HYDROGEOLOGIC INVESTIGATION REPORT

PROPOSED RESIDENTIAL DEVELOPMENT
GRANITE RIDGE ESTATES SUBDIVISION PHASE 2
PART LOTS 8 AND 9, CONCESSION 9
TOWNSHIP OF GALWAY-CAVENDISH AND HARVEY
PETERBOROUGH COUNTY

PROJECT NO. G023134E1

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NOVEMBER 2010
REVISED SEPTEMBER 2014

TABLE OF CONTENTS

ENCLOSURES

TABLES

APPENDICES

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HYDROGEOLOGIC INVESTIGATION REPORT
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1.0 INTRODUCTION

This report presents the results of a hydrogeologic investigation that was completed for a proposed residential development within the Township of Galway-Cavendish & Harvey, Peterborough County. The proposed development is approximately 1.0 kilometre southwest of Buckhorn, Ontario. The proposed development is 18.85 hectares in size and includes 32 lots, an internal road, open space and existing pond. Mr. Jeff Chesher of Granite Ridge Estates retained Geo-Logic to complete this hydrogeological investigation. The work was completed in accordance with our proposal dated August 4, 2010. Additional work conducted to address peer review comments is also included within this consolidated report.

The property, herein referred to as "the Site", is geographically located at Part Lots 8 and 9, Concession 9 within the Township of Galway-Cavendish & Harvey, County of Peterborough. The development will be serviced by private well and septic systems. The Site was formerly used as a gravel pit and a pond remains from the historical extraction activities.

The Site is located on the east of Melody Bay Road and north of Adam and Eve Road and is currently undeveloped. The general location of the Site is illustrated on the Vicinity Plan, Plate 1 at a scale of 1:50,000. The plan has been compiled from the National Topographic System Mapping from Energy, Mines and Resources Canada Map 31 D/9 (based on 1976 aerial photography, published in 1979).

The Site location with respect to adjacent roadways and surrounding land uses is presented on Ontario Base Mapping Series (10 17 7050 49350 and 10 17 7100 49350, based on 1984 aerial photography and dated 1990) and is shown on the Property Plan, Plate 2 (at a scale of 1:10,000). The surrounding features were observed to be a gravel pit to the west, and residential homes to the north, south and east. The homes to the north comprise Granite Ridge Estates, Phase 1. The homes to the south and east are constructed on waterfront property on Buckhorn Lake, approximately 150 m from the Site at its closest point. The existing pond is the topographic low point of the Site.

A Plot Plan depicting the proposed residential development is provided as Plate 3 showing the general layout of the 32 lots. The Plot Plan is based upon a concept plan completed Skelton Brumwell and Associates Inc., dated September 2010 (preliminary plan).

2.0 PURPOSE AND SCOPE

The purpose of the hydrogeologic investigation was to identify the local hydrogeology of the Site (including recharge characteristics), to evaluate potential impacts resulting from the development and related construction and determine if the local aquifer, based upon three drilled wells, can support the proposed development.

The study consisted of the following tasks:

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 (MOE) for the immediate area to evaluate the physical characteristics of the aquifer complexes that underlie the region. A well survey of the neighbouring properties was completed adjacent to the study area to compliment the MOE records. Water samples were collected to assess the background drinking water quality and establish a baseline water quality of the tapped aquifer complexes.

3. A walkover inspection of the property was conducted to review surficial ground characteristics of the study area.

4. Investigated and defined the existing overburden and hydrogeologic conditions at the site by excavating, sampling and logging eight (8) test pits ranging in depth from 1.4 to 3.1 metres below existing grade (mbeg) using a track-mounted excavator. A temporary monitoring well was installed in one (1) representative test pit in order to facilitate the measurement of stable groundwater levels.

   Grain size testing was performed on four representative soil samples to aid in their classification and analysis. The testing program also included moisture content determinations.

5. Assessed the aquifer conditions using three (3) new drilled wells on the Site to aid in providing information regarding the use of groundwater as the potable source to service the development. Groundwater samples were collected during the pumping tests for laboratory chemical analyses.

6. Completed engineering analyses of the acquired data and prepared a detailed report, which outlines our conclusions and recommendations. The data was used to determine the suitability of the Site for a potable water source of groundwater and sewage waste disposal.

3.0 PROJECT DETAILS

The development is proposed for an area of nearly 19 ha and will be privately serviced for water and septic. The Site abuts Adam and Eve Road to the south and east, Melody Bay Road to the west and existing properties to the north that comprise Granite Ridge Estates Phase 1. The proposed development for this Site includes 32 lots (14.3 hectares), an open space (existing pond – 1.95 hectares) and open space (0.35 hectares) and the internal roadway to access the development (2.25 hectares). There is proposed to be access to the Site from Adam and Eve Road (south and east side) as well as from the north from Stabler's Way.

4.0 FIELD METHODOLOGY

4.1 GENERAL

The field methodology consisted of a site inspection, a soils exploration investigation, three pumping tests, a water well survey and water level measurements. The Plot Plan, Plate 3 shows the locations of the test wells where the pumping tests were conducted and the test hole locations.

A site inspection was conducted on September 20, 2010 by Geo-Logic to observe the general surficial characteristics of the property. The Site is currently undeveloped and relatively open (i.e. no trees) with a large pond in the centre. The perimeter of the Site is ringed with trees. The Site was used formerly as a pit with large boulders and soil piles observed. There were several dirt roads across the Site. The Site slopes radially toward the pond on the order of 15 m from the northwest corner to the pond. The soil generally appeared to be of relatively good drainage as sandy soil was observed at the surface across much of the Site and no ponded surface water was observed. Scouring of the loose sandy soils into erosional channels was observed on the slopes draining to the pond.

The soils exploration work was conducted by Buckhorn Sand and Gravel under the supervision of Geo-Logic staff on September 24, 2010 and consisted of subsurface exploration by means of excavating a total of eight (8) test pits with a track-mounted excavator ranging in depth from 1.4 to 3.1 mbeg. The test pit logs are presented in Appendix A. The locations of the test pits are illustrated on the Plot Plan, Plate 3. A detailed log of each test pit was maintained and representative samples of the materials encountered in the test pits were collected. Soil samples obtained from the test pits were inspected in the field for soil type, texture, colour and relative moisture content. A piezometer was installed within test hole TP-2. The test holes were backfilled immediately following the completion of the test pits. Soil samples collected from each test pit were transported to Geo-Logic's laboratory sealed in clean plastic bags for further visual-tactile examination. Physical laboratory testing was completed on selected soil samples consisting of moisture content tests on all recovered samples and gradation analyses on five (5) representative soil

samples. The analytical results of the moisture content tests are plotted on the attached logs. The gradation analyses are presented graphically in Appendix A.

Geo-Logic staff conducted a door-to-door well survey of the local homes nearest to the Site on October 4, 2010. The details are provided in Appendix B. A total of eleven (11) homes were visited in close proximity of the Site along Melody Bay Road, Adam and Eve Road and Mitchell Crescent (see Plot Plan, Plate 3 for locations). Generally, the information gathered during the door-to-door well survey provides information regarding groundwater characteristics of the immediate area and supplements the MOE Well Record data. Five (5) drilled wells and one dug well (653 Adam and Eve Road) were observed during the well survey of neighbouring homes. The water quantity and quality were indicated to be good by the home owners.

Background water quality is provided from twelve (12) lots within the Granite Ridge Estates Phase 1 development that were tested for water quality by Geo-Logic in 2009. In general, the water quality was good but results did exceed the Ontario Drinking Water Standards (ODWS) for hardness (10 instances), iron and turbidity (3 instances each), and pH, manganese, colour and fluoride (1 instance each). The twelve (12) wells tested yielded an average of 4.9 Imperial gallons per minute (Igpm) during pumping tests conducted by Geo-Logic. A water sample was also collected from the temporary monitoring well to characterize the shallow groundwater table. Further discussion of the local hydrogeology is provided in Section 5 and background water quality data is provided in Section 5.3.

The pumping tests at the Site were conducted under the supervision of Geo-Logic staff on:

- October 4, 2010 at TW-1 (MOE well record A095797);
- October 5, 2010 at TW-2 (MOE well record A095800); and
- October 6, 2010 at TW-3 (MOE well record A095798).

Copies of the MOE Well Records are provided in Appendix B. Preparation for the pumping test involved water levels of nearby wells, site wells and a temporary piezometer at the Site. The pumping tests are discussed in Section 6 of this report.

Geo-Logic re-visited the site on April 29, 2013 to observe spring time conditions, and specifically to measure water levels in the piezometer that was installed at TP-2. The piezometer was observed to have been destroyed during site activities. Geo-Logic observed several excavated areas in the lower lying area in the southwestern part of the Site. This low-lying area includes Lots 17 through 23. Ponded water was observed to be between 0.6 and 0.75 m below grade at Lot 22 near Street A and at Lot 19 east end, respectively. Based upon these water levels, the approximate elevations are 249.40 and 247.25 metres above sea level at the locations within Lot 22 and Lot 19, respectively (locations and elevations based upon Skelton Brumwell concept plan).

4.2 SURFACE CONDITIONS

The existing surface at the Site is generally sand in the open areas and generally topsoil around the perimeter where trees and vegetation exists. The Site is undeveloped with a large pond in the central region of the Site. Stormwater flows overland occur radially toward the pond. As noted during the site inspection, the soil appeared to be of relatively good drainage and no ponded surface water was observed. Some erosional channels were observed on the slopes draining toward the pond. The Site relief changes on the order of 15 m from northwest to southeast.

Geo-Logic reviewed the overall conditions of the Site representing spring-time conditions in 2013. It was observed that overland flow was occurring from the northwest corner of the Site and draining to the south; and from the north-central region and draining toward the east and south. Shallow water appears to drain via overland flow paths or infiltrate into the sandy soils and is expected to flow along the bedrock interface to the south-central pond. The soils are well-drained due to the permeable nature of the native sands and the generally steep gradient toward the central pond.

4.3 SUBSURFACE CONDITIONS

4.3.1 Regional Geology

The Site is situated within the regional physiographic region known as the Dummer Moraines and sits near the geologic boundaries of the Peterborough drumlin field to the south and Georgian Bay fringe to the north (Chapman and Putnam, 1984). Locally, the Site is located within the till moraines (Chapman and Putnam, 1966). The moraines of this area are characterized by angular fragments and blocks of limestone with many Precambrian rocks also present. The stratigraphy of the area is generally inferred to be a shallow layer of sand/gravel underlain by limestone and/or granite. The underlying bedrock is located upon a geology boundary comprising of Precambrian rock (early felsic plutonic rocks) and Middle Ordovician sedimentary limestone mostly of the Black River Group.

4.3.2 Local Geology

The exploration program indicated that the shallow soils are composed mainly of sand underlain by bedrock (inferred based on observations within the test holes). Some areas of shallow bedrock may influence the construction of foundations and septic systems. Based upon the subsurface exploration program, the shallow underlying sand is estimated to have a hydraulic conductivity on the order of 10^{-1} to 10^{-4} cm/sec and related percolation rate (T-Time) ranging from 2 to 12 minutes per centimetre (min/cm). The test holes were not advanced into the underlying bedrock.

4.3.3 Local Groundwater

Groundwater and seepage into the test pits was only observed at TP-1 and TP-2 at 1.8 and 0.8 mbeg, respectively. The other test pits were dry ranging in depth from 1.4 to 3.1 mbeg. At TP-2, a temporary monitoring well was installed to facilitate groundwater measurements. This test pit is located in the southwest corner of the Site. Groundwater was observed at 0.84 mbeg at the monitor.

The piezometer at TP-2 was installed in the southwest and lowest lying area of the Site. It is Geo-Logic's opinion that this area (Lots 17 through 23) is where the water table may be encountered and should be considered for foundations and septic systems. As noted previously, groundwater elevations were approximated to be 249.40 and 247.25 masl at the eastern edges of Lot 22 and Lot 19, respectively. Based upon observations within excavations in this southwest area on April 29, 2013, the sandy subsurface soils appeared to be saturated below a thin surficial layer. There is little gradient in this area as the topography flattens out. The surface water feeding this area was coming from the northwest corner of the Site. Geo-Logic tracked upgradient of the Site to evaluate the source of the surface water. It appeared to be groundwater discharging from the south of Mitchell Crescent and east of Melody Bay Road. The area of discharge is seasonal in nature. There was no evidence of vegetation that would be expected if the source was permanent (i.e. cattails, reeds, ferns etc). The high water table in the southwest appears to be the result of a low-lying area, with a reduced gradient and the nearby pond which is saturating the soil. The shallow water table in the southwest area should improve with appropriate management of the surface water that is entering the Site from the northwest corner through the use of vegetated swales or ditches. There are no other concerns regarding basement footings from a shallow water table perspective.

Plotting of groundwater elevations is typically completed to determine groundwater flow direction. Due to the limited shallow groundwater data at this Site, the shallow groundwater flow direction must be inferred based on the ground surface topography and will be influenced by the on-site pond, bedrock surface and Buckhorn Lake. When shallow groundwater is present, the predominant flow direction is expected to be toward the southeast (Lots 1 through 4 and 13 to 19 and 21 through 28, and 32). However, the influence of topography and the pond is expected to promote a southerly flow for Lots 5, 6, 11, 12, 29, 30 and 31; a southwesterly flow for Lots 7 through 10; and a northerly flow for Lot 20. Thus, the layout of the septic and wells should utilize the local topography as a guide and impacts from septic effluent will be minimized with properly constructed wells and septic systems.

5.0 HYDROGEOLOGY

5.1 GENERAL

Information regarding groundwater characteristics of the immediate area was obtained from an inventory of well records on file with the MOE (Appendix B). In total, 109 water wells have been identified within close proximity to the Site and the data for these wells has been summarized below in Table 1 (the details of the data are also provided in Appendix B). The inventory included well records for (Lots 7, 8 and 9, Concessions 9 and 10 in the Township of Galway-Cavendish & Harvey (formerly the Township of Harvey), with the County of Peterborough.

5.2 EXISTING LOCAL WATER SUPPLIES

Physical and hydraulic data are presented on MOE well records and the information indicates the presence of two (2) principal aquifer systems:

1. An unconfined shallow water table system within the buried sand and gravel layers tapped by shallow dug or bored wells and shallow drilled overburden wells; and,
2. A deep aquifer within the bedrock fractures tapped by drilled wells.

A summary of the MOE data is presented in Table 1. The information from the MOE data indicates that 96 percent of the wells were drilled, two (2) percent were bored/dug and two (2) percent were drilled into the overburden. One (1) of the wells reported in the MOE records were indicated to be dry (0.9 percent) and 81 percent of the wells were reported to have "fresh" water. Other wells were reported to have water quality that was "unknown" (11 percent), sulphur (0.9 percent) and seven (7) wells did not have any indication as to the type of water (6 percent). One of the wells was reported to be artesian.

TABLE 1: Summary of Local Water Wells

	Total Number of Wells Inventoried	109	
	Bored / Dug Wells	2	(2%)
	Drilled Wells (Overburden)	2	(2%)
	Drilled Wells (Bedrock)	105	(96%)

PARAMETERS	STATISTICAL SUMMARY Bored/Dug Wells	Overburden Wells	Bedrock Wells
WELL YIELDS Range	27.2 to 40.9 L/min (6.0 to 9.0 Igpm)	68.1 to 227.0 L/min (15.0 to 50.0 Igpm)	0.0 to 272.4 L/min (0.0 to 60.0 Igpm)
Average	34.1 L/min (7.5 Igpm)	147.6 L/min (32.5 Igpm)	61.5 L/min (13.6 Igpm)
REPORTED YIELDS	FREQUENCY		
Not Reported	0 (0.0%)	0 (0.0%)	12 (11.4%)
Unknown	0 (0.0%)	0 (0.0%)	7 (6.7%)
Dry	0 (0.0%)	0 (0.0%)	1 (1.0%)
0 to 1 Igpm	0 (0.0%)	0 (0.0%)	12 (11.4%)
2 to 4 Igpm	0 (0.0%)	0 (0.0%)	11 (10.5%)
5 to 9 Igpm	2 (100%)	0 (0.0%)	19 (18.1%)
≥10 Igpm	0 (0.0%)	2 (100%)	50 (47.6%)
STATIC WATER LEVELS Range	2.4 to 3.0 m (7.9 to 9.8 feet)	0.9 to 1.8 m (3.0 to 5.9 feet)	0.0 to 42.7 m (0.0 to 140.1 feet)
Average	2.7 m (8.9 feet)	1.4 m (4.6 feet)	4.5 m (14.8 feet)
WATER ENCOUNTERED Range	4.3 to 8.8 m (14.1 to 28.9 feet)	7.0 to 12.8 m (23.0 to 42.0 feet)	2.4 to 149.4 m (7.9 to 490.2 feet)
Average	6.6 m (21.7 feet)	9.9 m (32.5 feet)	22.0 m (72.2 feet)
DEPTH Range	4.6 to 10.4 m (15.1 to 34.1 feet)	7.0 to 13.4 m (23.0 to 44.0 feet)	5.5 to 159.4 m (18.0 to 523.0 feet)
Average	7.5 m (24.6 feet)	10.2 m (33.5 feet)	33.1 m (108.6 feet)

Notes: Igpm = Imperial gallons per minute; L/min = litres per minute; m = metres

Geo-Logic staff conducted a door-to-door well survey of the local homes. The details are provided in Appendix B and the location of the homes visited during the door-to-door survey is shown on the Plot Plan, Plate 3. A total of eleven (11) homes were visited in close proximity of the Site along Melody Bay Road, Adam and Eve Road and Mitchell Crescent. No issues relating to quantity or quality were raised during the well survey at the homes visited.

The average values in Table 1 show the dug/bored wells are the shallowest wells, followed by the drilled overburden wells (unconfined) and drilled bedrock wells. Based on the average values, the wells of the area provide excellent groundwater yields of generally fresh groundwater.

In general, bored/dug wells are susceptible to shallow sources of contamination. These types of shallow wells are also susceptible to large seasonal fluctuations in the groundwater. Shallow wells are more prone to becoming dry in the winter and summer months. It is concluded that these shallow well types will not provide reliable long term supplies of potable water.

Based on the subsurface exploration program, the MOE well data and well survey, the hydrogeology of the site is characterized by hilly topography, a shallow unconfined water table within the sand deposits with an inferred groundwater flow direction of southeast and a deeper bedrock aquifer regime that is tapped by the majority of the wells in the area. Only a minor portion of the existing infiltration is expected to recharge the deeper bedrock aquifer complexes that are confined within the fracture networks. Surface water is expected to infiltrate into the shallow overburden that supports the local dug/bored wells and ponds and creeks.

5.3 BACKGROUND GROUNDWATER QUALITY

As noted previously, 81 percent of the well locations in the vicinity of the Site were indicated to be "fresh" water. Samples of the groundwater were previously obtained from twelve (12) drilled wells for the purpose of chemical analyses from twelve drilled wells during pumping tests conducted within the Granite Ridge Estates Phase 1. The Certificates of Analysis of the testing are presented in Appendix C. The data is summarized and compared with the Ontario Drinking Water Standards (ODWS) in Table 2 based on samples collected after six (6) hours of pumping (general chemistry data for water samples collected after one (1) hour of pumping is provided in Appendix C only).

In general, the majority of the general chemistry parameters tested for from the drilled wells are within the ODWS. Exceptions were:

- Elevated hardness at ten (10) locations (83 percent of the locations);
- Hardness below ODWS at one (1) location (8 percent of the locations);
- Elevated turbidity and iron at three (3) locations (25 percent of the locations); and
- Elevated colour, manganese and fluoride at one (1) location (8 percent of the locations); and
- pH below ODWS at one (1) location (8 percent of the locations).

The groundwater in the area appears to be hard likely related to the overburden materials containing calcium and to a lesser extent, magnesium. Turbidity in the water can increase over time due to iron precipitating from the sample. This is typical of a groundwater sample with elevated iron to observe elevated turbidity as the iron precipitates from the sample before it can be analysed at the laboratory.

In general, a commercial water treatment device such as a water softener can remove iron and hardness from the water adequately. In instances of elevated manganese, commercial water treatment such as a greensand filter can be used. Proper treatment of the groundwater may be necessary, if desired, to increase the pH and hardness to acceptable levels. Commercial treatment systems can be used for each of the applicable parameters.

Public water supplies usually contain fluoride in concentrations adjusted to 0.5 – 0.8 mg/L for optimal concentrations to control tooth decay. In the case of water supplies with naturally occurring fluoride, at concentrations of 1.5 mg/L to 2.4 mg/L, the Ministry of Health and Long-Term Care recommends awareness of the condition, to control excessive exposure to fluoride from these sources. Excessive fluoride may lead to the mottling of tooth enamel, affecting the tooth density. This is particularly sensitive to children who drink too much fluoridated water while their permanent teeth are forming. Levels in excess of the listed MAC for fluoride must be reported to the local Medical Health Officer.

TABLE 2: Background Water Quality Summary – Drilled Wells

PARAMETER	Drilled Well Samples (Pumping Test Samples Collected after 6 hours)												Ontario Drinking Water Standards
	W-14	W-18	W-19	W-23	W-24	W-26	W-30	W-31	W-38	W-40	W-42	W-44	
Sodium	32.1	22.5	8.7	1.2	20.7	29.8	37.8	38.4	48.5	38.2	24.2	37.5	200
Potassium	2.2	0.9	1.3	0.4	1.0	2.1	1.4	0.5	1.3	0.9	1.4	2.1	--
Calcium	158	85.6	39.6	18.9	64.6	135	166	135	121	94.4	95.1	160	--
Magnesium	11.5	3.50	5.22	1.29	5.53	25.8	2.73	2.02	6.51	3.99	4.67	10.4	--
Hardness	**442**	**228**	**120**	**52**	**184**	**443**	**425**	**346**	**330**	**252**	**257**	**442**	80 to 100
Alkalinity	406	196	114	40.2	150	337	411	306	293	235	234	393	30 to 500
Fluoride	0.2	0.2	**1.7**	0.2	0.9	0.2	0.1	<0.1	0.2	0.2	0.3	0.2	1.5
Sulphate	24	11	13	10	20	14	13	13	15	14	16	30	500
Chloride	36.4	34.7	2.7	2.0	35.2	75.3	36.0	67.3	74.4	41.5	32.3	63.3	250
Ortho Phosphate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	--
Nitrite –N	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.0
Nitrate –N	2.2	0.6	<0.1	<0.1	0.2	2.2	4.5	0.3	1.4	1.2	0.4	2.7	10
Ammonia-N	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.04	--
Colour (T.C.U.)	4	1	**7**	2	1	3	2	3	2	5	<1	<1	5
Turbidity (N.T.U.)	**7.8**	<1.0	<1.0	1.4	<1.0	**18.2**	<1.0	<1.0	1.2	2.1	**18.0**	1.3	5
Conductivity (umhos/cm)	912	524	271	117	454	916	894	797	835	625	548	938	--
pH (units)	7.01	7.03	7.69	**6.43**	7.48	7.57	7.05	7.68	6.83	7.11	7.28	7.17	6.5 to 8.5
Iron	**0.329**	<0.002	0.006	0.012	0.011	**0.384**	0.005	<0.005	0.041	0.047	**0.691**	**10.46**	0.3
Copper	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	1.0
Manganese	0.022	<0.001	**0.056**	0.016	**0.115**	0.019	<0.001	0.003	0.009	0.002	0.015	0.047	0.05
Zinc	<0.005	<0.005	<0.005	0.006	<0.005	0.008	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	5.0
E. Coli	0	0	0	0	0	0	0	0	0	0	0	0	Non-detect
Total Coliform	5	0	0	0	0	0	3	0	0	0	0	1	<6
Fecal Coliform	0	--	--	0	0	0	0	0	0	0	--	0	Non-detect

Notes: All units are ppm (mg/L) unless otherwise stated.
"<" indicates concentrations are below the detectable limit.
"- -" denotes not tested
Bolded value exceeds ODWS
"W-19" refers to sub-lot 19 of Granite Ridge Estate, Phase 1.
W-18 tested on June 9, 2009; W-19 tested on June 9, 2009; W-14 tested on December 8, 2009; W-23 tested on March 8, 2010; W-24 tested on March 15, 2010; W-27 tested on April 29, 2010; W-30 tested on November 6, 2009; W-31 tested on April 30, 2010; W-38 tested on November 16, 2009; W-40 tested on December 7, 2009; W-42 tested on May 26, 2009; and W-44 tested on November 6, 2009.

The groundwater quality from the temporary monitoring well is summarized in Table 3. In general, the majority of the general chemistry parameters tested for from the temporary piezometer (representing the shallow groundwater) are within the ODWS. The exceptions were:

- Hardness;
- Organic nitrogen;
- Manganese;
- Total Dissolved Solids; and
- Turbidity.

The shallow groundwater in the area appears to be hard likely related to the overburden materials containing calcium and to a lesser extent, magnesium. There also appears to be elevated manganese in the shallow groundwater. The elevated levels of turbidity and total dissolved solids are attributed to a temporary monitoring well that has been developed only for purposes of collecting an analytical sample and not developed to meet drinking water standards for consumption. Organic nitrogen is an operational guideline calculated by the difference between total Kjeldahl nitrogen and ammonia nitrogen.

Although nitrate contamination was not a concern at the monitoring well and drilled locations, shallow dug/bored wells are generally difficult to seal at the surface and therefore considered to be susceptible to shallow sources of contamination such as organic nitrogen. It is recommended that the planned development utilize drilled wells that are properly sealed in accordance with Regulation 903 (OWRA).

TABLE 3: Background Water Quality Summary – Monitoring Well

PARAMETER	Analytical Results: Shallow Well TP-2 Sampled: October 28, 2010	Ontario Drinking Water Standards		
		MAC	IMAC	AO/OG
Alkalinity (as $CaCO_3$)	431	–	–	30 to 500
Aluminium	0.0551	–	–	0.1
Ammonia+Ammonium (N)	0.21	–	–	–
Antimony	<0.00002	–	0.006	–
Arsenic	0.0009	–	0.025	–
Barium	0.415	1	–	–
Boron	0.045	5	–	–
Cadmium	0.000035	0.005	–	–
Calcium	171	–	–	–
Chloride	65	–	–	250
Chromium	<0.0005	0.05	–	–
Colour (T.C.U.)	4	–	–	5
Conductivity (µS/cm)	939	–	–	–
Copper	0.0026	–	–	1.0
Fluoride	0.07	1.5	–	–
Hardness (as $CaCO_3$)	**456**	–	–	80 to 100
Iron	0.059	–	–	0.3
Lead	0.00052	0.01	–	–
Magnesium	7.13	–	–	–
Manganese	**7.77**			0.05
Nickel	0.0088	–	–	–
Nitrogen-Kjeldahl (N)	0.9	–	–	–

PARAMETER	Analytical Results: Shallow Well TP-2 Sampled: October 28, 2010	Ontario Drinking Water Standards		
		MAC	IMAC	AO/OG
Nitrite (N)	<0.005	1.0	--	--
Nitrate (N)	<0.013	10	--	--
Nitrite + Nitrate (N)	<0.018	10	--	--
Organic Nitrogen	**0.7**	--	--	0.15
pH (units)	7.86	--	--	6.5 to 8.5
Phosphorus	0.023	--	--	--
Potassium	3.95	--	--	--
Selenium	<0.001	0.01	--	--
Sodium	42.7	--	--	200
Silver	0.00003	--	--	--
Strontium	0.448	--	--	--
Sulphate	6.5	--	--	500
Titanium	0.0031	--	--	--
Total Dissolved Solids	**555**	--	--	500
Total Organic Carbon	3.9	--	--	--
Total Suspended Solids	41100	--	--	--
Turbidity (N.T.U.)	**>4000**	--	--	5
Uranium	0.000988	0.02	--	--
Vanadium	0.00141	--	--	--
Zinc	0.002	--	--	5.0

Notes: All units are ppm (mg/L) unless otherwise stated.
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)
"<" indicates concentrations are below the detectable limit.
"- -" denotes not tested
Bolded value exceeds ODWS

6.0 TEST WELLS

6.1 WELL CONSTRUCTION

Three new wells were constructed at the Site for the purpose of conducting the pumping tests. The new drilled wells were constructed by Joe Legge and Sons completed on April 23rd, April 28th, and May 27th, 2010. The test wells are located as shown on the Plot Plan, Plate 3 (TW-1 through TW-3).

6.1.1 Test Wells

A copy of the water well records for the drilled wells is provided in Appendix B. The well denoted as TW-1 (MOE Well Tag No. A095797) during the pumping test was:

- Drilled to approximately 61 mbeg encountering sand and gravel to 4.9 mbeg then granite

bedrock to the bottom of the well;

- Static water level was indicated as 2.7 mbeg by the well driller;
- Constructed on May 27, 2010, the well is cased from ground to 6.7 mbeg and open hole from 6.7 to 61 mbeg and is expected to be a confined well; and
- Recommended for pumping at 5 Imperial gallons per minute (Igpm) or 22.7 litres per minute (L/min) based on the driller's findings.

The well denoted as TW-2 (MOE Well Tag No. A095800) during the pumping test was:

- Drilled to approximately 54.9 mbeg encountering sand and gravel to 0.9 mbeg then granite bedrock to the bottom of the well;
- Observed to be an artesian well, overflowing at a rate of approximately 0.1 Igpm (0.5 L/min);
- Constructed on April 23, 2010, the well is cased from ground to 6.1 mbeg and open hole from 6.1 to 54.9 mbeg and is expected to be a confined well; and
- Recommended for pumping at 10 Igpm (45.4 L/min) based on the driller's findings.

