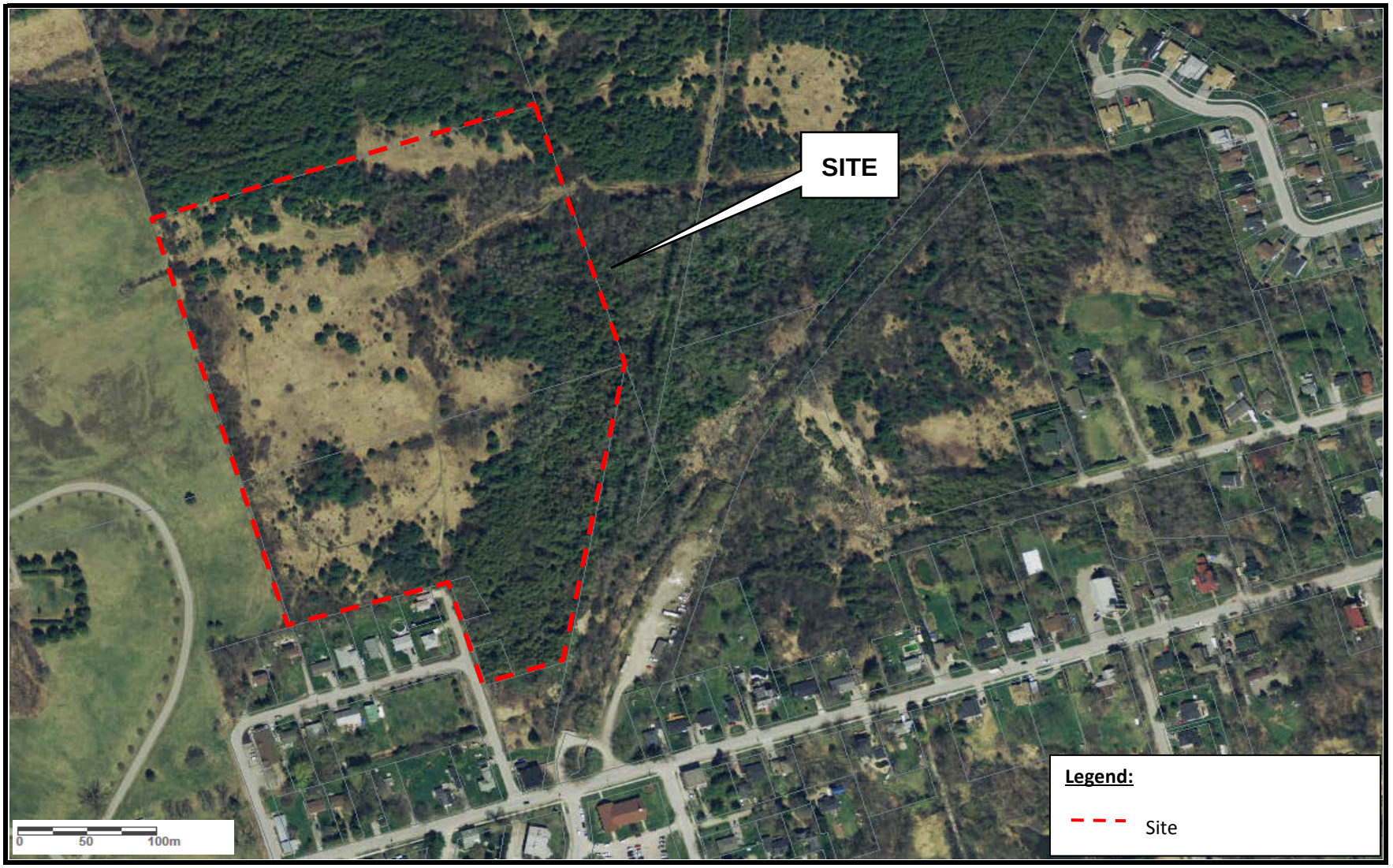
Property Plan

FIGURE 2



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2018.

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Plot Plan

FIGURE 3

Based Plan compiled from Drawing CGP-1 by D.G. Biddle & Associates Limited

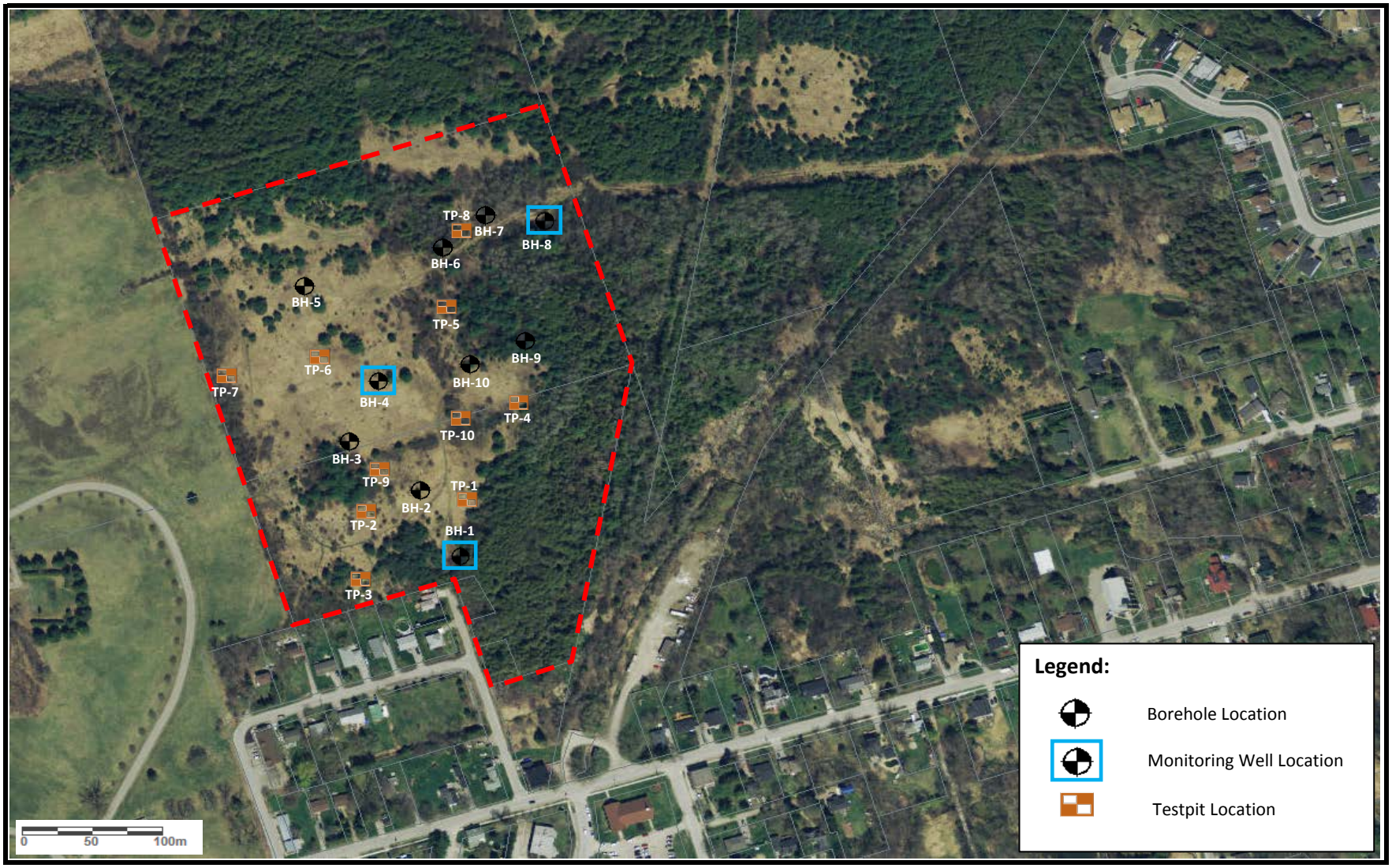
Scale:
1:500
Coordinate System
NAD 1983 UTM
Zone 17

Veltri and Son Limited
Turner Street, Millbrook, ontario
Geotechnical Investigation

11178428-01
August, 2018

Concept Plan

FIGURE 4



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2018.

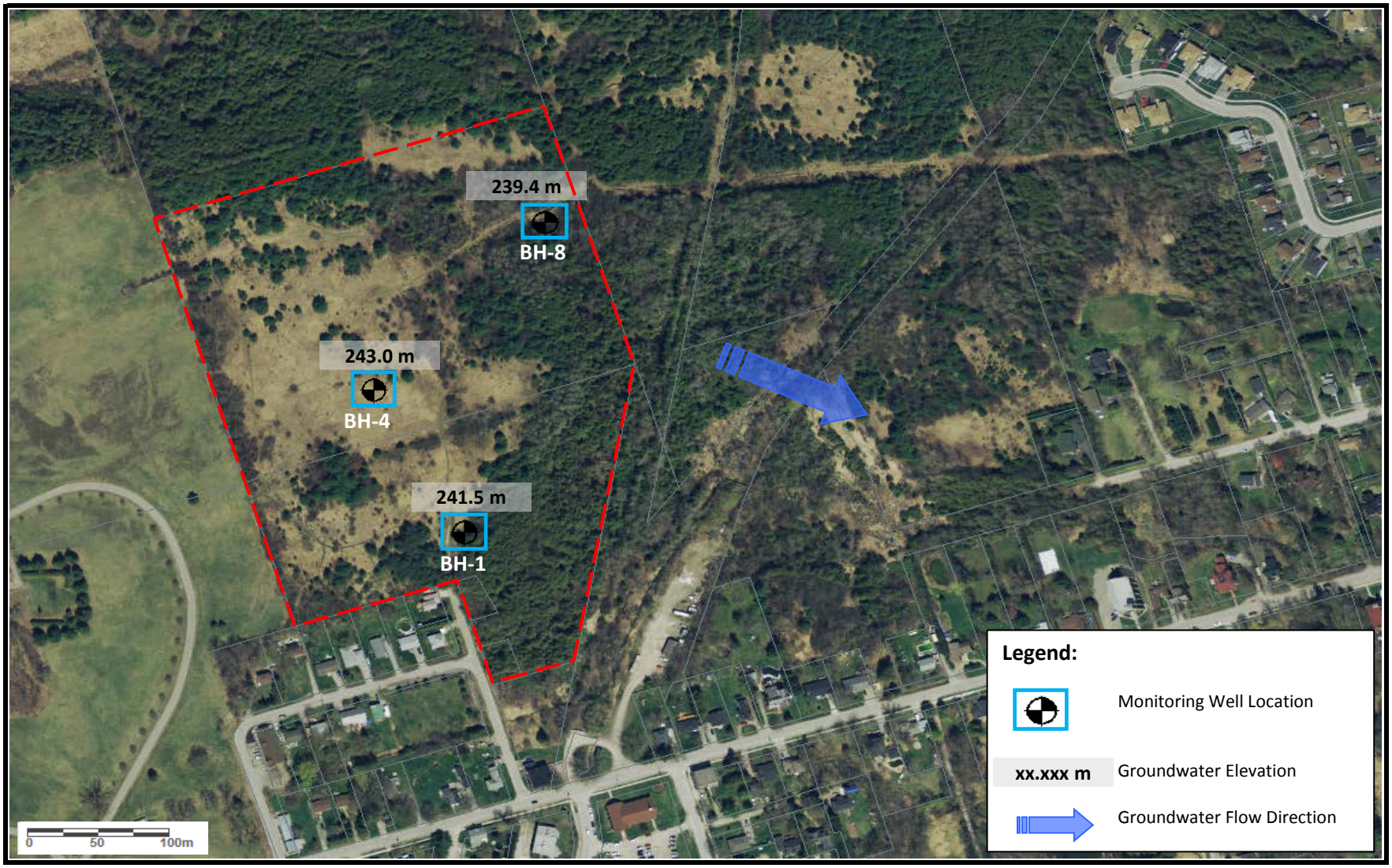
Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Test Hole Plan

FIGURE 5



Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2018. Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

N

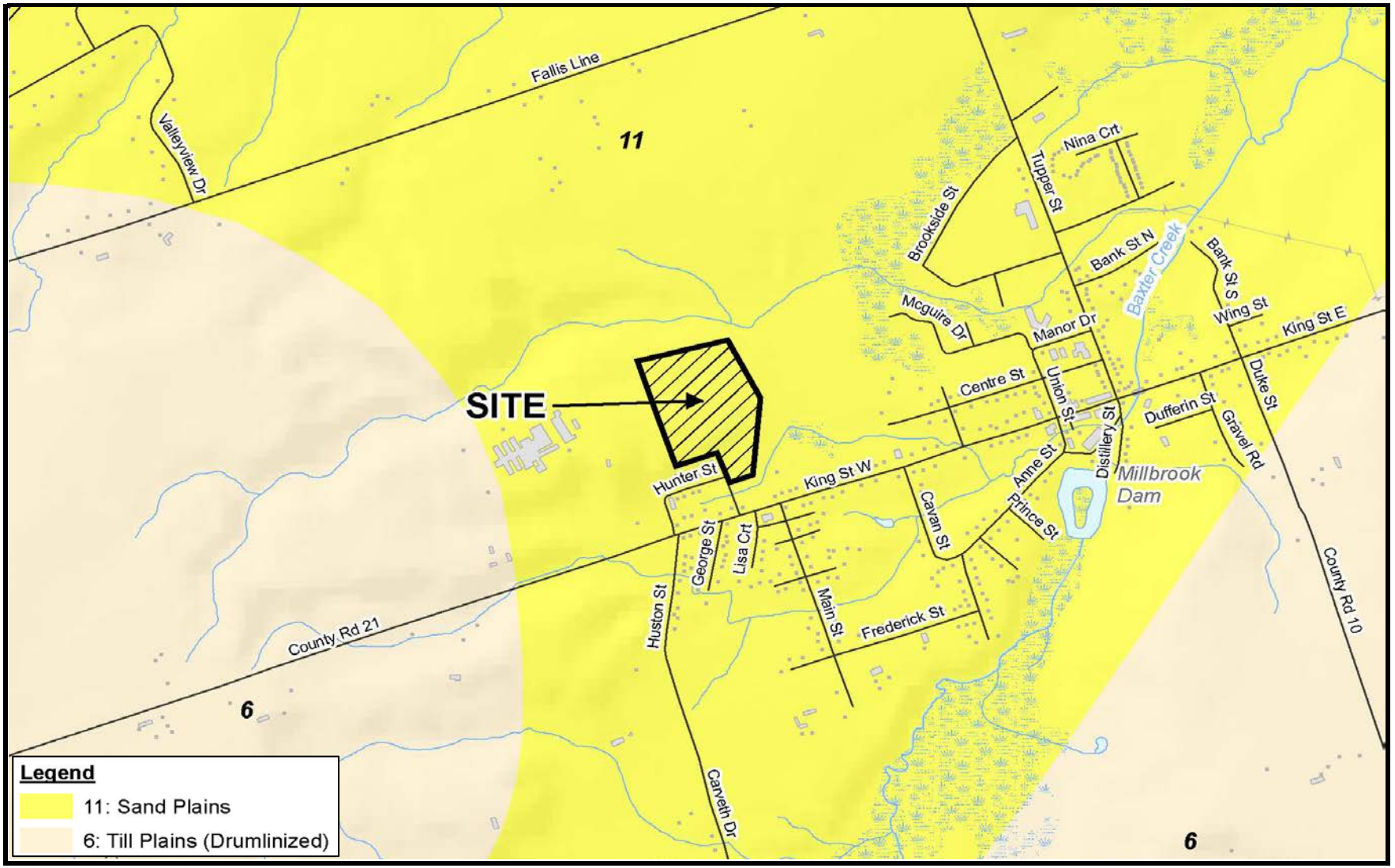
GHD

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Groundwater Elevation

FIGURE 6



Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2018; Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

N

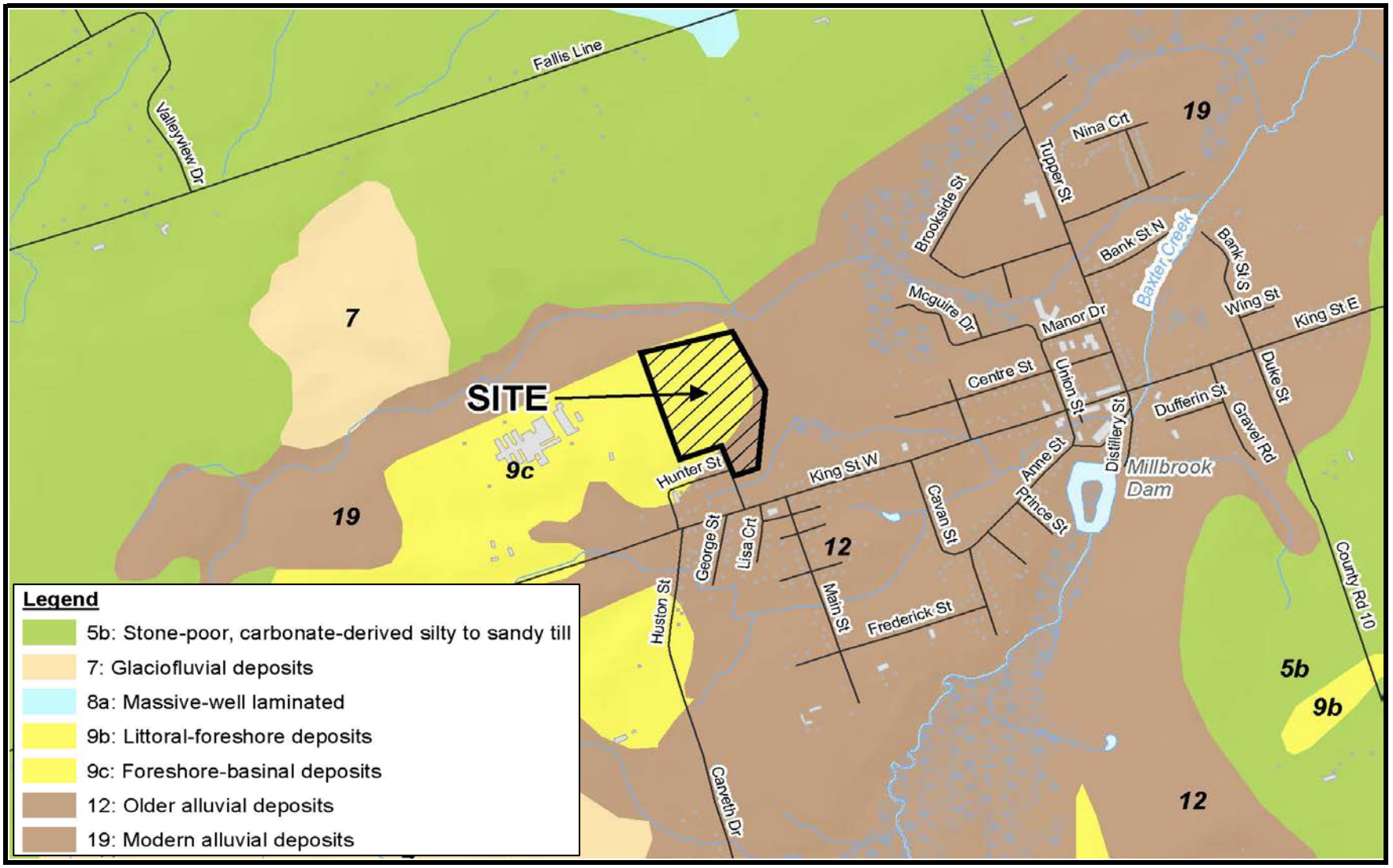
GHD

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Physiography

FIGURE 7



Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2018; Ontario Geological Survey 2003. Surficial geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release---Data 128.