The well denoted as TW-3 (MOE Well Tag No. A095798) during the pumping test was:

- Drilled to approximately 61 mbeg encountering sand and gravel to 7.3 mbeg then granite bedrock to the bottom of the well;
- Static water level was indicated as 1.95 mbeg by the well driller;
- Constructed on April 28, 2010, the well is cased from ground to 9.1 mbeg and open hole from 9.1 to 61 mbeg and is expected to be a confined well; and
- Was pumped by the driller at 15 Igpm (68.1 L/min) after construction of the well.

6.2 AQUIFER PERFORMANCE TESTING

The pumping test programs were carried out in order to assess aquifer responses on October 4 to 6, 2010. Controlled constant rate pumping tests were conducted for six hours at all wells with full recovery measurements. Water levels in two (2) adjacent private wells, the shallow monitoring well and test wells were monitored throughout the aquifer performance testing to evaluate the potential

for interference. The discharge water was directed away from each pumped well a distance of approximately 30 m (downgradient of the wells) and was allowed to flow overland toward the pond, the topographic low point of the Site. This practice safeguards against artificial recharge of the well from occurring during the pumping test. Chlorine levels were checked prior to sampling conducted at six hours at each of the test wells. The residual chlorine was non-detect prior to obtaining the bacteriological samples.

The results of the constant rate pumping tests are graphically presented in Appendix D (TW-1 on Plates D-1 to D-5; TW-2 on Plates D-6 to D-10; and TW-3 on Plates D-11 to D-15). Pumping test information is summarized for each test well below.

6.2.1 Test Well No. 1

The water level within TW-1 is illustrated in Appendix D, Plates 1 and 2 showing the measured water level compared to time elapsed and log time elapsed, respectively. The plot shows the water level dropping rapidly when pumping at 5 Igpm (22.7 L/min). After three hours, the flow rate was adjusted to 3.5 Igpm (15.9 L/min) for 30 minutes, then re-adjusted to 3.0 Igpm (13.6 L/min)and pumped for six hours at 3.0 Igpm (total pumping time was 9.5 hours). After re-adjustment to 3.0 Igpm, the water level recovered and began levelling off at approximately 22.5 metres below top of pipe (mbtp).

During the pumping, the discharge water was tested for parameters such as flow rate, conductivity, pH, temperature, methane gas, turbidity, and free chlorine. The results of the field analyses are presented on the Constant Rate Drawdown, Recovery and Testing Details curve (Appendix D, Plate D-3). At the end of the pumping test, free chlorine was zero (0) parts per million (ppm), turbidity was zero (0) N.T.U., pH was 6.95, temperature was 10.0 degrees Celsius, methane zero (0) percent and conductivity was 937 µmhos/cm.

Drawdown data from the constant rate pumping test was plotted on a drawdown versus time semi-log plot in order to determine relevant coefficients (Appendix D, Plate D-4). The computed coefficients for the test well are summarized in Table 4. While pumping the test well at five (5) Igpm, the estimated transmissivity for TW-1 was approximately 7.9 Imperial gallons per day per foot (Igpd/ft) based on the drawdown and 24 Igpd/ft based on the recovery period and represents a low transmissivity.

6.2.2 Test Well No. 2

The water level within TW-2 is illustrated in Appendix D, Plates 6 and 7 showing the measured water level compared to time elapsed and log time elapsed, respectively. TW-2 is a slightly artesian well, measured to be discharging water from the top of the casing, 0.7 m above grade, at 0.5 L/min. The TW-2 plot shows the water level drops slowly over time to nearly five (5) mbtp after six hours of pumping at a rate of nine (9) Igpm.

During the pumping, the discharge water was tested for parameters such as flow rate, conductivity, pH, temperature, methane gas, turbidity, free chlorine. The results of the field analyses are presented on the Pump Test Drawdown, Recovery and Testing Details curve (Appendix D, Plate D-8). At the end of the pumping test, free chlorine was zero (0) parts per million (ppm), turbidity was 3.09 N.T.U., pH was 7.28, temperature was 10.6 degrees Celsius, methane zero (0) percent and conductivity was 667 µmhos/cm.

Drawdown data from the six-hour constant rate pumping test have been plotted on a drawdown versus time semi-log plot in order to determine relevant coefficients (Appendix D, Plate D-9). The computed coefficients for the test well are summarized in Table 4. While pumping the test well at nine (9) Igpm, the estimated transmissivity for TW-2 was nearly 660 Igpd/ft based on the drawdown and 580 Igpd/ft based on the recovery period and represents a moderate transmissivity.

6.2.3 Test Well No. 3

The water level within TW-3 is illustrated in Appendix D, Plate 11 and 12, showing the measured water level compared to time elapsed and log time elapsed, respectively. The TW-3 plot shows a relatively quick drawdown to approximately five (5) mbtp then remains relatively static for the duration of the constant rate pumping test at seven (7) Igpm.

During the pumping, the discharge water was tested for parameters such as flow rate, conductivity, pH, temperature, methane gas, turbidity, free chlorine. The results of the field analyses are presented on the Pump Test Drawdown, Recovery and Testing Details curve (Appendix D, Plate D-13). At the end of the pumping test, free chlorine was zero (0) parts per million (ppm), turbidity was 0.09 N.T.U., pH was 7.41, temperature was 13.2 degrees Celsius, methane zero (0) percent and conductivity was 665 µmhos/cm.

Drawdown data from the six-hour constant rate pumping test have been plotted on a drawdown versus time semi-log plot in order to determine relevant coefficients (Appendix D, Plate D-14). The computed coefficients for the test well are summarized in Table 4. While pumping the test well at seven (7) Igpm, the estimated transmissivity for TW-3 was approximately 625 Igpd/ft based on the drawdown and about 355 Igpd/ft based on the recovery period and represents a moderate transmissivity.

TABLE 4: Aquifer Performance Testing Summary

WELL No.	STEP No.	YIELD		TYPE	TIME	MAXIMUM DRAWDOWN		AVAILABLE DRAWDOWN*		SPECIFIC CAPACITY		ESTIMATED TRANSMISSIVITY	
		Igpm	L/min		min.	ft	m	ft	m	Igpm/ft	L/min/m	Igpd/ft	m^2/day
TW-1	1	0	0	Static	0	0	0	188.5	57.5	---	---	---	---
	2	5.0	22.7	Const	180	141.4	43.1	47.1	14.4	---	---	---	---
	3	3.5	15.9	Const	30	153.9	46.9	34.6	10.5	---	---	---	---
	4	3.0	13.6	Const	360	67.1	20.4	121.4	37.0	0.0	0.7	7.9	0.1
	5	0	0	Recvy	95.0% recovery after 11.1 hours							24.1	0.4
TW-2	1	0	0	Static	0	0	0	176.0	53.6	---	---	---	---
	2	9.0	40.9	Const	402	14.8	4.5	161.2	49.1	0.6	9.1	658.4	9.8
	3	0	0	Recvy	95% recovery after 7.4 hours							579.4	8.6
TW-3	1	0	0	Static	0	0	0	188.6	57.5	---	---	---	---
	2	7.0	31.8	Const	360	7.8	2.4	180.8	55.1	0.9	13.5	625.9	9.3
	3	0	0	Recvy	96% recovery after 22.5 minutes							354.3	5.3

Notes:
Igpm = Imperial gallons per minute; Igpd/ft = Imperial gallons per day per foot
"Recvy" refers to Recovery measurements; "Const" refers to the 6 hr Constant Rate test
*Available Drawdown refers to the height of water in the well above the pump.

The pumping data at the wells reflects relatively low to moderate transmissivities of the aquifer complexes for which they draw water from. The recovery measurements also show moderate to very rapid recharge. It is concluded that the tested drilled wells can provide safe conservative operational yields on the order of 3 to 9 Igpm based on an adequate period of recharge. Over the duration of the pumping tests, the drilled wells yielded approximately:

- TW-1: 2085 Imperial gallons of water (~9465 litres);
- TW-2: 3618 Imperial gallons of water (~16,425 litres); and
- TW-3: 2520 Imperial gallons of water (~11,440 litres).

The shallow monitor wells, test wells and two (2) neighbouring private wells were monitored during the pumping tests to assess the potential for well interference. The approximate linear distances between the test wells, monitoring well and private wells are provided in Table 5 and range from approximately 90 to 515 m. The monitoring data collected during the pumping tests illustrated that there was no significant impact caused by the pumping of the test wells at the locations monitored (shown graphically in Appendix D, Plates D-5, D-10 and D-15).

The water levels in the monitoring well, private wells and test wells did not lower significantly during the pumping tests as a result of conducting the pumping tests and impact to the neighbouring well quantities as a result of the proposed residential development is not expected.

Interference between the test wells, monitoring well and neighbouring water wells is not considered to be a concern based on the information collected. The closest wells adjacent to the Site are drilled wells located along Mitchell Crescent and Adam and Eve Road and the distance between the wells is expected to be on the order of 30 to 50 m. The potential for interference between the tested wells and neighbouring drilled wells is expected to be minimal given the size of the proposed development (18.85 ha for 32 lots).

TABLE 5: Approximate Distances Between Test Wells, Monitor and Private Wells

LOCATION	OBSERVATION WELLS (all measurements in metres and approximate)					
	TW-1	TW-2	TW-3	TP-2 (monitor)	8 Mitchell Crescent	684 Adam & Eve Road
TW-1	--	90	410	255	135	315
TW-2	90	--	370	210	220	225
TW-3	410	370	--	165	515	305

TABLE 6: Maximum Drawdowns in Test Wells, Monitor and Private Wells

PUMPED WELL	OBSERVATION WELLS (all measurements in metres)					
	TW-1	TW-2	TW-3	TP-2 (monitor)	8 Mitchell Crescent	684 Adam & Eve Road
TW-1	**-46.9 (Q=5 lgpm)** **-20.4 (Q=3 lgpm)**	Artesian	-0.05	0.0	Not monitored	Not monitored
TW-2	-0.39	**-4.5**	-0.07	0.0	-0.07	0.0
TW-3	-0.29	-0.03	**-2.4**	0.0	-0.13	-0.01

Notes: Bold value is maximum drawdown in pumped well during pumping test
Negative values indicate the water level is lowering; Positive values indicate the water level is rising

Drawdowns of 29 and 39 centimetres were observed at TW-1 while pumping TW-2 and TW-3, respectively. The well at TW-1 is expected to require storage to reduce stress on the well and supplement its low flow. Recommendations will be provided in Section 7 of this report.

Given the pumping data information calculated and observed at the drilled test wells on Site suggests that there is a sufficient quantity of water below the Site for the planned development without significant impact to existing neighbouring wells.

6.3 TEST WELL WATER QUALITY

Groundwater samples were collected from all of the tested wells during the course of the pumping tests for the purpose of water quality analyses. The wells were sampled after a minimum period of about one (1) and six (6) hours into the constant rate test.

Certificates of all chemical analyses are presented in Appendix C. The water quality data are summarized in Table 6.

6.3.1 Drilled Well Water Quality

The analyses indicate that the drilled test wells produced water of relatively good quality with the majority of parameters meeting the ODWS (all health related parameters met their respective standards at 6 hours) with the exceptions being hardness and turbidity. No bacteria was reported in any of the samples collected. Hardness exceeded its standard at all locations tested as the groundwater in the area appears to be hard likely related to the overburden materials containing calcium and to a lesser extent, magnesium. Iron concentrations were less than the aesthetic objective in the final samples suggesting that treatment for iron may not be necessary but should be a personal preference to the individual. For this development, commercial treatment such as a water softener could be used to remove the hardness (and if necessary, iron) to appropriate levels. For greater iron concentrations, an iron filter may be preferred by the individual resident and will be the responsibility of the resident.

There is minimal evidence of organic pollution as indicated by the absence of nitrite, nitrate and ammonia at the test well locations. Nitrate and organic contamination in general is not a concern at these locations. Organic nitrogen marginally exceeds its operational guideline at TW-2 and TW-3. Taste and odour problems are common above of organic nitrogen concentrations above 0.15 mg/L.

The guideline value of 0.15 mg/L is typically applicable for treatment systems organic compounds react with chlorine and can severely reduce its disinfectant power. It is Geo-Logic's opinion that the trace organic nitrogen levels are not of environmental concern at the Site. The sample result for total dissolved solids at TW-1 is elevated after six (6) hours at 514 mg/L, slightly above the aesthetic objective of 500 mg/L.

TABLE 7: Test Well Water Quality Summary

PARAMETER	DRILLED TEST WELL (TW-1)		DRILLED TEST WELL (TW-2)		DRILLED TEST WELL (TW-3)		Ontario Drinking Water Standards		
	(1 hr)	(6 hrs)	(1 hr)	(6 hrs)	(1 hr)	(6 hrs)	MAC	IMAC	AO/OG
Alkalinity (as $CaCO_3$)	452	430	278	244	266	269	--	--	30 to 500
Aluminium	**1.46**	0.0256	**0.116**	0.0641	**0.184**	0.0041	--	--	0.1
Ammonia+Ammonium	0.06	<0.04	0.08	<0.04	<0.04	<0.04	--	--	--
Antimony	0.00027	0.00004	<0.00002	<0.00002	0.00032	<0.00002	--	0.006	--
Arsenic	0.0004	<0.0002	0.0003	<0.0002	0.0002	<0.0002	--	0.025	--
Barium	0.398	0.278	0.164	0.200	0.0843	0.0859	1	--	--
Boron	0.034	0.042	0.254	0.150	0.055	0.035	5	--	--
Cadmium	0.000016	$<3x10^{-6}$	$<3x10^{-6}$	$<3x10^{-6}$	$3x10^{-6}$	$<3x10^{-6}$	0.005	--	--
Calcium	162	153	83.9	103	113	112	--	--	--
Chloride	100	40	26	28	60	47	--	--	250
Chromium	0.0028	0.0005	0.0009	0.0008	0.0009	<0.0005	0.05	--	--
Cobalt	0.00132	0.000297	0.000171	0.000190	0.000775	0.000425	--	--	--
Colour (T.C.U.)	<3	<3	<3	<3	<3	<3	--	--	5
Conductivity (µS/cm)	1110	917	677	584	723	661	--	--	--
Copper	0.0110	0.0017	0.001	0.0009	0.0034	0.0013	--	--	1.0
Fluoride	0.16	0.19	**1.60**	1.04	0.34	0.23	1.5	--	--
Hardness (as $CaCO_3$)	**442**	**417**	**254**	**294**	**306**	**298**	--	--	80 to 100
Iron	**6.721**	0.05	0.242	0.134	**1.33**	0.069	--	--	0.3
Lead	0.00112	0.00028	0.00016	0.00009	0.00041	0.00007	0.01	--	--
Magnesium	9.2	8.59	10.8	8.98	5.77	4.34	--	--	--
Manganese	**0.0707**	0.0106	0.0402	0.0245	**0.0673**	0.0109			0.05
Nitrogen-Kjeldahl (N)	0.62	0.09	0.17	0.29	0.11	0.16	--	--	--
Nitrite (N)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1.0	--	--
Nitrate (N)	1.48	1.40	0.146	0.470	<0.013	<0.013	10	--	--
Nitrite + Nitrate (N)	1.48	1.40	0.146	0.470	<0.018	<0.018	10	--	--
Organic Nitrogen	**0.56**	0.05	0.09	**0.29**	0.11	**0.16**	--	--	0.15
pH (units)	7.40	7.45	8.08	7.85	7.81	8.07	--	--	6.5 to 8.5
Phosphorus	0.136	0.018	<0.009	<0.009	0.011	0.025	--	--	--
Potassium	4.42	2.07	1.45	1.44	1.48	1.33	--	--	--
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	--	--
Sodium	72.7	31.4	26.9	27.0	36.3	29.7	--	--	200
Silver	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	--	--	--
Sulphate	18	19	24	20	38	20	--	--	500
Titanium	0.0875	0.0021	0.0067	0.0039	0.0178	0.0013	--	--	--
Total Dissolved Solids	**639**	**514**	342	346	414	376	--	--	500
Total Organic Carbon	2.0	<1.0	<1.0	<1.0	1.2	1.6	--	--	--
Total Suspended Solids	216	<2	4	3	42	<2	--	--	--

PARAMETER	DRILLED TEST WELL (TW-1)		DRILLED TEST WELL (TW-2)		DRILLED TEST WELL (TW-3)		Ontario Drinking Water Standards		
	(1 hr)	(6 hrs)	(1 hr)	(6 hrs)	(1 hr)	(6 hrs)	MAC	IMAC	AO/OG
Turbidity (N.T.U.)	**248**	1.56	**5.93**	2.67	**25.2**	0.23	--	--	5
Uranium	0.00638	0.00578	0.0116	0.00772	0.0179	0.0109	0.02	--	--
Vanadium	0.00336	0.00033	0.00054	0.00052	0.00067	0.00025	--	--	--
Zinc	0.057	0.033	0.014	0.013	0.02	0.12	--	--	5.0
E. coli	---	0	---	0	---	0	0	--	--
Total Coliform	---	0	---	0	---	0	<6	--	--
Fecal Coliform	---	0	---	0	---	0	0	--	--

Notes: All units in mg/L (ppm) unless otherwise noted. Time indicates period during pumping test at which the sample was obtained.
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)
Bacteriological data is presented in Colony Forming Units per 100 mL (CFU/100 mL).
Bolded value exceeds ODWS

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 GENERAL

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 assumes that they are representative of the overall Site conditions.

Based on the results of our hydrogeologic review, it is our professional opinion that the Site is suitable for the planned residential development. Three pumping tests were conducted as part of this investigation. The groundwater generally exhibits good chemical quality that may require commercial water treatment (i.e. commercial water softeners in most cases). Testing for microbiological parameters was non-detect at each of the three test wells.

Based on the water level information and the Site topography, the water table flow direction is inferred to be toward Buckhorn Lake.

It is our professional opinion that there is minimal potential for groundwater and surface water impact as a result of the planned residential development. Although it is our opinion that the Site has a minor role in the overall baseflow of the area, it is our recommendation that good construction and mitigation techniques must be used to minimize the potential for any impact. Detailed water balance evaluations are provided in the following section.

Based on the pumping tests, the drilled wells, TW-1, TW-2 and TW-3 were rated to have a safe conservative operational yield of 3.0 Igpm (13.6 L/min or 0.23 L/s); 9.0 Igpm (40.9 L/min or 0.68 L/s); and 7.0 Igpm (31.8 L/min or 0.53 L/s), respectively. The available well data confirms that adequate groundwater resources are available for the proposed development.

It is recommended that the planned water systems utilize individual drilled wells that are properly constructed, sealed and tested.

On-site septic waste disposal may be accomplished in-ground where soil conditions permit, however, some of the lots will require conventional fully raised leaching tile beds. The calculated impact of the development on the off-site groundwater regime meets current MOE guidelines.

Detailed conclusions and recommendations are presented in the following sections regarding a water balance evaluation, water supply assessment, soils information for septic system design and nitrate impact assessment.

7.2 WATER BALANCE EVALUATION

An evaluation of the water balance for the Site was completed to determine the potential impacts that may occur in the recharge/discharge characteristics related to the proposed development. The computations have used detailed parameters such as precipitation (Lindsay Frost, Ontario, with data from 1974 to 2000 was used), regional evapotranspiration, infiltration and runoff. The detailed calculations can be reviewed in Appendix E.

Weather data from the Lindsay Frost weather station was selected due to its relative proximity to the Site (approximately 35 kilometres southwest of the Site). Assumptions were made at this time in order to compute the water balance evaluation from a preliminary Site drawing provided by Skelton Brumwell and Associates Inc (dated September 2010) such as the area of impervious surfaces (i.e. roads and roof tops), lots and pond and other surfaces. Other assumptions include the division of the Site into hilly and flatter areas. The hilly areas reflect the topography along the edge of the Site toward the west, north and east sides while the flatter area is toward the central portion of the Site and toward the south. It is inferred that runoff and groundwater flow are directed toward the pond and ultimately toward Buckhorn Lake.

A summary of the pre-development water budget is presented in Table 8.

TABLE 8: Pre-Development Water Budget Summary (current Site)

1.	Total Precipitation (Lindsay Frost):	- 881.5 mm/year
2.	Regional Evapotranspiration:	- 579.5 mm/year
3.	Recharge Available:	- 302.0 mm/year
4.	Area of Recharge On-site:	- 18.85 ha
5.	Water Surplus (over area of site):	- 56925 m^3/year
6.	Infiltration Factor:	- 0.63
7.	Estimated Annual Infiltration:	- 35706 m^3/year
8.	Estimated Annual Runoff:	- 21219 m^3/year

The infiltration factors for the areas were 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 infiltration factor of 0.63 was based on:

- Soil sub-factor of 0.35 based on test pit logs that indicate fine to medium sand and gravel in the shallow overburden material of the Site;
- Topography sub-factor of 0.12 (intermediate between rolling land and hilly land with an emphasis on hilly land due to the relief at the Site); and
- Cover sub-factor of 0.12 (intermediate between cultivated land and woodland with greater consideration given to cultivated land due to the lack of vegetation across the Site).

The computation of the water budget was repeated for the proposed development assuming no mitigation techniques, that is, runoff from impervious surfaces is predominantly unrecoverable and not infiltrated into the ground and that the surface soils are compacted during construction further reducing the infiltration capacity of the soils. The anticipated impact of the development is related to increased runoff from imperious surfaces such as road surfaces and the roof tops. A summary of the post-development water budget with no mitigation is provided in Table 9:

TABLE 9: Post-Development (without mitigation for the development)

1.	Area of Site:	- 18.85 ha
2.	Impervious Surfaces (road, roofs):	
	Internal Road (Asphalt)	- 2.25 ha
	Roof tops	- 0.45 ha
3.	Pond Block and Open Space	- 2.3 ha
4.	Area Available for Infiltration:	- 16.2 ha
5.	Infiltration Factors:	
	Lots 5-7, 13, 16-20 *(rolling land)*	- 0.65
	Lots 1-4, 8-12, 14-15, 21-32 (*hilly land)*	- 0.55
6.	Estimated Annual Infiltration:	- 32450 m^3/year
7.	Estimated Annual Runoff:	- 28219 m^3/year

Based on these calculations and the post-development activities, the runoff difference has increased by 33 percent of the original water runoff volume while infiltration has dropped by approximately 9 percent. These post-development conditions indicate that mitigation techniques are required in order to maintain the infiltration capacity of the pre-development subsurface soil conditions.

Therefore, the post-construction water budget computations were repeated considering proposed enhancements for the development. The primary enhancement is to promote infiltration by moving water from impervious surfaces to areas where infiltration can occur. Table 10 provides a summary of the calculations completed with enhanced infiltration for the development.

TABLE 10: Post-Development (with enhanced infiltration for the development)

1.	Area of Site:	- 18.85 ha
2.	Impervious Surfaces (roads, roofs):	
	Internal Road (Asphalt)	- 2.25 ha
	Roof tops	- 0.45 ha
3.	Pond Block and Open Space	- 2.3 ha
4.	Area Available for Infiltration:	- 16.65 ha
5.	Infiltration Factors:	
	Lots 5-7, 13, 16-20 *(rolling land)*	- 0.65
	Lots 1-4, 8-12, 14-15, 21-32 *(hilly land)*	- 0.55
6.	Estimated Annual Infiltration:	- 34732 m^3/year
7.	Estimated Annual Runoff:	- 25937 m^3/year

Under these conditions, the Site will see a decrease in infiltration of approximately 974 m^3/year (2.7%) and conversely an increase in run off of approximately 4718 m^3/year (22%) compared to the pre-development values. It is expected that additional runoff from the Site will be directed to the existing pond.

There are possible options that may further decrease surface water runoff from the Site and promote infiltration. Options that may be considered include directing runoff from walkways and impervious surfaces to infiltrate into the soil through soak away pits or infiltration trenches within on-site ditches.

Infiltration within ditches may be constructed with a non-woven geotextile and infilled with clear stone backfill to promote infiltration. Additional enhancement features such as directing runoff from roads and walkways to side margins where infiltration can be promoted are recommended. These techniques would further increase the infiltration factor of the Site while minimizing long-term maintenance.

By including the septic system effluent discharged to the subsurface, there will actually be a gain in water to the shallow groundwater regime. Additional discussion of the septic system and loading to the environment is found in Section 7.7.

It is our professional opinion that there will be little or no impact to the local shallow groundwater and surface water regimes and their interactions due to the proposed development. It is Geo-Logic's professional opinion that the Site is a small contributor to the overall baseflow in the area.

7.3 IMPACT ON GROUNDWATER RESOURCES

The importance of the groundwater baseflow is that it provides discharge to the water bodies and wells in the area. As indicated above, with an overall net gain to the shallow groundwater baseflow predicted, there would not be an impact to the groundwater baseflow supplying shallow wells from a quantity perspective. Over time, the infiltrating surface water will reach the deeper bedrock aquifers. Based upon the pumping tests and corresponding interference calculations, there appears to be sufficient groundwater to supply the proposed development and not impact the quantity of groundwater available to the deeper wells.

Currently, only a minor portion of the existing infiltration is expected to recharge the deeper aquifer complexes that within the bedrock fractures. Impacts to the deeper groundwater resources and neighbouring drilled wells are expected to be minor in the long-term.

7.4 IMPACT TO 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 road salting, minor fuel and oil leaks, fertilizer application etc. It is expected that there will be a minor loss of infiltration to the groundwater regime based upon the proposed development with infiltration enhancements. It is our professional opinion that there will no significant impact to the groundwater baseflow and there is not expected to be an impact to the neighbouring surface water bodies and any shallow dug wells that may be utilized in the immediate area as there will be a net surplus of water to the shallow groundwater regime from the proposed development.

The pond is an aesthetic feature and provides stormwater management controls. Effluent from properly constructed tile bed systems will have little impact on the pond. Any remaining nitrate will be immediately diluted. The pond is a feature that is fed by both groundwater and surface water. Water quality sampling should be completed twice per year (spring and late summer) in the pond to address water quality changes over time. A water sample is to be collected and analyzed for the following minimum test parameters:

- Nitrogen species;
- Phosphorus;
- Sodium;
- Chloride;
- Temperature; and,
- Basic inorganic water quality parameters.

Water samples should be collected from at the outlet (if no flow at the outlet, then collected near the outlet preferably close to the bottom of the pond) and for a period of two (2) years following 80% build out. These recommendations can be implemented through the Conditions of Draft Approval for the subdivision.

7.5 MITIGATION MEASURES

Several mitigative techniques have been recommended in order to address concerns relating to the potential for impact to the base flow from the Site. The impact and mitigation measures can be arranged into two (2) distinct categories: construction phase and operational phase. During the course of the planned construction, there is the possibility of silt or other fine-grained soil particles becoming mobile and entering drainage channels during the construction phase of development.

Prior to construction, storm water management techniques will control additional surface water runoff and permit enhanced infiltration into the surrounding ground. This will minimize the potential for groundwater impact and also minimize the amount of runoff. The installation of strategically placed silt fences will filter any excess storm water runoff prior to entering the infiltration areas.

A portion of the storm water could be directed to subsurface infiltration blankets or infiltration trenches. This would permit a more natural attenuation of precipitation. This would maximize the infiltration capability of the structures while minimizing long-term maintenance.

It is recommended that roof leaders of future buildings drain onto the ground surface of rear sodded lawns. Swales may be required in some areas to divert the runoff water from roads, driveways and other structures.

7.6 WATER SUPPLY

7.6.1 Groundwater Availability

Minimum well yield requirements are defined in MOE Procedure D-5-5. Ideally, the wells in the development should be capable of supplying water at a rate of 18.75 L/min (4.1 Igpm) for a period of 6 hours (a rate of not less than 3.0 Igpm must be attained). The ideal rate is based on a peak demand rate of 3.75 L/min/person and five persons per well. The minimum well yield is equivalent to a total flow of 216,000 L/day for the proposed 32-lot development. This figure equates to a continuous flow of 150 L/min (33.0 Igpm). The three (3) wells that were tested as part of this study are capable of providing a combined yield of 86.3 L/min (19.0 Igpm). As indicated on the MOE well records and observed during the pumping tests, test wells TW-2 and TW-3 are capable of higher yields on the order of 68.1 L/min (15 Igpm) each. A typical household will use on the order of 1000 L/day or 32,000 L/day for the entire proposed development or approximately 22.2 L/min (4.9 Igpm). As such, we conclude that ample groundwater supplies are available to meet the needs of the proposed development.

7.6.2 Production Well Requirements

Based on the results of this investigation, it is recommended that the proposed development be serviced by properly constructed drilled wells. The wells should be extended into the granite bedrock with pump settings of sufficient depth in each well to minimize the potential for water quantity impacts and provide adequate well storage to meet daily and typical water demands.

It is expected that the drilled wells will require drilling to depths on the order of approximately 55 to 60 mbeg based on the existing wells on Site. Large diameter (300 mm or greater) wells are not considered suitable as a source of water supply for this Site. Each well installed should meet the following design criteria.

1. For this Site, new wells within a weathered bedrock zone must be cased to the bedrock and must be at least 6 m in depth (in accordance with Regulation 903 of the Ontario Water Resources Act) and that the casing of new wells in a bedrock zone that is not weathered must be sealed into the bedrock with suitable sealant to prevent impairment of the quality of the groundwater and the water in the well.

2. Bedrock wells do not require well screens and may be constructed as open hole wells after following the protocol outlined in Item 1 above.