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

N

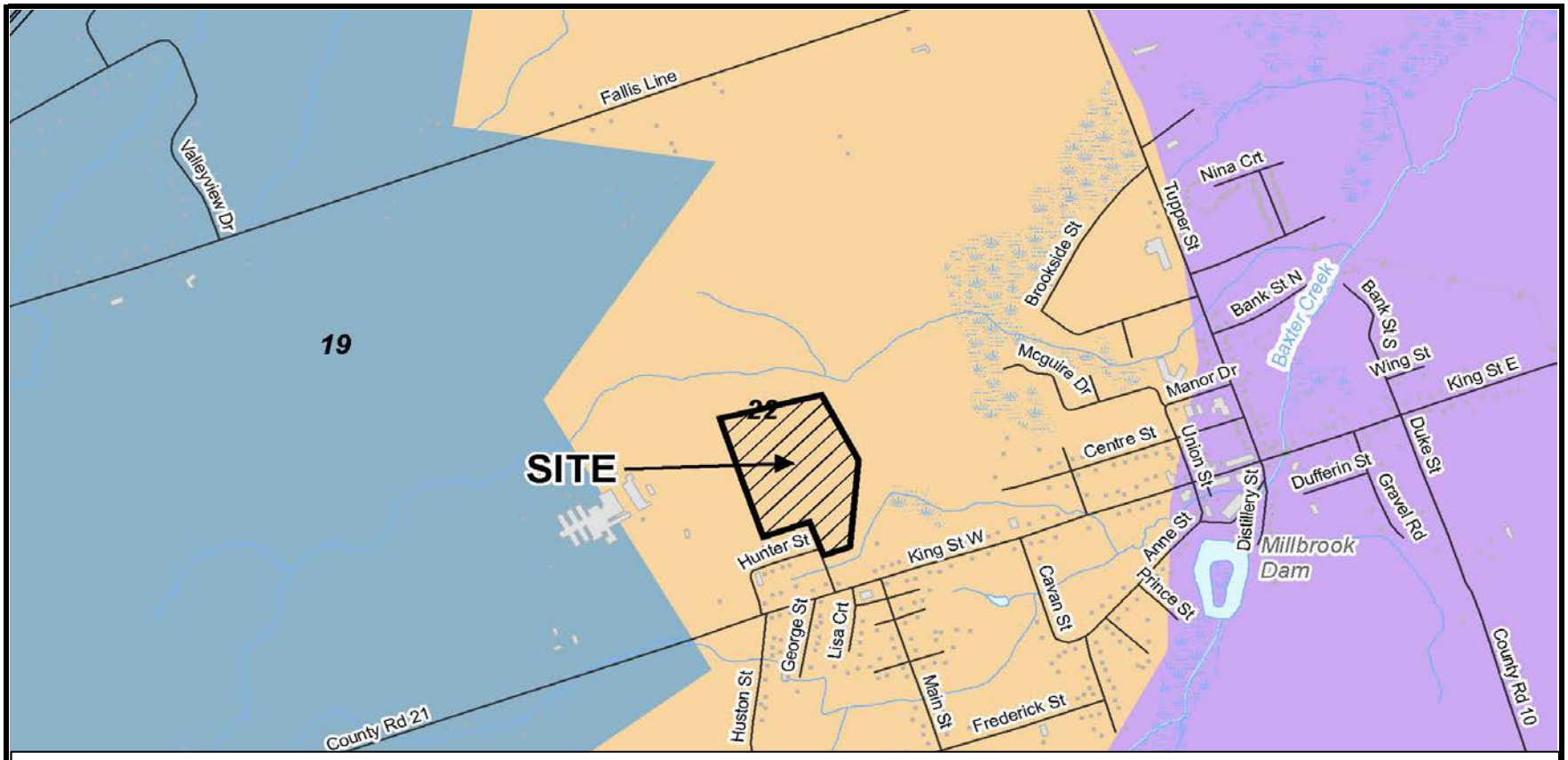
GHD

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Surficial Geology

FIGURE 8



Legend

- 19;till;undifferentiated, predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content
- 22;glaciofluvial ice-contact deposits;gravel and sand, minor till, includes esker, kame, end moraine, ice-marginal delta and subaqueous fan deposits
- 25;glaciolacustrine deposits;sand, gravelly sand and gravel, nearshore and beach deposits
- 32;organic deposits;peat, muck and marl

0 200 400 600
Meters

Coordinate System:
NAD 1983 UTM Zone 17N

N

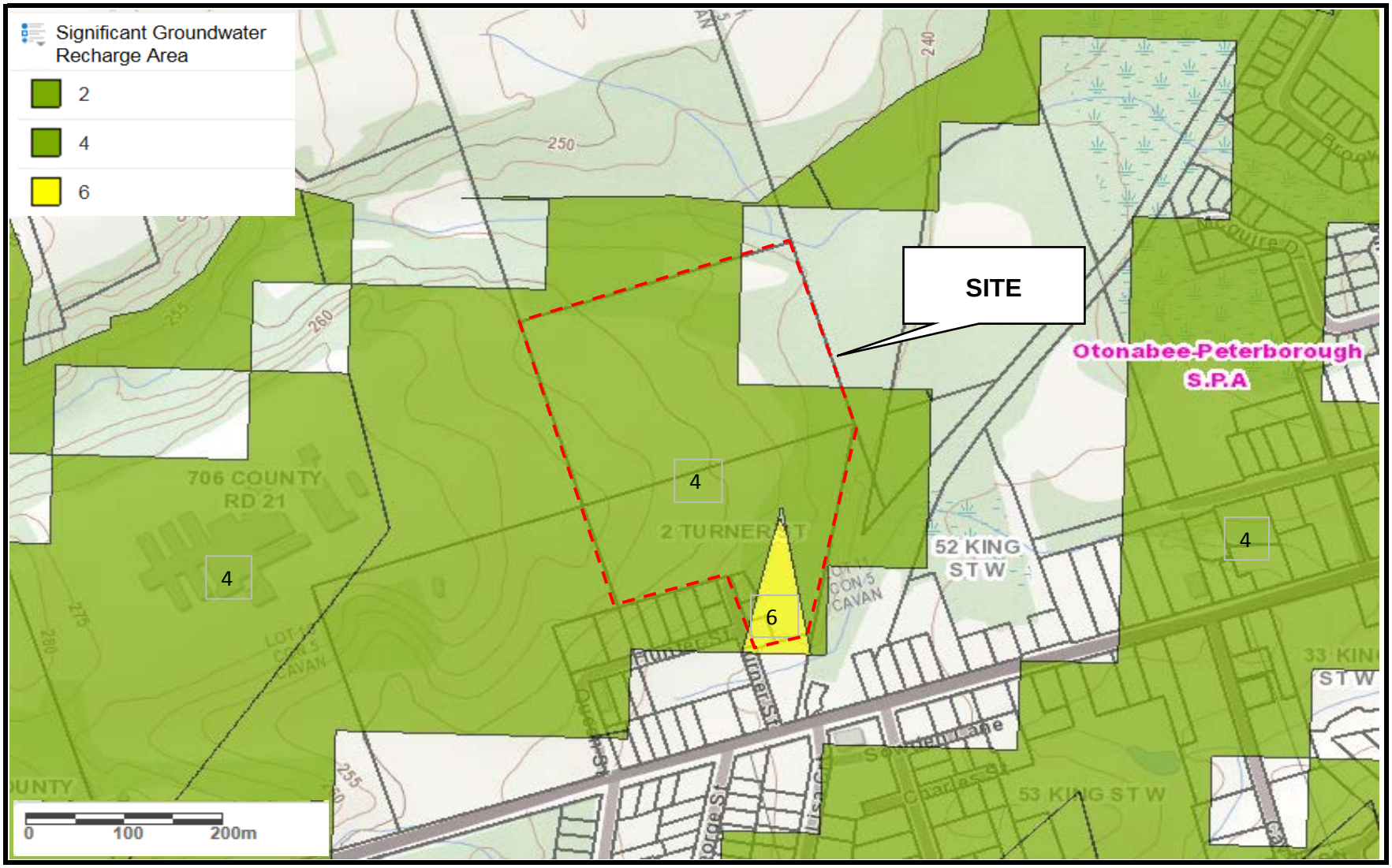
GHD

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

Quaternary Geology

FIGURE 9



Source: MNRF NRVIS, 2018. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2018; Ontario Geological Survey 2000. Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14---Revised.

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

Significant Groudwater Recharge Areas

11178428-01
August, 2018

FIGURE 10

Appendix A
Soil Exploration Data

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-1

BOREHOLE No.: BH-1
ELEVATION: 246.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Milbrook
LOGGED BY: J. McEachern DATE: 18 July 2018
DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
		0.0		GROUND SURFACE					
1		0.3		**TOPSOIL** (300mm)				3	
2		0.8		**SAND AND GRAVEL** - Light Brown Sand and Gravel, Moist, Compact	SS-1	75	2	7 9 9	16
3	1.0	0.9		**TILL** - Brown Sandy Silt with Clay, Moist, Compact	SS-2	78	1	6 9 23	32
4				Grading Light Brown Sand and Gravel, Moist, Very Dense					
5					SS-3	89	6	20 32 42	74
6	2.0								
7					SS-4a	100	5	14	49
8		2.4			SS-4b		13	26 23	
9				Grading Brown Sandy Silt with Clay and Gravel, Moist, Compact					
10	3.0							12	
11					SS-5	100	11	15 17	32
12									
13	4.0								
14									
15		4.6		**SAND** - Light Brown Sand, Wet, Very Dense	SS-6a	100	18	12 18	56
16		4.9			SS-6b		14	48	
17	5.0	5.0		**TILL** - Brown Sandy Silt with Clay and Gravel, Moist, Compact					
18				END OF BOREHOLE					
19									
20	6.0								
21									
22									
23	7.0								
24									
25									
26	8.0								
27									
28									
29	9.0								
30									
31									
32									
33	10.0								

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

— m
— 0.64 m

Water at 4.0m upon completion

WL - 4.29m August 14, 2018

WL - 4.5 m August 22, 2018

Water first encountered at 4.6m

Borehole open upon completion

50mm Diameter monitoring well installed to 4.65m

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-2

BOREHOLE No.: BH-2

ELEVATION: 250.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 17 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / Field / Lab / RQD / CONE	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
				TOPSOIL (230mm)				1			
1		0.2		**SILTY SAND** - Brown Silty Sand, Occasional Cobble, Moist, Very Loose	SS-1	78	4	2 22	24	○ ×	
2											
3	1.0				SS-2	56	4	1 2 2	4	⊠	
4											
5								5			
6		1.8			SS-3	67	5	12	26	○ ×	
7	2.0			**TILL** - Light Brown to Grey Sandy Silt with Gravel, Moist, Compact				14			
8					SS-4	100	12	5 10	16	○ ×	Grain Size Analysis (SS-4): 2% Gravel 16% Sand 82% Silt and Clay 64% between 5-75 µm
9								16			
10	3.0	3.0		Grading Dense							
11					SS-5	100	11	15 18 22	40	○ ×	
12											
13	4.0										
14											
15								12			
16					SS-6	100	10	18	34	○ ×	
17	5.0							16			
18											
19											
20	6.0	6.1		Grading Very Dense				12			
21					SS-7	100	9	35	100	○ ×	Borehole open and dry upon completion
22		6.6		END OF BOREHOLE				50=4"			
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-3

BOREHOLE No.: BH-3
ELEVATION: 255.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 18 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / Field △ / Lab □ / RQD ◆ / CONE ◎	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.3		**TOPSOIL** (305mm)				1			
1				**SILTY SAND** - Light Brown Silty Sand Occasional Cobble, Moist, Very Loose	SS-1	100	5	1 29	30		
2								8			
3	1.0				SS-2	100	3	2 2	4		Grain Size Analysis (SS-2): 0% Gravel 83% Sand 17% Silt and Clay 9% between 5-75 µm
4								2			
5		1.5		Grading Gravel, Compact				6			
6					SS-3	100	4	7	18		
7	2.0							11			
8		2.3		Grading, Very Dense				21			
9					SS-4	100	4	21	53		
10	3.0							32			
11		3.4			SS-5	100	9	27 23	56		
12				**TILL** - Brown Sandy Silt with Clay, some Gravel, Moist, Very Dense				33			
13	4.0										
14											
15		4.6		Grading Grey				30			
16					SS-6	100	13	30	75		
17	5.0							45			
18											
19											
20	6.0							14			
21					SS-7	100	9	27	72		Borehole open and dry upon completion
22		6.6		END OF BOREHOLE				45			
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-4

BOREHOLE No.: BH-4
ELEVATION: 250.9 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Milbrook
LOGGED BY: J. McEachern DATE: 17 July 2018
DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
	0.0			GROUND SURFACE					
		0.3		**TOPSOIL** (300mm)	SS-1	100	9	1 2 2	4
		0.8		**SILTY SAND** - Brown Silty Sand with Gravel, Moist, Very Loose	SS-2	100	10	4 3 3	15
	1.0			**TILL** - Brown Sandy Silt Trace Gravel, Moist, Compact	SS-3	100	9	12 50=3"	100
		1.7		Grading Occasional Cobbles					
	2.0	2.3		**SAND** - Brown Sand with Silt, Moist, Dense to Very Dense	SS-4	100	5	18 20 25	45
					SS-5	100	5	17 50=2"	100
	3.0	3.7		Grading Trace Gravel					
	4.0	4.6		**SAND AND GRAVEL** - Light Brown Sand and Gravel, Moist, Very Dense	SS-6	100	3	28 45 41	86
	5.0								
	6.0				SS-7	80	2	18 50=4"	100
	7.0								
		7.8		**SAND** - Brown Sand with Silt, Wet, Very Dense	SS-8	100	16	48 40 50=4"	100
	8.0								
	9.0				SS-9a	100	14	4 23 50=4"	100
		9.4			SS-9b		8		
		9.6		**TILL** - Grey Silty Sand, Trace Gravel, Very Dense					
	10.0			END OF BOREHOLE					

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m) ◆ RQD ◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

— m
— 0.66 m

Grain Size Analysis (SS-2):
9% Gravel
21% Sand
70% Silt and Clay
43% between 5-75 µm

50mm standpipe installed to 1.43m
Dry on July 17/18
Dry on Aug.14/18
Dry on Aug.22/18

Water first encountered at 7.6m

WL - 7.81m August 14, 2018

WL - 7.9 m August 22, 2018

Borehole cave-in to 8m

50mm Diameter monitoring well installed to 8.38m

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-5

BOREHOLE No.: BH-5
ELEVATION: 252.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Milbrook
LOGGED BY: J. McEachern DATE: 17 July 2018
DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (W_P, W_l) / "N" Value (blows / 0.3 m) / RQD / CONE — Field △ Lab □	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.3		**TOPSOIL** (300mm)				2			
1				**SILTY SAND** - Brown Silty Sand, Moist, Very Loose	SS-1	100	5	2 3 4	5	⊠	
2											
3	1.0				SS-2	100	11	1 0 1	1	× ○	
4											
5		1.5		**TILL** - Brown Silty Sand Trace Gravel, Moist, Very Loose	SS-3	89	22	1 2 1	3	× ○	
6	2.0										
7											
8		2.6			SS-4	100	14	9 12 14	26	○ ×	
9				Little Gravel, Compact							
10	3.0	3.0		Grading, Dense	SS-5	100	12	13 14 30	44	○ ×	
11											
12											
13	4.0										
14											
15		4.6		**SAND** - Light Brown Sand Trace Gravel, Moist, Very Dense	SS-6	100	3	19 22 32	54	○ ×	Borehole open and dry upon completion
16	5.0	5.0		END OF BOREHOLE							
17											
18											
19											
20	6.0										
21											
22											
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-6

BOREHOLE No.: BH-6
ELEVATION: 246.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 17 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / RQD / CONE (10 20 30 40 50 60 70 80 90)	COMMENTS
		0.0		GROUND SURFACE							
		0.3		**TOPSOIL** (280mm)							
1				**SILTY SAND** - Light Brown Silty Sand, Moist, Loose to Very Loose	SS-1	100	1	2 2 4	6		
2								3			
3	1.0				SS-2	100	7	1 1 2	3		
4											
5											
6					SS-3	100	23	3 3 2	5		
7	2.0	2.0		Grading to Wet at 1.8m							Water first encountered at 1.8m (slight seepage)
8		2.3		**TILL** - Brown Silty Sand Trace Gravel, Wet, Compact	SS-4	100	14	6 4 8	12		
9											
10	3.0	3.0		Grading to Grey, with Clay	SS-5	100	17	3 5 5	10		
11											
12											
13	4.0										
14											
15		4.6		Grading, Very Dense	SS-6a		7	50=4"	100		
16		5.0			SS-7		4	100 50=3"			
17	5.0			END OF BOREHOLE							Borehole open and wet upon completion
18											
19											
20	6.0										
21											
22											
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-7

BOREHOLE No.: BH-7
ELEVATION: 243.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 17 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / Field / Lab / RQD / CONE	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.4		**TOPSOIL** (380mm)	SS-1	100	7	2 1 5 8	6		
		0.8		**SILTY SAND** - Light Red/Brown Silty Sand, Moist, Loose	SS-2	100	15	4 4 6	10		
	1.0			**TILL** - Brown Silty Sand Trace Gravel some Clay, Moist, Compact	SS-3	100	15	4 6 10	16		
	2.0	2.3		Grading Grey	SS-4	100	16	3 5 7	12		Water at 2.4m upon completion
	3.0	3.2		**SILTY SAND** - Brown Silty Sand, Wet, Compact	SS-5	100	19	6 8 9	17		Water first encountered at 3.2m
	4.0	4.1		END OF BOREHOLE	SS-6	100	21	4 4 6	10		Borehole open upon completion
	5.0										
	6.0										
	7.0										
	8.0										
	9.0										
	10.0										

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-8

BOREHOLE No.: BH-8
ELEVATION: 241.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 18 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N
	0.0			GROUND SURFACE					
		0.2		**TOPSOIL** (200mm)					
1				**SILTY SAND** - Light Brown Silty Sand, Moist, Very Loose	SS-1	100	12	0 2 1	3
2		0.6						2	
3	1.0			Grading Occassional Organics	SS-2	100	14	2 2 3	5
4									
5		1.4		Grading Wet, Compact	SS-3a	100	13	7	10
		1.7		**TILL** - Light Brown Silty Sand Little Clay and Gravel, Moist, Compact	SS-3b	100	22	6 4	
6									
7	2.0								
8					SS-4	100		3 6 10	16
9									
10	3.0	3.0		Grading Grey				6	
11					SS-5	100	17	10 15	25
12									
13	4.0								
14									
15								5	
16					SS-6	100	16	7 9	16
17	5.0	5.0		END OF BOREHOLE					
18									
19									
20	6.0								
21									
22									
23	7.0								
24									
25									
26	8.0								
27									
28									
29	9.0								
30									
31									
32									
33	10.0								

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
W_p W_l Atterberg limits (%)
× "N" Value (blows / 0.3 m)
◆ RQD
◎ CONE

10 20 30 40 50 60 70 80 90

COMMENTS

— m
— 0.69 m

Water first encountered at 1.4m (slight seepage)

WL - 2.06m August 14, 2018

WL - 2.1 m August 22, 2018

50mm diameter monitoring well installed to 4.54m

Borehole open and wet upon completion

50mm standpipe installed to 1.47m
Dry on July 17/18
Dry on Aug.14/18
Dry on Aug.22/18

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-9

BOREHOLE No.: BH-9
ELEVATION: 245.0 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 18 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (W_P W_l) / "N" Value (blows / 0.3 m) / RQD / CONE (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.2		**TOPSOIL** (180mm)							
1				**SILTY SAND** - Light Brown Silty Sand Trace Gravel, Moist, Compact to Dense	SS-1	75	6	3 5 6	11	○ ×	
2								6			
3	1.0				SS-2	100	2	9 18 20	38	○ ×	
4											
5								16			
6					SS-3	100	3	22	42	○ ×	
7	2.0							20			
8								23			
9		2.6		Grading Brown Occasional Cobbles, Dense to Very Dense	SS-4	100	5	19 16	35	○ ×	
10	3.0							14			
11					SS-5	100	6	34 50=3"	100	○ ×	Water at 3.2m upon completion
12											Water first enountered at 3.4m
13	4.0										
14											Borehole Cave-in to 4.1m
15								28			
16		4.9			SS-6	100	6	37	79	○ ×	
17	5.0	5.0		**TILL** - Light Brown Sandy Silt Little Gravel, Wet, Very Dense				42			
18				END OF BOREHOLE							
19											
20	6.0										
21											
22											
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-10

BOREHOLE No.: BH-10
ELEVATION: 247.5 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Milbrook

LOGGED BY: J. McEachern DATE: 18 July 2018

DRILLING COMPANY: Land Shark Drilling METHOD: Solid Stem Augers and SPT

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

- SS - SPLIT SPOON
- AS - AUGER SAMPLE
- ST - SHELBY TUBE
- CS - CORE SAMPLE
- ▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Recovery %	Moisture Content %	Blows per 6 in. / 15 cm	Penetration Index N	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) / "N" Value (blows / 0.3 m) / RQD / CONE (△ Field, □ Lab)	COMMENTS
		0.0		GROUND SURFACE						10 20 30 40 50 60 70 80 90	
		0.3		**TOPSOIL** (280mm)							
1				**SILTY SAND** - Light Brown Silty Sand, Moist, Compact	SS-1	50	5	2 2 8	10		
2		0.8						9			
3	1.0			**TILL** - Light Brown Sandy Silt Trace Gravel, Moist, Compact	SS-2	100	15	9 10 12	22		
4											
5								7			
6		1.8			SS-3	100	9	23 24	47		
7	2.0			Grading Sand with Gravel, Very Dense							
8					SS-4	100	2	18 21 36	57		Grain Size Analysis (SS-4): 2% Gravel 53% Sand 45% Silt and Clay
9											
10	3.0							12			
11					SS-5	100	3	30 31	61		
12		3.7		Occasional Cobbles							
13	4.0										
14											
15											
16					SS-6	100	1	50=3"	100		Water first encountered at 6.1m
17	5.0										
18											
19											
20	6.0	6.1		**SAND AND GRAVEL** - Coarse Sand and Gravel, Wet, Very Dense	SS-7	100	11	16 27 29	56		Borehole open and wet upon completion
21		6.6		END OF BOREHOLE							
22											
23	7.0										
24											
25											
26	8.0										
27											
28											
29	9.0										
30											
31											
32											
33	10.0										

BOREHOLE LOG GEOTECH 11178428-01, 18-07-19 BOREHOLE LOGS, JC GINT.GPJ GEOLOGIC.GDT 10/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-11

TEST PIT No.: TP-1
ELEVATION: 248.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) ○ Water content (%) w_p w_l Atterberg limits (%) △ Field ☐ Lab	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (300mm)				
1		0.3		**SILTY SAND** - Reddish Brown Silty Sand Trace Gravel, Occasional Cobbles and Boulders, Moist, Compact	GS-1	4	○	
	0.5							
2		0.6		Grading Light Brown, Dense				
3					GS-2	5	○	
	1.0							
4		1.4		Grading no Cobbles or Boulders				
5	1.5				GS-3	4	○	
6								
	2.0							
7					GS-4	5	○	
8	2.5							
9		2.7		Grading Occassional Cobbles and Boulders				
10	3.0				GS-5	5	○	
11		3.4		END OF TEST PIT				Test Pit open and dry upon completion
	3.5							
12								
13	4.0							
14								
	4.5							

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-12

TEST PIT No.: TP-2
ELEVATION: 250.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Millbrook
LOGGED BY: J.McEachern DATE: 14 August 2018
EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (250mm)				
		0.3		**SILTY SAND** - Light Reddish Brown Silty Sand, Moist, Loose	GS-1	4	○	
1	0.5							
2								
3	1.0				GS-2	3	○	
		1.1		Grading Occasional Cobbles and Boulders, Compact				
4								
5	1.5	1.5		Dense, Little Gravel	GS-3	3	○	
6								
7	2.0							
8	2.5							
9					GS-4	11	○	
10	3.0							
11		3.4		**TILL** - Light Brown Silty Sand Trace Gravel, Moist, Dense				
12	3.5	3.7		END OF TEST PIT				Test Pit open and dry upon completion
13	4.0							
14								
	4.5							

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-13

TEST PIT No.: TP-3
ELEVATION: 250.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) △ Field / Sensitivity (S) □ Lab; ○ Water content (%); w_p w_l Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (180mm)				
		0.2		**SILTY SAND** - Light Reddish Brown Silty Sand Trace Gravel, Moist, Loose	GS-1	5	○	
1	0.5	0.6		Grading Brown				
2								
3	1.0	0.9		Grading Occasional Cobbles and Boulders, Compact	GS-2	1	○	
4					GS-3	3	○	
5	1.5							
6	2.0							
7					GS-4	5	○	
8	2.5							
9								
10	3.0				GS-5	4	○	
11		3.4		END OF TEST PIT				Test Pit open and dry upon completion
12	3.5							
13	4.0							
14								
	4.5							

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-14

TEST PIT No.: TP-4
ELEVATION: 247.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Millbrook
LOGGED BY: J.McEachern DATE: 14 August 2018
EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) — △ Field □ Lab	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (230mm)				
		0.2		**SILTY SAND** - Light Reddish Brown Silty Sand Trace Gravel, Moist, Loose	GS-1	3	○	
1	0.5							
2		0.6		Grading Light Brown				
3		0.9		Grading Occasional Cobbles and Boulders, Compact	GS-2	1	○	
4	1.0							
5	1.5							
6					GS-3	3	○	
7	2.0							
8					GS-4	3	○	
9	2.5							
10	3.0				GS-5	7	○	
11		3.4		**SANDY SILT** - Light Brown Sandy Silt with Sand, Moist, Compact	GS-6	24	○	Test Pit open and dry upon completion
12	3.5	3.7		END OF TEST PIT				
13	4.0							
14								
	4.5							

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-15

TEST PIT No.: TP-5
ELEVATION: 246.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) — △ Field □ Lab	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (360mm)				
		0.4		**SILTY SAND** - Light Reddish Brown Silty Sand, Moist, Loose	GS-1	2	○	
	0.5	0.6		Grading Brown	GS-2	3	○	
	1.0							
		1.4		**TILL** - Light Brown Silty Sand Trace Gravel, Moist, Dense	GS-3	13	○	
	1.5							
					GS-4	15	○	
	2.0	2.1		Grading Very Dense	GS-5	12	○	
	2.5							
		2.7		Grading Occasional Cobble	GS-6	11	○	
	3.0	3.0		END OF TEST PIT				Test Pit open and dry upon completion
	3.5							
	4.0							
	4.5							

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-16

TEST PIT No.: TP-6
ELEVATION: 253.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Millbrook
LOGGED BY: J.McEachern DATE: 14 August 2018
EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %
		0.0		GROUND SURFACE		
				TOPSOIL (250mm)		
		0.3		**SILTY SAND** - Light Reddish Brown Silty Sand Trace Gravel, Moist	GS-1	7
1	0.5	0.4		Grading Occasional Cobble and Boulders, Compact		
2		0.6		**TILL** - Light Brown Silty Sand Trace Gravel, Moist, Dense	GS-2	7
3	1.0					
4		1.4		Grading Brown, Compact	GS-3	2
5	1.5					
6	2.0					
7						
8	2.5				GS-4	3
9						
10	3.0	3.0		Grading Some Gravel, Dense	GS-5	2
11		3.4		Grading Occasional Cobble		
	3.5	3.4		END OF TEST PIT		
12						
13	4.0					
14						
	4.5					

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

10 20 30 40 50 60 70 80 90

COMMENTS

Test Pit open and dry upon completion

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-17

TEST PIT No.: TP-7
ELEVATION: 259.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) 10 20 30 40 50 60 70 80 90	COMMENTS
		0.0		GROUND SURFACE				
		0.1		**TOPSOIL** (250mm)				
1	0.5			**SILTY SAND** - Light Reddish Brown Silty Sand Trace Gravel, Moist, Loose				
2		0.6		**SAND AND GRAVEL** - Brown Sand and Gravel Occasional Cobbles and Boulders, Moist, Loose	GS-1	1	○	
3	1.0				GS-2	2	○	
4		1.2		**SILTY SAND** - Brown Silty Sand, Moist, Compact	GS-3	3	○	
5	1.5							
6	2.0							
7		2.1		Grading Occasional Cobbles and Boulders				
8	2.5	2.4		Grading to coarse Sand and Gravel	GS-4	3	○	
9								
10	3.0	3.0		Grading to Some Gravel, Moist, Dense				
11					GS-5	2	○	Test Pit open and dry upon completion
12	3.5	3.7		END OF TEST PIT				
13	4.0							
14								
	4.5							

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-18

TEST PIT No.: TP-8
ELEVATION: 244.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited
PROJECT: Proposed Residential Development, Turner Street, Millbrook
LOGGED BY: J.McEachern DATE: 14 August 2018
EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator
NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND
GS - GRAB SAMPLE
▼ - WATER LEVEL

Depth ft	Depth m	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content %	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) — △ Field □ Lab	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
		0.1		**TOPSOIL** (250mm)				
1	0.5			**SILTY SAND** - Light Reddish Brown Silty Sand, Moist, Loose	GS-1	4	○	
2		0.6		**TILL** - Light Brown Silty Sand Trace Gravel, Moist, Dense	GS-2	16	○	
3	1.0				GS-3	16	○	
4								
5	1.5							
6					GS-4	18	○	
7	2.0							
8		2.4		Grading Grey, Little Clay	GS-5	18	○	
9	2.5	2.7		END OF TEST PIT				Test Pit open and dry upon completion
10	3.0							
11								
12	3.5							
13	4.0							
14								
	4.5							

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-19

TEST PIT No.: TP-9
ELEVATION: 253.5 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%) — △ Field □ Lab	COMMENTS
		0.0		GROUND SURFACE			10 20 30 40 50 60 70 80 90	
				TOPSOIL (300mm)				
1		0.3		**SILTY SAND** - Light Brown Silty Sand, Moist, Loose	GS-1	3	○	
	0.5	0.45		Grading Occasional Cobbles and Boulders, Compact				
2		0.55		Grading Brown Little Gravel	GS-2	2	○	
3	1.0							
4								
5	1.5				GS-3	8	○	
6								
	2.0							
7								
8	2.5							
9								
10	3.0				GS-4	2	○	Test Pit open and dry upon completion
		3.2		END OF TEST PIT				
11	3.5							
12								
13	4.0							
14								
	4.5							

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

REFERENCE No.: 11178428-01 ENCLOSURE No.: A-20

TEST PIT No.: TP-10
ELEVATION: 250.0 m

TEST PIT REPORT

Page: 1 of 1

CLIENT: Veltri and Son Limited

PROJECT: Proposed Residential Development, Turner Street, Millbrook

LOGGED BY: J.McEachern DATE: 14 August 2018

EXCAVATION COMPANY: Les Brown Excavation Ltd. METHOD: Rubber Track Excavator

NOTES: Elevations from Drawing CGP-1 by D.G. Biddle & Associates Limited.

LEGEND

GS - GRAB SAMPLE

▼ - WATER LEVEL

Depth (ft)	Depth (m)	m Below Existing Grade	Stratigraphy	DESCRIPTION OF SOIL AND BEDROCK	Type and Number	Moisture Content (%)	Shear test (Cu) / Sensitivity (S) / Water content (%) / Atterberg limits (%)	COMMENTS
		0.0		GROUND SURFACE				
				TOPSOIL (360mm)				
		0.4		**SILTY SAND** - Light Brown to Red Silty Sand, Trace Gravel, Moist, Loose	GS-1	2	○	
		0.8		**SAND** - Brown Sand and Gravel with Cobbles and Boulders, Moist, Compact	GS-2	2	○	
		2.1		**SILTY SAND** - Brown Silty Sand, Trace Gravel, Moist, Compact	GS-3	7	○	
					GS-4	5	○	
		3.2		END OF TEST PIT				Test Pit open and dry upon completion

Shear test (Cu) △ Field
Sensitivity (S) □ Lab
○ Water content (%)
w_p w_l Atterberg limits (%)

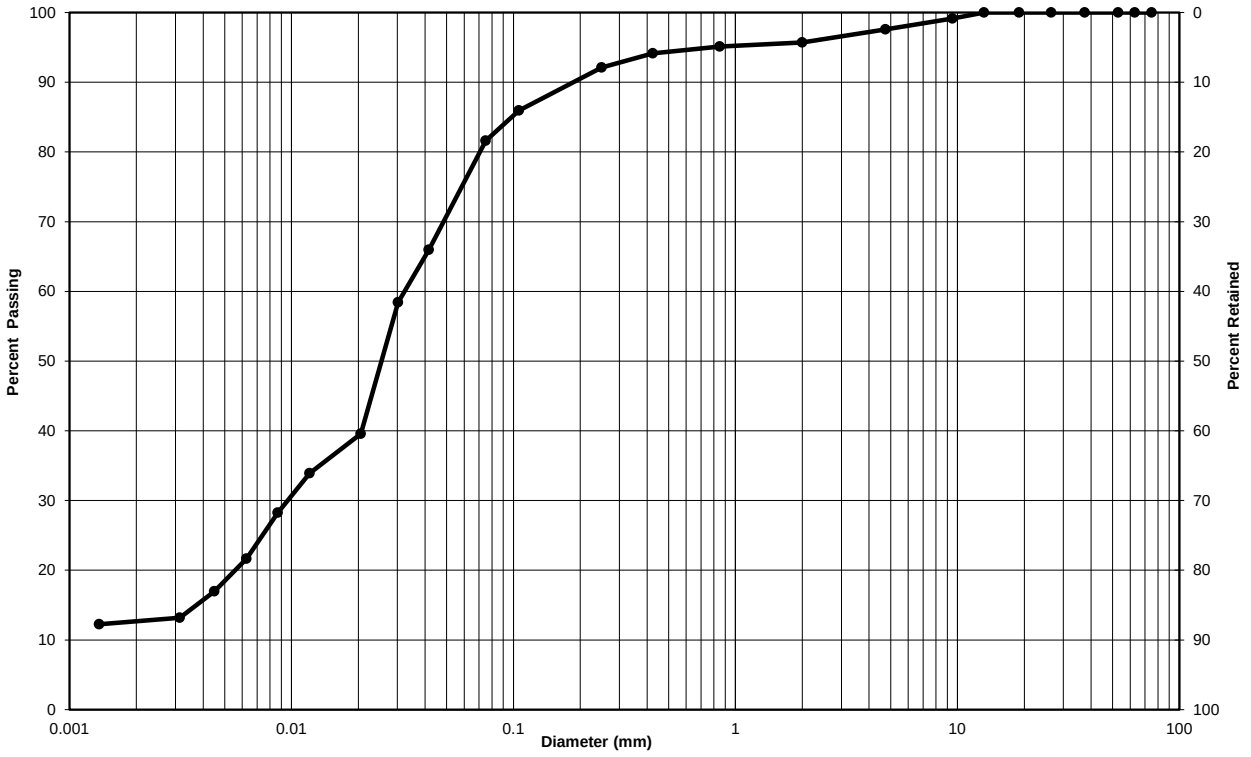
10 20 30 40 50 60 70 80 90

TEST PIT LOG GEOTECH 11178428-01, 18-07-19 TEST PIT LOGS, JC GINT.GPJ GEOLOGIC.GDT 11/9/18

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

Client:	Veltri and Son Ltd.	**Lab no.:**	SS-18-46
Project/Site:	Turner Street, Millbrook	**Project no.:**	11176428-01

Borehole no.:	BH2	Sample no.:	SS4
Depth:	2.29-2.74m	Enclosure:	A-21



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

Soil Description	Gravel	Sand	Clay & Silt
	2	16	82

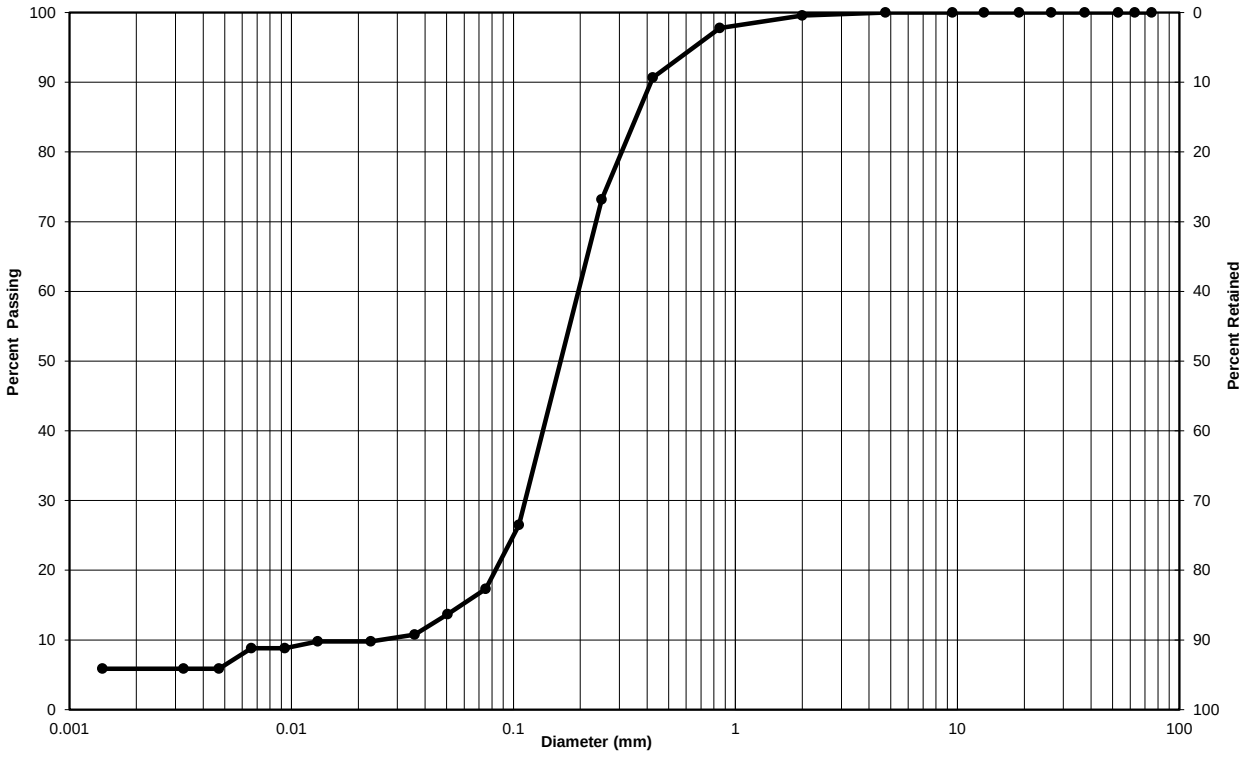
Remarks:

Performed by:	J. Sullivan	**Date:**	September 6, 2018
Verified by:		**Date:**	September 6, 2018

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

Client:	Veltri and Son Ltd.	**Lab no.:**	SS-18-46
Project/Site:	Turner Street, Millbrook	**Project no.:**	11176428-01

Borehole no.:	BH3	Sample no.:	SS2
Depth:	0.76-1.22m	Enclosure:	A-22



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

Soil Description	Gravel	Sand	Clay & Silt
	0	83	17

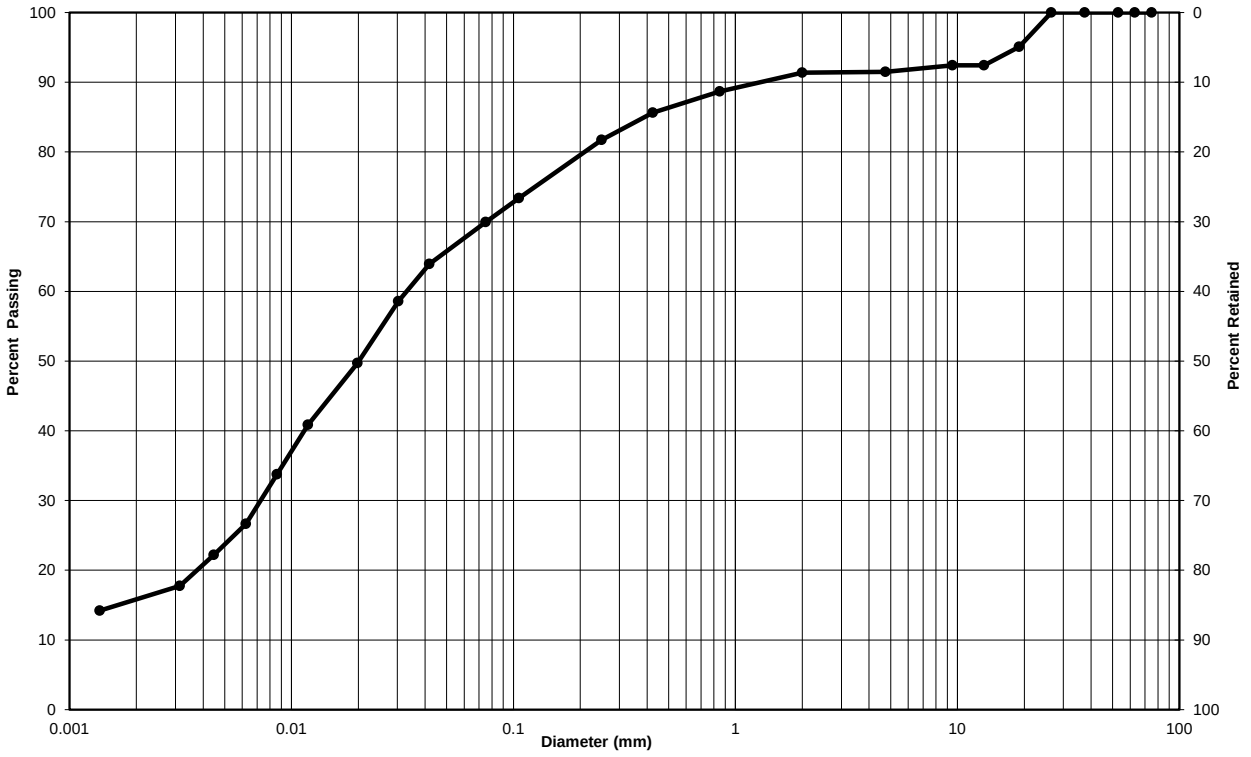
Remarks:

Performed by:	J. Sullivan	**Date:**	September 6, 2018
Verified by:		**Date:**	September 6, 2018

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

Client:	Veltri and Son Ltd.	**Lab no.:**	SS-18-46
Project/Site:	Turner Street, Millbrook	**Project no.:**	11176428-01