3. Each well must be developed by conventional techniques to obtain a minimum of 70% efficiency. It is recommended that a statement be provided that indicates the well is essentially sand-free (i.e. less than 5 mg/L sand). In addition, the statement should also include that the total drawdown in the well, comprising the pumping level plus the mutual interference from the other wells, is within a reasonable tolerance of the available drawdown.

4. A water sample must be collected from each new well and analyzed for the following minimum test parameters to meet the ODWS

- Alkalinity	- Fluoride	- Chloride
- Iron	- Manganese	- Nitrate
- Sodium	- Hardness	- Turbidity
- Colour	- Total Coliform	- E. *coli*
- Fecal coliform	- pH	

5. **It is recommended that each properly constructed well be pump tested by qualified hydrogeologic personnel prior to issuance of a building permit (with a short letter prepared for the Township Building Inspector or others as directed).** The well should be pump tested to determine a safe long-term yield and short-term capacity to ensure uninterrupted water supply for the development and to ensure that adjacent properties will not be impacted. A report should be prepared by a Professional Engineer or Professional Geoscientist with expertise in the requirements of Ontario Regulation 903 and water well tests for water quantity and quality. The report should be reviewed by the appropriate representatives (i.e. local municipality).

The use of properly constructed drilled wells that are adequately sealed and certified by qualified hydrogeological personnel should be sufficient to provide ample quantities of potable water while preserving the long term water quality of the existing aquifer complexes.

The use of groundwater heat pumps that extract water from the aquifer is not recommended. Geothermal drilling is unregulated and there are no mandatory requirements to seal boreholes that are drilled through or into aquifers. Therefore, unsealed or improperly sealed boreholes into the aquifer could put the water supply at risk.

7.7 SEPTIC WASTE DISPOSAL

7.7.1 General

A detailed assessment of the septic system suitability is required to determine the potential impact of individual on-Site sewage systems on groundwater resources since the proposed lot sizes are less than one (1) ha. The Site is not considered to be hydrogeologically sensitive (Procedure D-5-4, MOE, 1996). The MOE dilution model was used to confirm that the projected post-development nitrate concentration meets the drinking water standard of 10 mg/L for nitrate. It is our professional opinion that the Site is suitable for the construction of a septic waste disposal system. Based upon the subsurface soils in the area of the proposed leaching beds, it is expected that the waste disposal system may be designed as an in-ground or partially raised bed systems depending on the shallow groundwater table and shallow bedrock surface. Shallow groundwater was observed at TP-2 at 0.84 mbeg and shallow bedrock at TW-2 was observed at 0.9 mbeg. A detailed review of the expected waste disposal impacts and recommendations are presented in the following sections.

7.7.2 Developmental Impact

For the purposes of calculating the potential impact of the planned residential development, 1,000 L/day/household is considered to be an acceptable septic effluent loading rate. Therefore, the proposed development is expected to generate about 32,000 L/day (32 m^3/day) of septic effluent based on thirty-two lots. While most constituents in septic effluent are usually removed within a short distance of movement within soil, mobile constituents such as chlorides and nitrates will require sustained dilution to meet the drinking water standards of 10 mg/L N for nitrate.
The MOE normally considers sewage from a Class 4 waste disposal system will contain 40 mg/L of nitrate. For the purpose of assessing the impact of projected nitrate loading, the dilution requirement of 4:1 was utilized in the impact computations.

A summary of the applicable parameters that were considered in the waste disposal evaluation and the computation of the projected nitrate concentration are presented below. The detailed calculations can be reviewed in Appendix E. The calculations used an estimated recharge rate on the order of about 200 mm/year based on exploratory test pits and infiltration factors computed in the water balance evaluation.

Using dilution only, the nitrate concentration generated from sewage at the Site is calculated to be 9.5 mg/L based on a background nitrate concentration of less than 0.013 mg/L collected from the shallow temporary monitoring well at TP-2. The proposed development meets the 10 mg/L drinking water standard for nitrate. Any remaining nitrate that migrates through the sandy soils to the central pond will be immediately diluted. Table 11 provides a summary of the septic impact parameters for the proposed development:

TABLE 11: Septic Impact Parameters

1.	Total Precipitation (Lindsay Frost):	- 881.5 mm/year
2.	Regional Evapotranspiration:	- 579.5 mm/year
3.	Recharge Available:	- 302.0 mm/year
4.	Recharge Available for Dilution:	- 198.9 mm/year
5.	Development Area:	- 18.85 ha
6.	Background Nitrate (one location):	- <0.013 mg/L
7.	Nitrate Loading (40 mg/L x 32,000 L/day)	- 1,280,000 mg/day
8.	Projected Nitrate Concentration	- 9.5 mg/L

Wells at the proposed development should be properly located in relation to the septic systems to minimize cross contamination.

7.7.3 Waste Disposal Requirements

Based on the results of this assessment, it is our professional opinion that the Site is suitable for a private septic waste disposal system. The design of an individual leaching bed system should be adjusted to suit local Site conditions. It is recommended that the septic systems use in-ground or partially raised leaching beds where subsurface conditions allow; otherwise, fully raised leaching beds are appropriate. A minimum of 900 mm of soil is required above bedrock and the water table. The waste disposal systems should meet Ontario Regulation 350/06 made under the Building Code Act, 1992 and incorporate the following design features:

1. All organics should be stripped from the area of the leaching beds and down-gradient mantle.

2. The exposed subgrade below the tile beds should be trimmed and scarified, and provided with a gentle slope of 0.5% in the direction of the mantle.

3. The tile beds can be constructed as conventional in ground tile bed or as fully raised leaching type beds to the full height of at least 1 m above existing grade. The raised beds should consist of clean, granular fill capable of providing an in-place percolation rate (T-time) of 4 to 8 min/cm.

4. The mantle should be constructed along the downgradient margin of the raised beds. Each mantle should extend along the full width of the bed and for a minimum of 15 m downgradient from the bed. The mantle should consist of similar granular fill raised to a minimum of 250 mm above the surrounding grade. All surface runoff should be diverted away from the leaching beds by means of proper site drainage.

No mantle would be required for an in-ground tile bed.

5. The waste disposal systems should be kept clear of surface drainage swales, roof leader drains, and other sources of surface water.

6. The tile beds should be kept away from shade trees and a healthy cover of vegetation should be developed and maintained over the beds to promote evapotranspiration.

7. When sighting tile beds on sloping ground, it is recommended that procedures outlined in the Building Code be followed closely.

8. Minimum set back distances from septic tank (plus 2 times height raised):
   a) Building – 1.5 m
   b) Property line – 3 m
   c) Drilled Well – 15 m
   d) Open water course – 15 m

9. Minimum set back distances from septic tile bed (plus 2 times height raised):
   a) Building – 5 m
   b) Property line – 3 m
   c) Drilled well, properly sealed – 15 m
   d) Shallow well – 30 m
   e) Open water course – 15 m

10. The layout, design and construction of the waste disposal bed should be subject to inspection by experienced hydrogeologic personnel.

7.8 SUMMARY CONCLUSIONS

In summary, a 32-lot residential development to be serviced by individual wells and septic systems is proposed on an 18.85 ha parcel of land southwest of Buckhorn within the Township of Galway-Cavendish & Harvey, County of Peterborough. The three wells tested in support of the development are completed into the bedrock aquifer system ranging in depth from approximately 55 to 61 mbeg. The following conclusions and recommendations are made in support of this report:

- The test wells were pumped for six hours ranging in rates from 3 Igpm (13.6 L/min), 9 Igpm (40.9 L/min) and 7 Igpm (31.8 L/min) at TW-1, TW-2 and TW-3, respectively. Relatively static pumping levels and good recovery characterized the test wells at TW-2 and TW-3. Pumping test results at TW-1 suggest that the well can safely provide 3 Igpm over the long term. The results indicate that the bedrock aquifer is capable of providing sustainable domestic water supplies;

- Minor interference was observed in the test wells during the six hour tests that will not be a significant impact to the future proposed domestic wells or the existing wells along the nearby roads including Mitchell Crescent and Adam and Eve Road or in the immediate vicinity;
- Water quality is generally good with hardness requiring softening to meet the ODWS at the majority of locations. Elevated iron was also encountered in some of the wells sampled and can be removed using commercial water softening equipment with treatment recommended to be at the preference of the individual. No bacteria was recorded within any of the samples and no health related exceedances of the ODWS were noted;
- The water balance calculations suggests that a loss of 2.7 percent infiltration and 22 percent more runoff will occur as a result of the proposed development. Water should be directed from roofs and impermeable surfaces to rear-sodded lots for natural attenuation of precipitation;
- Based on the MOE dilution model, the projected post-development nitrate concentration met the drinking water standard of 10 mg/L for nitrate. The calculated projected post-development nitrate concentration was 9.5 mg/L based on a background nitrate concentration of less than 0.013 mg/L from the Site monitoring well;
- The Site is characterized by shallow deposits of a sand above bedrock (granite);
- The water table was measured to be less than one (1) mbeg at the southwest area of the Site. Shallow groundwater was only observed in the southwest corner of the Site and no water was observed in the other test pits;
- Groundwater is inferred to be migrating in a southeast direction toward Buckhorn Lake;
- Where the soil conditions suit, in-ground tile beds may be constructed, otherwise raised or partially raised tile beds are required;
- Provided that the waste disposal system is properly constructed, no significant impact is anticipated on downgradient baseline water quality functions. The proposed development is expected to have a negligible impact on the existing baseflow conditions and on the water quality of the shallow and deeper aquifer systems;
- Implementation of water quality sampling of the central pond for a period of 2 years upon 80% build out of the subdivision; and
- The use of groundwater heat pumps that extract water from the aquifer is not recommended as this practice may pose a risk to the quality of the aquifer.

Provided that the waste disposal systems are properly constructed, no significant impact is anticipated on down-gradient baseline water quality functions.

The proposed residential development is expected to have a negligible impact on the existing baseflow conditions and on the water quality of the overburden aquifer.

The use of properly constructed drilled wells that are certified and adequately sealed, should be sufficient to provide ample quantities of potable groundwater while preserving the long-term water quality of the aquifer complex.

7.9 STATEMENT OF LIMITATIONS

The attached 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 yours,

Geo-Logic
GEOTECHNICAL ENGINEERS
AND HYDROGEOLOGISTS

Robert Neck, M.Eng., P.Geo. (Limited)
Project Manager

Nyle C. McIlveen, P.Eng.
Senior Engineer

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STATEMENT OF LIMITATIONS

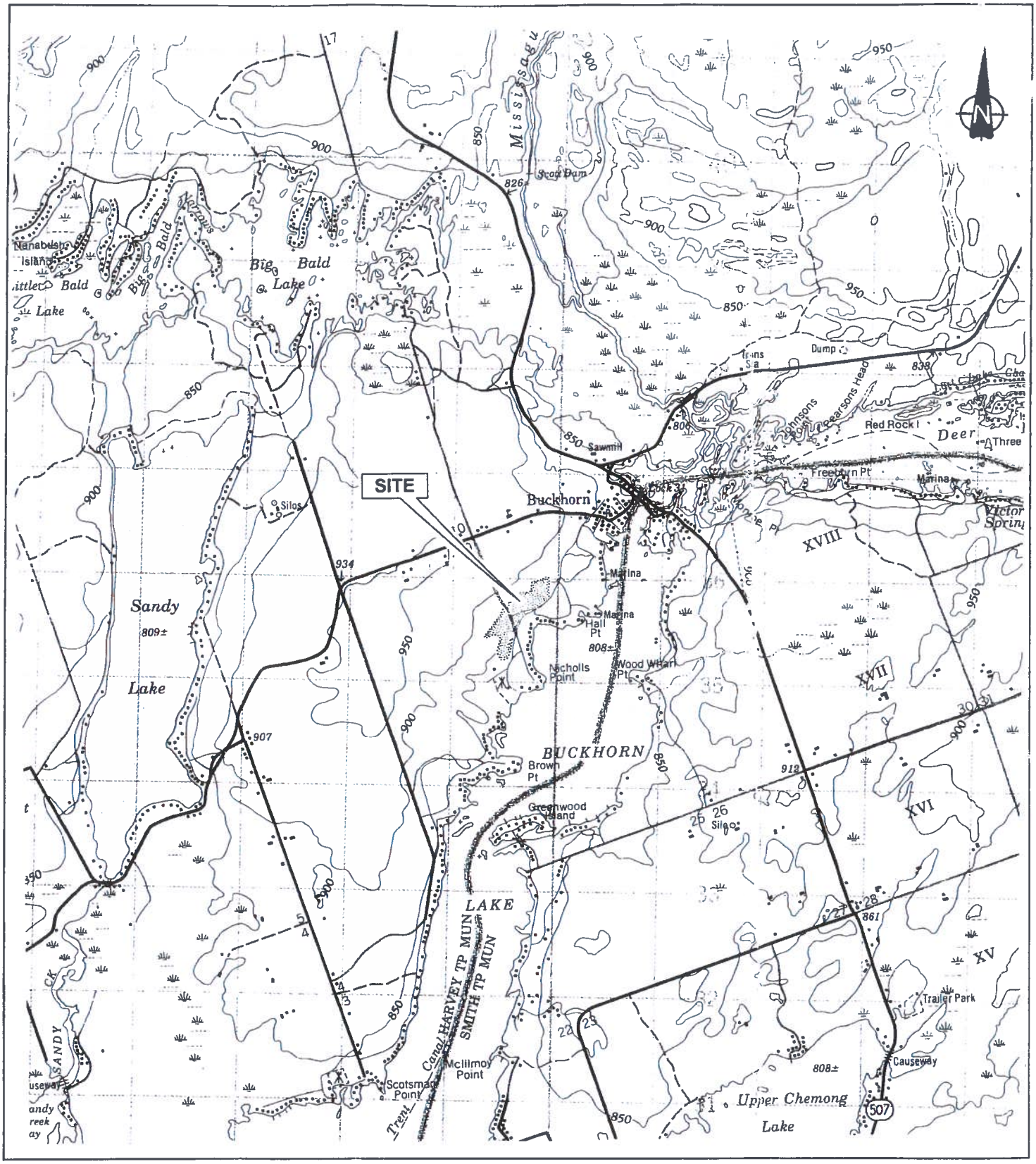
This report is intended solely for Jeff Chesher of Buckhorn Sand and Gravel and other parties explicitly identified in the report in assessing the hydrogeologic concerns of the property identified as Part Lots 8 and 9, Concession 9 within the Township of Galway-Cavendish & Harvey (formerly Township of Harvey), County of Peterborough and is prohibited for use by others without Geo-Logic's prior written consent. This report is considered Geo-Logic's professional work product and shall remain the sole property of Geo-Logic. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to Geo-Logic. Client shall defend, indemnify and hold Geo-Logic 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 geotechnical 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 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, Geo-Logic will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

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 investigation. 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 Geo-Logic is completed.

ENCLOSURES



VICINITY PLAN

Hydrogeological Assessment

Proposed Residential Development

Granite Ridge Estates, Buckhorn, ON

Base plan compiled from Energy, Mines and Resources Canada Map 31 D/9
Published 1979 Air photography dated 1976

DATE: October 2010
SCALE: 1 : 50,000
JOB NUMBER: G023134 E1
DRAWING NUMBER: PLATE 1

GEO-LOGIC

347 PIDO ROAD, UNIT 29

PETERBOROUGH, ON K9J 6X7

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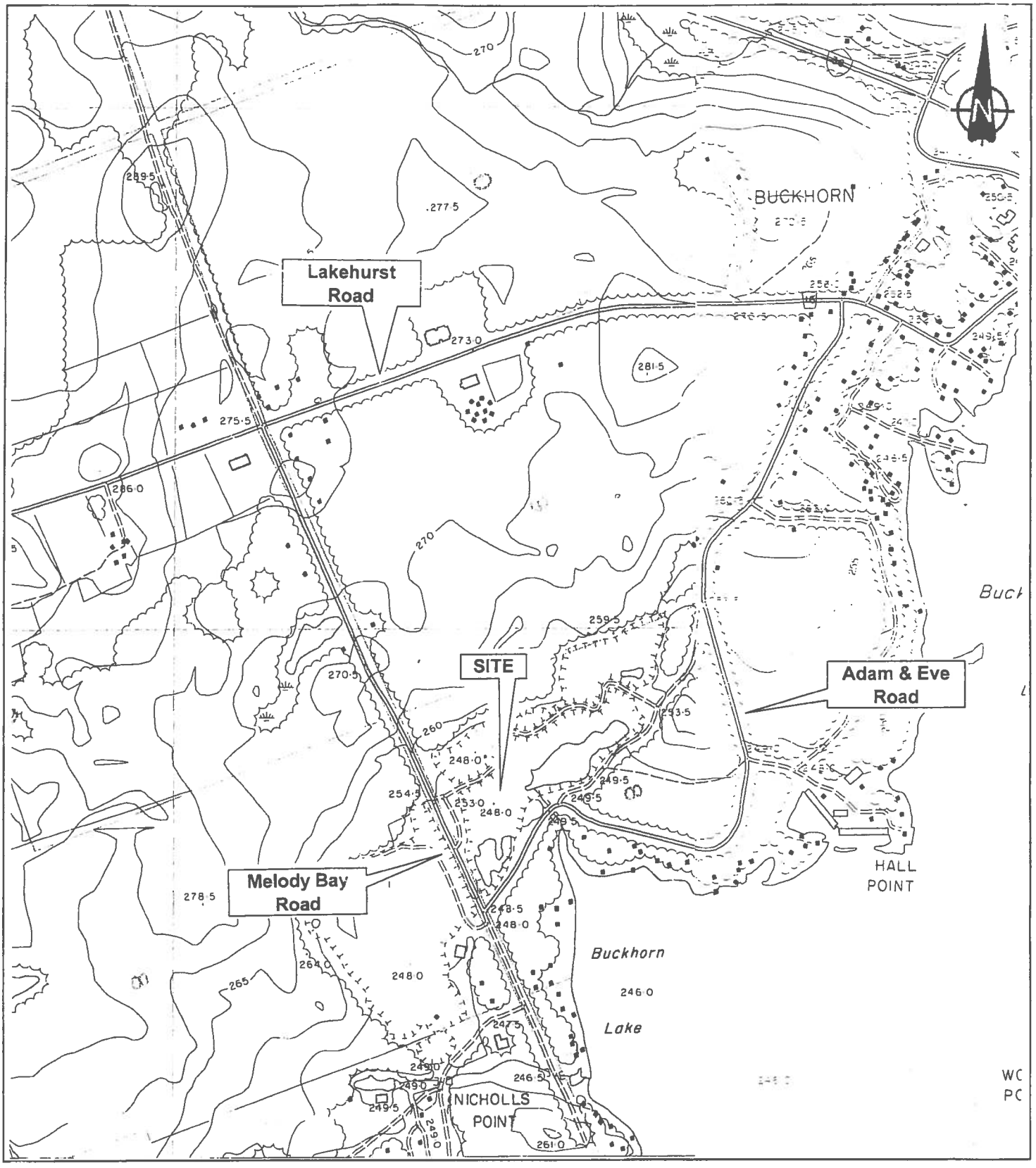

PROPERTY PLAN

Hydrogeological Assessment

Proposed Residential Development

Granite Ridge Estates, Buckhorn, Ontario

Base plan compiled from Ministry of Natural Resources, Ontario Base Map Series, Maps 10 17 7050 49350 and 10 17 7100 49350 Published 1990 Air photography dated 1984

DATE: October 2010

SCALE: 1 : 10,000

JOB NUMBER: G023134 E1

DRAWING NUMBER: PLATE 2

GEO-LOGIC

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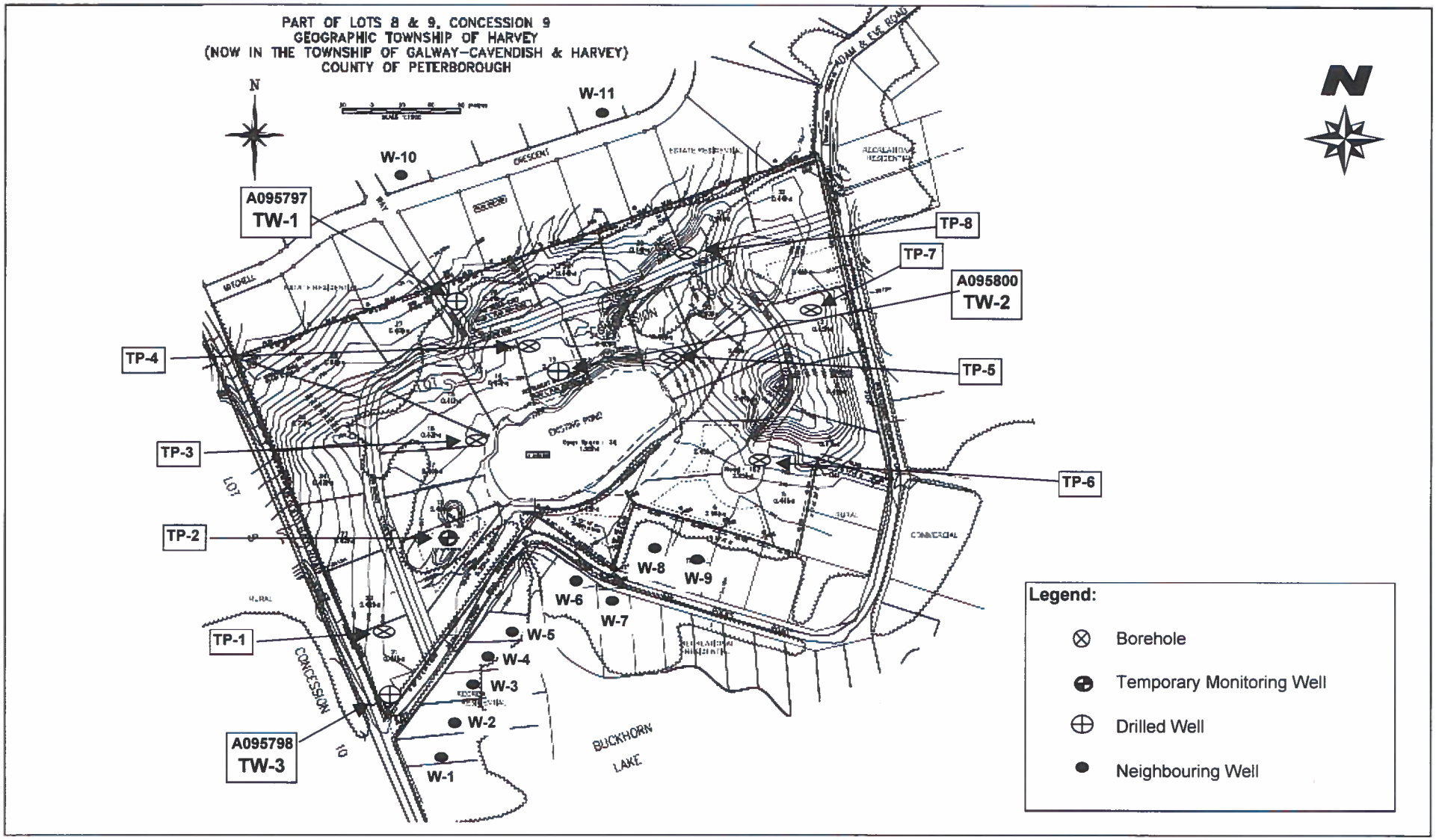


PLOT PLAN

Granite Ridge Estates Phase 2

Proposed Residential Development

Township of Galway-Cavendish & Harvey, Peterborough County

Plot Plan based upon Skelton Brumwell drawing "Granite Ridge Phase 2" - 2361-BASE, September 2010 (preliminary)

DATE: November 2010

SCALE: N.T.S.

JOB NUMBER: G023134 E1

DRAWING NUMBER: PLATE 3

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29

PETERBOROUGH, ON K9J 6X7

(705) 749-3317 FAX (705) 749-9248 www.geo-logic.ca

APPENDIX A

SOILS EXPLORATION DATA

Log of Test Pit: TP-1

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE				
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	MOISTURE CONTENT (10 20 30 40)	Piezometer Data	REMARKS
0 ft / 0 m		Ground Surface	0.0					
		SAND Brown Sand, with Gravel, Moist, Loose	0.0	1	GS			
				2	GS			
				3	GS			
6 ft / 2 m		Brown Sand, with Gravel, Wet, Loose	-1.8 / 1.8					
7 ft		Test Pit terminated	-2.1 / 2.1					Borehole terminated at 2.13 mbeg. Open hole water level at 2.13 mbeg.
10 ft / 3 m								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 2.13

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 1

Log of Test Pit: TP-2

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 / 0		Ground Surface	0.0 / 0.0					
0 – 2.5 / 0 – 0.8		***SAND*** Brown Sand, with Gravel, Moist, Loose		1	GS			
2.5 – 6.3 / 0.8 – 1.9		Brown Sand, with Gravel, trace Boulders, Wet, Loose		2	GS	2.8		Water level at 0.84 mbeg.
6.3 / 1.9		Test Pit terminated	-1.9 / 1.9					Borehole terminated at 1.93 mbeg.