Borehole no.:	BH4	Sample no.:	SS2
Depth:	0.76-1.22m	Enclosure:	A-23



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

Soil Description	Gravel	Sand	Clay & Silt
	9	21	70

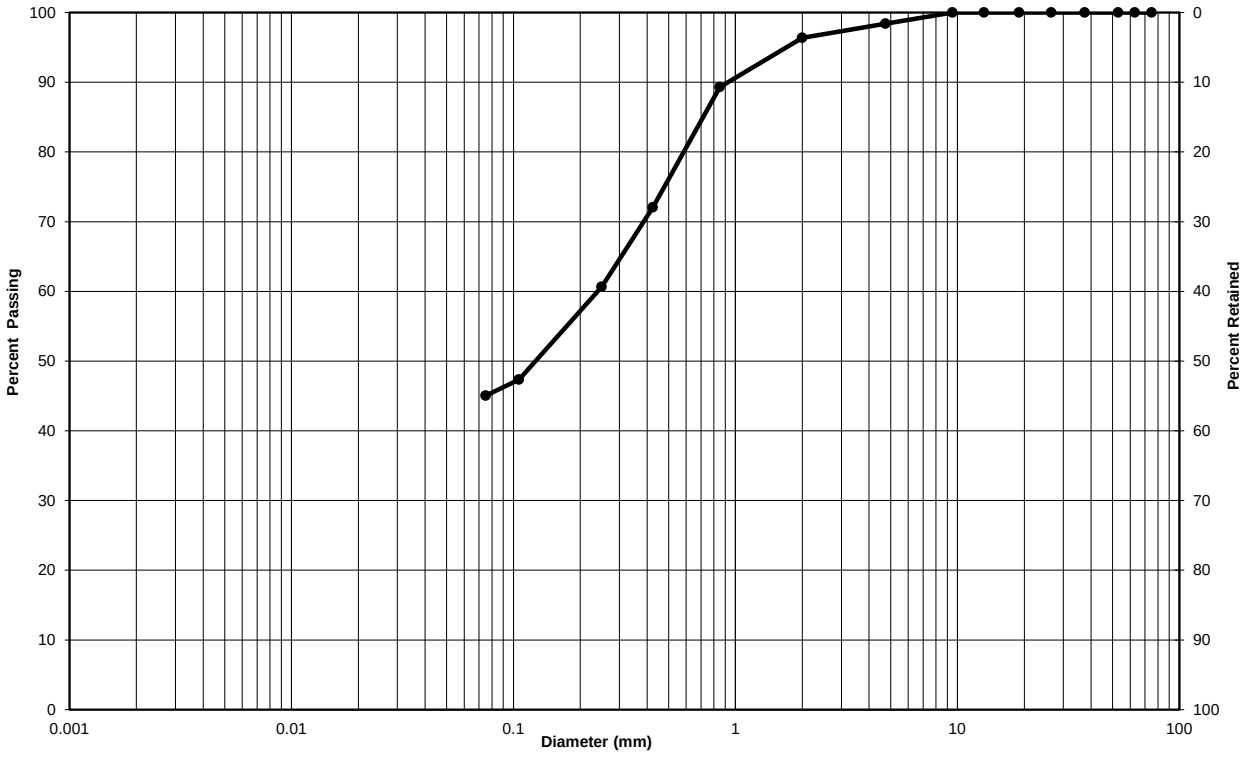
Remarks:

Performed by:	J. Sullivan	**Date:**	September 6, 2018
Verified by:		**Date:**	September 6, 2018

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

Client:	Veltri and Son Ltd.	**Lab no.:**	SS-18-46
Project/Site:	Turner Street, Millbrook	**Project no.:**	11176428-01

Borehole no.:	BH10	Sample no.:	SS4
Depth:	2.29-2.74m	Enclosure:	A-24



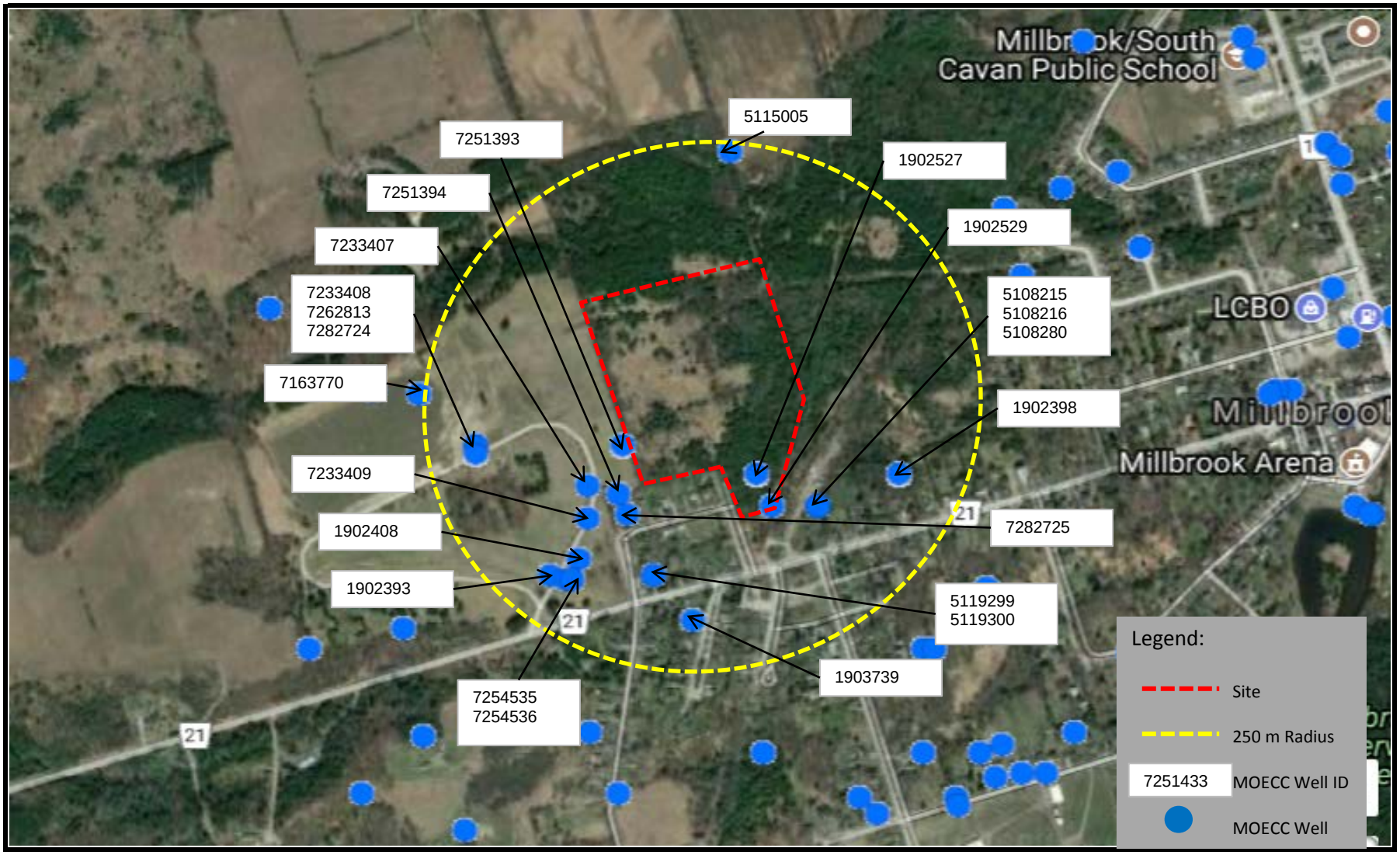
Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel	Sand	Clay & Silt
	2	53	45

Remarks:

Performed by:	J. Sullivan	**Date:**	September 6, 2018
Verified by:		**Date:**	September 6, 2018

Appendix B
MOECP Well Records and Well Survey



Source: Ministry of the Environment and Climate Change online Well Records Map (2018)

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1989 UTM Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
June 2018

Well Inventory Map

Appendix B.1

APPENDIX B.1.1: WELL SUMMARY - DUG/BORED

Well Record Summary -Turner Street Development
Project No.: 11178428-01
Millbrook, Ontario

Lot. No.	MOECC Well No.	Well Use	Water Found Feet	Water Found Metres	Static Level Feet	Static Level Metres	Test Rate Igpm	Test Rate L/min	Well Depth Feet	Well Depth Metres	Comments
(Conc. 5) Lot 10	5119300	Abandonment	--	--	--	--	--	--	29	8.8	Well abandonment record. Topsoil to 1.5', clay & stones to 5', clay & gravel to 26', sand w/ gravel to 29'.

Number of wells= 1

	Water Found Feet	Water Found Metres	Static Level Feet	Static Level Metres	Test Rate Igpm	Test Rate L/min	Well Depth Feet	Well Depth Metres
AVERAGE	0.0	0.0	0.0	0.0	0.0	0.0	29.0	8.8
MAXIMUM	0.0	0.0	0.0	0.0	0.0	0.0	29.0	8.8
MINIMUM	0.0	0.0	0.0	0.0	0.0	0.0	29.0	8.8

APPENDIX B.1.2: WELL SUMMARY - DRILLED OVERBURDEN

Well Record Summary -Turner Street Development
Project No.: 11178428-01
Millbrook, Ontario

Location	MOECC	Well	Water Found		Static Level		Test Rate		Well Depth		Comments
Lot No.	Well No.	Use	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres	
(Conc. 4)											
Lot 10	1903739	Domestic	79	24.1	0	0.0	8.3	37.7	80	24.4	Fresh water at 79', well flowing at 7.6 L/min, topsoil to 5', wet clay to 80'.
(Conc. 5)											
Lot 10	7163770	Monitor	--	--	--	--	--	--	66	20.1	No water information recorded, sand to 66'.
Lot 10	7233408	Monitor	89	27.1	--	--	--	--	100	30.5	Water found at 89', sand w/ gravel & silt to 77', sand & silt to 100'.
Lot 10	7282724	Monitor	--	--	--	--	--	--	--	--	No information recorded.
Lot 10	7262813	Monitor	--	--	--	--	--	--	123	37.5	No water information or lithology available.
Lot 10	7251393	Montior	--	--	--	--	--	--	--	--	No information recorded.
Lot 10	7233407	Monitor	34	10.4	--	--	--	--	88	26.8	Water found at 34' & 72', sand w/ gravel & silt to 30', silt w/ sand to 48', clay w/ silt & sand to 72', sand w/ silt to 88'.
Lot 10	7251394	Monitor	--	--	--	--	--	--	--	--	No information recorded.
Lot 10	7233409	Monitor	15	4.6	--	--	--	--	58.7	17.9	Water found at 15', sand w/ gravel to 10', silt w/ sand to 27', clay w/ silt & sand to 41', sand w/ silt to 58.7'.
Lot 10	7282725	Monitor	--	--	--	--	--	--	147	44.8	No water information recorded, sand w/ gravel to 20', sand to 58', clay to 75', sand to 130', sand w/ gravel to 146', clay to 147'.
Lot 10	5119299	Municipal	86	26.2	16.5	5.0	291	1321.1	106	32.3	Water found at 86', topsoil to 1.5', clay & stones to 5', sandy clay & gravel to 28', sand w/ gravel to 74', gravel w/ sand to 105', clay & gravel to 106'.
Lot 10	1902393	Municipal	--	--	4	1.2	64	290.6	91	27.7	Water found not recorded, topsoil to 1', clay to 5', gravel w/ sand & clay to 10', clay w/ gravel to 22', cemented sand & gravel to 32', sandy clay to 54', cemented sand & gravel w/ boulders to 60', clay & sand to 69', clay & gravel to 71', cemented sand & gravel to 73', sand & gravel w/ boulders to 82', clay & gravel w/ sand to 91'.
Lot 10	7254535	Abandonment	--	--	6	1.8	--	--	64	19.5	Well abandonment record, no lithology recorded.
Lot 10	7254536	Abandonment	--	--	--	--	--	--	20	6.1	Well abandonment record, no lithology recorded.
Lot 10	1902408	Municipal	60	18.3	6	1.8	233	1057.8	98	29.9	Water found at 60', topsoil to 2', clay & sand to 6', sand to 28', clay to 32', sand to 50', cemented sand & gravel to 61', grave; to 73', clay & gravel to 78', cemented gravel to 98'.
Lot 11	1902398	Municipal	40	12.2	6	1.8	233	1057.8	78	23.8	Water found at 40', topsoil to 2', clay & sand to 4', sand to 28', clay to 32', sand to 50', cemented sand & gravel to 61', gravel to 73', clay & gravel to 78'.
Lot 11	1902527	Domestic	73	22.3	23	7.0	2.5	11.4	95	29.0	Water found at 73', topsoil to 1', fill to 11', sandy clay to 45', clay w/ gravel to 63', silty clay & sand to 73', sand to 81', gravel w/ sand & clay to 91', sand & gravel to 95'.
Lot 11	1902529	Domestic	74	22.6	23	7.0	--	--	118	36.0	No pump test performed, water found at 74', topsoil to 1', fill to 12', sandy clay to 66', sandy clay & gravel to 74', sand w/ silt & gravel to 78', sand w/ gravel to 85', sand w/ gravel & boulders to 104', silty clay w/ gravel to 118'.
Lot 11	5108215	Municipal	30	9.1	16	4.9	250	1135.0	105	32.0	Water found at 30', clay & stones to 28', sandy clay & gravel to 55', sandy gravel to 105'.
Lot 11	5108216	Municipal	30	9.1	--	--	250	1135.0	110	33.5	Static level not recorded, water found at 30', clay & stones to 30', sandy clay & gravel to 53', sand to 56', gravel to 108', clay & gravel to 110'.
Lot 11	5108280	Municipal	25	7.6	20	6.1	125	567.5	102	31.1	Water found at 25' & 51', clay w/ stones to 25', clay w/ gravel to 29', clay w/ stones to 30', clay w/ gravel to 51', sandy gravel to 56', gravel to 102'.
Lot 11	5115005	Domestic	47	14.3	--	--	6	27.2	105	32.0	Static level not recorded, fresh water at 47' & 74', topsoil to 1', clay w/ stones to 12', clay w/ sand to 105'.

Number of wells= 22

	Water Found		Static Level		Test Rate		Well Depth	
	Feet	Metres	Feet	Metres	Igpm	L/min	Feet	Metres
AVERAGE	52.5	16.0	12.1	3.7	146.3	664.1	92.4	28.1
MAXIMUM	89.0	27.1	23.0	7.0	291.0	1321.1	147.0	44.8
MINIMUM	15.0	4.6	0.0	0.0	2.5	11.4	20.0	6.1

UTM 17 Z 702831 E
9 R 4891227 N
Elev. 9 F 0815
Basin 24

ONTARIO

The Well Drillers Act
Department of Mines, Province of Ontario

Water Well Record

County or Territorial District. Northumberland Township, Village, Town or City. Millbrook
Con. 5 Lot 10 Street and Number (if in Village, Town or City)
Owner Provincial Reformatory (site) Millbrook Address Millbrook Ont.
Date Completed 27 (day) 7 (month) 53 (year) Cost of Well (excluding pump)

Pipe and Casing Record

Casing diameter(s) 2"
Length(s) of casing(s) 5'-10", 7', 1', 22', 20'-4"
Type of screen Slotted
Length of screen 10'-2"
Distance from top of screen to ground level 86'-10"
Is well a gravel-wall type? yes

Pumping Test

Date July 24/53
Static level 4' 3" G.L.
Pumping level 5'-9" G.L. July 27/53. 3'-7½" G.L.
Pumping rate 6 H I G P M
Duration of test 4 hrs.
Distance from cylinder or bowls to ground level Air Compressor

Water Record

Kind (fresh or mineral) Fresh
Quality (hard, soft, contains iron, sulphur, etc.) Fairly Hard
Appearance (clear, cloudy, coloured)
For what purpose(s) is the water to be used?
How far is well from possible source of contamination?
What is the source of contamination?
Enclose a copy of any mineral analysis that has been made of water

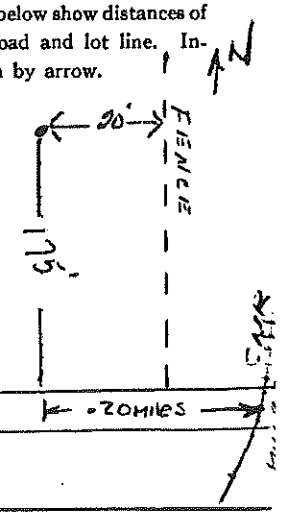
Depth(s) to Water-Horizon(s)	Kind of Water	No. of Feet Water Rises
HARD	226 ppm	
ALK	232 "	
Iron	0.0 ppm	
Chlorides	6 ppm	
PH	7.6	

Well Log

Overburden and Bedrock Record	From	To
Top soil	0 ft.	1 ft.
Brown clay	1	3'
Blue clay sandy	3'	5'
Gravel, Sand & Boulders	5'	7'
Gravel, Streaks fine sand & clay	7'	10'
Soft blue clay & gravel streaks	10'	22'
Cemented Sand & gravel	22'	32'
Sandy clay	32'	54'
Cemented sand and gravel	54'	57'
Boulders gravel & sand	57'	59'
Cemented sand & gravel	59'	60'
Clay, streaks of sand	60'	69'
Clay & gravel	69'	71'
Cemented sand & gravel	71'	73'
Boulders gravel, sand streaks of clay	73'	82'
Clay & gravel & sand streaks	82'	91'

Location of Well

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



Situation. Is well on upland, in valley, or on hillside? hillside
Drilling Firm International Water Supply Ltd.
Address 12 Maitland St. Toronto 2 Ont.
Name of Driller C. Mayer Address Toronto Ont.
Date Nov. 24/53 Licence Number 561

C. Mayer
Signature of Licensee

FORM 5

UTM 17 Z 703375 E
9 R 4891411 N
Elev. 9 R 0765
Basin 24

ONTARIO

The Well Drillers Act
Department of Mines, Province of Ontario

RECEIVED 19 No. 2398
AUG 8 1955
GEOLOGICAL BRANCH
DEPARTMENT of MINES

Water Well Record

County or Territorial District... Durham ...Township, Village, ~~Town or City~~ Millbrook BW
Con. ... Lot ... Street and Number (if in Village, Town or City) TOWN OF MILLBROOK, ONT.
Owner Dept. of Public works Address Parl. Buildings Toronto
Date Completed July 13/55 (day) (month) (year) Cost of Well (excluding pump)

Pipe and Casing Record

Casing diameter(s) 22"
Length(s) of casing(s) 64'
Type of screen 12" stainless steel
Length of screen 10'
Distance from top of screen to ground level 62'
Is well a gravel-wall type? Yes

Pumping Test

Date
Static level 04
Pumping level 62 ft.
Pumping rate 280 G.P.M.
Duration of test 40 hrs.
Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral) fresh
Quality (hard, soft, contains iron, sulphur, etc.) hard
Appearance (clear, cloudy, coloured) clear
For what purpose(s) is the water to be used? ~~domestic~~ → Reformatory.
How far is well from possible source of contamination? 200 feet
What is the source of contamination? privy
Enclose a copy of any mineral analysis that has been made of water

Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
60-70'	fresh	54

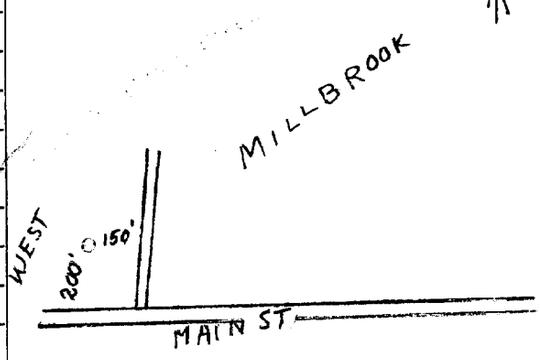
Well Log

Overburden and Bedrock Record	From	To
	0 ft.	....ft.
top sand	0	2
clay & sand	2	4
main sand	6	28
grey clay	28	32
coarse sand	32	60
cemented sand & gravel	60	61
gravel	61	73
clay & gravel	73	78
[illegible]	[illegible]	[illegible]

Location of Well

BW

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



(This well 15' west of July 1/55 well.)

Situation: Is well on upland, in valley, or on hillside? valley
Drilling Firm A. Bradbury
Address Verona
Name of Driller Louis Crouch Address Verona
Date July 16/55 Licence Number Louis Crouch

Signature of Licensee

FORM 5

UTM 17 Z 702874 E
9 R 4891248 N
Elev. 9 R 0805'
Basin 24

ONTARIO

RECEIVED
19 No. 2408
GEOLOGICAL BRANCH
DEPARTMENT of MINES

The Well Drillers Act
Department of Mines, Province of Ontario

Water Well Record

County or Territorial District..... Durham ..... ~~Township~~, Village, ~~Town or City~~ ..... Millbrook
Con. — Lot — Street and Number (if in Village, Town or City) ... TOWN OF MILLBROOK ONT.
Owner ... Dept. of Public works ... Address ... Parl. Bldgs. Toronto.
Date Completed ... July. 1/55 ... Cost of Well (excluding pump) .....
(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) ... 24"
Length(s) of casing(s) ... 64'
Type of screen ... 12" stainless steel
Length of screen ... 10' 64'
Distance from top of screen to ground level ... 60 ft.
Is well a gravel-wall type? ... yes

Pumping Test

Date .....
Static level ... 6' ~~64~~
Pumping level ... 62
Pumping rate ... 280 G.P.M.
Duration of test ... 40 hrs
Distance from cylinder or bowls to ground level .....

Water Record

Kind (fresh or mineral) ... fresh
Quality (hard, soft, contains iron, sulphur, etc.) ... hard
Appearance (clear, cloudy, coloured) ... clear
For what purpose(s) is the water to be used? ... ~~domestic~~ Reformatory.
How far is well from possible source of contamination? ... 200'
What is the source of contamination? ... privy
Enclose a copy of any mineral analysis that has been made of water

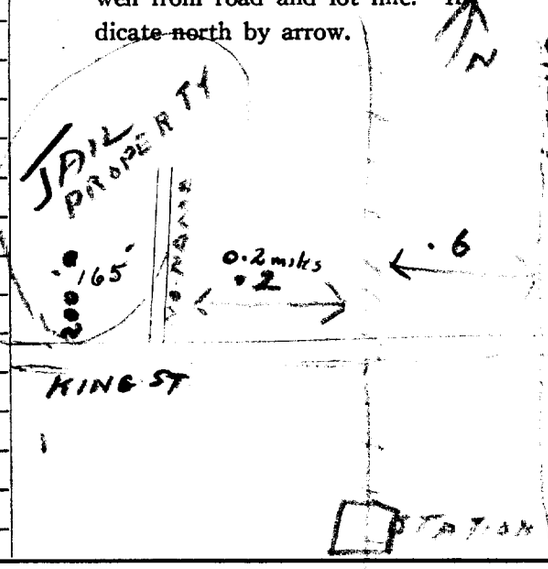
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
60-70'	good	54'

Well Log

Overburden and Bedrock Record	From	To
	0 ft.	....ft.
top soil	0	2
clay & sand	2	6
water sand	6	28
grey clay	28	32
coarse sand	32	50
cemented sand & gravel	50	61
gravel	61	73
clay & gravel	73	78
cemented gravel	78	98

Location of Well

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



Situation: Is well on upland, in valley, or on hillside? ... Valley
Drilling Firm ... C. Gravelbury
Address ... Virginia
Name of Driller ... Norris Cronk ... Address ... Virginia
Date ... July 16/55 ... Licence Number ... Norris Cronk

Signature of Licensee

FORM 5

UTM 17 Z 703650 E Cont Lot 11
Z 48914 N CODED
Elev 5 R 0775
Basin 24

The Ontario Water Resources Commission Act

WATER WELL RECORD

1902527

P. #1.

7

County or District Durham County Township, Village, Town or City Clarke Twp
Con. V Lot 11 Date completed 14 (day) Feb month 1968 year)

[redacted] Address

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 78'
Type of screen 2" slotted pipe
Length of screen 22'
Depth to top of screen 78'
Diameter of finished hole 2"
21' of 7" Surface Casing Cemented.

Pumping Test

Static level +23.42' ABOVE GROUND.
Test-pumping rate 31 G.P.M.
Pumping level +15.22' ABOVE GROUND.
Duration of test pumping 8 hr.
Water clear or cloudy at end of test clear.
Recommended pumping rate ——— G.P.M.
with pump setting of ——— feet below ground surface

Well Log Test Hole #1-68.

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Top soil	0'	1'		
Gravel fill + clay	1'	11'		
Stiff sandy + clay	11'	45'		
Boulders + clay	45'	46'		
Sticky clay + odd streak of gravel	46'	63'		
Silty clay + sand	63'	73'		
Fine sand + some fine gravel	73'	81'	73'	F.
Packed fine gravel, sand with streaks of fine sand + some sandy clay	81'	91'		
Fine + coarse sand + fine gravel	91'	95'		

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

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

Drilling or Boring Firm International Water Supply Co. Ltd.

Address 12 Maitland St. London.

Licence Number

Name of Driller or Borer Howard Peterman

Address 377 Oak St. Newmarket.

Date Mar 6/68

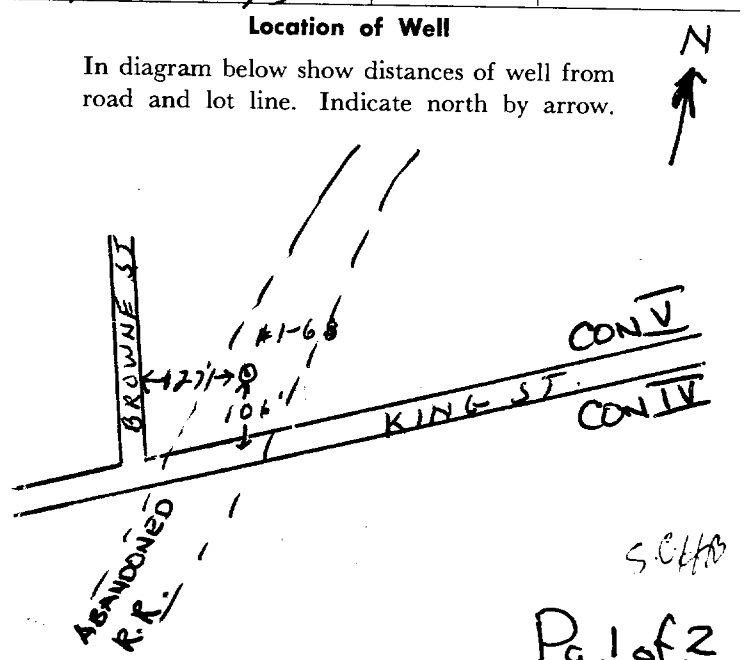
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

O W R C COPY

Location of Well

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



SCHB

Pg 1 of 2

UTM [17] E [7]0[3]1[7]5 Cont. Lot 11
N [5]R [4]8[9]1[3]5[0]

Elev. [6]R [0]7[2]9 CODED

Basin [2]2[4]

1902529

WATER RESOURCES DIVISION
APR 1 1968
ONTARIO WATER RESOURCES COMMISSION

7

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Durham County Township, Village, Town or City Caesarea Twp.

Con. V Lot 11 Date completed 23 (day) FEB. (month) 68 (year)

[redacted] dress

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 89'
Type of screen 2" Slotted Pipe.
Length of screen 11'
Depth to top of screen 89'
Diameter of finished hole 2"
7" SURFACE CASING CEMENTED @ 22.75'

Pumping Test

Static level + 23.17' ABOVE GROUND.
Test-pumping rate Not Pumped. G.P.M.
Pumping level
Duration of test pumping
Water clear or cloudy at end of test
Recommended pumping rate G.P.M.
with pump setting of feet below ground surface

Well Log

Test-Hole #2-68.

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)
Top soil	0'	1'		
Topsoil, boulders + clay (fill)	1'	12'		
Sandy clay	12'	66'		
Sandy clay + some gravel	66'	74'		
Fine sand, silt + fine gravel	74	78'	74	F
Silt, some sand. Odd bit of gravel	78'	85'		
Packed fine + coarse sand + some fine gravel	85'	101'		
Packed, sand, some gravel + odd boulder with cemented streaks	101'	104'		
Packed silty clay + odd bit of gravel	104'	118'		

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

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

Drilling or Boring Firm International Water Supply Co. Ltd.

Address 12 Maitland St. London

Licence Number

Name of Driller or Borer Howard Peterman

Address 377 Oak St. Newmarket

Date May 6/68.

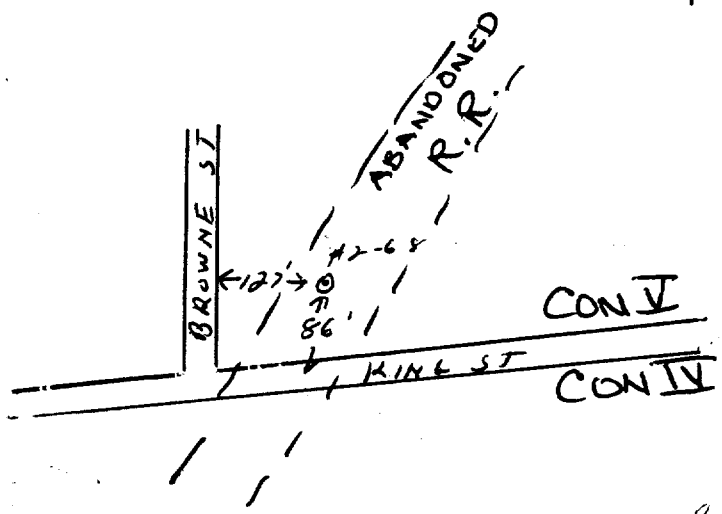
J.R. Turnbull
(Signature of Licensed Drilling or Boring Contractor)

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.



S.C.

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

31 Dlc

Ontario

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

11 | 1903739 | S | L704 | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Durham	CAVAN MILLBROOK	4	12

OWNER (SURNAME FIRST) — ADDRESS — DATE COMPLETED

N. P. CONSTRUCTION | 213 FAIRWELL ST. OSHAWA | DA 05 MO 06 YR 73

21 | UTM ZONE 17 | EASTING 703060 | NORTHING 4891160 | PC 4 | ELEVATION 0785 | SC 5 | BASIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
DARK	Top soil		SOFT.	0	5
BLUE	CLAY		MUCKY	5	80

31 | 0005 0289 | 0080305

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0079	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	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	1/4	0	080
	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 INCHES	LENGTH FEET
NIL		

MATERIAL AND TYPE: NIL — DEPTH TO TOP OF SCREEN 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: OVERFLOW GPM — DURATION OF PUMPING: HOURS 02 MINS 30

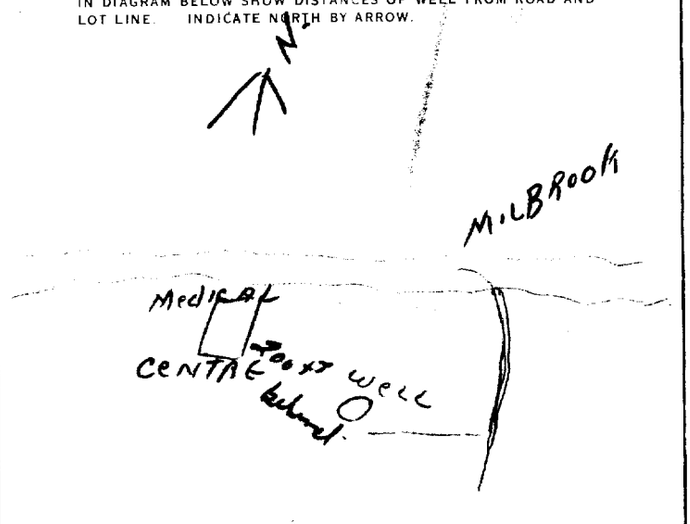
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY			
-00 FEET	015 FEET	15 MINUTES 005 FEET	30 MINUTES 010 FEET	45 MINUTES 015 FEET	60 MINUTES 015 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
0002 GPM	70 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	070 FEET	0010 GPM

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 | 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 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER HOUSE 9 ☐ NOT USED

METHOD OF DRILLING 57: 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: Lloyd A. Gillespie — LICENCE NUMBER: 2342

ADDRESS: R.R. #2 PRT HOPE

NAME OF DRILLER OR BORER: Lloyd A Gillespie — LICENCE NUMBER: 2342

SIGNATURE OF CONTRACTOR — SUBMISSION DATE: DAY 18 MO. 7 YR 73

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 2342 — DATE RECEIVED 63-68: 080174

DATE OF INSPECTION — INSPECTOR

REMARKS: Reduced 1/2 inch.

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FORM 7 07-091

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

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

11 | 5108215 | MUNICIP. 5170[illegible] | P W I

COUNTY OR DISTRICT: PETERBOROUGH | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: MILLBROOK | CON., BLOCK, TRACT, SURVEY, ETC. | LOT

[redacted] St. Avenue West, Toronto, Ontario. | DATE COMPLETED: DAY 01 MO 06 YR 76

UTM | RC: 4 | ELEVATION: 0770 5 | SOURCE CODE: 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
		x#x8xWxxlx			
Grey	Clay and Stones			0	28
Grey	Sandy clay and gravel			28	55
Brown	Sandy Gravel			55	105

31 | 00282051[illegible] | 00552052811 | 01056111[illegible]

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0030 30-100	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL — #5
15-18	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
20-23	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
25-28	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
30-33	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
10"	1 ☒ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE		0	0090
17-18	1 ☐ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.): 060 ~~100~~ ~~80~~ | DIAMETER: 10.000 ~~10~~ INCHES | LENGTH: 15 ~~12~~ ~~5~~ FEET

MATERIAL AND TYPE: SS. Stel ~~XXX XXXXX~~ | DEPTH TO TOP OF SCREEN: 00 86 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 Flow 2 ☐ BAILER | PUMPING RATE: 0300 Flow/300 GPM | DURATION OF PUMPING: 24 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
-16 ~~146~~ FEET	+ 7.9 ~~- FEET~~	+10.3 FEET	+8.9 FEET	+8.5 FEET	+8.2 FEET

1 ☐ PUMPING 2 ☐ RECOVERY

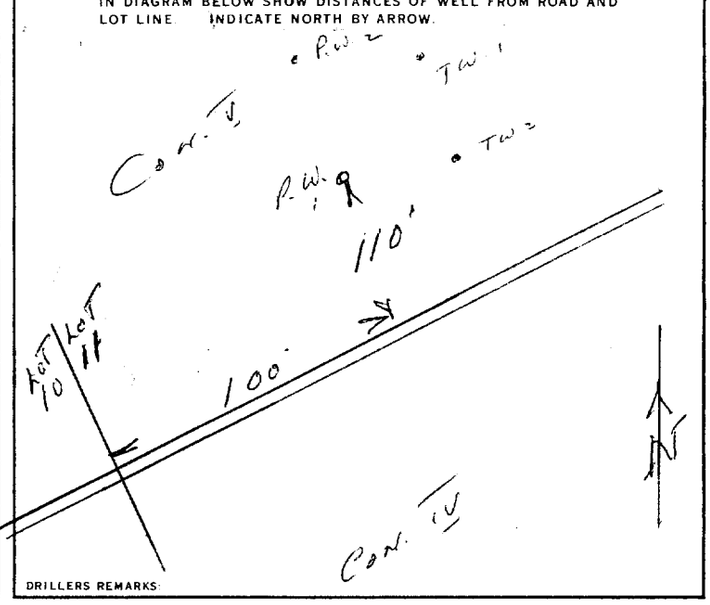
IF FLOWING, GIVE RATE: 0300 GPM | PUMP INTAKE SET AT: NA FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

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

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: 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: 06

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

OF WELL CONTRACTOR: G. HART AND SONS | LICENCE NUMBER: 2517

neth H. Hart

nelon Falls, Ontario K0M 1N0

RER: Johnston | LICENCE NUMBER: 2517

SUBMISSION DATE: DAY ____ MO. 06 YR. 76

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 2517 | DATE RECEIVED: 061076

DATE OF INSPECTION | INSPECTOR

REMARKS: P W I

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MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

1. PRINT ONLY IN SPACES PROVIDED
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11 — 5108216 — MUNICIP. 51704 — COD — #PW-2

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY ETC.	LOT 25-27
PETERBOROUGH	MILLBROOK		

[redacted] St.Clair Avenue West,Toronto,Ontario — DATE COMPLETED 48-53: DA 01 MO 06 YR 76

THING 891350 — ELEVATION 0770 — RESIN CODE 24

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Grey	Clay and Stones			0	30
Grey	Sandy Clay and gravel, silty clay			30	53
Brown	sand			53	56
Brown	Gravel			56	108
Brown	Clay and gravel			108	110

DRWD — 1.9

31 — 0030205112 — 0053205281.1 — 0056628 — 0108611 — 0110605111

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
30 0030 100	1 ☐ FRESH 2 ☐ SALTY #5 3 ☐ SULPHUR 4 ☐ MINERAL
15-18	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
20-23	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
25-28	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
30-33	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
10-11	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0088 88
17-18	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			20-23
24-25	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH
100 060	10.000 INCHES	15 12 FEET

MATERIAL AND TYPE: SS STEEL — DEPTH TO TOP OF SCREEN: 0088 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER — PUMPING 0300 [illegible] GPM — DURATION OF PUMPING 24 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
19-21 FEET	22-24 FEET		26-28 FEET	29-31 FEET	32-34 FEET	35-37 FEET

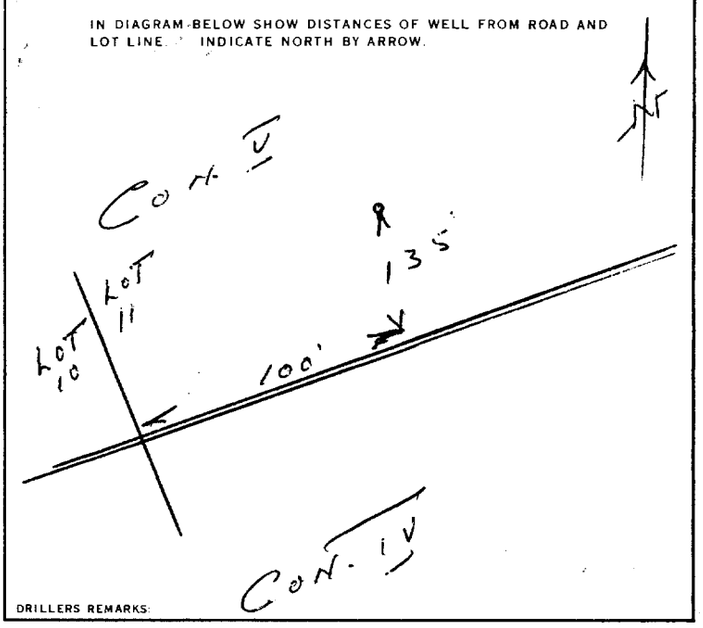
IF FLOWING, GIVE RATE 38-41 GPM — PUMP INTAKE SET AT FEET — WATER AT END OF TEST 42: 1 ☐ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP — RECOMMENDED PUMP SETTING 43-45 FEET — RECOMMENDED PUMPING RATE 46-49 GPM

50-53 ____ 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 06: 1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☒ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 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

DRWD — 5.8

CONTRACTOR

NAME OF WELL CONTRACTOR: G. HART AND SONS — LICENCE NUMBER: 2517

ADDRESS: KENNETH H. HART R.R.#1,Fenelon Falls,Ontario,K0M 1N0.

NAME OF DRILLER OR BORER: Mr. Cecil Johnston — LICENCE NUMBER: 2517

SIGNATURE OF CONTRACTOR — SUBMISSION DATE: DAY ____ MO. 06 YR 76

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 2517 — DATE RECEIVED 63-68: 06 10 76

DATE OF INSPECTION — INSPECTOR

REMARKS: PM WI

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FORM 7 MOE 07-091

Ontario

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

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

11   5108280   MUNIC. 51704 CON. 76

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
PETERBOROUGH	MILLBROOK		

[redacted] 5 St Clair Ave W. TORONTO — DATE COMPLETED: DAY 01 MO. 04 YR. 76

[redacted] 891350 | RC 4 | ELEVATION 0770 | RC 5 | BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Grey	Clay	Stones		0	25
Grey	Clay	Gravel		25	29
Grey	Clay	Stones		29	30
Brown	Clay	Gravel		30	51
Brown	Gravel	Sandy		51	56
Brown	Gravel			56	102

31 | 002520512 | 002920511 | 003020512 | 005160511 | 005661128 | 0102611

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0025	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
0051	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
13	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☒ CONCRETE 4 ☐ OPEN HOLE	2 1/2	0	0025
08"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.277	+1'	~~0026~~ 25
~~06~~ 6 1/4	1 ~~STEEL~~ 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE — Removed	.188	+8	96' ~~0096~~

SCREEN

SIZE(S) OF OPENING (SLOT NO.): ~~70~~ 060 — DIAMETER: ~~06~~ 6" INCHES — LENGTH: 3'06 FEET

MATERIAL AND TYPE: Stainless Steel — Removed — DEPTH TO TOP OF SCREEN: 0096' FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0000	0026	Cement grout
0026	0102	Cuttings

71 PUMPING TEST

PUMPING TEST METHOD: ~~Flow~~ 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE: ~~Flow Rate 350~~ 0150 GPM — DURATION OF PUMPING: HOURS / MINS

STATIC LEVEL: -20 ~~+13.8~~ FEET — WATER LEVEL END OF PUMPING: ~~+12~~ FEET

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY — 15 MINUTES / 30 MINUTES / 45 MINUTES / 60 MINUTES

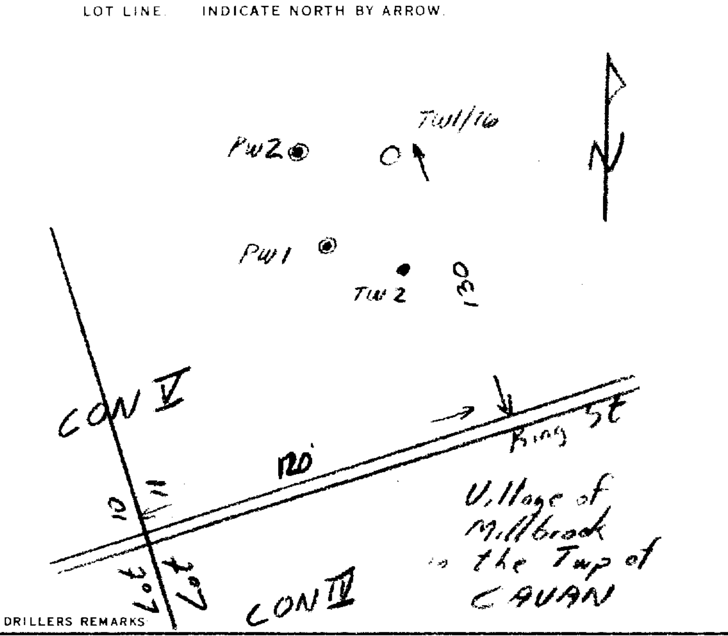
IF FLOWING, GIVE RATE: 0150 GPM — PUMP INTAKE SET AT: NA FEET — WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

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

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: 3

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

WATER USE: 69

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: G Hart & Sons — Kenneth H Hart — LICENCE NUMBER: 2517

ADDRESS: RR#1, Fenlon Falls, Ont

NAME OF DRILLER OR BORER: Mr Cecil Johnston — LICENCE NUMBER: 2517

SIGNATURE OF CONTRACTOR — SUBMISSION DATE: DAY ___ MO. Nov YR. '76

OFFICE USE ONLY

DATA SOURCE: 1 — CONTRACTOR: 2517 — DATE RECEIVED: 101276

DATE OF INSPECTION — INSPECTOR

REMARKS: — P — WI

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 — 5115005 — MUNICIP 51024 — CON. CON 05