Elevation (m): Existing Grade

Completion Depth (m): 1.93

Excavation Date: Sept. 24, 2010

Geologist/Technologist: J. Geraldi

Excavating Company: Buckhorn Sand & Gravel

Excavating Equipment: Small Track Excavator

Plate No.: 2

Log of Test Pit: TP-3

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 ft / 0 m		Ground Surface	0.0					
		SAND Brown Sand, trace Silt, trace Gravel, Moist, Loose	0.0	1	GS			
			-0.8					
		Brown Sand, few Boulders, trace Gravel, Moist, Loose	0.8	2	GS			
5 ft / 1 m			-1.5					
		Test Pit terminated	1.5					Borehole terminated at 1.52 mbeg. Refusal at 1.52 mbeg due to inferred bedrock. Dry upon completion.
10 ft / 3 m								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 1.52

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 3

Log of Test Pit: TP-4

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 / 0		Ground Surface	0.0					
		SAND Brown Sand, with Gravel, Moist, Loose	0.0	1	GS			
1								
2								
3 / 1				2	GS	7.9 •		
4			-1.4					
		Test Pit terminated	1.4					Borehole terminated at 1.37 mbeg. Refusal at 1.37 mbeg due to inferred bedrock. Dry upon completion.
5								
6 / 2								
7								
8								
9								
10 / 3								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 1.37

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 4

Log of Test Pit: TP-5

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 ft / 0 m		Ground Surface	0.0					
		SAND Brown Sand, with Gravel, few Boulders, Moist, Loose	0.0	1	GS			
1								
2								
3				2	GS			
1 m								
4								
5			-1.5 1.5					Borehole terminated at 1.52 mbeg. Refusal at 1.52 mbeg due to inferred bedrock. Dry upon completion.
		Test Pit terminated						
6								
2 m								
7								
8								
9								
3 m								
10								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 1.52

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 5

Log of Test Pit: TP-6

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 / 0		Ground Surface	0.0					
		TOPSOIL	0.0 / -0.2					
1		***SILTY SAND*** Light Brown Silty Sand, Moist, Loose	0.2	1	GS	7.7		
2			-0.8					
3 / 1		***SAND*** Brown Sand, Moist, Loose	0.8	2	GS	2.4		
5		Brown Sand, trace Silt, Moist, Loose	-1.5 / 1.5	3	GS			
6 / 2								
7			-2.3					
8		Brown Sand, with Gravel, few Boulders, Moist, Loose	2.3	4	GS			
9 / 3								
10			-3.0					
		Test Pit terminated	3.0					Borehole terminated at 3.05 mbeg. Dry upon completion.
11								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 3.05

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 6

Log of Test Pit: TP-7

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 / 0		Ground Surface	0.0					
		SAND Brown Sand, with Gravel, few Boulders, Moist, Loose	0.0	1	GS			
				2	GS			
5 / 1			-1.5					
		Test Pit terminated	1.5					Borehole terminated at 1.52 mbeg. Refusal at 1.52 mbeg due to inferred bedrock. Dry upon completion.
10 / 3								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 1.52

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

Excavating Equipment: Small Track Excavator

Plate No.: 7

Log of Test Pit: TP-8

Project No: G023134 E1

Project: Granite Ridge Estates Phase 2

Location: Buckhorn, ON

Geo-Logic Inc.
347 Pido Road, Unit 29
Peterborough, Ontario
K9J 6X7

SUBSURFACE PROFILE				SAMPLE		MOISTURE CONTENT	Piezometer Data	REMARKS
DEPTH (ft / m)	SYMBOL	DESCRIPTION	ELEVATION / DEPTH (m)	NUMBER	TYPE	10 20 30 40		
0 / 0		Ground Surface	0.0					
		TOPSOIL	0.0 / -0.2					
1		***SAND*** Dark Brown Sand, trace Gravel, Moist, Loose	0.2	1	GS			
2			-0.8					
3 / 1		Brown Sand, with Gravel, few Boulders, Moist, Loose	0.8	2	GS	3.1 •		
4								
5				3	GS			
6 / 2								
7				4	GS			
8								
9			-2.9					
10 / 3		Test Pit terminated	2.9					Borehole terminated at 2.90 mbeg.
11								

Elevation (m): Existing Grade

Geologist/Technologist: J. Geraldi

Completion Depth (m): 2.90

Excavating Company: Buckhorn Sand & Gravel

Excavation Date: Sept. 24, 2010

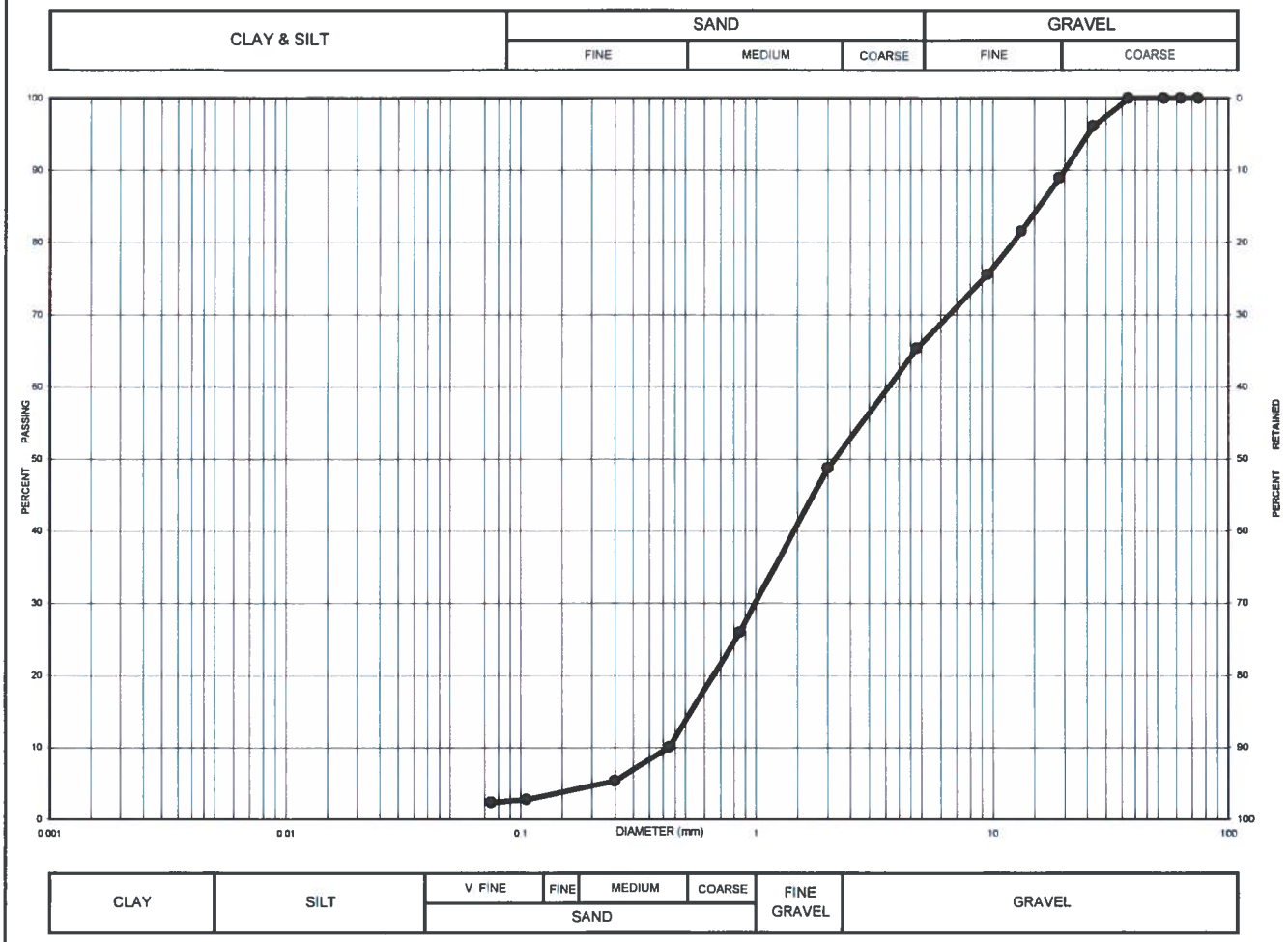
Excavating Equipment: Small Track Excavator

Plate No.: 8

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Jeff Chesher*	Ref No.:	*G023134E1*
Project:	*Granite Ridge Estates*	Location:	*Granite Ridge - Phase 2*
Borehole No.:	*TP2*	Sample No.:	*GS2*
Depth:	*1.2 m*	Enclosure:	

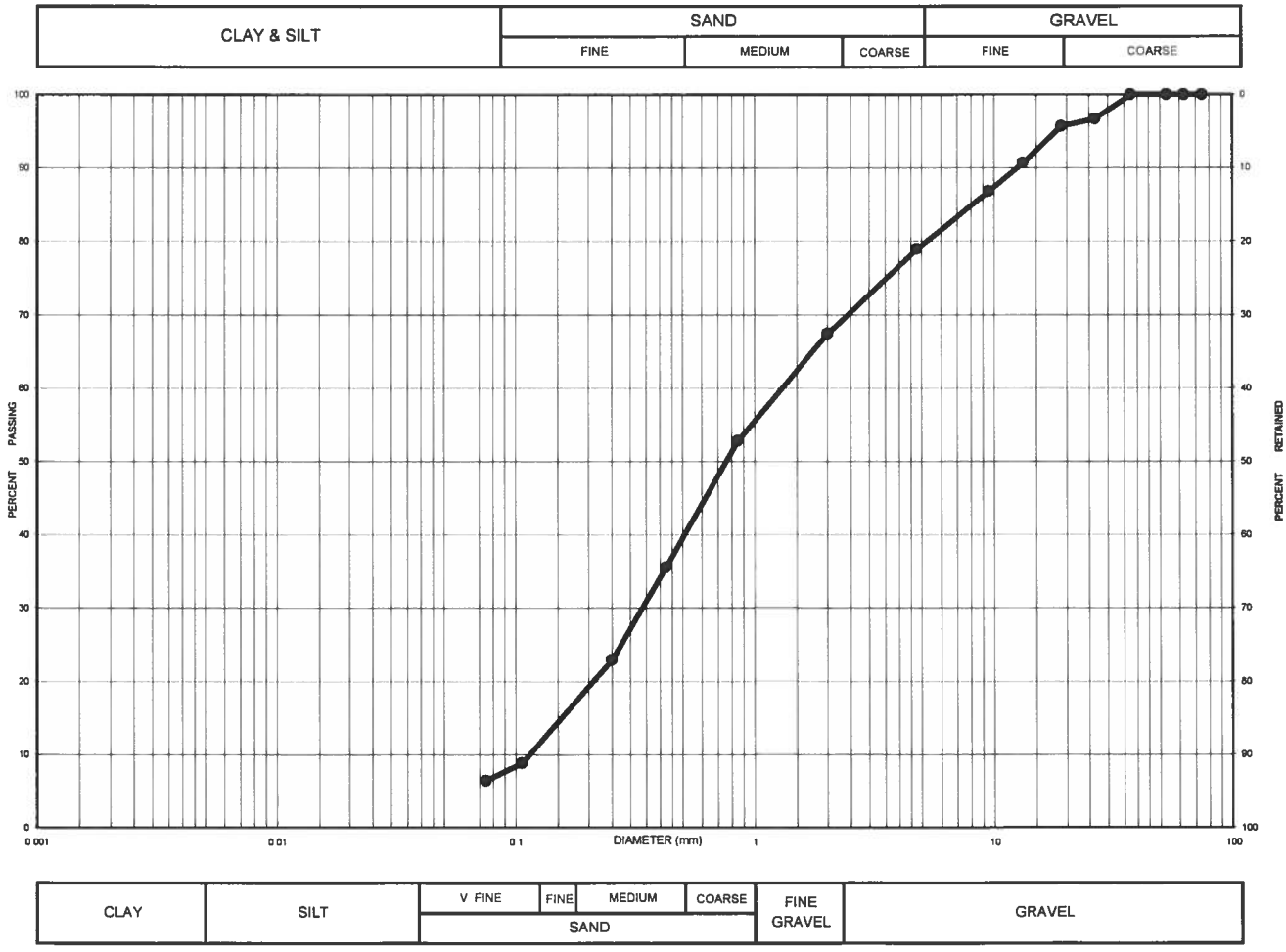


Sample No.	Depth	% Gravel	% Sand	% Silt / Clay
TP2,GS2	1.2 m	35	63	2

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Jeff Chesher*	Ref No.:	*G023134E1*
Project:	*Granite Ridge Estates*	Location:	*Granite Ridge - Phase 2*
Borehole No.:	*TP4*	Sample No.:	*GS2*
Depth:	*1.4 m*	Enclosure:	

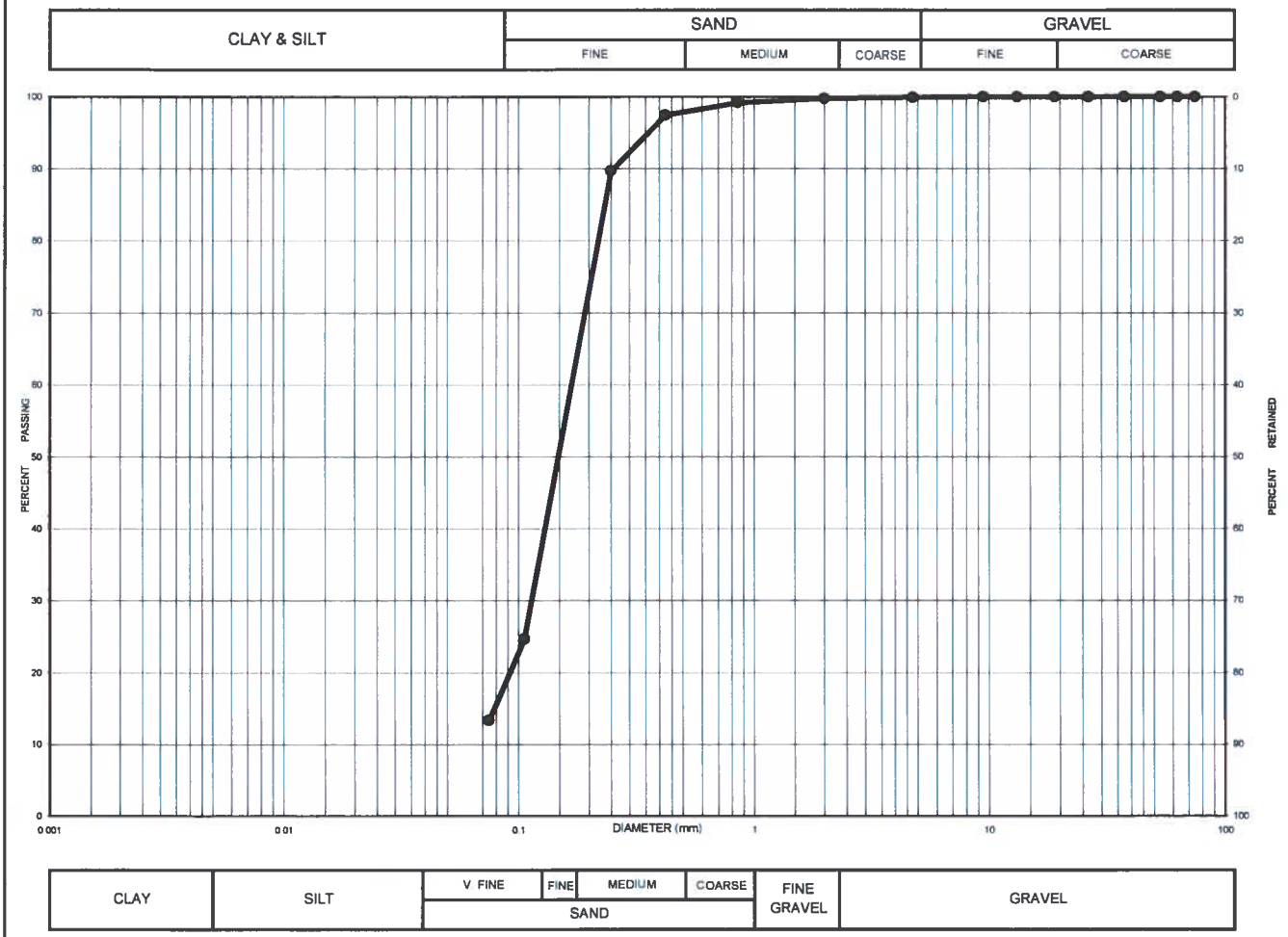


Sample No.	Depth	% Gravel	% Sand	% Silt / Clay
TP4,GS2	1.4 m	21	73	6

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Jeff Chesher*	Ref No.:	*G023134E1*
Project:	*Granite Ridge Estates*	Location:	*Granite Ridge - Phase 2*
Borehole No.:	*TP6*	Sample No.:	*GS1*
Depth:	*0.75 m*	Enclosure:	

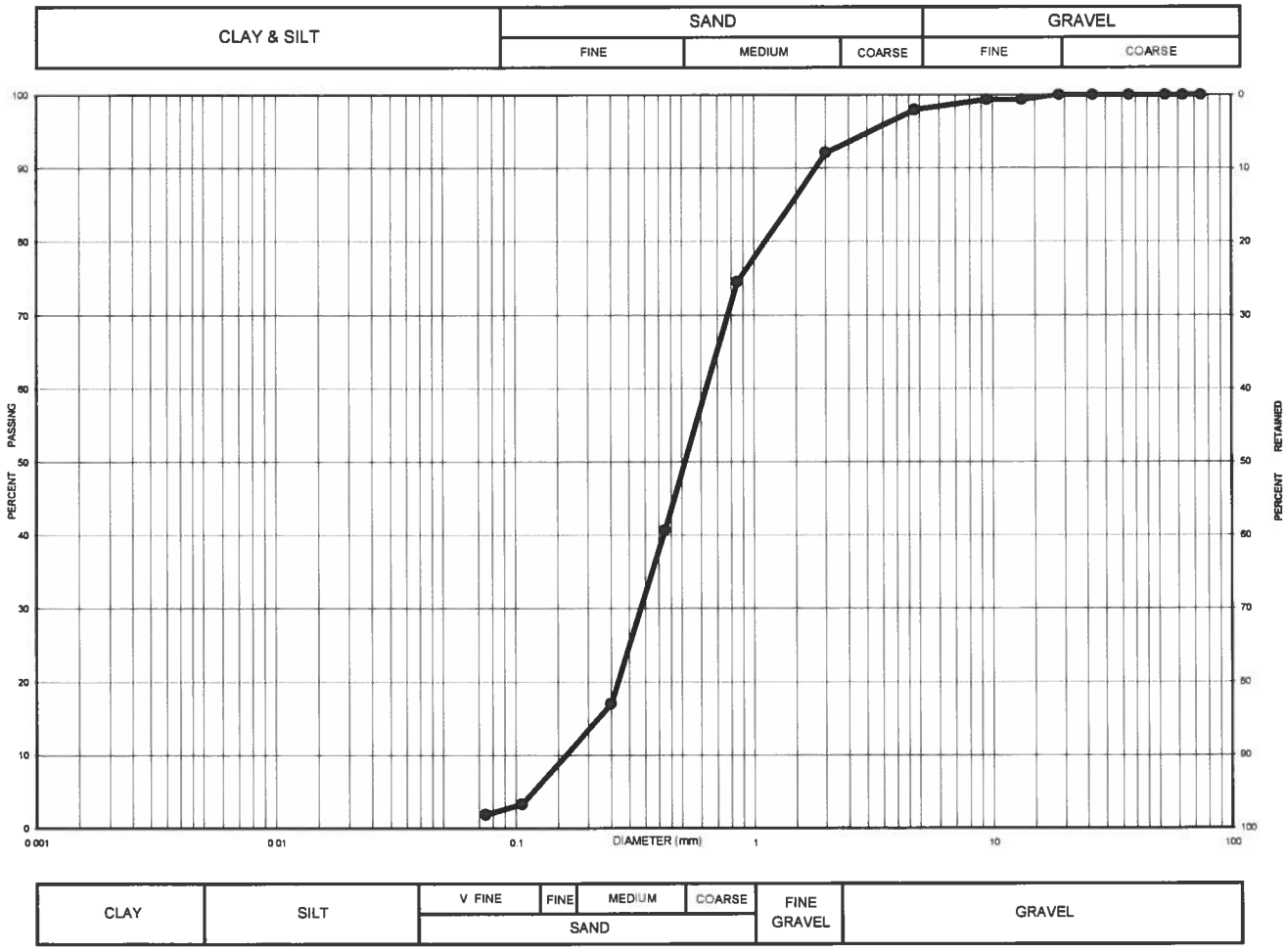


Sample No.	Depth	% Gravel	% Sand	% Silt / Clay
TP6,GS1	0.75 m	0	87	13

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Jeff Chesher*	Ref No.:	*G023134E1*
Project:	*Granite Ridge Estates*	Location:	*Granite Ridge - Phase 2*
Borehole No.:	*TP6*	Sample No.:	*GS2*
Depth:	*1.5 m*	Enclosure:	

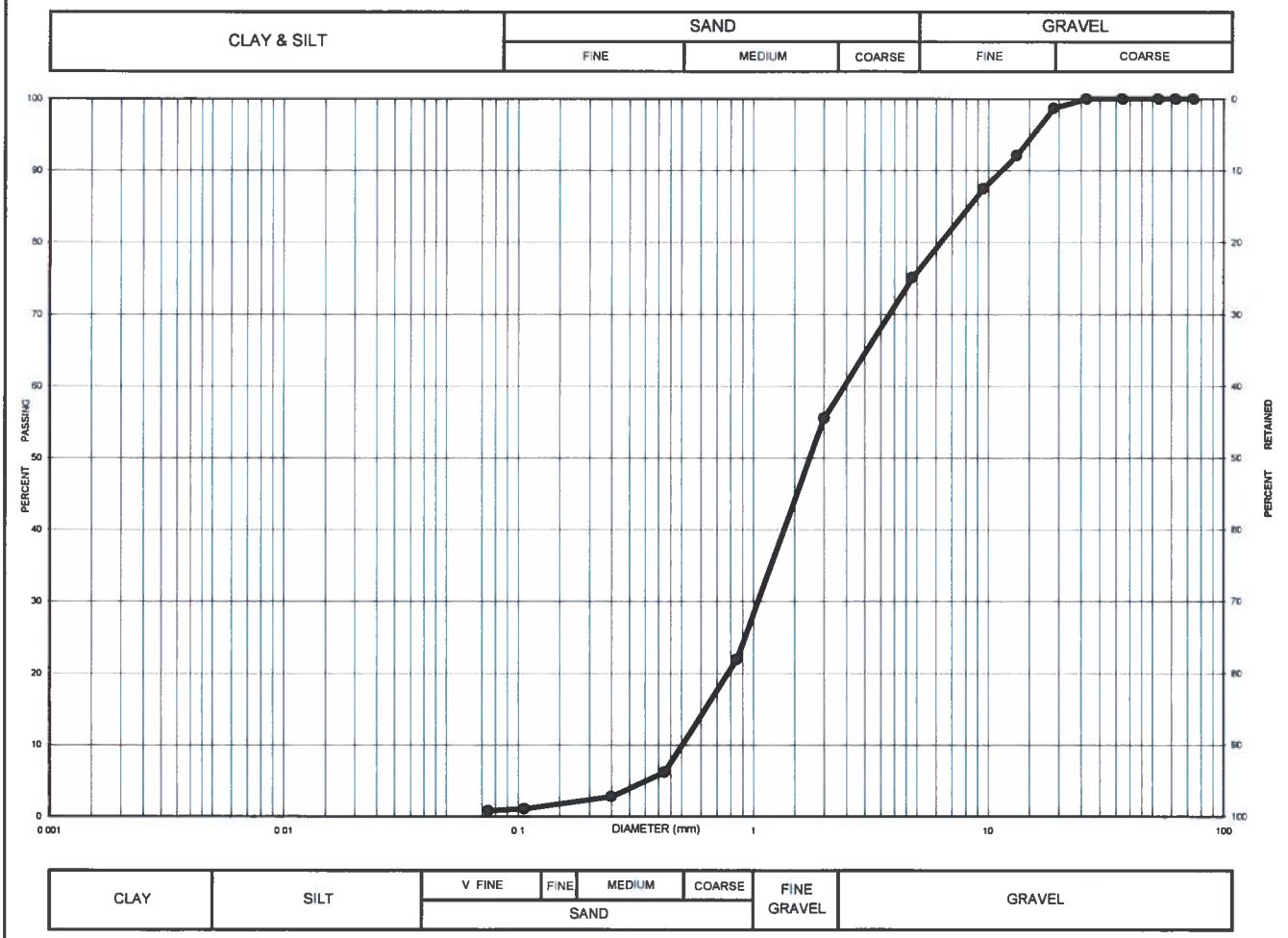


Sample No.	Depth	% Gravel	% Sand	% Silt / Clay
TP6,GS2	1.5 m	2	96	2

GEO-LOGIC INC. 347 Pido Road Unit 29 Peterborough, ON, K9J 6X7 Tel: (705) 749-3317 Fax: (705) 749-9248

GRAIN SIZE DISTRIBUTION CHART

Client:	*Jeff Chesher*	Ref No.:	*G023134E1*
Project:	*Granite Ridge Estates*	Location:	*Granite Ridge - Phase 2*
Borehole No.:	*TP8*	Sample No.:	*GS2*
Depth:	*1.5 m*	Enclosure:	



Sample No.	Depth	% Gravel	% Sand	% Silt / Clay
TP8,GS2	1.5 m	25	74	1

WATER CONTENT DETERMINATION

PROJECT	Granite Ridge Estates Phase 2	PROJECT NO.	G023134E1
CLIENT	Jeff Chesher	DATE	September 24, 2010

BOREHOLE NUMBER	TP2	TP4	TP6	TP6	TP8	
SAMPLE NUMBER	GS2	GS2	GS1	GS2	GS2	
DEPTH OF SAMPLE	1.2 m	1.4 m	0.75 m	1.5 m	1.5 m	
TARE NUMBER	Bowl	Bowl	Bowl	Bowl	Bowl	
WT. WET SOIL + TARE	1807.0	1612.6	1228.3	1229.3	1306.2	
WT. DRY SOIL + TARE	1639.2	1517.9	1164.1	1205.9	1276.0	
WEIGHT OF WATER	167.8	94.8	64.2	23.4	30.2	
TARE	326.7	316.9	334.5	218.3	311.1	
WT. OF DRY SOIL	1312.5	1200.9	829.7	987.6	964.9	
WATER CONTENT	12.8	7.9	7.7	2.4	3.1	

BOREHOLE NUMBER						
SAMPLE NUMBER						
DEPTH OF SAMPLE						
TARE NUMBER						
WT. WET SOIL + TARE						
WT. DRY SOIL + TARE						
WEIGHT OF WATER						
TARE						
WT. OF DRY SOIL						
WATER CONTENT						

BOREHOLE NUMBER						
SAMPLE NUMBER						
DEPTH OF SAMPLE						
TARE NUMBER						
WT. WET SOIL + TARE						
WT. DRY SOIL + TARE						
WEIGHT OF WATER						
TARE						
WT. OF DRY SOIL						
WATER CONTENT						

BOREHOLE NUMBER						
SAMPLE NUMBER						
DEPTH OF SAMPLE						
TARE NUMBER						
WT. WET SOIL + TARE						
WT. DRY SOIL + TARE						
WEIGHT OF WATER						
TARE						
WT. OF DRY SOIL						
WATER CONTENT						

Tested By: __________ Date: __________

Checked By: __________ Date: __________

APPENDIX B

WELL SURVEY, MOE WELL RECORDS AND INVENTORY DATA

APPENDIX B: WATER WELL INFORMATION SURVEY

PROJECT: Hydrogeologic Assessment G023134E1
LOCATION: Granite Ridge Estates, Buckhorn, ON
DATE: October 4, 2010

Address	I.D.	Type	Top of Well (m)	Well Data Water Level (m)	Well Data Depth (m)	Quality	Quantity	Comments
753 Melody Bay Road	W-1	Drilled			12.8	Good	Good	John and Bettsy Dart 657-1533, did not want us to monitor
641 Adam & Eve Road	W-2							Nobody Home
647 Adam & Eve Road	W-3	Drilled			12.8	Good	Good	UV system now, E.coli and Coliform present 8 years ago. Richard Smith 657-1827.
649 Adam & Eve Road	W-4	Drilled			> 30.5	Good	Good	Use softner, Gary Logan, 657-2718.
653 Adam & Eve Road	W-5	Dug						Nobody Home
677 Adam & Eve Road	W-6							Nobody Home
679 Adam & Eve Road	W-7							Nobody Home
684 Adam & Eve Road	W-8							Nobody Home
688 Adam & Eve Road	W-9							Nobody Home
8 Mitchell Cresent	W-10	Drilled				Good	Good	Father was home, son is owner.
12 Mitchell Cresent	W-11	Drilled						Nobody Home

NOTE:
MP - Measuring point reference at top of well, in metres above ground level
N/A - Well was not accessible
N/L - Well not located or observed on property
WP - Drilled well located inside of well pit
* - information provided by neighbour
Well I.D. illustrated on the Property Plan, Plate 2

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. **A 095800**

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
LOT 26 PHASE II	HARVEY	8	9

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCKHORN	Ontario	K0L1J0

UTM Coordinates: Zone | Easting | Northing — NAD 8 3 | 17 | 709743 | 4936063

Municipal Plan and Sublot Number: | Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND	GRAVEL	LOOSE	0	3
RED	GRANITE			3	180

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	5 Ft³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4	STEEL	.188	0	22
6"	OPEN HOLE		22	180

Construction Record - Screen

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

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

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20	9"
20	180	6"

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): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 14.0

If flowing give rate (l/min / GPM): 3.5

Recommended pump depth (m/ft): 50

Recommended pump rate (l/min / GPM): 10

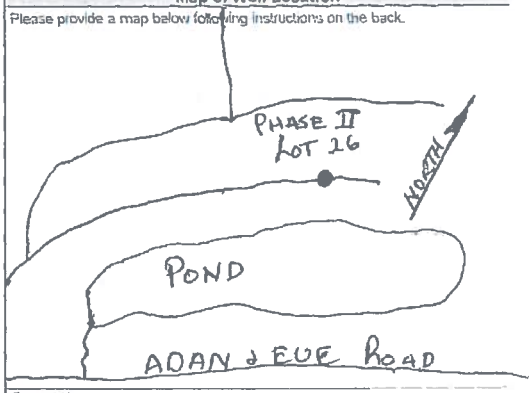
Well production (l/min / GPM): 15+

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		FLOW		20.8
1	5/6	9.2	1	9.2
2	8.1		2	4.4
3	9.8		3	2.5
4	11.1		4	1.9
5	12.0		5	1.5
10	14.0		10	FLOW
15	15.8		15	
20	16.9		20	
25	17.7		25	
30	18.5		30	
40	19.7		40	
50	20.4		50	
60	20.8		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: JOE LEGGE & SONS

Well Contractor's Licence No.: 7052

Business Address (Street Number/Name): 1344 INLET BAY ROAD

Municipality: BANCROFT

ONT K0L1C0

Telephone and Fax: 613 339 2023 LEGGE JOE

Well Technician's Licence No.: 1879

Signature of Technician and/or Contractor: Joe Legge

Date Submitted: 20100423

Date Work Completed: 20100423

☒ Yes ☐ No

Ministry Use Only

Received: JAN 17 2011

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Sticker) A 095797

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
LOT 8 PHASE II	HARVEY	8	9

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCKHORN	Ontario	K0L 1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	709675	4936145		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND	GRAVEL	LOOSE	0	16
RED	GRANITE		BEDROCK	16	200

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	6 FT³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼"	STEEL	.188	0	22
6"	OPEN HOLE		22.	200

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No	Depth (m/ft) From	Depth (m/ft) To

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	9"
20	200	6"

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): 200.0

Pumping rate (l/min / GPM): 15.

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 200.0

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

Recommended pump depth (m/ft): 180

Recommended pump rate (l/min / GPM): 5

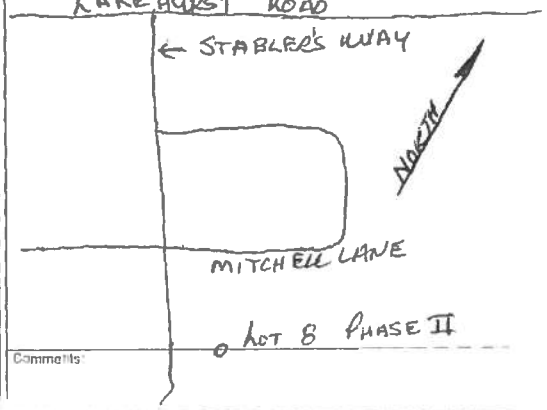
Well production (l/min / GPM): 4.1

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	9		200.0
1	16.6	1	194.4
2	24.1	2	189.1
3	30.6	3	184.3
4	36.6	4	180.2
5	43.2	5	177.2
10	79.0	10	162.5
15	113.8	15	149.9
20	146.5	20	136.1
25	176.8	25	123.4
30	200.0	30	~~195.5~~
40	"	40	98.5
50	"	50	80.1
60	200.0	60	62.3

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: JOE LEGGE & SONS

Well Contractor's Licence No.: 7052

Business Address (Street Number/Name): 344 INLET BAY RD.

Municipality:

Well Technician's Licence No.: 1315314

Signature of Technician and/or Contractor: JOE LEGGE - JOE LEGGE

Date Submitted: 2015/07/27

Ministry Use Only

Date Work Completed: 20.00527

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (If Applicable) **A 095798**

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
LOT 19. PHASE II	HARVEY.	8	9

County/District/Municipality	City/Town/Village	Province	Postal Code
PETERBOROUGH	BUCKHORN	Ontario	K0L1J0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	709616	4935734		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND	GRAVEL	PACKED	0	19
BROWN	SAND	BOULDERS	HARD PACKED	19	24
BLACK	GRANITE	RED GRANITE	BEDROCK.	24	200.