COUNTY OR DISTRICT: PTBO
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: CAVAN
CON. BLOCK, TRACT, SURVEY, ETC: CONC 5
LOT: 11
[redacted] TORONTO, ONT.
DATE COMPLETED: DAY 13 MO 05 YR 90

RC | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
			TOP SOIL	0	1
Brown	Clay	Rocky	Clay Rocks	1	12
Gray	Clay	Sand Stringers	Clay Sand Stringers	12	76
Gray	Clay	Sand	Clay Sand	76	105

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
47-53	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
74-76	1 ☐ FRESH 2 ☒ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	188	0	43
5 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	188	36	105
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.): Torch
DIAMETER: 5 1/4 INCHES
LENGTH: 67 FEET
MATERIAL AND TYPE: 5 1/4 steel 188 47-53 74-76
DEPTH TO TOP OF SCREEN: 36 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
0	15	Hole Plug

71 PUMPING TEST

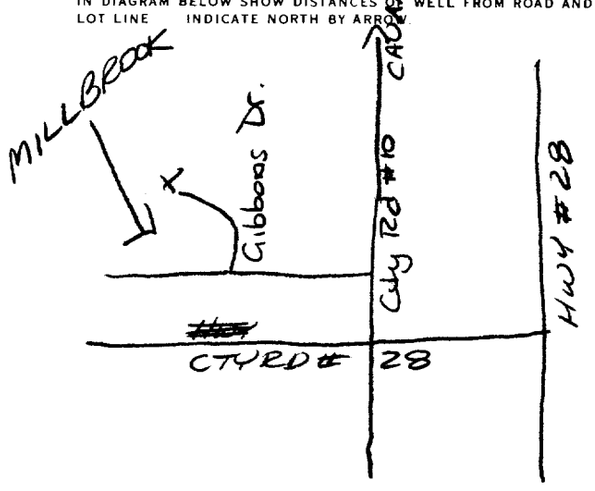
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 7 GPM
DURATION OF PUMPING: 4 HOURS ___ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
FEET	30 FEET	15 MINUTES: 10 FEET	30 MINUTES: FEET	45 MINUTES: FEET	60 MINUTES: FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 35 FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 2 FEET
RECOMMENDED PUMPING RATE: 2 GPM

LOCATION OF WELL

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



76225

DRILLERS REMARKS

FINAL STATUS OF WELL

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

WATER USE

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 CONSTRUCTION

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

CONTRACTOR

NAME OF WELL CONTRACTOR: Parsons Drilling
WELL CONTRACTOR'S LICENCE NUMBER: 4332
ADDRESS: RR#5 Peterborough, Ont
NAME OF WELL TECHNICIAN: RON PARSONS
WELL TECHNICIAN'S LICENCE NUMBER: 10484
SIGNATURE OF TECHNICIAN/CONTRACTOR: R Parsons
SUBMISSION DATE: DAY ___ MO. ___ YR. ___

OFFICE USE ONLY

DATA SOURCE
CONTRACTOR: 4332
DATE RECEIVED: DEC 10 1990
DATE OF INSPECTION
INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1 2) **5119299** Municipality 51024 (10 14) Con. CON 05 (15 22 23 24)

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
Peterborough	Cavan Twp., Town of Millbrook	Con.5	Pt.10

[redacted]

Address: 1 King St.E., Millbrook,Ont.L0A 1G0

Date completed (48-53): 21 day 11 month 02 year

21 (1 2) UTM (10) Northing (12 17 18 24) RC (25) Elevation (26) RC (30) Basin Code (31) ii iii iv (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Black	Topsoil			0	1½
Gray	Clay & stones		hard	1½	5
Gray	Sandy clay & gravel		soft	5	28
Brown	Sand	some gravel	water bearing	28	33
Brown	Coarse sand & gravel		water bearing	33	74
Brown	Gravel	some sand	water bearing	74	105
Gray	Clay & gravel			105	106
		* Finished depth 102 ft.			

31 (10 14 15 21)
32 (32 43 54 65 75 80)

41 WATER RECORD

Water found at - feet (10-13)	Kind of water	
86-101	1 ☒ Fresh 2 ☐ Salty (UNTESTED) 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas	(14)
15-18	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas	(19)
20-23	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas	(24)
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas	(29)
30-33	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas	(34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
(10-11) 10	(12) 1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.380	+3	(13-16) 85
(17-18) 14	(19) 1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.380	+1	(20-23) 20
(24-25)	(26) 1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38)	Length (39-40)
80	10 inches	15 feet

Material and type	Depth at top of screen (41-44)	(30)
S.S. Telescoping	86 feet	

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From (12-13)	To (21-22)	Material and type (Cement grout, bentonite, etc.)
0	20	Cement (outside 14")
0	20	Bentonite grout
(26-29)	(30-33)	(80) (inside 14")

71 PUMPING TEST

Pumping test method (10): 1 ☒ Pump 2 ☐ Bailer

Pumping rate (11-14): 350 GPM

Duration of pumping (15-16 Hours, 17-18 Mins): 24

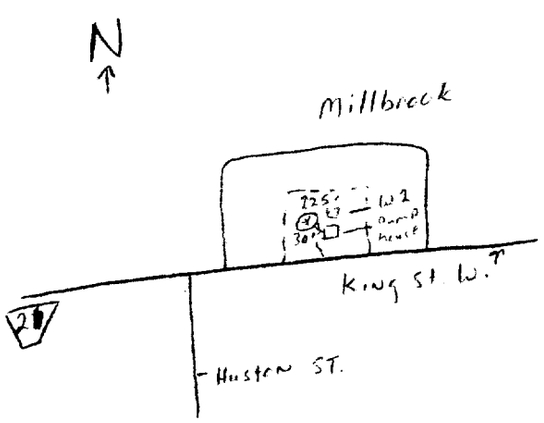
Static level (19-21)	Water level end of pumping (22-24)	Water levels during (25): 1 ☒ Pumping 2 ☐ Recovery			
		15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
+16.50 feet	+2.82 feet	+11.94 feet	+10.84 feet	+10.47 feet	+10.60 feet

If flowing give rate (38-41)	Pump intake set at	Water at end of test (42)	
+350 GPM	40 feet	☒ Clear	☐ Cloudy
Recommended pump type: ☐ Shallow ☒ Deep	Recommended pump setting (43-45): 40 feet	Recommended pump rate (46-49): 350 GPM	

(50-53)

LOCATION OF WELL

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



252383

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 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE (55-56)

1 ☐ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☒ Commercial
6 ☒ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool
2 ☒ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☒ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
G.Hart & Sons Well Drilling Ltd.	2662
Address	
Box 850, Fenelon Falls, ON	
Name of Well Technician	**Well Technician's Licence No.**
Bryan Watson	T-2441
Signature of Technician/Contractor	**Submission date** day mo yr
Bryan Watson	

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	2662	FEB 19 2003
Date of inspection	Inspector	
Remarks		
	CSS.ES3	

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario **Ministry of the Environment**

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1 2) **5119300**

Municipality (10 14) 51024 Con. (15 22 23 24) CON 05

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
Peterborough	Town of Cavan Twp., Millbrook	Con. 5	Pt. 10

[redacted]

Address: 1 King St. E., Millbrook, ONT L0A 1G0

Date completed (48-53): 15 day 10 month 02 year

21 (1 2) UTM (10) Northing (12 17 18 24) RC (25) Elevation (26) RC (30) Basin Code (31) ii iii iv (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Black	Topsoil			0	1½
Gray	Clay & Stones		hard	1½	5
Gray	Clay & Gravel		soft	5	26
Brown	Sand	some gravel	waterbearing	26	29

31 (1 2)

32 (10 14 15 21 32 43 54 65 75 80)

41 WATER RECORD

Water found at - feet	Kind of water
10-13	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (14)
15-18	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
20-23	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
30-33	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
10-11	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (12)			13-16
17-18	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (19)			20-23
24-25	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic (26)			27-30

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter inches (34-38)	Length feet (39-40)
Material and type	Depth at top of screen feet (41-44)	(30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☒ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0 (13)	29 (15-17)	Cement
18-21	22-25	
26-29	30-33	(80)

71 PUMPING TEST

Pumping test method (10): 1 ☐ Pump 2 ☐ Bailer

Pumping rate (11-14): GPM

Duration of pumping (15-16 Hours, 17-18 Mins)

Static level (19-21) feet	Water level end of pumping (22-24) feet	Water levels during (25): 1 ☐ Pumping 2 ☐ Recovery			
		15 minutes (26-28) feet	30 minutes (29-31) feet	45 minutes (32-34) feet	60 minutes (35-37) feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☐ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☐ Deep

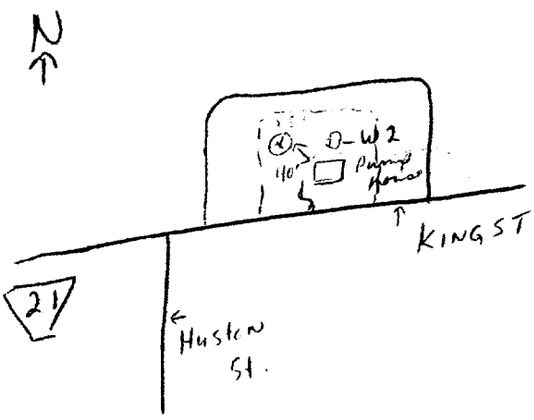
Recommended pump setting (43-45): feet

Recommended pump rate (46-49): GPM

(50-53)

LOCATION OF WELL

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



252384

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 ☐ Abandoned (Other)
8 ☐ Dewatering
9 ☐ Unfinished
10 ☐ Replacement well

WATER USE (55-56)

1 ☐ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool
2 ☒ Rotary (conventional)
3 ☐ Rotary (reverse)
4 ☐ Rotary (air)
5 ☐ Air percussion
6 ☐ Boring
7 ☐ Diamond
8 ☐ Jetting
9 ☐ Driving
10 ☐ Digging
11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
G.Hart & Sons Well Drilling Ltd.	2662
Address	
Box 850, Fenelon Falls, ON	
Name of Well Technician	**Well Technician's Licence No.**
Bryan Watson	T-2441
Signature of Technician/Contractor	**Submission date** day mo yr
Clark Watson	

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	2662	FEB 19 2003
Date of inspection	Inspector	
Remarks		
	CSS.ES3	

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario — Ministry of the Environment

Measurements recorded in: [x] Metric [ ] Imperial

Well Tag No. (Place Sticker and/or Print Below) A115631 **A115631**

Well Record

Regulation 903 Ontario Water Resources Act

8533 Page 2 of 3

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
706 CR-21			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Millbrook	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	670289	4849180		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brn	fine sand		soft, dry	0	6.1
Brn	fine sand		Dense packed, dry	6.1	15.24
Brn	fine sand		Dense packed, wet	15.24	20.11

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	17.98	Bensea	
17.98	20.11	Sand	

Method of Construction

[ ] Cable Tool [ ] Diamond
[x] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
4.03	PVC	.368	0	17.98

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
4.82	PVC	10	17.98	20.11

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	
	[ ] Fresh [ ] Untested	[ ]	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20.11	10.92

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

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

Map of Well Location

Please provide a map below following instructions on the back.

See map

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Strata Soil Sampling	7241

Business Address (Street Number/Name)	Municipality
147-2 West Beaver Creek Rd	Richmond Hill

Province	Postal Code	Business E-mail Address
Ontario	L4B1C6	wrecords@stratasoil.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
9057649304	Beatty Brian

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3616		2011 05 04

Well owner's information package delivered: [ ] Yes [ ] No

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

Date Work Completed: 2011 04 25

Ministry Use Only

Audit No. z131001

JUN 02 2011 Received

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3/3

0533

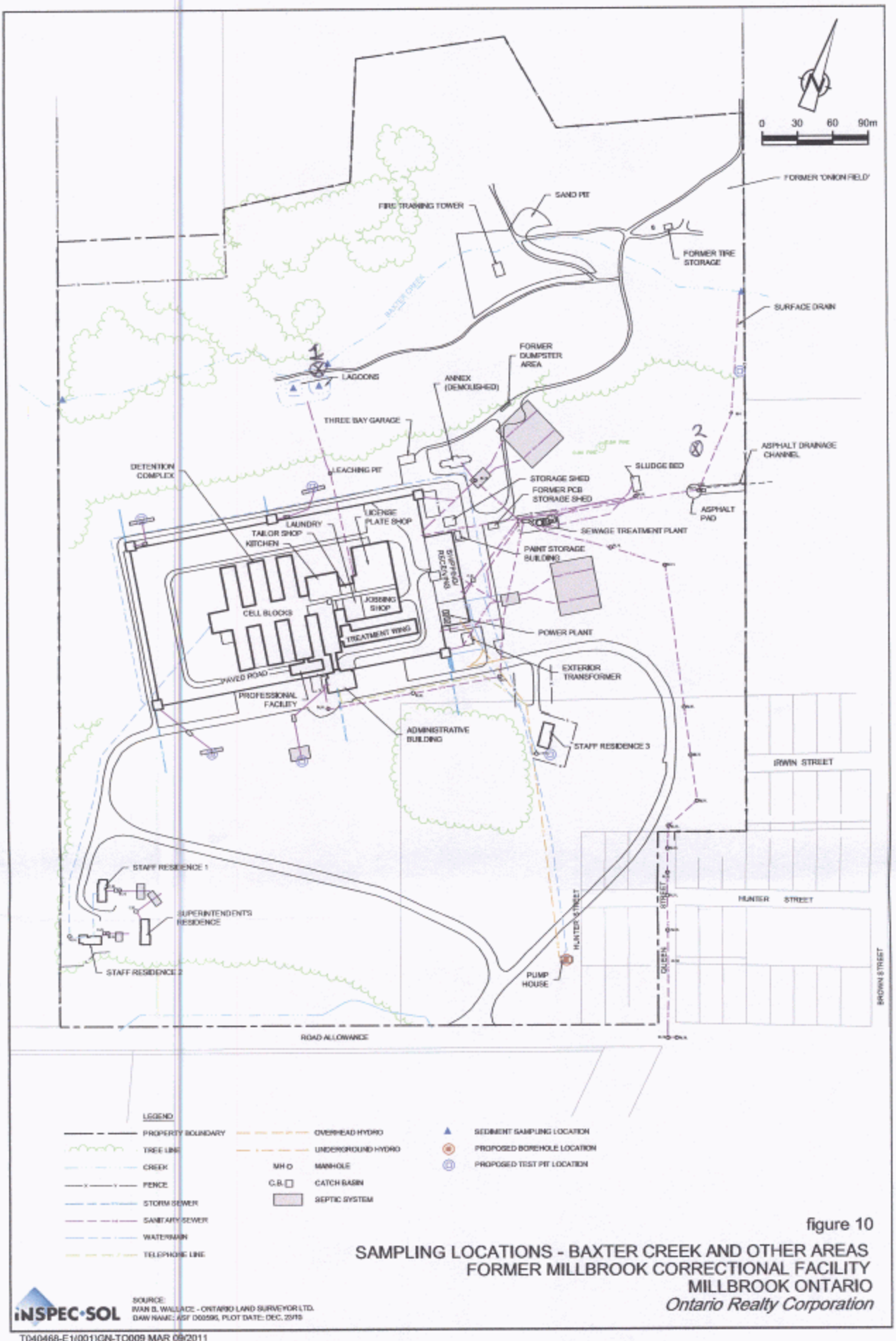

figure 10

SAMPLING LOCATIONS - BAXTER CREEK AND OTHER AREAS
FORMER MILLBROOK CORRECTIONAL FACILITY
MILLBROOK ONTARIO
Ontario Realty Corporation

iNSPEC·SOL

SOURCE:
IVAN B. WALLACE - ONTARIO LAND SURVEYOR LTD.
DAW NAME: ASF D00590, PLOT DATE: DEC. 25/10

T040468-E1(001)GN-TO009 MAR 09/2011

2111747
2131001

JUN 0 2 2011

Well ID Number: 7233407
Well Audit Number: *Z188641*
Well Tag Number: *A169898*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	HIGHWAY 21 WEST OF QUEEN ST.
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702901.00 Northing: 4891596.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	GRVL	SILT	0 ft	30 ft
BRWN	SILT	SAND		30 ft	48 ft
GREY	CLAY	SILT	SAND	48 ft	72 ft
GREY	SAND	SILT		72 ft	88 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	3 ft	CEMENT	
3 ft	70 ft	GROUT/HOLEPLUG	
70 ft	88 ft	SAND	

Method of Construction & Well Use

Method of Construction	Well Use
Auger	
	Monitoring and Test Hole

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	77 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2 inch	PLASTIC	77 ft	87 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind
34 ft	Untested
72 ft	Untested

Hole Diameter

Depth From	Depth To	Diameter
0 ft	40 ft	10 inch
40 ft	88 ft	5 inch

Audit Number: Z188641

Date Well Completed: November 19, 2014

Date Well Record Received by MOE: December 12, 2014

Well ID Number: 7233408
Well Audit Number: *Z188647*
Well Tag Number: *A169910*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	HIGHWAY 21 WEST OF QUEEN ST.
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702722.00 Northing: 4891649.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	GRVL	SILT	0 ft	77 ft
BRWN	SAND	SILT		77 ft	100 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	3 ft	CEMENT	
3 ft	85 ft	HOLEPLUG/GROUT	
85 ft	100 ft	SAND	

Method of Construction & Well Use

Method of Construction	Well Use
Auger	Monitoring and Test Hole

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	87 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2 inch	PLASTIC	87 ft	97 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind
89 ft	Untested

Hole Diameter

Depth From	Depth To	Diameter
0 ft	100 ft	8 inch

Audit Number: Z188647

Date Well Completed: November 19, 2014

Date Well Record Received by MOE: December 12, 2014

Updated: June 28, 2018
Rate Rate
Share facebook twitter Print

Well ID Number: 7233409
Well Audit Number: *Z188646*
Well Tag Number: *A169899*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	HIGHWAY 21 WEST OF QUEENS ST.
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702899.00 Northing: 4891537.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	GRVL		0 ft	10 ft
BRWN	SILT	SAND		10 ft	27 ft
GREY	CLAY	SILT	SAND	27 ft	41 ft
GREY	SAND	SILT		41 ft	58.667 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	3 ft	CEMENT	
3 ft	45 ft	GROUT/HOLEPLUG	
45 ft	58.667 ft	SAND	

Method of Construction & Well Use

Method of Construction	Well Use
Auger	
	Monitoring and Test Hole

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	46.667 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2 inch	PLASTIC	36.667 ft	46.667 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind
17 ft	Untested
41 ft	

Hole Diameter

Depth From	Depth To	Diameter
0 ft	15 ft	10 inch
15 ft	58.667 ft	5 inch

Audit Number: Z188646

Date Well Completed: November 19, 2014

Date Well Record Received by MOE: December 12, 2014

Well ID Number: 7251393
Well Audit Number: *Z217111*
Well Tag Number: *A185307*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	PETERBOROUGH COUNTY RD 21 WEST OF QUEEN
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702955.00 Northing: 4891666.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
	Monitoring

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter

Audit Number: Z217111

Date Well Completed: July 21, 2015

Date Well Record Received by MOE: November 02, 2015

Updated: June 28, 2018
Rate Rate
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Map: Well records

This map allows you to search and view well record information from reported wells in Ontario.

Full dataset is available in the Open Data catalogue.

Go Back to Map

Well ID

Well ID Number: 7251394
Well Audit Number: *Z217110*
Well Tag Number: *A185306*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	PETERBOROUGH COUNTY RD WEST OF QUEEN
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702949.00 Northing: 4891587.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
	Monitoring

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter

Audit Number: Z217110

Date Well Completed: July 14, 2015

Date Well Record Received by MOE: November 02, 2015

Updated: June 28, 2018
Rate Rate
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Tags

- Environment and energy,
- Drinking water,
- Environment maps,
- Well water

Ministry of the Environment, Conservation and Parks

The Ministry of the Environment, Conservation and Parks works to protect and sustain the quality of Ontario's air, land, and water. We also coordinate Ontario's actions on climate change in the name of healthier communities, ecological protection and economic prosperity.

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- Health and wellness
- Home and community
- Jobs and employment
- Law and safety
- Laws
- Rural and north
- Taxes and benefits
- Travel and recreation

ABOUT ONTARIO

Well ID Number: 7254535
Well Audit Number: *Z215538*
Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	706 COUNTY RD 21
Township	CAVAN TOWNSHIP
Lot	009
Concession	CON 05
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702881.00 Northing: 4891439.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	3 ft	3/8 CLEAR LIMESTONE, BENSEAL	
3 ft	8 ft	HOLEPLUG	
8 ft	25 ft	3/8 CLEAR LIMESTONE	
25 ft	30 ft	HOLEPLUG	
30 ft	60 ft	3/8 CLEAR LIMESTONE	
60 ft	64 ft	HOLEPLUG	

Method of Construction & Well Use

Method of Construction	Well Use

Status of Well

Abandoned-Other

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
12 inch	STEEL	0 ft	64 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 1413

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	Y

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL	6 ft		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter

Audit Number: Z215538

Date Well Completed: October 15, 2015

Date Well Record Received by MOE: December 18, 2015

Well ID Number: 7254536
Well Audit Number: *Z215539*
Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	706 COUNTY RD 21
Township	CAVAN TOWNSHIP
Lot	009
Concession	CON 05
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702877.00 Northing: 4891437.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	8 ft	3/8 CLEAR LIMESTONE	
8 ft	20 ft	HOLEPLUG	

Method of Construction & Well Use

Method of Construction	Well Use

Status of Well

Abandoned-Other

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
12 inch	STEEL	0 ft	20 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 1413

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	Y

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter

Audit Number: Z215539

Date Well Completed: October 15, 2015

Date Well Record Received by MOE: December 18, 2015

Updated: June 28, 2018
Rate Rate
Share facebook twitter Print
Tags

Well ID Number: 7262813
Well Audit Number: *Z217191*
Well Tag Number: *A185375*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	706 PETERBOROUGH COUNTY RD 21
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702725.00 Northing: 4891659.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
Rotary (Convent.)	Monitoring

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
5 inch	STEEL	0 ft	123 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter
0 ft	123 ft	10 inch

Audit Number: Z217191

Date Well Completed: January 08, 2016

Date Well Record Received by MOE: May 09, 2016

Updated: June 28, 2018
Rate Rate
Share facebook twitter Print
Tags

Well ID Number: 7282724
Well Audit Number: *Z252009*
Well Tag Number:

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	706 COUNTY RD 21
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702726.00 Northing: 4891656.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed

Method of Construction & Well Use

Method of Construction	Well Use
	Monitoring

Status of Well

Abandoned-Other

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was	
If pumping discontinued, give reason	
Pump intake set at	
Pumping Rate	
Duration of Pumping	
Final water level	
If flowing give rate	
Recommended pump depth	
Recommended pump rate	
Well Production	
Disinfected?	

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter
0 ft	85 ft	4 inch

Audit Number: Z252009

Date Well Completed: February 24, 2017

Date Well Record Received by MOE: March 08, 2017

Updated: June 28, 2018
Rate Rate
Share facebook twitter Print
Tags

Well ID Number: 7282725
Well Audit Number: *Z252010*
Well Tag Number: *A213571*

This table contains information from the original well record and any subsequent updates.

Well Location

Address of Well Location	706 COUNTY RD 21
Township	CAVAN TOWNSHIP
Lot	
Concession	
County/District/Municipality	PETERBOROUGH
City/Town/Village	MILLBROOK
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 702968.00 Northing: 4891555.00
Municipal Plan and Sublot Number	
Other	

Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
	SAND	GRVL		0 ft	20 ft
	SAND	WBRG		20 ft	30 ft
	FSND			30 ft	58 ft
	CLAY			58 ft	64 ft
	CLAY			64 ft	75 ft
	SAND	FGRD	CGRD	75 ft	130 ft
	SAND	GRVL		130 ft	146 ft
	CLAY			146 ft	147 ft

Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	100 ft	GROUT	
100 ft	104 ft	PELLETS	
104 ft	110 ft	SAND	
110 ft	135 ft	PELLETS	
135 ft	141 ft	SAND	

Method of Construction & Well Use

Method of Construction	Well Use
	Monitoring

Status of Well

Observation Wells

Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
1 inch	PLASTIC	0 ft	104 ft
1 inch	PLASTIC	0 ft	136 ft

Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
1 inch	PLASTIC	136 ft	141 ft
1 inch	PLASTIC	104 ft	109 ft

Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7238

Results of Well Yield Testing

After test of well yield, water was
If pumping discontinued, give reason
Pump intake set at
Pumping Rate
Duration of Pumping
Final water level
If flowing give rate
Recommended pump depth
Recommended pump rate
Well Production
Disinfected?

Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

Water Details

Water Found at Depth	Kind

Hole Diameter

Depth From	Depth To	Diameter
0 ft	141 ft	4.5 inch

Source: Ministry of Natural Resources and Forestry. © Queen's Printer for Ontario, 2015.

Scale:
Refer to Scale Bar
Coordinate System:
NAD 1983 UTM Zone 17

Veltri and Son Limited
Turner Street, Millbrook, Ontario
Geotechnical Investigation

11178428-01
August, 2018

WELL SURVEY LOCATIONS

APPENDIX B.2

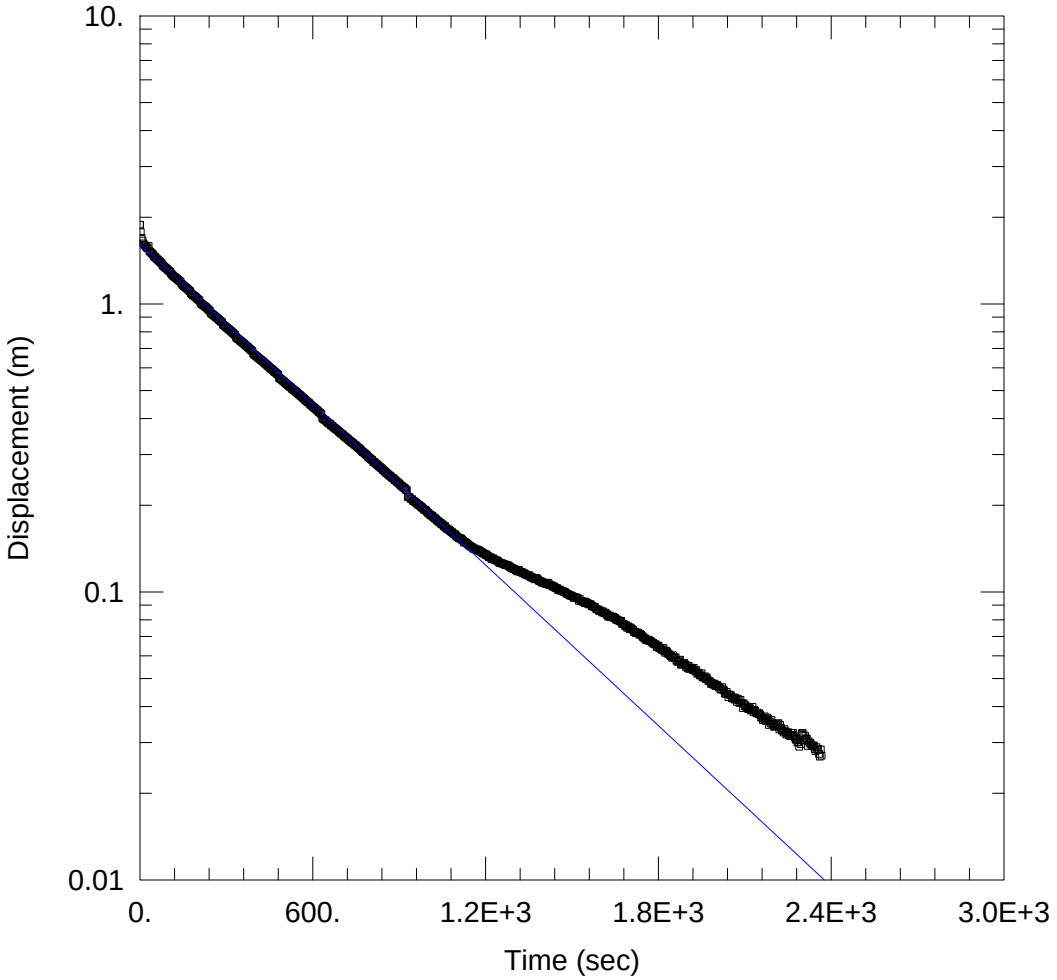
WATER WELL INFORMATION SURVEY
PROJECT: 11178428-01
LOCATION: Millbrook, Ontario

August 22, 2018
Appendix B.2.1

Address	Well ID for Map	Easting (m)	Northing (m)	Well Type	Top of Well (m)	Water Level (m)	Depth (m)	Quality	Quantity	Comments
9 Turner Street	L-1	--	--	--	--	--	--	--	--	Home owner indicated they are on municipal water and doesn't have a well.
6 Hunter Street	L-2	--	--	--	--	--	--	--	--	No one available at time of survey.
8 Hunter Street	L-3	--	--	--	--	--	--	--	--	No one available at time of survey.
10 Hunter Street	L-4									Home owner indicated they are on municipal water and doesn't have a well.
12 Hunter Street	L-5									No one available at time of survey.
14 Hunter Street	L-6									No one available at time of survey.
16 Hunter Street	L-7	--	--	--	--	--	--	--	--	No one available at time of survey.

Notes: Area is serviced by municipal water as indicated by numerous fire hydrants.

Appendix C
Hydraulic Conductivity Data



FALLING HEAD TEST

Data Set: G:\...\11178428-01, 18-08-15, BH-1 Falling Head Test.aqt
Date: 09/11/18 Time: 11:28:21

PROJECT INFORMATION

Company: GHD
Client: Veltri
Project: 11178428-01
Location: Turner Street, Millbrook
Test Well: BH-1
Test Date: August 14, 2018

AQUIFER DATA

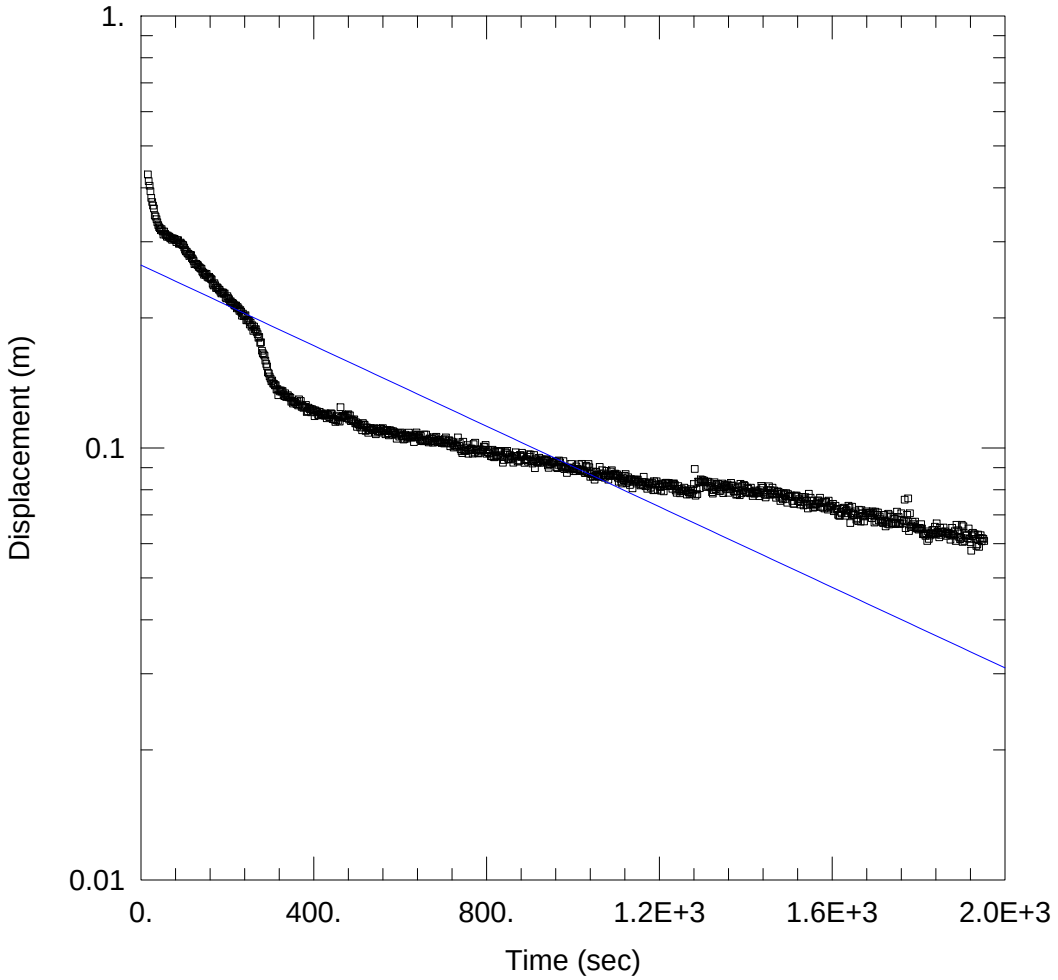
Saturated Thickness: 0.281 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-1)

Initial Displacement: 1.882 m
Static Water Column Height: 0.276 m
Total Well Penetration Depth: 4.562 m
Screen Length: 1.5 m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.000719 cm/sec
y0 = 1.616 m



FALLING HEAD TEST

Data Set: G:\...\11178428-01, 18-08-15, BH-4 Falling Head.aqt
Date: 09/11/18 Time: 11:30:34

PROJECT INFORMATION

Company: GHD
Client: Veltri
Project: 11178428-01
Location: Turner Street, Millbrook
Test Well: BH-4
Test Date: August 14, 2018

AQUIFER DATA

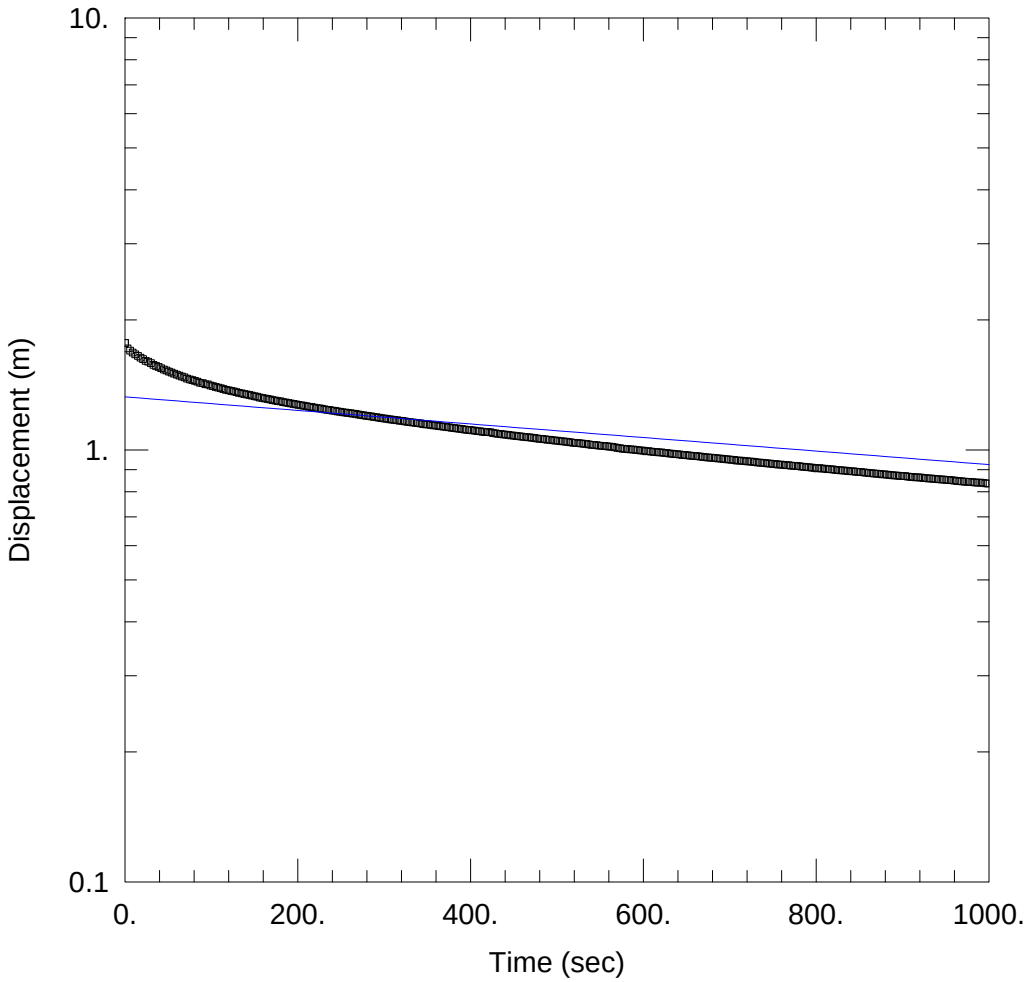
Saturated Thickness: 0.484 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-4)

Initial Displacement: 1.099 m Static Water Column Height: 0.484 m
Total Well Penetration Depth: 8.291 m Screen Length: 1.5 m
Casing Radius: 0.025 m Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.0002527 cm/sec y0 = 0.265 m



FALLING HEAD TEST

Data Set: G:\...\11178428-01, 18-08-15, BH-4 Standpipe Falling Head Test.aqt
Date: 09/11/18 Time: 11:36:56

PROJECT INFORMATION

Company: GHD
Client: Veltri
Project: 11178428-01
Location: Turner Street, Millbrook
Test Well: BH-4 Standpipe
Test Date: August 14, 2018

AQUIFER DATA

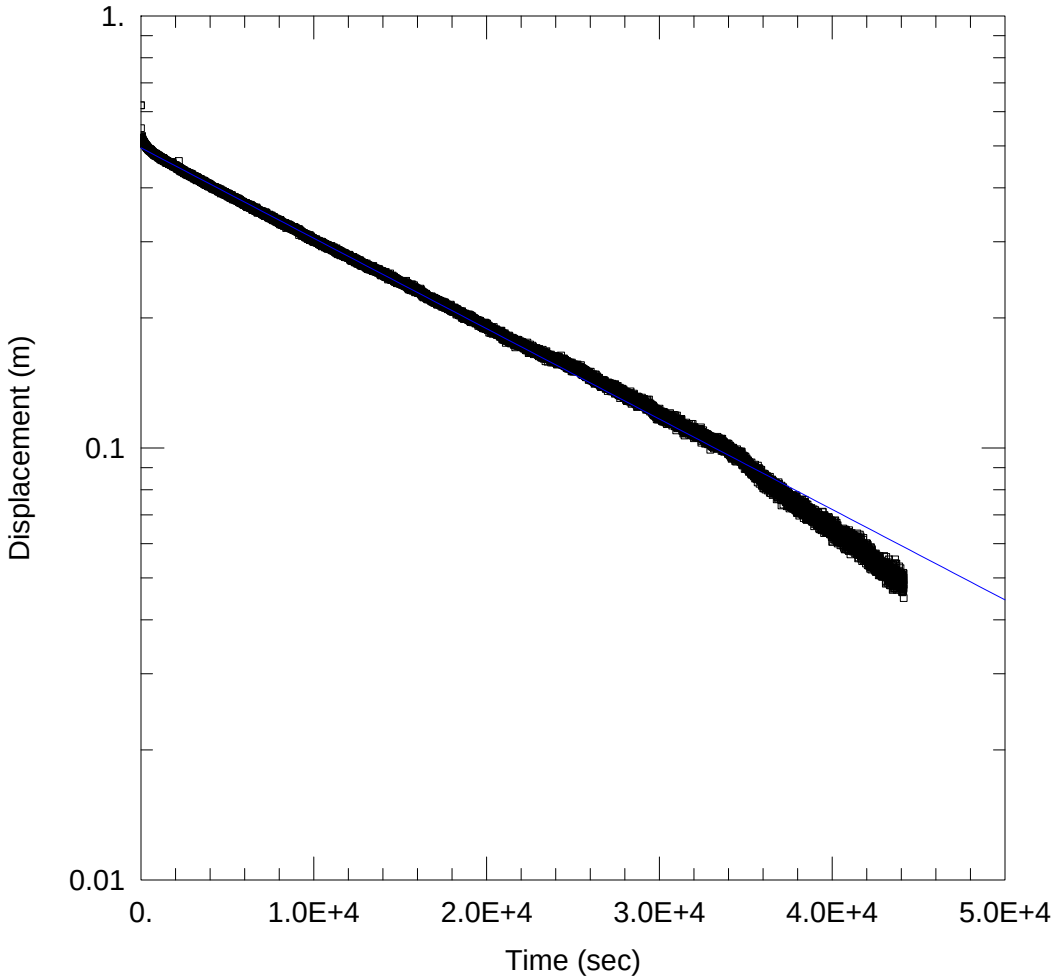
Saturated Thickness: 0.1 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (New Well)

Initial Displacement: 1.768 m
Total Well Penetration Depth: 1.333 m
Casing Radius: 0.025 m
Static Water Column Height: 0. m
Screen Length: 0.75 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0002423 cm/sec
y0 = 1.327 m



FALLING HEAD TEST

Data Set: G:\...\11178428-01, 18-08-15, BH-8 Falling Head Test.aqt
Date: 09/11/18 Time: 11:45:16

PROJECT INFORMATION

Company: GHD
Client: Veltri
Project: 11178428-01
Location: Turner Street, Millbrook
Test Well: BH-8
Test Date: August 14, 2018