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	30	BENTONITE SLURRY	7 FT³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4	STEEL.	.188	0	30
6"	OPEN HOLE		30	200

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Hole Diameter Depth From	To	Diameter (cm/in)
UK	☐	☒ Fresh ☐ Untested ☐ Other, specify	0	27	9"
	☐	☐ Fresh ☐ Untested ☐ Other, specify	27	200	6"
	☐	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 150

Pumping rate (l/min / GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 80.7

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

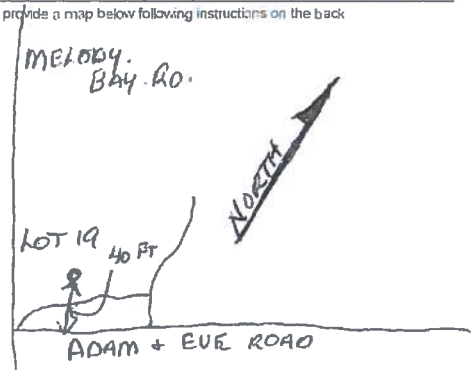
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		6.4		80.7
1	1	13.3	1	67.3
2	2	17.9	2	54.9
3	3	21.4	3	47.0
4	4	24.3	4	35.4
5	5	26.5	5	28.1
10	10	34.8	10	21.0
15	15	41.3	15	14.6
20	20	47.1	20	11.9
25	25	52.9	25	9.2
30	30	58.5	30	7.8
40	40	68.4	40	7.1
50	50	74.6	50	6.9
60	60	80.7	60	6.7

Map of Well Location

Please provide a map below following instructions on the back



Comments: WELL REQUIRED SHOCKING

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
JOE LEGGE & SONS	7052.

Business Address (Street Number/Name)	Municipality
1344 INLET BAY. ROAD	BANCROFT

ONT K0L1C0

6135592025 LEGGE JOE

Well Technician's Licence No. | Signature of Technician and/or Contractor | Date Submitted

1879 Legge | 2010/04/28

Submitted by: ☒ Yes ☐ No

Date Received (yyyy/mm/dd): 2010/04/28

Ministry Use Only

Appendix B - Summary of Neighbouring Water Wells
Harvey Township Concessions 9 & 10, Lots 7- 9

Selected Data for Dug/Bored Wells

Well #	Elevation masl	Well Depth m	Water Found m	Static Water Level m	Pump Level m	Pump Rate gpm	Pump Rate L/min	Specific Capacity gpm/m	Aquifer Material
51-05901	259.1	10.4	8.8	3.0	7.3	6.0	27.2	6.4	Granite
51-07350	257.6	4.6	4.3	2.4	4.0	9.0	40.9	26.8	Previously Dug
Average	**258.3**	**7.5**	**6.6**	**2.7**	**5.6**	**7.5**	**34.1**	**16.6**	**2 wells**

Selected Data for Drilled Wells (Overburden)

Well #	Elevation masl	Well Depth m	Water Found m	Static Water Level m	Pump Level m	Pump Rate gpm	Pump Rate L/min	Specific Capacity L/min/m	Aquifer Material
51-18220	---	13.4	12.8	1.8	13.4	15.0	68.1	5.9	Red Gravel
51-16659	---	7.0	7.0	0.9	3.0	50.0	227.0	106.4	Brown Sand Gravel
Average	**---**	**10.2**	**9.9**	**1.4**	**8.2**	**32.5**	**147.6**	**56.1**	**2 wells**

Selected Data for Drilled Wells (Bedrock)

Well #	Elevation masl	Well Depth m	Water Found m	Static Water Level m	Pump Level m	Pump Rate gpm	Pump Rate L/min	Specific Capacity L/min/m	Aquifer Material
51-12712	---	12.8	12.5	4.9	9.1	---	---	---	Granite
51-13641	---	30.5	27.4	7.6	27.4	20.0	90.8	4.6	Granite
51-16600	---	79.9	54.9	1.5	79.2	2.0	9.1	0.1	Granite
51-16601	---	79.9	67.1	0.9	79.9	3.0	13.6	0.2	Granite
51-16599	---	43.0	39.6	2.4	42.7	10.0	45.4	1.1	Granite
51-08436	248.4	9.8	3.0	0.9	7.9	5.0	22.7	3.2	Limestone
51-11849	---	87.8	82.6	19.8	83.8	1.0	4.5	0.1	Granite
51-12239	---	159.4	---	---	---	---	---	---	Granite
51-12072	---	26.5	25.3	3.0	15.2	50.0	227.0	18.6	Granite
51-11373	---	18.3	17.7	0.9	2.4	20.0	90.8	59.6	Granite
51-12580	---	61.0	---	---	---	---	---	---	Granite
51-11847	---	82.3	79.2	19.8	80.8	1.0	4.5	0.1	Granite
51-13610	---	19.2	17.1	3.0	19.2	20.0	90.8	5.6	Granite
51-14694	---	18.3	17.7	0.6	18.3	10.0	45.4	2.6	Granite
51-14695	---	13.7	12.8	1.2	---	10.0	45.4	---	Granite
51-14606	---	91.4	---	0.6	91.4	---	---	---	Granite
51-14607	---	85.3	---	---	---	---	---	---	Granite
51-14693	---	19.8	16.8	1.2	18.3	10.0	45.4	2.7	Granite
51-14692	---	13.4	12.8	0.6	13.4	10.0	45.4	3.5	Granite
51-15338	---	15.2	14.0	1.2	4.9	30.0	136.2	37.2	Granite
51-01634	253.0	8.8	6.1	1.2	4.6	7.0	31.8	9.5	Granite
51-01635	249.9	7.6	6.1	3.0	3.4	17.0	77.2	253.2	Granite
51-17880	---	84.4	9.1	---	---	---	---	---	Granite
51-17950	---	152.7	9.1	---	---	---	---	---	Granite
51-17056	---	38.7	38.1	0.9	3.0	20.0	90.8	42.6	Granite
51-10881	259.1	12.8	8.5	1.5	7.6	60.0	272.4	44.7	Granite

51-08896	248.4	9.1	3.7	0.6	3.0	30.0	136.2	55.9	Granite
51-08553	256.0	8.5	7.9	---	6.1	1.0	4.5	---	Granite
51-09331	259.1	51.2	7.9	4.6	50.9	1.0	4.5	0.1	Granite
51-08542	248.4	14.3	14.0	0.9	3.0	30.0	136.2	63.8	Granite
51-09171	259.1	9.4	9.4	1.2	3.7	20.0	90.8	37.2	Granite
51-12440	---	91.4	---	---	---	---	---	---	Granite
51-12714	---	61.0	10.7	3.7	61.0	1.0	4.5	0.1	Granite
51-12715	---	109.7	---	---	---	---	---	---	Granite
51-12517	---	21.3	15.2	10.4	21.3	26.0	118.0	10.8	Granite
51-12441	---	30.5	27.4	6.7	0.9	26.0	118.0	---	Granite
51-13612	---	37.8	36.0	6.1	---	15.0	68.1	---	Granite
51-14612	---	51.8	50.3	12.2	51.8	10.0	45.4	1.1	Granite
51-13640	---	61.6	42.7	3.0	61.0	3.0	13.6	0.2	Granite
51-13880	---	31.7	29.3	6.1	31.7	5.0	22.7	0.9	Granite
51-14018	---	19.5	19.5	7.6	16.8	5.0	22.7	2.5	Limestone
51-14605	---	51.8	51.8	12.2	51.8	20.0	90.8	2.3	Granite
51-01636	266.7	7.6	6.4	3.4	7.6	---	---	---	Granite
51-01637	253.0	18.3	17.7	4.9	6.7	16.0	72.6	39.7	Granite
51-01638	256.0	23.8	23.5	8.2	10.1	17.0	77.2	42.2	Granite
51-04676	259.1	17.1	16.8	0.9	12.2	---	---	---	Granite
51-17323	---	18.3	16.2	0.9	18.3	---	---	---	Granite
51-17803	---	43.3	41.1	4.6	39.6	3.0	13.6	0.4	Granite
51-16746	---	27.4	23.8	7.9	13.7	20.0	90.8	15.7	Granite
51-17345	---	19.8	9.8	3.4	18.6	4.0	18.2	1.2	Granite
51-16457	---	28.3	27.1	1.5	---	7.0	31.8	---	Granite
51-16551	---	15.2	14.3	4.6	9.1	50.0	227.0	49.7	Granite
51-10106	281.9	20.4	19.8	9.1	16.8	10.0	45.4	6.0	Limestone
51-11054	274.3	33.5	33.2	4.0	4.6	30.0	136.2	223.4	Granite
51-10103	259.1	10.4	9.1	4.6	7.6	20.0	90.8	29.8	Granite
51-10101	259.1	50.6	48.8	1.5	9.1	20.0	90.8	11.9	Granite
51-09922	259.1	21.3	18.9	3.0	19.8	5.0	22.7	1.4	Granite
51-10108	259.1	5.5	4.6	0.6	1.5	40.0	181.6	198.6	Granite
51-10178	266.7	53.3	27.4	18.3	50.3	2.0	9.1	0.3	Granite
51-09816	259.1	22.9	---	---	---	---	---	---	Granite
51-10109	259.1	18.3	16.8	1.5	4.9	35.0	158.9	47.4	Granite
51-09815	259.1	18.9	5.5	2.4	18.3	1.0	4.5	0.3	Granite
51-06588	266.7	12.2	10.7	4.6	10.7	4.0	18.2	3.0	Granite
51-06589	266.7	8.2	4.6	0.3	5.8	5.0	22.7	4.1	Granite
51-07335	259.1	5.5	2.4	1.5	1.5	---	---	---	Granite
51-07340	271.3	24.4	17.7	4.3	21.3	5.0	22.7	1.3	Granite
51-07339	274.3	12.5	12.2	3.7	11.9	1.0	4.5	0.6	Granite
51-07338	268.2	61.0	54.3	4.6	60.7	1.0	4.5	0.1	Granite
51-07337	259.1	7.9	3.0	0.9	1.5	40.0	181.6	297.9	Granite
51-07336	259.1	7.6	3.0	0.6	0.6	---	---	---	Granite
51-06447	268.2	15.8	14.9	1.8	1.8	5.0	22.7	---	Granite
51-08518	281.9	30.5	18.6	8.2	15.2	25.0	113.5	16.2	Granite
51-09322	259.1	6.1	5.8	1.5	4.6	5.0	22.7	7.4	Granite
51-08520	262.1	6.4	4.0	1.2	3.7	5.0	22.7	9.3	Granite
51-08808	283.5	25.0	24.7	3.0	18.3	20.0	90.8	6.0	Limestone
51-08551	262.1	14.6	13.7	1.8	10.7	20.0	90.8	10.3	Granite
51-09308	259.1	8.8	2.7	2.4	4.3	8.0	36.3	19.9	Granite
51-08541	262.1	37.5	33.5	3.7	35.7	2.0	9.1	0.3	Granite
51-08549	262.1	7.6	4.0	1.2	3.0	20.0	90.8	49.7	Granite
51-08927	280.4	151.5	149.4	6.1	91.4	6.0	27.2	0.3	Granite
51-09319	274.3	10.4	8.5	7.0	8.5	35.0	158.9	104.3	Granite

51-08155	259.1	15.2	14.3	1.8	5.5	16.0	72.6	19.9	Granite
51-08880	281.9	9.4	5.2	2.7	6.1	10.0	45.4	13.5	Limestone
51-08910	281.9	27.4	26.8	10.1	25.0	5.0	22.7	1.5	Limestone
51-08881	283.5	9.1	3.7	2.7	6.1	6.0	27.2	8.1	Limestone
51-08154	256.0	59.1	---	---	---	---	---	---	Granite
51-13853	---	11.9	11.3	0.6	---	25.0	113.5	---	Granite
51-14809	---	36.6	18.3	12.2	36.6	3.0	13.6	0.6	Granite
51-01656	249.9	5.8	5.5	0.6	3.0	7.0	31.8	13.0	Granite
51-01654	249.9	6.4	4.9	0.6	1.2	14.0	63.6	104.3	Granite
51-01655	253.0	6.7	5.5	0.9	3.7	10.0	45.4	16.6	Granite
51-17369	---	36.6	35.1	9.4	36.6	10.0	45.4	1.7	Limestone
51-10492	259.1	19.2	17.4	4.6	18.0	2.0	9.1	0.7	Granite
51-10111	259.1	20.1	18.3	2.7	10.7	30.0	136.2	17.2	Granite
51-09321	259.1	36.3	35.7	1.8	31.7	8.0	36.3	1.2	Granite
51-08519	248.4	10.7	7.9	0.3	9.1	4.0	18.2	2.1	Granite
51-09343	259.1	26.5	22.9	1.5	4.6	25.0	113.5	37.2	Granite
51-08403	262.1	11.0	3.0	0.9	0.9	20.0	90.8	---	Limestone
51-14602	---	106.7	106.4	42.7	106.7	20.0	90.8	1.4	Granite
51-13770	---	54.9	---	---	---	---	---	---	Limestone
51-01657	291.1	19.8	18.3	7.6	7.6	5.0	22.7	---	Limestone
51-01658	286.5	25.0	23.2	14.3	18.3	10.0	45.4	11.5	Granite
51-09797	289.6	26.5	25.3	7.6	9.1	15.0	68.1	44.7	Limestone
51-08401	283.5	16.8	15.2	3.0	14.6	6.0	27.2	2.4	Rock
51-08893	281.9	21.3	18.3	5.8	5.8	10.0	45.4	---	Limestone
Average	**264.4**	**33.1**	**22.0**	**4.6**	**21.1**	**14.2**	**64.3**	**27.7**	**105 wells**
Minimum	**248.4**	**5.5**	**2.4**	**0.3**	**0.6**	**1.0**	**4.5**	**0.1**	
Maximum	**291.1**	**159.4**	**149.4**	**42.7**	**106.7**	**60.0**	**272.4**	**297.9**	

Plate B-2

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	09	007	51- 709780 18220 4935126		1999/09	1748	06	FR	0042	6	44	15	1 :0	DO			WILSON,PETER BRWN LOAM STNS 0005 RED GRVL 0044
CON	09	007	51- 709780 12712 4935126		1987/09	5020	06	FR	0041	16	30		1 :0	DO			GLEN, EKIN BLCK MUCK LOAM 0006 BRWN SAND 0039 WHIT STNS GRNT GRVL 0042
CON	09	007	51- 709780 13641 4935126		1988/12	5020	06	FR	0090	25	90	20	1 :0	DO			MIKE & LYLNE BARRY GREY STNS SOFT 0009 GREY LMSN MGRD 0060 GREN LMSN MGRD 0090 BLCK GRNT MGRD 0100
CON	09	007	51- 709780 16659 4935126		1994/09	2104	06	UK	0023	3	10	50	1 :0	CO			COOK, MR & MRS RALPH BLCK LOAM 0003 GREY SAND CLAY 0015 BRWN SAND GRVL 0023
CON	09	007	51- 709780 16600 4935126		1994/05	5020	06	FR	0180	5	260	2	1 :0	DO			GRAY, LES BRWN SAND STNS LOOS 0004 BLCK GRVL STNS LOOS 0014 BLCK GRNT MGRD 0160 BLCK GRNT GRNT MGRD 0180 RED GRNT MGRD 0240 BLCK GRNT MGRD 0262
CON	09	007	51- 709780 16601 4935126		1994/05	5020	06	FR	0220	3	262	3	1 :0	DO			GIBSON, HOWARD BRWN SAND STNS LOOS 0006 BLCK GRVL LOOS 0012 BLCK GRNT MGRD 0155 RED GRNT MGRD 0185 BLCK GRVL QTZ MGRD 0220 RED GRNT MGRD 0240 BLCK GRNT MGRD 0262
CON	09	007	51- 709780 16599 4935126		1994/05	5020	06	FR	0130	8	140	10	1 :0	DO			PRESCOTT, WILFRRD E. BLCK LOAM LOOS 0002 RED CLAY STNS LOOS 0008 BLCK GRNT MGRD 0022 BLCK GRNT QTZ MGRD 0120 RED GRNT MGRD 0141
CON	09	007	51- 709750 08436 4935200	815	1977/05	5102	06	FR	0010	3	26	5	1 :40	DO			GOUDY J S BRWN SAND 0029 GREY LMSN 0032
CON	09	008	51- 709942 11849 4935758		1986/07	2104	06	UK	0271	65	275	1	3 :0	DO			K.C.HOMES LTD BRWN LOAM MGRD 0004 RED GRNT HARD 0150 GREY GRNT HARD 0190 RED GRNT HARD 0288
CON	09	008	51- 709942 12239 4935758		1987/02	2104	06						:				CANADA M.& H. CORP. BRWN SAND MGRD 0004 RED GRNT HARD 0260 BLCK GRNT HARD 0355 RED GRNT HARD 0490 GREY GRNT HARD 0523
CON	09	008	51- 709942 12072 4935758		1986/10	2104	06	FR	0083	10	50	50	2 :0	DO			HOGGARTH, CLIFF BRWN SAND STNS HARD 0004 RED GRNT HARD 0087
CON	09	008	51- 709942 11373 4935758		1985/04	2104	06	UK	0058	3	8	20	2 :0	DO			PLUNKETT, JOHN BRWN SAND GRVL LOOS 0008 BRWN GRNT HARD 0060
CON	09	008	51- 709942 12580 4935758		1987/09	5020	06			0		0	1 :0				MCWHIRTER, J. BRWN SAND 0002 RED GRNT 0020 RED GRNT QTZ 0050 RED GRNT 0115 BLCK GRNT 0145 RED GRNT 0180 RED GRNT QTZ 0200
CON	09	008	51- 709942 11847 4935758		1986/07	2104	06	UK	0260	65	265	1	2 :0	DO			K.COURT HOMES LTD BRWN LOAM MGRD 0004 RED GRNT HARD 0130 GREY GRNT HARD 0180 RED GRNT HARD 0270
CON	09	008	51- 709942 13610 4935758		1988/12	1748	06	FR	0056	10	63	20	1 :0	DO			HYMSON, TIM BRWN SAND 0007 RED GRNT 0063
CON	09	008	51- 709942 14694 4935758		1990/05	1748	06	FR	0058	2	60	10	1 :0	DO			FAWCETT CONST. BRWN SAND GRVL 0015 RED GRNT 0060
CON	09	008	51- 709942 14695 4935758		1990/05	1748	06	FR	0042	4		10	1 :0	DO			FAWCETT CONST. BRWN SAND 0012 RED GRNT 0045
CON	09	008	51- 709942 14606 4935758		1989/10	1748	06			2	300	0	1 :0	DO			CHESFP, MRS. BRWN SAND BLDR LOOS 0012 RED GRNT 0300
CON	09	008	51- 709942 14607 4935758		1989/09	1748	06						1 :0	NU			P. CONSTRUCTION BRWN SAND 0004 RED GRNT 0280

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	09	008	51- 14693	709942 4935758		1990/05	1748	06	FR	0055	4	60	10	1 :0	DO		FAWEETT CONST BRWN SAND GRVL 0018 RED GRNT 0065
CON	09	008	51- 14692	709942 4935758		1990/05	1748	06	FR	0042	2	44	10	1 :0	DO		STABLER, BURT BRWN SAND 0025 RED GRNT 0044
CON	09	008	51- 15374	709942 4935758		1991/06	1748	06	FR	0022	6	25	10	1 :0	DO		R.C.H. BRWN SAND 0008 RED GRVL 0025
CON	09	008	51- 15338	709942 4935758		1990/09	6069	06	FR	0046	4	16	30	1 :0	DO		WILLIAM, F.FISHER BLCK LOAM FILL SOFT 0002 RED GRNT CLAY LOOS 0005 BLCK GRNT QTZ HARD 0007 RED GRNT QTZ HARD 0034 BLCK GRNT QTZ HARD 0044 RED GRNT QTZ HARD 0048 BLCK GRNT QTZ HARD 0050
CON	09	008	51- 01634	710056 4935774	830	1959/04	4814	06	FR	0020	4	15	7	2 :0	DO		GRIFFIN G LOAM 0001 BRWN CLAY MSND 0015 RED GRNT 0029
CON	09	008	51- 01635	710225 4935724	820	1960/12	4814	06	FR	0020	10	11	17	2 :0	DO		MAY L RED GRNT 0025
CON	09	008	51- 17528	709942 4935758		1997/07	2104							:	NU		CMHC PRDG 0066
CON	09	008	51- 17880	709942 4935758		1998/06	3367	06	UK	0030				:	DO		MCCREA, KIM BRWN LOAM SOFT 0001 BRWN SAND STNS SOFT 0008 BLCK GRNT HARD 0100 RED GRNT HARD 0115 BLCK GRNT HARD 0200 RED GRNT HARD 0225 BLCK GRNT HARD 0277
CON	09	008	51- 17950	709942 4935758		1998/07	2662	06	UK	0030				:			MCCREA,KIM PRDR 0277 GREY GRNT 0325 BLCK GRNT 0327 BLCK GRNT 0370 GREY GRNT 0379 BLCK GRNT 0478 BLCK GRNT 0501
CON	09	008	51- 17056	709942 4935758		1995/09	3367	06	UK	0125	3	10	20	4 :30	DO		MORRIS, SIDNEY BLCK LOAM SOFT 0004 BRWN SAND GRVL SOFT 0019 RED GRNT HARD 0020 BLCK GRNT HARD 0035 RED GRNT HARD 0127
CON	09	008	51- 10881	710000 4935600	850	1983/10	2104	06	UK	0028	5	25	60	1 :0	DO		HOGGARTH P BRWN SAND STNS LOOS 0003 RED GRNT HARD 0042
CON	09	008	51- 08696	710500 4936100	815	1977/06	1904	06	FR	0012	2	10	30	2 :0	DO		KACSMARCZYK STAN BRWN SAND 0003 GRNT 0030
CON	09	008	51- 08553	709850 4935500	840	1976/05	1904	06	FR	0026	FLW	20	1	1 :0	DO		MITCHELL B SAND FILL 0003 SAND DKCL 0008 GRNT 0028
CON	09	008	51- 09311	710350 4935650	850	1978/10	1904	06	FR	0026	15	167	1	4 :0	DO		BARROW SYDNEY SAND FILL 0006 GRNT SHLE 0008 GRNT 0168
CON	09	008	51- 08542	709750 4935450	815	1976/03	1904	06	FR	0046	3	10	30	3 :0	DO		DART JOHN FILL SNDY 0007 BRWN SAND 0029 GREY SAND 0032 GRNT 0047
CON	09	008	51- 09171	709900 4935650	850	1978/09	5102	06	UK	0031	4	12	20	1 :40	DO		BROCHERT J BRWN SAND 0030 GREY GRNT 0031
CON	09	009	51- 12440	709863 4936347		1987/07	5020	06			0		0	:	NU		NAROIS, LENA BRWN LOAM STNS LOOS 0008 ROCK GRNT HARD 0080 BLCK GRNT PORS HARD 0180 GRNT HARD 0265 BLCK GRNT HARD 0300
CON	09	009	51- 12714	709863 4936347			1748	06	FR	0035	12	200	1	1 :0	DO		BEAN, GORD PRDG 0030 RED GRNT 0200
CON	09	009	51- 12715	709863 4936347		1987/09	1748	06						:	NU		DIXON, BRAD GRVL 0010 LMSN 0040 RED GRNT 0360
CON	09	009	51- 12517	709863 4936347		1987/08	5020	06	FR	0050	34	70	26	0 :15	DO		PAT, GREEN LOAM SAND STNS 0007 RED GRNT 0020 GRNT 0035 BRWN GRNT 0050 BLCK GRNT 0065 RED GRNT 0070

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	09	009	51- 12441	709863 4936347		1987/07	5020	06 FR	0090	22	3	26	1 :0	DO			MAROIS, LENA BRWN LOAM STNS LOOS 0004 ROCK GRNT PORS 0035 BLCK ROCK GRNT PORS 0100
CON	09	009	51- 13612	709863 4936347		1988/12	1748	06 FR	0118	20		15	1 :0	DO			DIXON, DOUG SAND 0004 RED GRNT 0124
CON	09	009	51- 14612	709863 4936347		1989/09	1748	06 FR	0165	40	170	10	1 :0	DO			P. CONSTRUCTION GREY CLAY STNS 0010 GREY LMSN 0090 RED GRNT 0170
CON	09	009	51- 13640	709863 4936347		1988/12	5020	06 FR	0140	10	200	3	1 :0	DO			JOHN, BANNAN BLCK LOAM FILL SOFT 0003 GRNT MGRD 0060 BLCK GRNT MGRD 0075 RED GRNT HARD 0110 WHIT GRNT MGRD 0140 BLCK GRNT MGRD 0155 RED GRNT HARD 0202
CON	09	009	51- 13880	709863 4936347		1989/06	1748	06 FR	0096	20	104	5	1 :0	DO			L.D. CONSTRUCTION BRWN SAND BLDR 0006 RED GRNT 0104
CON	09	009	51- 14018	709863 4936347		1989/06	4923	06 FR	0064	25	55	5	2 :30	DO			FAWCETT, TERRY BLCK LOAM 0001 GREY CLAY STNS 0012 GREY LMSN LYRD 0064
CON	09	009	51- 14605	709863 4936347		1989/09	1748	06 FR	0170	40	170	20	1 :0	DO			P. CONST. GREY CLAY STNS 0012 GREY LMSN 0090 RED GRNT 0170 BLCK GRNT 0170
CON	09	009	51- 01636	710218 4936844	875	1951/07	3532	06 FR	0021	11	25	0	1 :0	DO			CHESHER G MSND 0008 GRNT 0025
CON	09	009	51- 01637	710387 4936429	830	1959/10	4814	06 FR	0058	16	22	16	2 :0	DO			MILLS S L LOAM 0002 MSND STNS 0013 RED GRNT 0025 BLCK GRNT 0035 RED GRNT 0060
CON	09	009	51- 01638	710354 4936522	840	1960/05	4814	06 FR	0077	27	33	17	2 :0	DO			STEWART K LOAM 0001 CLAY MSND 0019 RED GRNT 0025 BLCK GRNT 0038 RED GRNT 0068 BLCK GRNT 0073 GREY GRNT 0078
CON	09	009	51- 04676	710370 4936250	850	1968/08	2104	06 FR	0055	3	40	100	2 :0	DO			EVANS T LOAM 0001 MSND GRVL 0003 GRNT SHLE 0013 RED GRNT 0056
CON	09	009	51- 05901	710375 4936550	850	1972/03	1918	36 FR	0029	10	24	6	2 :0	ST			LYN RUSSELL FERRILL PRDG 0014 BLCK GRNT 0034
CON	09	009	51- 17323	709863 4936347		1996/10	6016	06 FR	0053	3	60	102	2 :0	DO			WIGGINS, EDWIN BRWN SAND 0002 SAND GRVL 0014 GRNT 0060
CON	09	009	51- 17803	709863 4936347		1998/05	6851	06 FR	0135	15	130	3	2 :0	DO			MELS, TERRY BRWN LOAM SAND 0029 RED GRNT 0142
CON	09	009	51- 16746	709863 4936347		1994/11	3367	06 FR	0078	26	45	20	4 :0	DO			KARJC, JOE BRWN LOAM SOFT 0001 BRWN SAND SOFT 0003 RED GRNT HARD 0077 BLCK GRNT HARD 0090
CON	09	009	51- 17345	709863 4936347		1996/11	3367	06 FR	0032	11	61	4	3 :0	DO			BISSET, KELLY BRWN LOAM SOFT 0001 BRWN SAND GRVL SOFT 0004 BLCK GRNT HARD 0030 RED GRNT HARD 0034 BLCK GRNT HARD 0052 RED GRNT HARD 0056 BLCK GRNT HARD 0065
CON	09	009	51- 16457	709863 4936347		1993/10	1455	06 FR	0089	5		7	2 :0	DO			SOKOLINK, HANK BRWN LOAM 0001 BLCK GRNT ROCK 0075 RED GRNT ROCK 0093
CON	09	009	51- 16551	709863 4936347		1993/08	1312	06 UK	0047	15	30	50	1 :0	DO			RAMBOUGH, C. BLDR SAND 0012 BLCK GRNT 0050
CON	09	009	51- 10106	709299 4936099	925	1980/09	1904	06 FR	0065	30	55	10	3 :0	DO			BANNON S BRWN CLAY STNS GRVL 0015 GREY LMSN 0067
CON	09	009	51- 11054	709750 4936600	900	1984/04	1904	FR	0109	13	15	30	3 :0	DO			DIXON P PRDR 0034 GRNT 0110