AQUIFER DATA

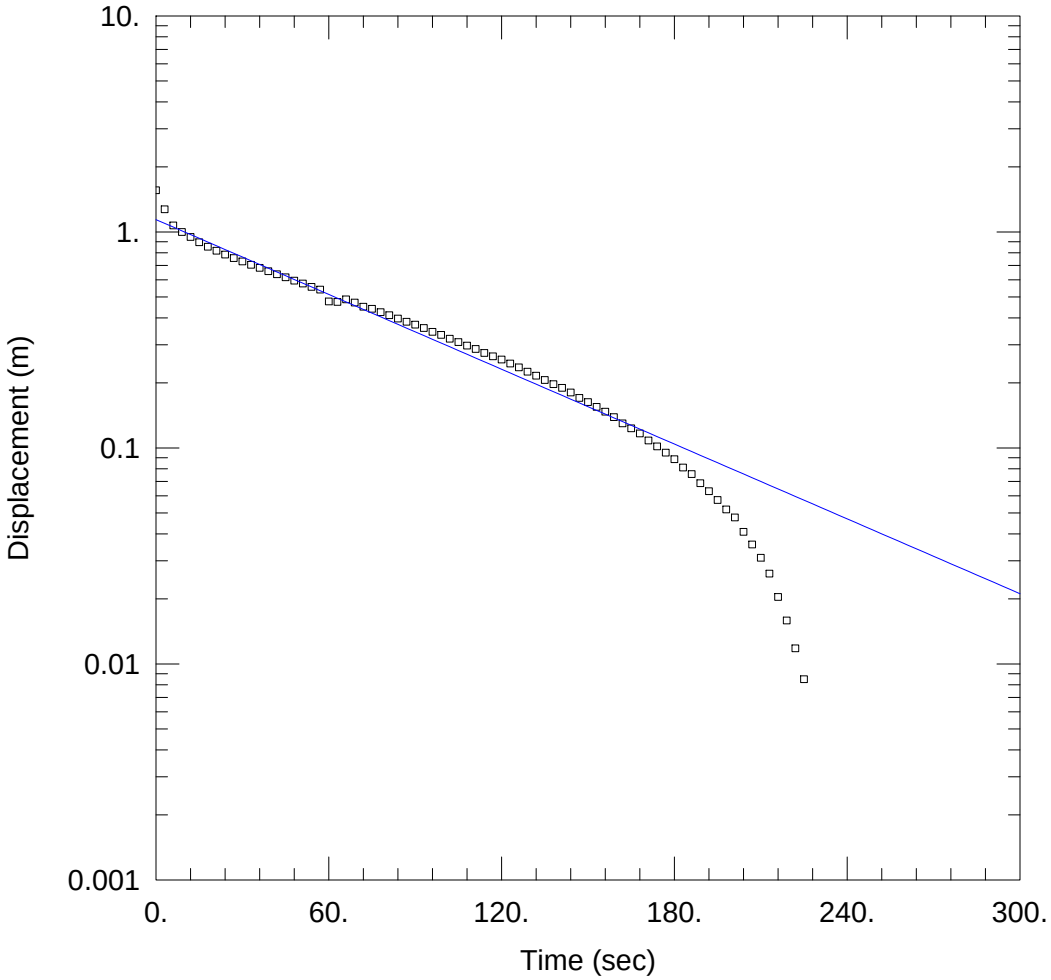
Saturated Thickness: 2.338 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-8)

Initial Displacement: 0.6209 m
Total Well Penetration Depth: 4.397 m
Casing Radius: 0.025 m
Static Water Column Height: 2.338 m
Screen Length: 1.5 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 3.823E-6 cm/sec
y0 = 0.495 m



FALLING HEAD TEST

Data Set: G:\...\11178428-01, 18-08-15, BH-8 Standpipe Falling Head Test.aqt
Date: 09/11/18 Time: 11:44:26

PROJECT INFORMATION

Company: GHD
Client: Veltri
Project: 11178428-01
Location: Turner Street, Millbrook
Test Well: BH-8 Standpipe
Test Date: August 14, 2018

AQUIFER DATA

Saturated Thickness: 0.1 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-8 Standpipe)

Initial Displacement: 1.559 m
Static Water Column Height: 0. m
Total Well Penetration Depth: 1.385 m
Screen Length: 0.75 m
Casing Radius: 0.025 m
Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.008971 cm/sec
y0 = 1.14 m

Appendix D
Analytical Data

CADUCEON™ ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G63209 **REPORT No. B18-25312**

Report To:

GHD Limited
455 Phillip Street,
Waterloo Ontario N2L 3X2 Canada
Attention: Jacquelyn Cummings

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 23-Aug-18
DATE REPORTED: 30-Aug-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Turner St Dev./11178428-01
P.O. NUMBER: 73512264
WATERWORKS NO.

			Client I.D.		BH - 4	BH - 8		
			Sample I.D.		B18-25312-1	B18-25312-2		
			Date Collected		22-Aug-18	22-Aug-18		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
pH @25°C	pH Units		SM 4500H	24-Aug-18/O	7.78	7.96		
Conductivity @25°C	µmho/cm	1	SM 2510B	24-Aug-18/O	367	394		
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	24-Aug-18/O	163	174		
Hardness (as CaCO3)	mg/L	1	SM 3120	29-Aug-18/O	170	203		
Chloride	mg/L	0.5	SM4110C	24-Aug-18/O	18.3	< 0.5		
Fluoride	mg/L	0.1	SM4110C	24-Aug-18/O	0.3	< 0.1		
Nitrite (N)	mg/L	0.1	SM4110C	24-Aug-18/O	< 0.1	< 0.1		
Nitrate (N)	mg/L	0.1	SM4110C	24-Aug-18/O	< 0.1	< 0.1		
Sulphate	mg/L	1	SM4110C	24-Aug-18/O	15	23		
Colour	TCU	2	SM 2120C	27-Aug-18/O	< 2	< 2		
Turbidity	NTU	0.1	SM 2130	27-Aug-18/O	624	20.7		
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	28-Aug-18/K	0.06	0.01		
o-Phosphate (P)	mg/L	0.01	PE4500-S	24-Aug-18/K	< 0.01	< 0.01		
Potassium	mg/L	0.1	SM 3120	29-Aug-18/O	3.8	2.8		
Sodium	mg/L	0.2	SM 3120	29-Aug-18/O	9.9	6.9		
Calcium	mg/L	0.02	SM 3120	29-Aug-18/O	56.9	50.1		
Magnesium	mg/L	0.02	SM 3120	29-Aug-18/O	6.71	18.9		
Iron	mg/L	0.005	SM 3120	29-Aug-18/O	< 0.005	< 0.005		
Copper	mg/L	0.002	SM 3120	29-Aug-18/O	0.008	0.009		
Manganese	mg/L	0.001	SM 3120	29-Aug-18/O	0.025	0.152		
Zinc	mg/L	0.005	SM 3120	29-Aug-18/O	< 0.005	0.010		
Anion Sum	meq/L		Calc.	29-Aug-18/O	4.09	3.96		
Cation Sum	meq/L		Calc.	29-Aug-18/O	3.92	4.43		
% Difference	%		Calc.	29-Aug-18/O	2.12	5.68		

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: G63209 **REPORT No. B18-25312**

Report To:

GHD Limited
455 Phillip Street,
Waterloo Ontario N2L 3X2 Canada
Attention: Jacquelyn Cummings

Caduceon Environmental Laboratories
110 West Beaver Creek Rd Unit 14
Richmond Hill ON L4B 1J9
Tel: 289-475-5442
Fax: 289-562-1963

DATE RECEIVED: 23-Aug-18
DATE REPORTED: 30-Aug-18
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Turner St Dev./11178428-01
P.O. NUMBER: 73512264
WATERWORKS NO.

			Client I.D.		BH - 4	BH - 8		
			Sample I.D.		B18-25312-1	B18-25312-2		
			Date Collected		22-Aug-18	22-Aug-18		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Ion Ratio	AS/CS		Calc.	29-Aug-18/O	1.04	0.893		
Sodium Adsorption Ratio	-		Calc.	29-Aug-18/O	0.330	0.211		
TDS(ion sum calc.)	mg/L	1	Calc.	29-Aug-18/O	209	206		
Conductivity (calc.)	µmho/cm		Calc.	29-Aug-18/O	391	393		
TDS(calc.)/EC(actual)	-		Calc.	29-Aug-18/O	0.569	0.524		
EC(calc.)/EC(actual)	-		Calc.	29-Aug-18/O	1.07	0.998		
Langelier Index(25°C)	S.I.		Calc.	29-Aug-18/O	0.315	0.468		

Christine Burke
Lab Manager

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Appendix E
Water Balance Calculations

Appendix E.1

Water Budget (Thornthwaite Method) - Average Values*

Peterborough A **Elevation:** 191.4 masl **Distance Away:** ~ 11.8 km

Month	Mean Temperature (^{o}C)	Heat Index	Potential ET (mm)	Daylight Correction Factor	Adjusted ET (mm)	Total Precipitation (mm)	Surplus (mm)	Deficit (mm)
January	-8.5	0	0	0.82	0	57.4	57.40	
February	-7	0	0	0.82	0	51.5	51.50	
March	-1.8	0	0	1.03	0	56.1	56.10	
April	5.9	1.28	28.76	1.1	31.64	68.6	36.96	
May	12.1	3.81	60.07	1.25	75.09	81.5	6.41	
June	17	6.38	85.13	1.27	108.11	79.9	0.00	28.21
July	19.6	7.91	98.50	1.29	127.06	70.6	0.00	56.46
August	18.3	7.13	91.81	1.15	105.58	77	0.00	28.58
September	13.9	4.70	69.25	1.04	72.02	85.3	13.28	
October	7.5	1.85	36.79	0.94	34.58	76.9	42.32	
November	1.9	0.23	9.00	0.8	7.20	86.4	79.20	
December	-4.4	0	0	0.78	0	64.2	64.20	
TOTAL	6.2	33.3	479.3		561.3	855.4	407.4	113.2
				TOTAL WATER SURPLUS:		294.1	mm	

Notes:

Peterborough A weather station utilized: 44^{o} 14' N, 78^{o} 22' W

*Average values of precipitation were used. Average values of temperature were also used.

Water budget adjusted for latitude and daylight

Total Water Surplus is calculated as total precipitation minus adjusted potential evapotranspiration

Total Moisture Surplus is calculated as total precipitation minus actual evapotranspiration

Formulas utilized:

$I = (T_i/5)^{1.514}$

$E=0$ when $T_i<0$ ^{o}C

$E=16(10T_i/I_{tot})^{a}$ when $0<T_i<26.5$ ^{o}C

$E=-415.85+32.24T_i-0.43T_i^{2}$ when $T_i>26.5$ ^{o}C

$a=6.7x10^{-7}I^{3}-7.71x10^{-5}I^{2}+1.79x10^{-2}I+0.49$

a = 1.025255156

Appendix E.2

Water Budget Pre-Development

Catchment Designation	***Undeveloped Site***		
	Treed	Pasture	Total
Area (m^2)	66372	44248	110620
Pervious Area (m^2)	66372	44248	110620
% Pervious	60%	40%	100%
Impervious Area (m^2)	0	0	0
% Impervious	0%	0%	0%
INFILTRATION FACTORS			
Topography Infiltration Factor	0.1	0.2	
Soil Infiltration Factor	0.2	0.2	
Land Cover Infiltration Factor	0.2	0.1	
MOE Infiltration Factor	0.5	0.5	
Actual Infiltration Factor	0.5	0.5	
Runoff Coefficient	0.5	0.5	
Runoff from Impervious Surfaces*	0	0	
INPUTS (PER UNIT AREA)			
Precipitation (mm/yr)	855	855	855
Run On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	855	855	855
OUTPUTS (PER UNIT AREA)			
Precipitation Surplus (mm/yr)	294	294	294
Net Surplus (mm/yr)	294	294	294
Evaportranspiration (mm/yr)	561	561	561
Infiltration (mm/yr)	147	147	147
Rooftop Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	147	147	147
Runoff Pervious Areas	147	147	147
Runoff Impervious Areas	0	0	0
Total Runoff (mm/yr)	147	147	147
Total Outputs (mm/yr)	855	855	855
Difference (Inputs - Outputs)	0	0	0
INPUTS (VOLUMES)			
Precipitation (m^3/yr)	56775	37850	94624
Run On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	56775	37850	94624
OUTPUTS (VOLUMES)			
Precipitation Surplus (m^3/yr)	19521	13014	32536
Net Surplus (m^3/yr)	19521	13014	32536
Evaportranspiration (m^3/yr)	37253	24835	62089
Infiltration (m^3/yr)	9761	6507	16268
Rooftop Infiltration (m^3/yr)	0	0	0
Total Infiltration (m^3/yr)	9761	6507	16268
Runoff Pervious Areas (m^3/yr)	9761	6507	16268
Runoff Impervious Areas (m^3/yr)	0	0	0
Total Runoff (m^3/yr)	9761	6507	16268
Total Outputs (m^3/yr)	56775	37850	94624
Difference (Inputs - Outputs)	0	0	0

Appendix E.3

Water Budget Post-Development - No Mitigation Strategies

Catchment Designation	SITE									
	SWM Pond Block		*Green Space*	*Rooftops*				*Lawns*	*Asphalt*	
	Grass	Pond	Lawn	Single Detached (10.7 m)	Single Detached (11.3 m)	Single Detached (12.2 m)	Semi-Detached (18.0 m)	Grass	Street A	Total
Area (m^2)	2015	2015	57580	600	8400	2800	3900	21170	12140	110620
Pervious Area (m^2)	2015	0	57580	0	0	0	0	21170	0	80765
% Pervious	1.8%	0%	52.1%	0%	0%	0%	0%	19.1%	0%	73.0%
Impervious Area (m^2)	0	2015	0	600	8400	2800	3900	0	12140	29855
% Impervious	0%	1.8%	0%	0.5%	7.6%	2.5%	3.5%	0%	11.0%	27.0%
INFILTRATION FACTORS										
Topography Infiltration Factor	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Soil Infiltration Factor	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Land Cover Infiltration Factor	0.15	0	0.15	0	0	0	0	0.15	0	
MOE Infiltration Factor	0.45	0.3	0.45	0.3	0.3	0.3	0.3	0.45	0.3	
Actual Infiltration Factor	0.45	0.05	0.5	0	0	0	0	0.45	0	
Runoff Coefficient	0.55	0.95	0.5	1	1	1	1	0.55	1	
Runoff from Impervious Surfaces*	0	0.8	0	0.8	0.8	0.8	0.8	0	0.8	
INPUTS (PER UNIT AREA)										
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855
OUTPUTS (PER UNIT AREA)										
Precipitation Surplus (mm/yr)	294	684	294	684	684	684	684	294	684	399
Net Surplus (mm/yr)	294	684	294	684	684	684	684	294	684	399
Evaportranspiration (mm/yr)	561	171	561	171	171	171	171	561	171	456
Infiltration (mm/yr)	132	34	147	0	0	0	0	132	0	105
Rooftop Infiltration (mm/yr)	0	0	0	0	0	0	0	0	0	0
Total Infiltration (mm/yr)	132	34	147	0	0	0	0	132	0	105
Runoff Pervious Areas	162	0	147	0	0	0	0	162	0	110
Runoff Impervious Areas	0	650	0	684	684	684	684	0	684	184
Total Runoff (mm/yr)	162	650	147	684	684	684	684	162	684	295
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0
INPUTS (VOLUMES)										
Precipitation (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
Run On (m^3/yr)	0	0	0	0	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0	0	0	0	0
Total Inputs (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
OUTPUTS (VOLUMES)										
Precipitation Surplus (m^3/yr)	593	1379	16936	411	5748	1916	2669	6227	8308	44185
Net Surplus (m^3/yr)	593	1379	16936	411	5748	1916	2669	6227	8308	44185
Evaportranspiration (m^3/yr)	1131	345	32318	103	1437	479	667	11882	2077	50439
Infiltration (m^3/yr)	267	69	8468	0	0	0	0	2802	0	11605
Rooftop Infiltration (m^3/yr)	0	0	0	0	0	0	0	0	0	0
Total Infiltration (m^3/yr)	267	69	8468	0	0	0	0	2802	0	11605
Runoff Pervious Areas (m^3/yr)	326	0	8468	0	0	0	0	3425	0	12218
Runoff Impervious Areas (m^3/yr)	0	1310	0	411	5748	1916	2669	0	8308	20361
Total Runoff (m^3/yr)	326	1310	8468	411	5748	1916	2669	3425	8308	32580
Total Outputs (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Appendix E.4

Water Budget Post-Development - Rooftop Infiltration Mitigation Strategy

Catchment Designation	SITE									
	SWM Pond Block		*Green Space*	*Rooftops*				*Lawns*	*Asphalt*	
	Grass	Pond	Lawn	Single Detached (10.7 m)	Single Detached (11.3 m)	Single Detached (12.2 m)	Semi-Detached (18.0 m)	Grass	Street A	Total
Area (m^2)	2015	2015	57580	600	8400	2800	3900	21170	12140	110620
Pervious Area (m^2)	2015	0	57580	0	0	0	0	21170	0	80765
% Pervious	1.8%	0%	52.1%	0%	0%	0%	0%	19.1%	0%	73.0%
Impervious Area (m^2)	0	2015	0	600	8400	2800	3900	0	12140	29855
% Impervious	0%	1.8%	0%	0.5%	7.6%	2.5%	3.5%	0%	11.0%	27.0%
INFILTRATION FACTORS										
Topography Infiltration Factor	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Soil Infiltration Factor	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Land Cover Infiltration Factor	0.15	0	0.15	0	0	0	0	0.15	0	
MOE Infiltration Factor	0.45	0.3	0.45	0.3	0.3	0.3	0.3	0.45	0.3	
Actual Infiltration Factor	0.45	0.05	0.5	0	0	0	0	0.45	0	
Runoff Coefficient	0.55	0.95	0.5	1	1	1	1	0.55	1	
Runoff from Impervious Surfaces*	0	0.8	0	0.8	0.8	0.8	0.8	0	0.8	
INPUTS (PER UNIT AREA)										
Precipitation (mm/yr)	855	855	855	855	855	855	855	855	855	855
Run On (mm/yr)	0	0	0	0	0	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855	855	855	855	855	855
OUTPUTS (PER UNIT AREA)										
Precipitation Surplus (mm/yr)	294	684	294	684	684	684	684	294	684	399
Net Surplus (mm/yr)	294	684	294	684	684	684	684	294	684	399
Evaportranspiration (mm/yr)	561	171	561	171	171	171	171	561	171	456
Infiltration (mm/yr)	132	34	147	0	0	0	0	132	0	105
% Rooftop to balance infiltration	--	--	--	43%	43%	43%	43%	--	--	--
Rooftop Infiltration (mm/yr)	0	0	0	297	297	297	297	0	0	42
Total Infiltration (mm/yr)	132	34	147	297	297	297	297	132	0	147
Runoff Pervious Areas	162	0	147	0	0	0	0	162	0	110
Runoff Impervious Areas	0	650	0	387	387	387	387	0	684	142
Total Runoff (mm/yr)	162	650	147	387	387	387	387	162	684	252
Total Outputs (mm/yr)	855	855	855	855	855	855	855	855	855	855
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0
INPUTS (VOLUMES)										
Precipitation (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
Run On (m^3/yr)	0	0	0	0	0	0	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0	0	0	0	0	0	0
Total Inputs (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
OUTPUTS (VOLUMES)										
Precipitation Surplus (m^3/yr)	593	1379	16936	411	5748	1916	2669	6227	8308	44185
Net Surplus (m^3/yr)	593	1379	16936	411	5748	1916	2669	6227	8308	44185
Evaportranspiration (m^3/yr)	1131	345	32318	103	1437	479	667	11882	2077	50439
Infiltration (m^3/yr)	267	69	8468	0	0	0	0	2802	0	11605
Rooftop Infiltration (m^3/yr)	0	0	0	178	2495	832	1158	0	0	4663
Total Infiltration (m^3/yr)	267	69	8468	178	2495	832	1158	2802	0	16268
Runoff Pervious Areas (m^3/yr)	326	0	8468	0	0	0	0	3425	0	12218
Runoff Impervious Areas (m^3/yr)	0	1310	0	232	3254	1085	1511	0	8308	15699
Total Runoff (m^3/yr)	326	1310	8468	232	3254	1085	1511	3425	8308	27917
Total Outputs (m^3/yr)	1724	1724	49254	513	7185	2395	3336	18109	10385	94624
Difference (Inputs - Outputs)	0	0	0	0	0	0	0	0	0	0

Notes:

*Evaporation from impervious areas was assumed to be 20% of precipitation.

Appendix E.5

Summary: Pre-Development vs Post-Development

PARAMETER	SITE				
	Pre-Development	***Post-Development No Mitigation***	***Difference Pre- vs. Post-***	***Post-Development Mitigation***	***Difference Pre- vs. Post-***
INPUTS (VOLUMES)					
Precipitation (m^3/yr)	94624	94624	0%	94624	0%
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)	94624	94624	0%	94624	0%
OUTPUTS (VOLUMES)					
Precipitation Surplus (m^3/yr)	32536	44185	36%	44185	36%
Net Surplus (m^3/yr)	32536	44185	36%	44185	36%
Evapotranspiration (m^3/yr)	62089	50439	-19%	50439	-19%
Infiltration (m^3/yr)	16268	11605	-29%	11605	-29%
Rooftop Infiltration (m^3/yr)	0	0	0%	4663	--
Total Infiltration (m^3/yr)	16268	11605	-29%	16268	0%
Runoff Pervious Areas (m^3/yr)	16268	12218	-25%	12218	-25%
Runoff Impervious Areas (m^3/yr)	0	20361	--	15699	--
Total Runoff (m^3/yr)	16268	32580	100%	27917	72%
Total Outputs (m^3/yr)	94624	94624	0%	94624	0%

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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