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUINC... HARVEY TOWNSHIP																	
CON	09	009	51-10103	710699 4936699	850	1980/10	1904	05	FR	0030	15	25	20	2 :0			ST MATTHEWS CHURCH GRNT FCRD 0034
CON	09	009	51-10101	710399 4936199	850	1979/10	1904	05	FR	0160	5	30	20	2 :0	DO		MONKS H PRDR 0017 GRNT 0166
CON	09	009	51-09922	710399 4936699	850	1980/06	2104	06	FR	0062	10	65	5	2 :0	DO		FALLSTROM C BRWN SAND GRVL DNSE 0003 GREY GRNT DNSE 0052 RED GRNT LYRD 0070 GREY GRNT DNSE 0070
CON	09	009	51-10108	710499 4936299	850	1980/01	1904	06	FR	0015	2	5	40	2 :0	DO		SAMBROOK E SAND BLDR 0008 GRNT 0015 GRNT FCRD 0018
CON	09	009	51-10178	710099 4936399	875	1980/10	1455	06	FR	0090	60	165	2	1 :10	DO		HARVEY TOWNSHIP LOAM 0001 BRWN CLAY SNDY 0005 BRWN CLAY STNS 0018 GREY LMSN STNS 0095 RED GRNT STNS 0175
CON	09	009	51-09816	710200 4936350	850	1979/08	1904		DRY					:			IRELAND R PRDG 0010 GRVL 0011 GRNT 0075
CON	09	009	51-10109	710099 4936399	850	1980/03	1904	05	FR	0055	5	16	35	4 :0	DO		MICHELL B GRNT FCRD 0060
CON	09	009	51-09815	710200 4936300	850	1979/08	1904	06	FR	0018	8	60	1	2 :0	DO		IRELAND R SAND 0007 GRNT 0062
CON	09	009	51-06588	710227 4936608	875	1973/03	1904	06	FR	0035	15	35	4	2 :0	DO		CUMMINGS NOOLE GRNT 0040
CON	09	009	51-06589	710164 4936625	875	1973/03	1904	06	FR	0015	1	19	5	3 :0	DO		MAROIS LENA BRWN CLAY STNS 0005 RED GRNT 0015 GREY GRNT 0027
CON	09	009	51-07335	710348 4936229	850	1974/06	1904	06	FR	0008	5	5		2 :0	DO		SMITH DON PRDG 0008 GRNT 0018
CON	09	009	51-07340	709887 4936183	890	1974/06	1904	06	FR	0058	14	70	5	2 :0	DO		BARR BRIAN W BRWN SAND SHLE 0012 GRNT 0080
CON	09	009	51-07339	709861 4936177	900	1974/06	1904	06	FR	0040	12	39	1	3 :0			BARR BRIAN PRDG 0008 BRWN SHLE GRVL 0010 GRNT 0041
CON	09	009	51-07338	709958 4936184	880	1974/07	1904	06	FR	0178	15	199	1	6 :0	DO		SMITH NEAL GRNT 0200
CON	09	009	51-07337	710430 4936218	850	1974/06	1904	06	FR	0010	3	5	40	2 :0	DO		CHESHER MERT BRWN SAND STNS 0007 GRNT 0026
CON	09	009	51-07336	710385 4936250	850	1974/06	1904	06	FR	0010	2	2		2 :0	DO		SLADE JOE BRWN SAND BLDR SHLE 0006 GRNT 0025
CON	09	009	51-07350	710343 4936381	845	1974/07	1904	30	FR	0014	8	13	9	8 :0	DO		CHESHER NOEL PRDG 0015
CON	09	009	51-06447	710078 4936400	880	1973/07	1666	06	FR	0049	6	6	5	2 :0	DO		LOCHERS LAURIER BRWN SAND 0010 RED GRNT 0052
CON	09	009	51-08518	709500 4936450	925	1975/03	1904	06	FR	0061	27	50	25	8 :0	PS MN		BUCKHORN COM CENTRE SAND BLDR 0012 GREY LMSN 0050 GRNT 0100
CON	09	009	51-09322	710300 4936550	850	1978/09	1904	06	FR	0019	5	15	5	3 :0	DO		MARSHALL FRANK GREY CLAY STNS 0007 GRNT 0020
CON	09	009	51-08520	710200 4936150	860	1975/06	1904	06	FR	0013	4	12	5	4 :0	DO		DUNDAS JIM SAND BLDR 0003 GRNT 0021
CON	09	009	51-08808	709300 4936400	930	1977/10	1455	06	FR	0081	10	60	20	3 :10	DO		WIERDSMA COALS BLDR LOAM 0001 BRWN CLAY STNS SNDY 0010 GREY CLAY STNS 0020 GREY LMSN STNS 0030 RED SHLE LMSN STNS 0050 GREY LMSN STNS 0082
CON	09	009	51-08551	710300 4936550	860	1976/05	1904	06	FR	0045	6	35	20	4 :0	DO		WIERDSMA SIEBE SAND STNS 0002 GRNT 0048
CON	09	009	51-09308	710400 4936450	850	1978/02	1904	06	FR	0009	8	14	8	2 :0	DO		BIGGS JOHN PRDG 0009 GRNT 0029

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	09	009	51- 08541	710100 4936100	860	1976/03	1904	06	FR	0110	12	117	2	4 :0	DO		PAGE PAUL LOAM DKCL 0001 BRWN SAND STNS 0013 GRNT 0123
CON	09	009	51- 08549	710250 4936500	860	1976/05	1904	06	FR	0013	4	10	20	2 :0	DO		JOPLING RODGER LOAM 0001 SAND STNS 0004 GRNT 0025
CON	09	009	51- 08927	709800 4936550	920	1977/11	1904	06	FR	0490	20	300	6	16:0	DO		DIXON PAUL FILL SNDY 0004 BRWN CLAY STNS 0010 BRWN LMSN 0040 GRNT 0497
CON	09	009	51- 09319	710000 4936600	900	1978/08	1904	06	FR	0028	23	28	35	:	DO		DIXON PAUL BRWN SAND 0002 BRWN CLAY LMSN BLDR 0008 GREY LMSN 0028 GRNT 0034
CON	09	009	51- 08155	710430 4936218	850	1975/02	1904	06	FR	0047	6	18	16	3 :0	DO		CHESHER MERT PRDR 0026 GRNT 0050
CON	09	009	51- 08880	709300 4936300	925	1977/04	1904	06	FR	0017	9	20	10	2 :0	DO		DIXON DOUG FILL 0002 BRWN CLAY STNS 0013 GREY LMSN 0031
CON	09	009	51- 08910	709350 4936250	925	1977/07	1904	06	SU	0088	33	82	5	3 :0	DO		BANNON JOHN BRWN CLAY BLDR 0008 GREY SHLE 0014 GREY LMSN 0049 GREN LMSN 0090
CON	09	009	51- 08881	709250 4936400	930	1977/04	1904	06	FR	0012	9	20	6	2 :0	DO		P & D CONSTRUCTION LOAM 0001 BRWN CLAY STNS 0012 GREY LMSN 0030
CON	09	009	51- 08154	710370 4936470	840	1975/01	1904							:	DO		SMITH NEAL GRNT 0194
CON	09	010	51- 13608	709681 4936918		1988/12	1748	06	FR	0196	20	200	2	1 :0	DO		KUASNAK, RUDY GREY LMSN 0100 RED GRNT 0200
CON	09	010	51- 01642	710309 4936668	865	1963/06	3515		FR	0070	20	79	2	1 :0	DO		FULTON A PRDR 0025 RED GRNT 0079
CON	09	010	51- 01643	709496 4936577	920	1966/11	3515	06	FR	0090	145			:	NU		SUTTON M LOAM 0001 MSND 0013 GREY GRNT 0090 RED GRNT 0165
CON	09	010	51- 01645	709363 4936519	925	1967/05	4814	06	FR	0020	5	10	16	2 :0	DO		SIMMONS N BRWN CLAY STNS 0006 GREY LMSN 0033
CON	09	010	51- 01640	710341 4936605	855	1963/04	3515	06	FR	0064	15	15	5	1 :0	DO		CRICKMORE T LOAM MSND 0020 GREY GRNT 0064
CON	09	010	51- 01639	710045 4936717	890	1959/10	3515	06	FR	0070	20	20	8	2 :0	DO		WINDOVER H CLAY STNS 0010 LMSN 0070
CON	09	010	51- 01644	710034 4936849	875	1967/06	4603	02	FR	0042	11	24	2	1 :0	DO		SUTTON S LOAM MSND 0005 GREY CLAY 0010 GRVL 0014 RED GRNT 0042
CON	09	010	51- 01641	710426 4936752	845	1963/06	3515	06	FR	0060	20	20	8	1 :0	DO		FALSTROM M F CLAY 0002 RED GRNT 0068
CON	09	010	51- 05640	709300 4936520	925	1971/05	2548	06	FR	0079	25	79	6	2 :0	DO		SIMMONS N GREY LMSN SHLE 0010 GREY LMSN 0079
CON	09	010	51- 05859	709565 4936640	915	1971/11	2104	06	FR	0150	30	222	10	3 :10	PS		BOARD OF EDUCATION LOAM 0001 BRWN CLAY 0003 GREY LMSN 0055 RED GRNT 0172 GREY GRNT 0200 RED GRNT 0236
CON	09	010	51- 08598	709200 4936500	910	1976/11	1904	06	FR	0081	35	60	18	4 :0	DO		WINGETT RAYMOND LOAM DKCL 0001 GREY CLAY STNS 0007 GREY LMSN SHLE 0013 GREY LMSN SHLE 0084
CON	09	010	51- 09020	709850 4936700	925	1974/09	4713	06	FR	0265	70	265	5	1 :0	DO		RONIE DAVID BRWN SAND STNS 0006 RED GRNT 0270
CON	09	011	51- 18223	709476 4937485		1999/08	5020	06	FR	0240	34	300	3	1 :0	DO		BLANCHGELD CARL JENN BRWN LOAM STNS LOOS 0004 WHIT GRNT 0160 BLCK GRNT 0250 WHIT GRNT 0280 RED GRNT 0302

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	10	006	51- 04960	709070 4933750	820	1969/07	2104	06	FR	0020	10	26	2	3 :0	DO		PETERBOROUGH LUMBER LOAM 0001 RED MSND STNS 0014 RED GRNT 0030
CON	10	006	51- 05187	709600 4934250	830	1970/05	1904	06	FR	0018	11			2 :0	DO		SESKY STEVEN RED CLAY BLDR 0006 GRNT 0020
CON	10	006	51- 05185	709400 4934050	820	1970/04	1904	06	FR	0018	4	23	10	8 :0	DO		PETERBOROUGH LUMBER BRWN LOAM MSND 0004 BLDR 0017 RED GRNT 0026
CON	10	006	51- 05454	709150 4933950	820	1970/11	1904	06	FR	0060	6	60	1	4 :0	DO		PETERBORO LUMBER RED CLAY BLDR 0020 RED GRNT 0062
CON	10	006	51- 05241	709000 4933650	830	1970/05	1904	06	FR	0018	1	10	30	6 :0	DO		PETERBORO LUMBER CO BLDR CLAY 0018 RED GRNT 0020
CON	10	006	51- 05184	709600 4934150	830	1970/03	1904	06	FR	0048	8	46	2	2 :0	CO		PETERBORO LUMBER BRWN MSND 0005 RED GRNT 0051
CON	10	006	51- 17694	709095 4934067		1997/04	1455	06	FR	0102	20	80	20	2 :0	DO		RICKMAN, JM BRWN LOAM SAND 0002 RED GRNT ROCK HARD 0027 GREN GRNT ROCK HARD 0060 RED GRNT HARD 0074 BLCK GRNT HARD 0102 RED GRNT 0107
CON	10	006	51- 09645	709500 4934200	850	1979/09	4923	06	FR	0043	15	60	1	2 :30	DO		REYNOLDS F BRWN SAND STNS 0005 BLCK GRNT 0043 RED GRNT 0046 BLCK GRNT 0070
CON	10	006	51- 10390	709399 4934499	850	1982/03	2104	06	FR	0036	10	15	20	4 :30	DO		HOLBROOK R PRDG 0008 RED GRNT HARD 0025 BLCK GRNT HARD 0030 RED GRNT HARD 0040
CON	10	006	51- 06716	709331 4934076	840	1973/12	5102	06	FR	0106	7	104	1	1 :20	DO		NORRIS K BLCK LOAM 0001 BRWN SAND 0014 RED GRNT 0042 GREY GRNT 0090 RED GRNT 0107
CON	10	006	51- 06691	709146 4933964	840	1973/11	5102	06	FR	0040	2	43	3	1 :40	DO		STRICKER M BRWN SAND 0015 BRWN CLAY GRVL 0019 RED GRNT 0047
CON	10	006	51- 06033	709000 4933660	830	1972/08	5102	06	FR	0040	5	12	20	2 :30	DO		SKELTON A BLCK LOAM 0001 GREY SAND GRVL 0014 RED GRNT 0045
CON	10	006	51- 06017	709455 4934080	820	1972/01	5102	06	FR	0056	9	40	12	2 :15	DO		PETERBORO LUMBER BLCK LOAM 0001 BRWN CLAY BLDR 0006 RED GRNT 0052 GREY GRNT 0058
CON	10	006	51- 07348	708951 4933574	850	1974/08	1904	06	FR	0087	6	86	2	3 :0	DO		ROMANICK STANLEY LOAM STNS 0001 RED CLAY STNS 0015 GRNT BLDR 0018 RED CLAY STNS 0030 GRNT SHLE 0031 GRNT 0091
CON	10	007	51- 13853	709075 4934760		1989/03	1748	06	FR	0037	2		25	1 :0	DO		FAWCETT SAND 0017 RED GRNT 0039
CON	10	007	51- 14809	709075 4934760		1990/07	1748	06	FR	0060	40	120	3	1 :0	DO		MCEACHERN, RUSS GREY CLAY 0005 BLCK GRNT 0120
CON	10	007	51- 01656	709704 4934984	820	1966/05	4814	06	FR	0018	2	10	7	2 :0	DO		MYERS L LOAM MSND 0012 MSND GRVL 0017 RED GRNT 0019
CON	10	007	51- 01654	709640 4934952	820	1965/08	4814	06	FR	0016	2	4	14	1 :0	DO		BARBATAVICIUS P LOAM MSND 0010 GRVL MSND 0015 RED GRNT 0021
CON	10	007	51- 01655	709620 4935112	830	1966/04	4814	06	FR	0018	3	12	10	2 :0	DO		KNUTH R LOAM MSND 0007 RED GRNT 0022
CON	10	007	51- 17369	709075 4934760		1996/11	6016	06	FR	0115	31	120	10	2 :0	DO		MELS, TERRY BRWN LOAM 0001 GREN LMSN FCRD 0010 GREN LMSN 0120
CON	10	007	51- 10492	709699 4934899	850	1981/09	4814	06	FR	0057	15	59	2	2 :0	DO		FAWCETT D BRWN LOAM 0001 BRWN CLAY SNDY 0004 BRWN CLAY GRNT 0007 GRNT 0032 BLCK GRNT 0058 GREN GRNT 0061 BLCK GRNT 0063

MUNICIPALITY CONCESSION ETC	LOT	WELL NO	UTM EASTING NORTHING	ELEV FEET	DATE	DRILLER	CSG DIA INS	KIND OF WATER	WATER FOUND FEET	STAT LVL FEET	PUMP LVL FEET	TEST RATE GPM	TEST TIME HR:MN	WATER USE	SCREEN DEPTH FEET	SCREEN LENGTH FEET	OWNER DEPTHS IN FEET TO WHICH FORMATIONS EXTEND
CONTINUING... HARVEY TOWNSHIP																	
CON	10	007	51-10111	709399 4934599	850	1980/12	1904	06	FR	0060	9	35	30	4 :0	DO		JONES R PRDG 0009 RED GRVL SAND SILT 0027 GREY GRNT 0045 RED GRNT DKCL 0050 BRWN GRNT DKCL 0066
CON	10	007	51-09321	709500 4934550	850	1978/09	1904	06	FR	0117	6	104	8	2 :0	DO		SHALE SHIRLEY SAND STNS 0008 GRNT 0119
CON	10	007	51-08519	709550 4934700	815	1975/04	1904	06	FR	0026	1	30	4	4 :0	DO		PYRKE EDWARD BRWN SAND 0018 GRNT SHLE 0024 GRNT GRVL 0026 RED GRNT 0035
CON	10	007	51-09343	709600 4934900	850	1979/02	2104	06	FR	0075	5	15	25	15:0	DO		HESS HARRY PRDG 0008 BRWN SAND WDFR LOOS 0035 RED GRNT LYRD 0087
CON	10	008	51-08403	709540 4935550	860	1977/05	5102	06	FR	0010	3	3	20	1 :40	DO		HILL RON BRWN SAND 0032 GREY LMSN 0036
CON	10	009	51-14602	708641 4935888		1989/10	1748		FR	0349	140	350	20	1 :0	DO		PRDG 0180 RED GRNT 0350
CON	10	009	51-13770	708641 4935888		1988/10	1748	06	FR					:	MN		WEBSTER, QLEY LOAM 0009 LMSN 0180
CON	10	009	51-01657	708769 4936121	955	1956/07	3515	06	FR	0060	25	25	5	1 :0	DO		VEENMAN R CLAY BLDR 0020 GREY LMSN 0065
CON	10	009	51-01658	709083 4936200	940	1961/06	4814	06	FR	0076	47	60	10	2 :0	ST DO		IRWIN BEN PRDG 0040 GREY LMSN 0078 RED GRNT 0080 GREY GRNT 0082
CON	10	009	51-09797	708999 4936199	950	1979/08	1904	06	FR	0083	25	30	15	4 :0	DO		WATSON B SAND GRVL 0010 GREY LMSN 0087
CON	10	009	51-08401	709300 4936100	930	1977/05	5102	06	FR	0050	10	48	6	1 :40	DO		HUGHES J OBDN 0014 ROCK 0055
CON	10	009	51-08893	709300 4936050	925	1977/06	1904	06	FR	0060	19	19	10	3 :0	DO		MCQUADE DENNIS BRWN CLAY BLDR 0008 BLDR GRVL 0015 GREY LMSN 0039 BRWN LMSN 0061 GREN LMSN 0070
CON	10	010	51-12645	708409 4936452		1987/09	2104	06	UK	0040	6	40	4	2 :0	DO		CUTTELL, DON J. BRWN SAND MGRD 0004 RED GRNT HARD 0044
CON	10	010	51-14598	708409 4936452		1989/11	1748	06	FR	0110	10	125	10	1 :0	DO		C., DAVE RED CLAY 0002 GREY LMSN 0060 RED GRNT 0125
CON	10	010	51-13868	708409 4936452		1989/06	1748	06	FR	0096	40	100	8	1 :0	DO		CARTREEL, DAUE GREY LMSN 0050 RED GRNT 0100
CON	10	010	51-15493	708409 4936452		1991/10	1748		FR	0145	6	150	8	1 :	DO		AMERIE, ERNEST ROSS PRDG 0090 RED GRNT 0150
CON	10	010	51-15457	708409 4936452		1991/08	1748	06	FR	0080	15	90	1	1 :0	DO		AMERIE, ERNEST ROSS GREY CLAY 0010 RED GRNT 0090
CON	10	010	51-01659	708580 4936241	945	1964/08	4814	06	FR	0030	20	45	2	2 :0	DO		SIMPKIN R LOAM 0001 BRWN CLAY STNS 0010 GREY LMSN 0050
CON	10	010	51-17107	708409 4936452		1995/10	3367	06	FR	0025	20	134	3	2 :0	DO		SZCZERBIAK, M. PRDG 0058 GREY LMSN HARD 0137
CON	10	011	51-11580	708201 4937030		1985/10	1672	06	UK	0011	6	30	2	2 :0	DO		ROVA ENTERPRISES LOAM 0003 GRNT 0033
CON	10	011	51-14227	708201 4937030		1989/11	1748	06	FR	0190	30	200	15	1 :0	DO		MEALINA, JOHN GREY CLAY 0002 GREY LMSN 0080 RED GRNT 0200
CON	10	011	51-15047	708201 4937030		1990/11	1748	06	FR	0110	20	120	4	1 :0	DO		WAYNE, EUANS GREY LMSN 0070 RED GRNT 0120
CON	10	011	51-16297	708201 4937030		1993/07	1748	06	FR	0095	20	100	6	1 :0	DO		MOYD, M.C. BRWN SAND 0003 GREY LMSN 0103

APPENDIX C

CERTIFICATES OF CHEMICAL ANALYSIS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Friday, October 15, 2010

Geo-Logic Inc.
Attn : Todd Palmer

347 Pido Rd., Unit #29
Peterborough, ON
K9J 6Z8,

Phone: 749-3317
Fax:749-9248

Date Rec. : 05 October 2010
LR Report: **CA11053-OCT10**
Reference: G023134E1

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	7: NR Lot 8 1 Hour	8: NR Lot 8 6 Hour
Sample Date & Time					04-Oct-10 15:00	04-Oct-10 21:00
Temperature Upon Receipt [°C]	---	---	---	---	12.0	12.0
UV Transmittance [%]	06-Oct-10	16:10	12-Oct-10	12:31	0.4	92.9
Alkalinity [mg/L as CaCO3]	06-Oct-10	08:30	08-Oct-10	10:03	452	430
Colour [TCU]	06-Oct-10	22:26	07-Oct-10	09:36	< 3	< 3
Conductivity [uS/cm]	06-Oct-10	08:30	08-Oct-10	10:03	1110	917
pH [no unit]	06-Oct-10	08:30	08-Oct-10	10:03	7.40	7.45
Tot. Suspended Solids [mg/L]	06-Oct-10	14:23	08-Oct-10	09:16	216	< 2
Turbidity [NTU]	05-Oct-10	20:12	06-Oct-10	15:57	248	1.56
Organic Nitrogen [mg/L]	05-Oct-10	15:45	08-Oct-10	16:15	0.56	0.05
Nitrogen-Kjeldahl (N) [mg/L]	06-Oct-10	09:17	07-Oct-10	14:49	0.62	0.09
Ammonia+Ammonium (N) [mg/L]	05-Oct-10	15:45	08-Oct-10	16:14	0.06	< 0.04
Total Organic Carbon [mg/L]	08-Oct-10	06:34	12-Oct-10	13:06	2.0	< 1.0
Chloride [mg/L]	06-Oct-10	10:41	14-Oct-10	16:16	100	40
Fluoride [mg/L]	08-Oct-10	10:06	13-Oct-10	09:18	0.16	0.19
Nitrite (as nitrogen) [mg/L]	05-Oct-10	17:23	08-Oct-10	15:47	< 0.005	< 0.005
Nitrate (as nitrogen) [mg/L]	05-Oct-10	17:23	08-Oct-10	15:47	1.48	1.40
Sulphate [mg/L]	06-Oct-10	10:41	13-Oct-10	15:11	18	19
Hardness [mg/L as CaCO3]	---	---	07-Oct-10	14:50	442	417
Aluminum [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	1460	25.6
Silver [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.03	< 0.01
Arsenic [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.4	< 0.2
Boron [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	34	42
Barium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	398	278
Beryllium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.40	< 0.02
Calcium [mg/L]	07-Oct-10	07:52	07-Oct-10	14:50	162	153
Cadmium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.016	< 0.003
Cobalt [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	1.32	0.297
Copper [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	11.0	1.7
Chromium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	2.8	0.5
Iron [ug/L]	07-Oct-10	07:52	07-Oct-10	14:50	6721	50
Potassium [mg/L]	07-Oct-10	07:52	07-Oct-10	14:50	4.42	2.07
Magnesium [mg/L]	07-Oct-10	07:52	07-Oct-10	14:50	9.20	8.59

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA11053-OCT10

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	7: NR Lot 8 1 Hour	8: NR Lot 8 6 Hour
Manganese [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	70.7	10.6
Molybdenum [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.53	0.50
Nickel [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	6.3	1.9
Sodium [mg/L]	07-Oct-10	07:52	07-Oct-10	14:51	72.7	31.4
Phosphorus [mg/L]	07-Oct-10	07:52	07-Oct-10	14:51	0.136	0.018
Lead [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	1.12	0.28
Antimony [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.27	0.04
Selenium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	< 1	< 1
Tin [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.08	< 0.01
Strontium [ug/L]	07-Oct-10	07:52	07-Oct-10	14:51	2490	2840
Thallium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.05	< 0.02
Titanium [mg/L]	08-Oct-10	13:14	13-Oct-10	08:54	0.0875	0.0021
Uranium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	6.38	5.78
Vanadium [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	3.36	0.33
Zinc [ug/L]	08-Oct-10	13:14	13-Oct-10	08:54	57	33
Membrane filtration: Total coliform [cfu/100mL]	05-Oct-10	12:20	07-Oct-10	09:40	---	0
Membrane filtration: E. coli [cfu/100mL]	05-Oct-10	12:20	07-Oct-10	09:40	---	0
Membrane filtration: Fecal Coliforms [cfu/100mL]	05-Oct-10	12:20	07-Oct-10	09:40	---	0
Cation sum [meq/L]	---	---	---	---	12.54	9.83
Anion Sum [meq/L]	---	---	---	---	12.25	10.14
Anion-Cation Balance [% difference]	---	---	---	---	1.16	-1.57
Ion Ratio	---	---	---	---	1.02	0.97
Total Dissolved Solids (calculated) [mg/L]	---	---	---	---	639	514
Conductivity (calculated) [µS/cm]	---	---	---	---	1240	998
Langelier's Index [@4°C]	---	---	---	---	0.28	0.29
Saturation pH [pHs @ 4°C]	---	---	---	---	7.12	7.16

NR - Not reportable under O.Reg 170/03 or 243/07 of the SDWA or O.Reg 318/08 & 319/08 of the HPPA as per client.

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Friday, October 15, 2010

Geo-Logic Inc.
Attn : Bob Neck

347 Pido Rd., Unit #29
Peterborough, ON
K9J 6Z8,

Phone: 749-3317
Fax:pdf format

Date Rec. : 06 October 2010
LR Report: **CA11078-OCT10**
Reference: G023134 E1

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	7: TW-2 1 Hour	8: TW-2 6 Hour
Sample Date & Time					05-Oct-10	05-Oct-10
Temperature Upon Receipt [°C]	---	---	---	---	6.0	6.0
UV Transmittance [%]	08-Oct-10	14:02	12-Oct-10	12:28	92.5	95.3
Alkalinity [mg/L as CaCO3]	07-Oct-10	14:57	08-Oct-10	11:06	278	244
Colour [TCU]	08-Oct-10	14:30	12-Oct-10	12:22	< 3	< 3
Conductivity [uS/cm]	07-Oct-10	14:57	08-Oct-10	11:06	677	584
pH [no unit]	07-Oct-10	14:57	08-Oct-10	11:06	8.08	7.85
Tot. Suspended Solids [mg/L]	08-Oct-10	08:43	12-Oct-10	11:08	4	3
Turbidity [NTU]	06-Oct-10	18:47	07-Oct-10	09:31	5.93	2.67
Organic Nitrogen [mg/L]	08-Oct-10	20:30	08-Oct-10	22:18	0.09	0.29
Nitrogen-Kjeldahl (N) [mg/L]	07-Oct-10	20:30	08-Oct-10	22:18	0.17	0.29
Ammonia+Ammonium (N) [mg/L]	08-Oct-10	06:47	08-Oct-10	16:29	0.08	< 0.04
Total Organic Carbon [mg/L]	12-Oct-10	09:42	14-Oct-10	08:54	< 1.0	< 1.0
Chloride [mg/L]	08-Oct-10	18:04	14-Oct-10	15:25	26	38
Fluoride [mg/L]	08-Oct-10	06:15	12-Oct-10	13:33	1.60	1.04
Nitrite (as nitrogen) [mg/L]	06-Oct-10	18:28	08-Oct-10	15:02	< 0.005	< 0.005
Nitrate (as nitrogen) [mg/L]	06-Oct-10	18:28	08-Oct-10	15:02	0.146	0.470
Sulphate [mg/L]	08-Oct-10	18:04	14-Oct-10	15:25	24	20
Hardness [mg/L as CaCO3]	---	---	11-Oct-10	13:17	254	294
Aluminum [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	116	64.1
Silver [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 0.01	< 0.01
Arsenic [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.3	< 0.2
Boron [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	254	150
Barium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	164	200
Beryllium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 0.02	< 0.02
Calcium [mg/L]	08-Oct-10	07:58	11-Oct-10	13:17	83.9	103
Cadmium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 0.003	< 0.003
Cobalt [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.171	0.190
Copper [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	1.0	0.9
Chromium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.9	0.8
Iron [ug/L]	08-Oct-10	07:58	11-Oct-10	13:17	242	134
Potassium [mg/L]	08-Oct-10	07:58	11-Oct-10	13:17	1.45	1.44
Magnesium [mg/L]	08-Oct-10	07:58	11-Oct-10	13:17	10.8	8.98

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA11078-OCT10**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Approval Date	4: Analysis Approval Time	7: TW-2 1 Hour	8: TW-2 6 Hour
Manganese [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	40.2	24.5
Molybdenum [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	7.08	5.34
Nickel [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.8	0.7
Sodium [mg/L]	08-Oct-10	07:58	11-Oct-10	13:18	26.9	27.0
Phosphorus [mg/L]	08-Oct-10	07:58	11-Oct-10	13:18	< 0.009	< 0.009
Lead [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.16	0.09
Antimony [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 0.02	< 0.02
Selenium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 1	< 1
Tin [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.02	< 0.01
Strontium [ug/L]	08-Oct-10	07:58	11-Oct-10	13:18	6120	4250
Thallium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	< 0.02	< 0.02
Titanium [mg/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.0067	0.0039
Uranium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	11.6	7.72
Vanadium [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	0.54	0.52
Zinc [ug/L]	08-Oct-10	17:41	12-Oct-10	19:38	14	13
Membrane filtration: Total coliform [cfu/100mL]	06-Oct-10	14:30	07-Oct-10	15:22	---	0
Membrane filtration: E. coli [cfu/100mL]	06-Oct-10	14:30	07-Oct-10	15:22	---	0
Membrane filtration: Fecal Coliforms [cfu/100mL]	06-Oct-10	14:30	07-Oct-10	15:22	---	0
Cation sum [meq/L]	---	---	---	---	6.44	7.20
Anion Sum [meq/L]	---	---	---	---	6.87	6.42
Anion-Cation Balance [% difference]	---	---	---	---	-3.25	5.68
Ion Ratio	---	---	---	---	0.94	1.12
Total Dissolved Solids (calculated) [mg/L]	---	---	---	---	342	346
Conductivity (calculated) [µS/cm]	---	---	---	---	665	681
Langelier's Index [@4°C]	---	---	---	---	0.49	0.29
Saturation pH [pHs @ 4°C]	---	---	---	---	7.59	7.56

NR - Not reportable under O.Reg 170/03 or 243/07 of the SDWA or O.Reg 318/08 & 319/08 of the HPPA as per client.

Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

SGS Canada Inc.
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Phone: 705-652-2000 FAX: 705-652-6365

Wednesday, November 10, 2010

Geo-Logic Inc.
Attn : Todd Palmer

347 Pido Rd., Unit #29
Peterborough, ON
K9J 6Z8,

Phone: 749-3317
Fax:749-9248

Date Rec. : 07 October 2010
LR Report: **CA11092-OCT10**
Reference: G023134 E1

Copy: #2

CERTIFICATE OF ANALYSIS

Final Report - Revised

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	7: Lot 19 1 Hour	8: Lot 19 6 Hour
Sample Date & Time			05-Oct-10	05-Oct-10
Temperature Upon Receipt [°C]	---	---	13.0	13.0
UV Transmittance [%]	12-Oct-10	12:31	85.9	94.9
Alkalinity [mg/L as CaCO3]	12-Oct-10	14:15	266	269
Colour [TCU]	12-Oct-10	12:36	< 3	< 3
Conductivity [uS/cm]	12-Oct-10	14:15	723	661
pH [no unit]	12-Oct-10	14:15	7.81	8.07
Tot. Suspended Solids [mg/L]	14-Oct-10	09:15	42	< 2
Turbidity [NTU]	08-Oct-10	14:03	25.5	0.23
Organic Nitrogen [mg/L]	13-Oct-10	15:01	0.11	0.16
Nitrogen-Kjeldahl (N) [mg/L]	13-Oct-10	10:43	0.11	0.16
Ammonia+Ammonium (N) [mg/L]	13-Oct-10	15:01	< 0.04	< 0.04
Total Organic Carbon [mg/L]	14-Oct-10	09:14	1.2	1.6
Chloride [mg/L]	16-Oct-10	11:10	60	47
Fluoride [mg/L]	13-Oct-10	12:32	0.34	0.23
Nitrite (as nitrogen) [mg/L]	12-Oct-10	10:55	<0.005	<0.005
Nitrate (as nitrogen) [mg/L]	12-Oct-10	10:55	<0.013	<0.013
Sulphate [mg/L]	16-Oct-10	08:03	38	20
Hardness [mg/L as CaCO3]	21-Oct-10	12:09	306	298
Aluminum [ug/L]	21-Oct-10	11:26	184	4.1
Silver [ug/L]	21-Oct-10	11:26	< 0.01	< 0.01
Arsenic [ug/L]	21-Oct-10	11:26	0.2	< 0.2
Boron [ug/L]	21-Oct-10	11:26	55	35
Barium [ug/L]	21-Oct-10	11:26	84.3	85.9
Beryllium [ug/L]	21-Oct-10	11:26	< 0.02	< 0.02
Calcium [mg/L]	21-Oct-10	11:26	113	112
Cadmium [ug/L]	21-Oct-10	11:26	0.003	< 0.003
Cobalt [ug/L]	21-Oct-10	11:26	0.775	0.425
Copper [ug/L]	21-Oct-10	11:26	3.4	1.3
Chromium [ug/L]	21-Oct-10	11:26	0.9	< 0.5
Iron [ug/L]	21-Oct-10	11:27	1330	69
Potassium [mg/L]	21-Oct-10	11:26	1.48	1.33
Magnesium [mg/L]	21-Oct-10	11:26	5.77	4.34

OnLine LIMS

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
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LR Report : CA11092-OCT10

Analysis	3: Analysis Approval Date	4: Analysis Approval Time	7: Lot 19 1 Hour	8: Lot 19 6 Hour
Manganese [ug/L]	21-Oct-10	11:27	67.3	10.9
Molybdenum [ug/L]	21-Oct-10	11:27	0.44	0.40
Nickel [ug/L]	21-Oct-10	11:27	1.7	0.7
Sodium [mg/L]	21-Oct-10	11:27	36.3	29.7
Phosphorus [mg/L]	21-Oct-10	11:27	0.011	0.025
Lead [ug/L]	21-Oct-10	11:27	0.41	0.07
Antimony [ug/L]	21-Oct-10	11:27	0.32	< 0.02
Selenium [ug/L]	21-Oct-10	11:27	< 1	< 1
Tin [ug/L]	21-Oct-10	11:27	0.24	0.02
Strontium [ug/L]	21-Oct-10	11:27	1090	802
Thallium [ug/L]	21-Oct-10	11:27	0.04	< 0.02
Titanium [mg/L]	21-Oct-10	11:27	0.0178	0.0013
Uranium [ug/L]	21-Oct-10	11:27	17.9	10.9
Vanadium [ug/L]	21-Oct-10	11:27	0.67	0.25
Zinc [ug/L]	21-Oct-10	11:27	20	12
Membrane filtration: Total coliform [cfu/100mL]	12-Oct-10	09:39	---	0
Membrane filtration: E. coli [cfu/100mL]	12-Oct-10	09:39	---	0
Membrane filtration: Fecal Coliforms [cfu/100mL]	12-Oct-10	09:39	---	0
Cation sum [meq/L]	---	---	7.81	7.28
Anion Sum [meq/L]	---	---	7.79	7.11
Anion-Cation Balance [% difference]	---	---	0.08	1.14
Ion Ratio	---	---	1.00	1.02
Total Dissolved Solids (calculated) [mg/L]	---	---	414	376
Conductivity (calculated) [µS/cm]	---	---	780	719
Langelier's Index [@4°C]	---	---	0.32	0.58
Saturation pH [pHs @ 4°C]	---	---	7.49	7.49

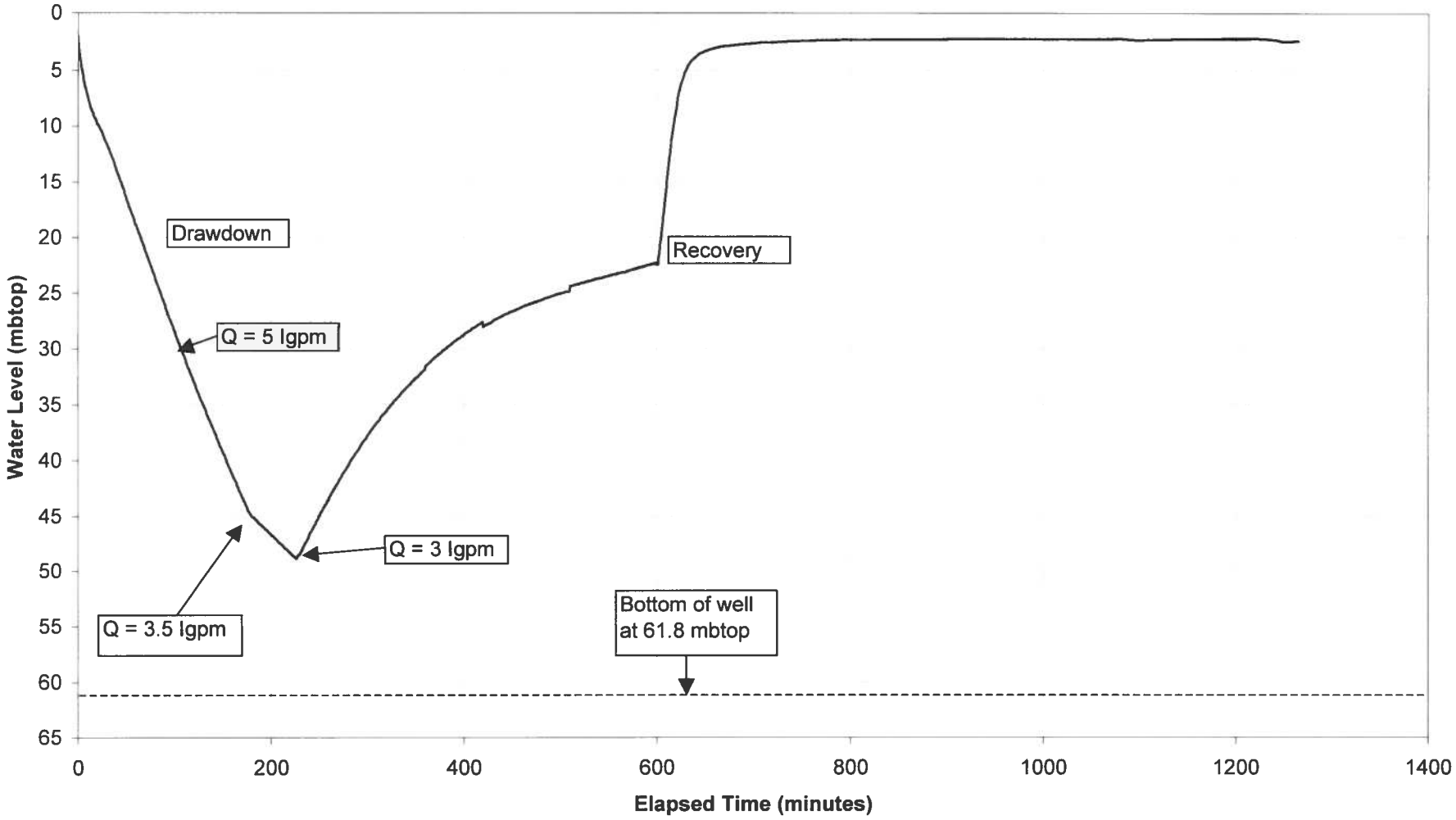
Brian Graham B.Sc.
Project Specialist
Environmental Services, Analytical

OnLine LIMS

APPENDIX D

AQUIFER PERFORMANCE TESTING RESULTS

PUMP HISTORY CURVE
TW-1: October 4, 2010



PUMP HISTORY CURVE

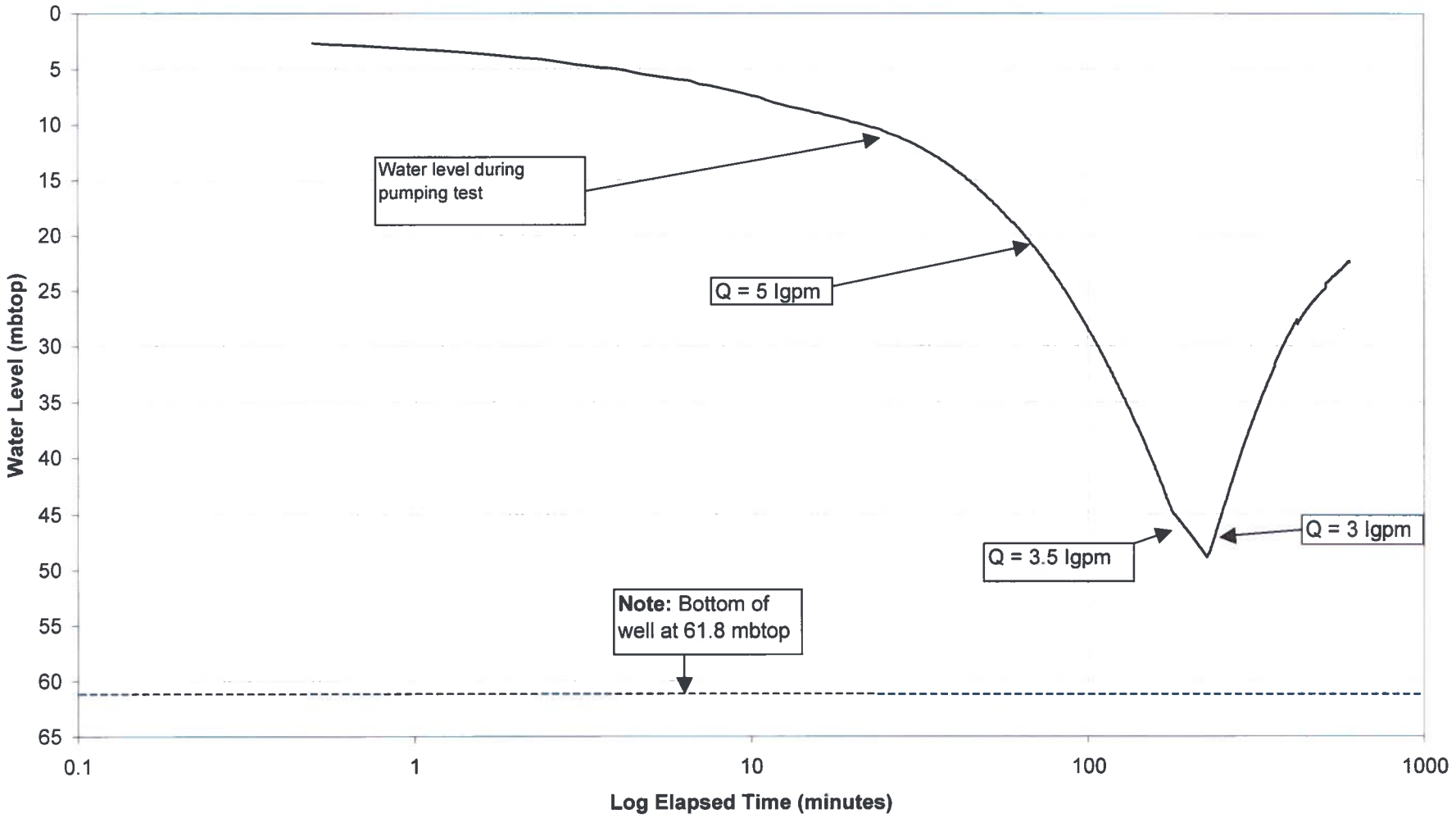
TW-1
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 1.98 m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: D-1

GEO-LOGIC

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
TW-1: October 4, 2010



PUMP HISTORY CURVE

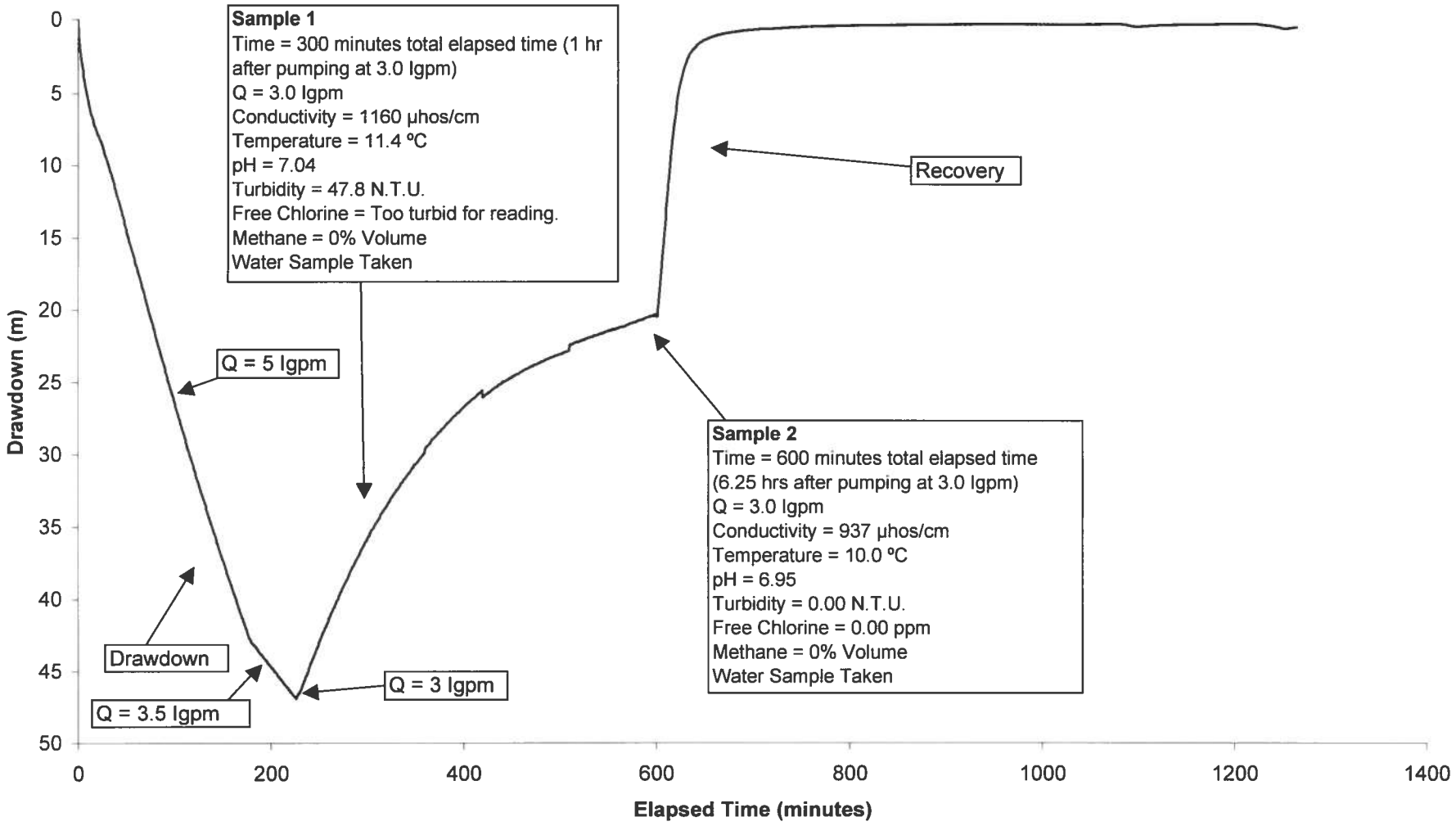
TW-1
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 1.98 m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: D-2

GEO-LOGIC

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
TW-1: October 4, 2010



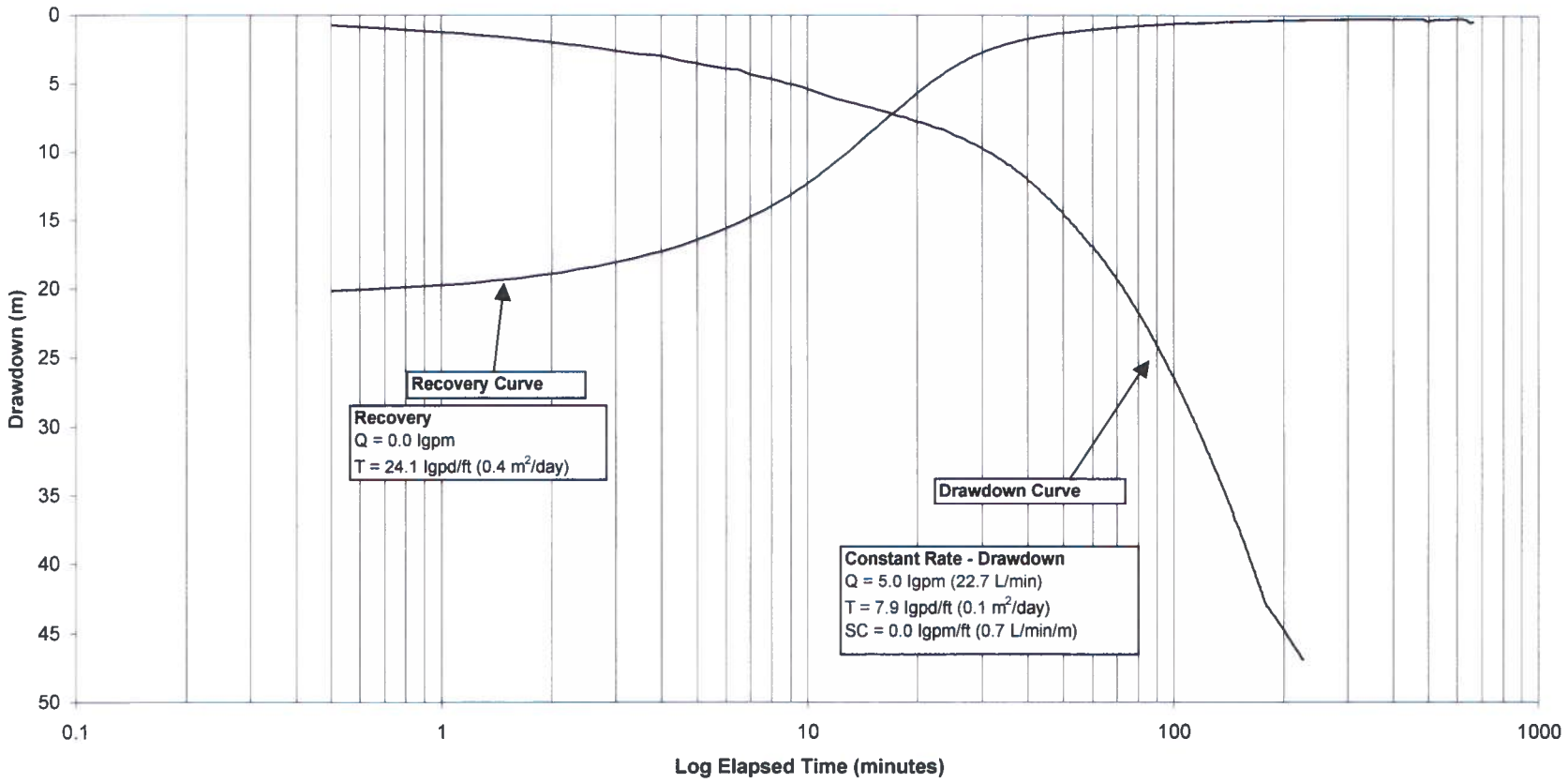
CONSTANT RATE

TW-1
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 1.98 m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: D-3

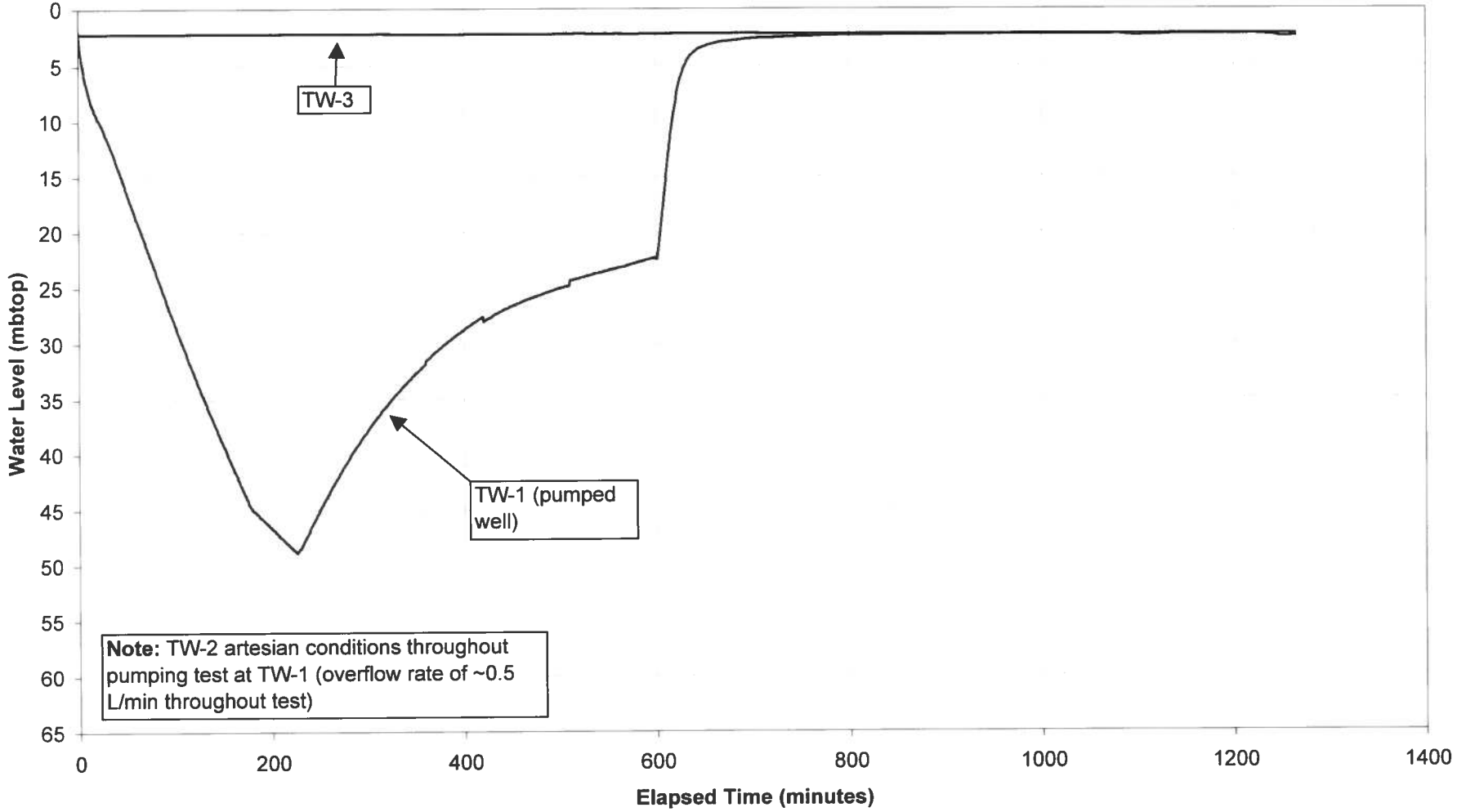
GEO-LOGIC
347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: DRAWDOWN AND RECOVERY CURVES VS LOG ELAPSED TIME
TW-1: October 4, 2010



CONSTANT RATE TW-1 Drilled Well - Granite Ridge Estates Phase 2 Static Level = 1.98m below top of pipe	**LOG TIME VERSUS DRAWDOWN** Q = Pumping Rate T = Transmissivity SC = Specific Capacity	DATE: November 2010 LOCATION: Buckhorn, Ontario JOB NUMBER: G023134E1 DRAWING NUMBER: Plate D-4	GEO-LOGIC INC. *347 PIDO ROAD, UNIT 29* *PETERBOROUGH, ON K9J 6X7*

OBSERVATION WELL MONITORING
Pumping at TW-1: October 4, 2010



OBSERVATION WELL MONITORING

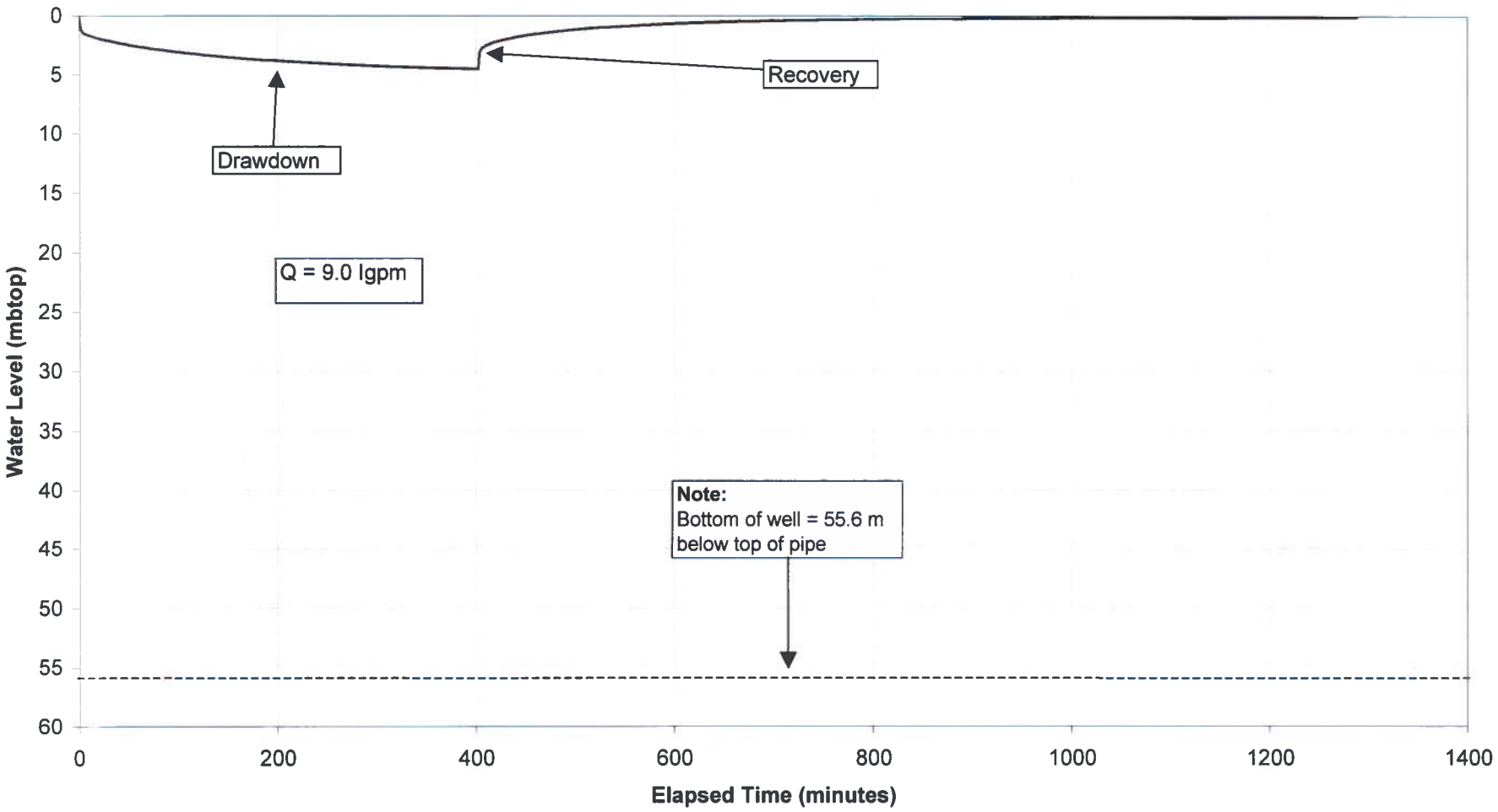
Pumping at TW-1
Drilled Well - Granite Ridge Estates Phase 2

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: D-5

GEO-LOGIC

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

PUMP HISTORY CURVE
TW-2: October 5, 2010



PUMP HISTORY CURVE

TW-2

Drilled Well - Granite Ridge Estates Phase 2

Static Level = Flowing

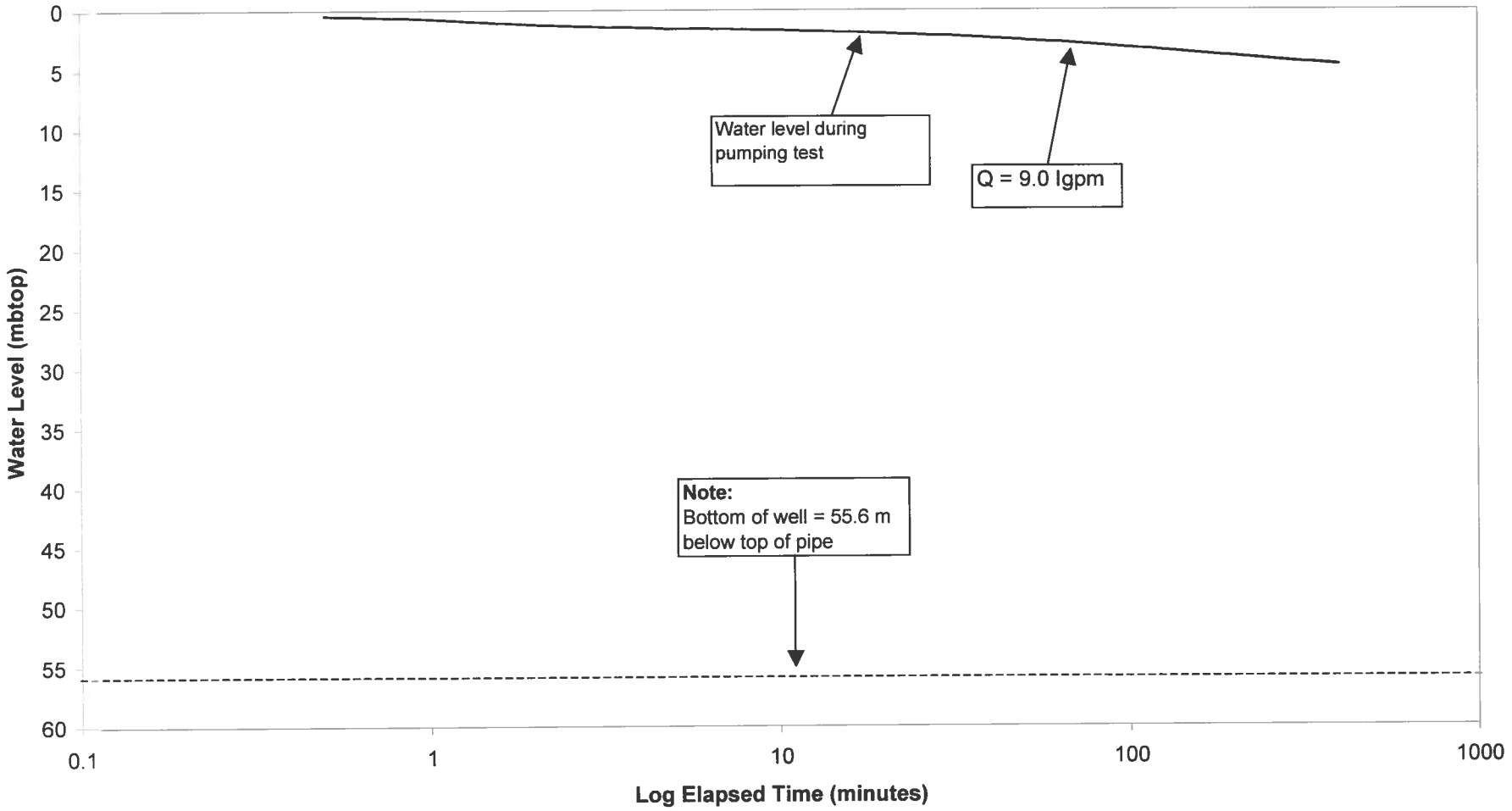
DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-6

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29

PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
TW-2: October 5, 2010



PUMP HISTORY CURVE

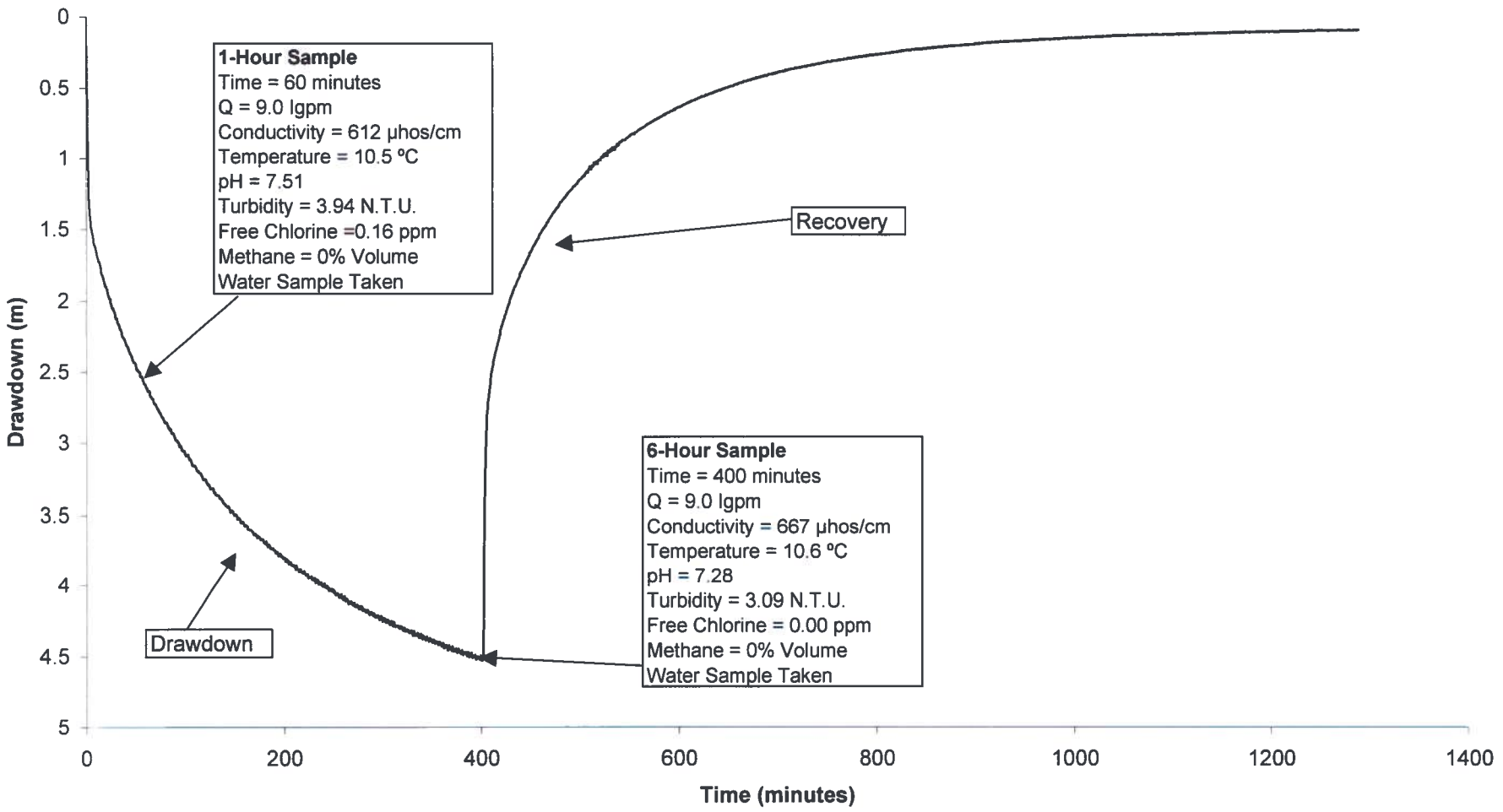
TW-2
Drilled Well - Granite Ridge Estates Phase 2
Static Level = Flowing

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-7

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
TW-2: October 5, 2010



PUMP HISTORY CURVE

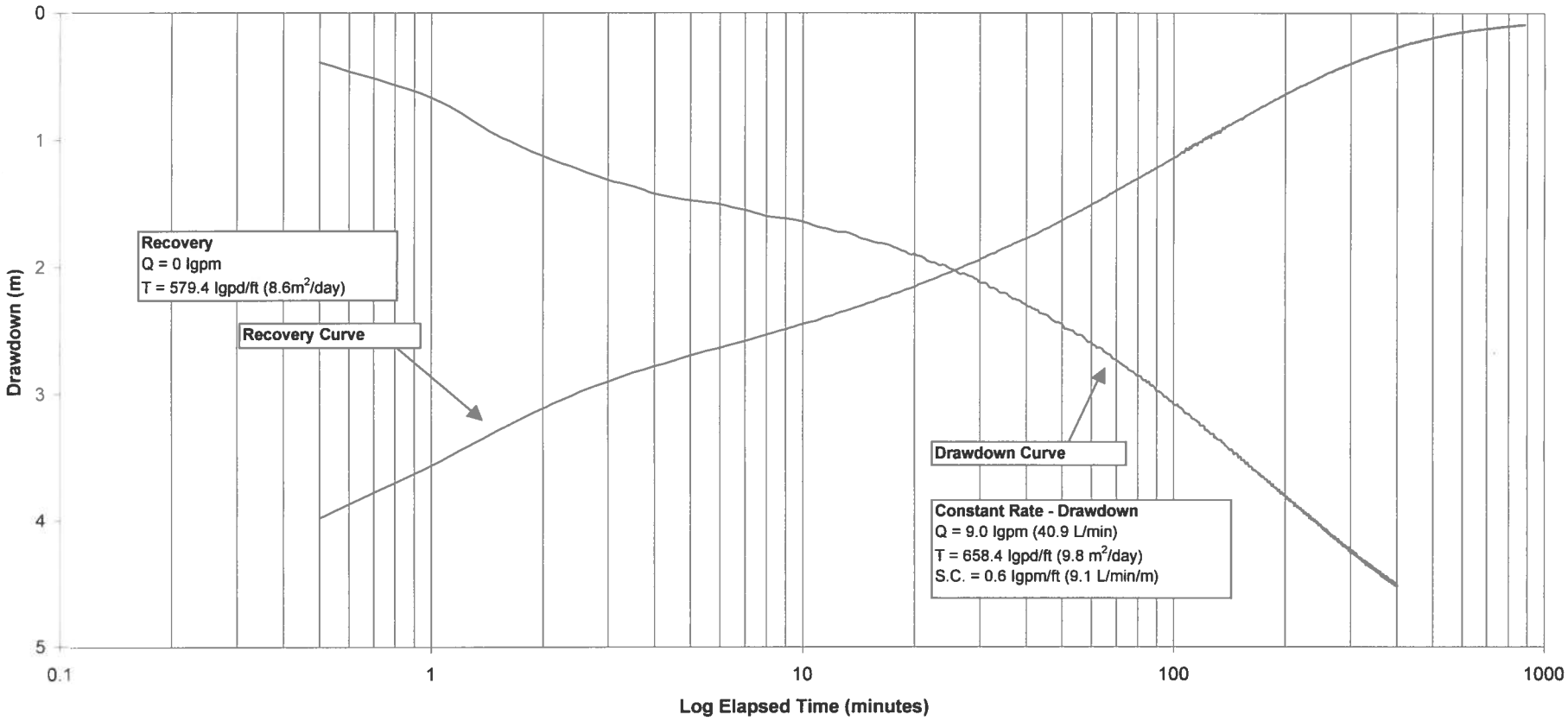
TW-2
Drilled Well - Granite Ridge Estates Phase 2
Static Level = Flowing

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-8

GEO-LOGIC

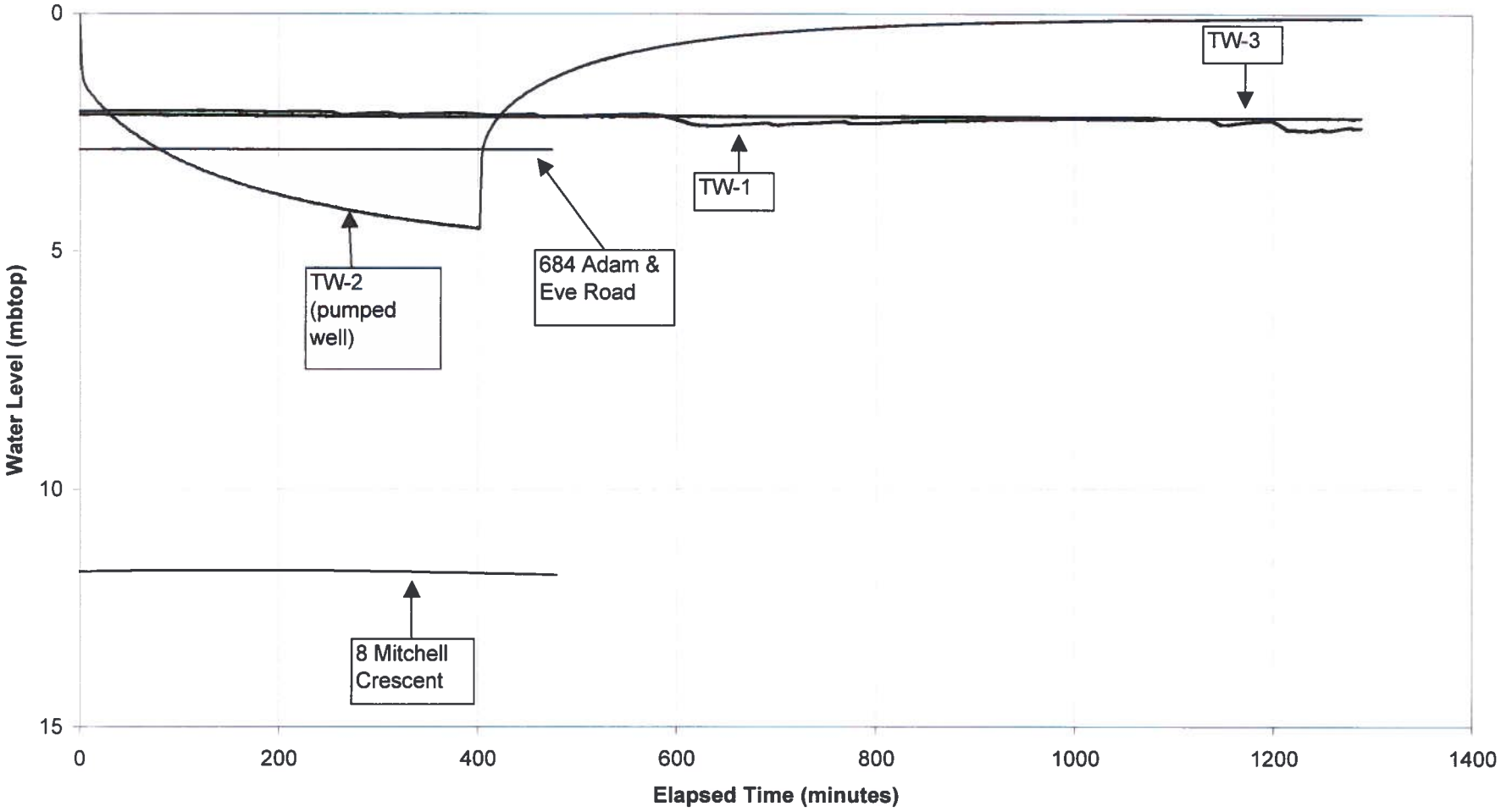
347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: DRAWDOWN AND RECOVERY CURVES VS LOG ELAPSED TIME
TW-2: October 5, 2010



CONSTANT RATE TW-2 Drilled Well - Granite Ridge Estates Phase 2 Static Level = Flowing	**TIME VERSUS DRAWDOWN** Q = Pumping Rate T = Transmissivity SC = Specific Capacity	DATE: November 2010 LOCATION: Buckhorn, Ontario JOB NUMBER: G023134E1 DRAWING NUMBER: Plate D-9	GEO-LOGIC *347 PIDO ROAD, UNIT 29* *PETERBOROUGH, ON K9J 6X7*

OBSERVATION WELL MONITORING
Pumping at TW-2: October 5, 2010



OBSERVATION WELL MONITORING

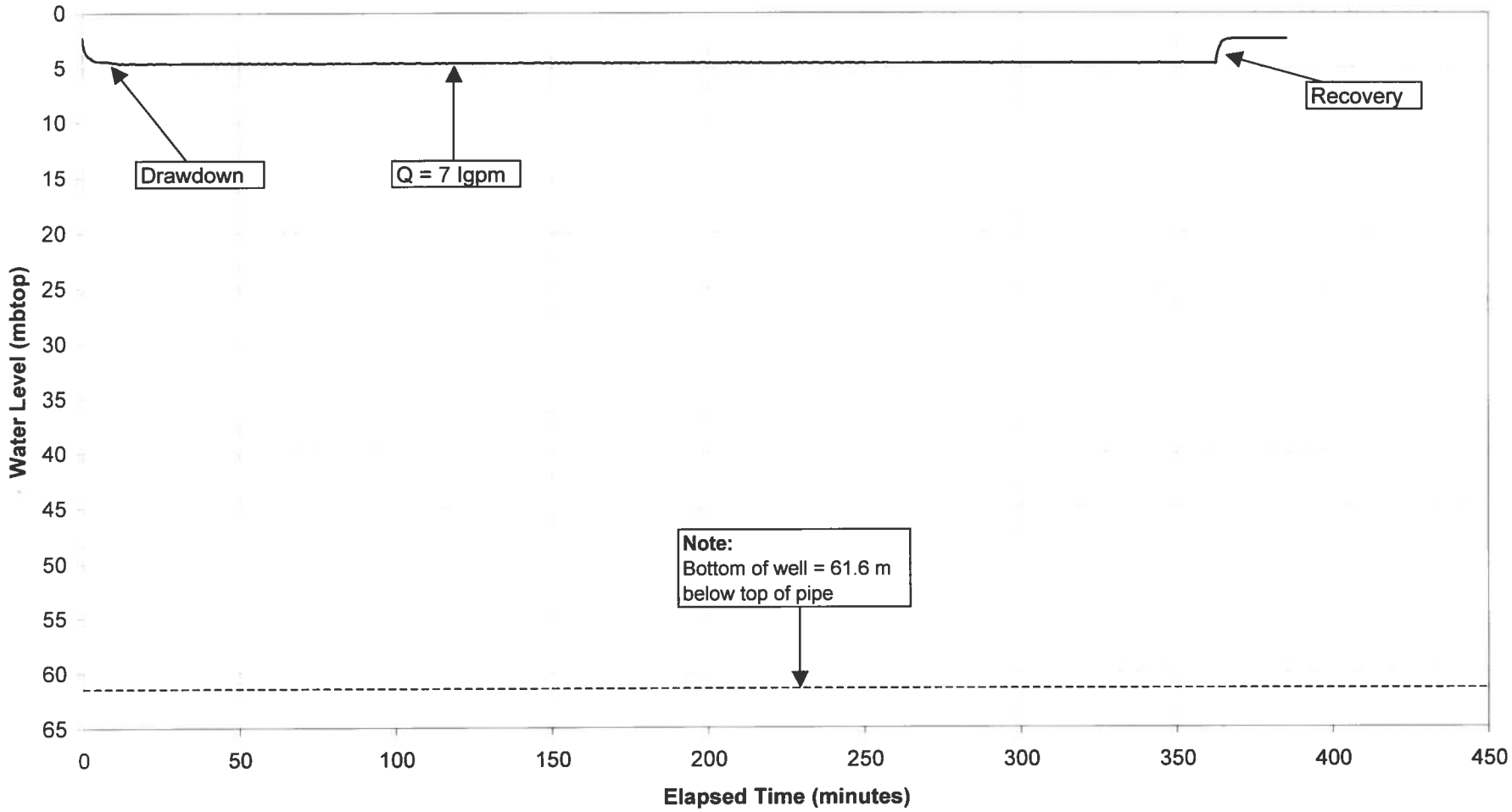
Pumping at TW-2
Drilled Well - Granite Ridge Estates Phase 2

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-10

GEO-LOGIC

347 PIDO ROAD, UNIT 2S
PETERBOROUGH, ON K9J 6X7

PUMP HISTORY CURVE
TW-3: October 6, 2010



PUMP HISTORY CURVE

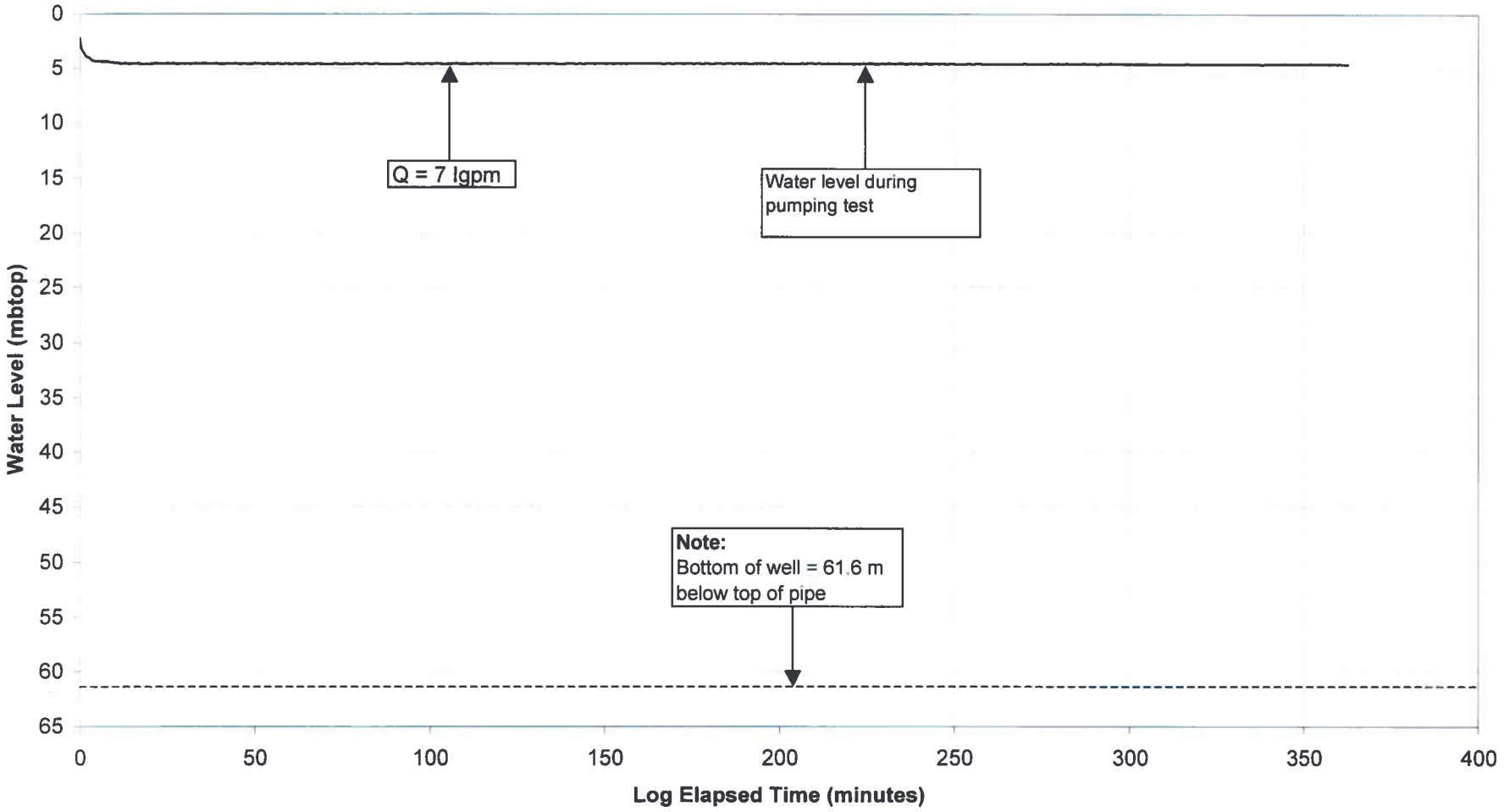
TW-3
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 2.27m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-11

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: WATER LEVEL vs. LOG ELAPSED TIME
TW-3: October 6, 2010



PUMP HISTORY CURVE

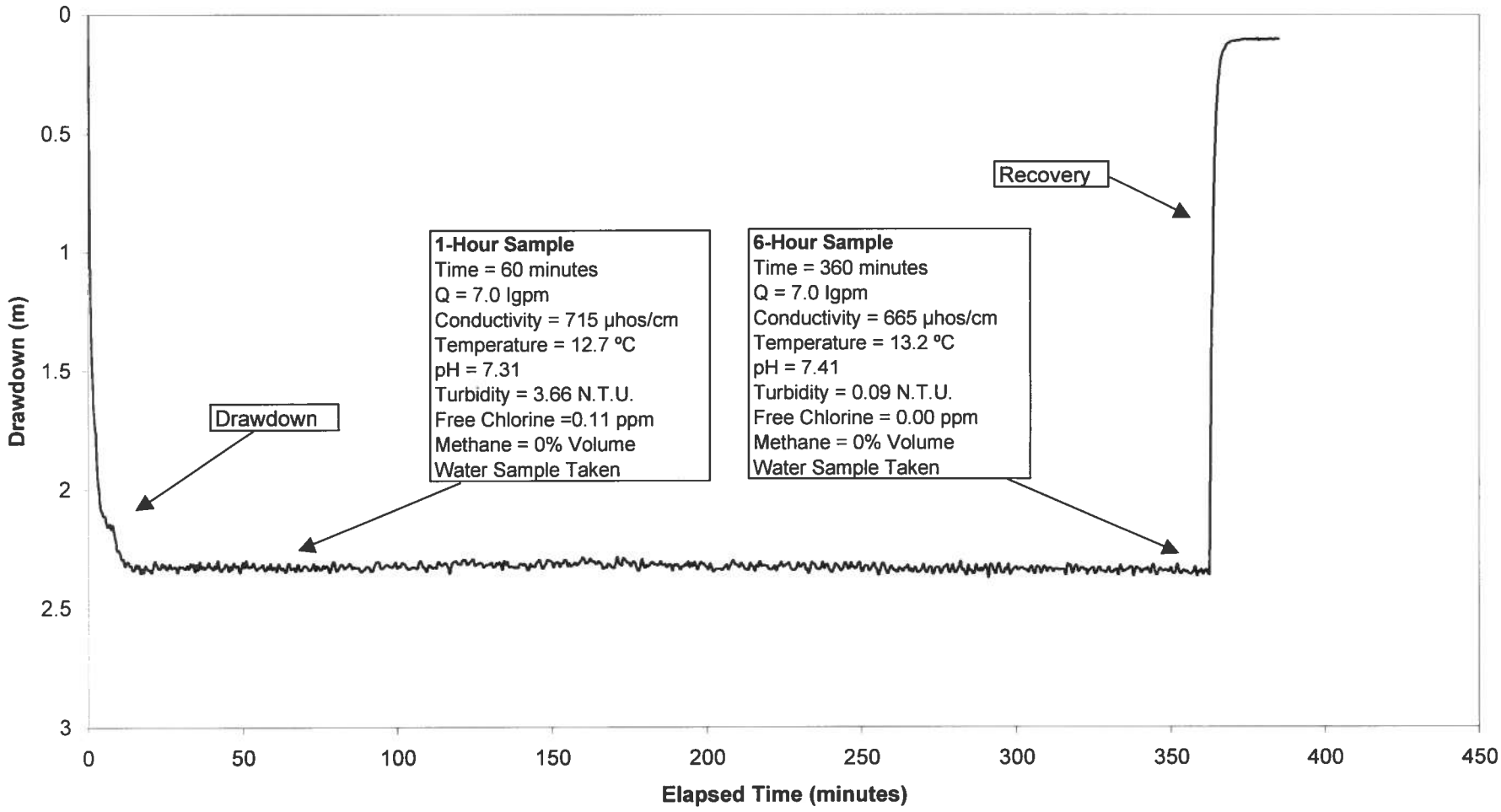
TW-3
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 2.27m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-12

GEO-LOGIC

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE DRAWDOWN, RECOVERY AND TESTING DETAILS
TW-3: October 6, 2010



CONSTANT RATE

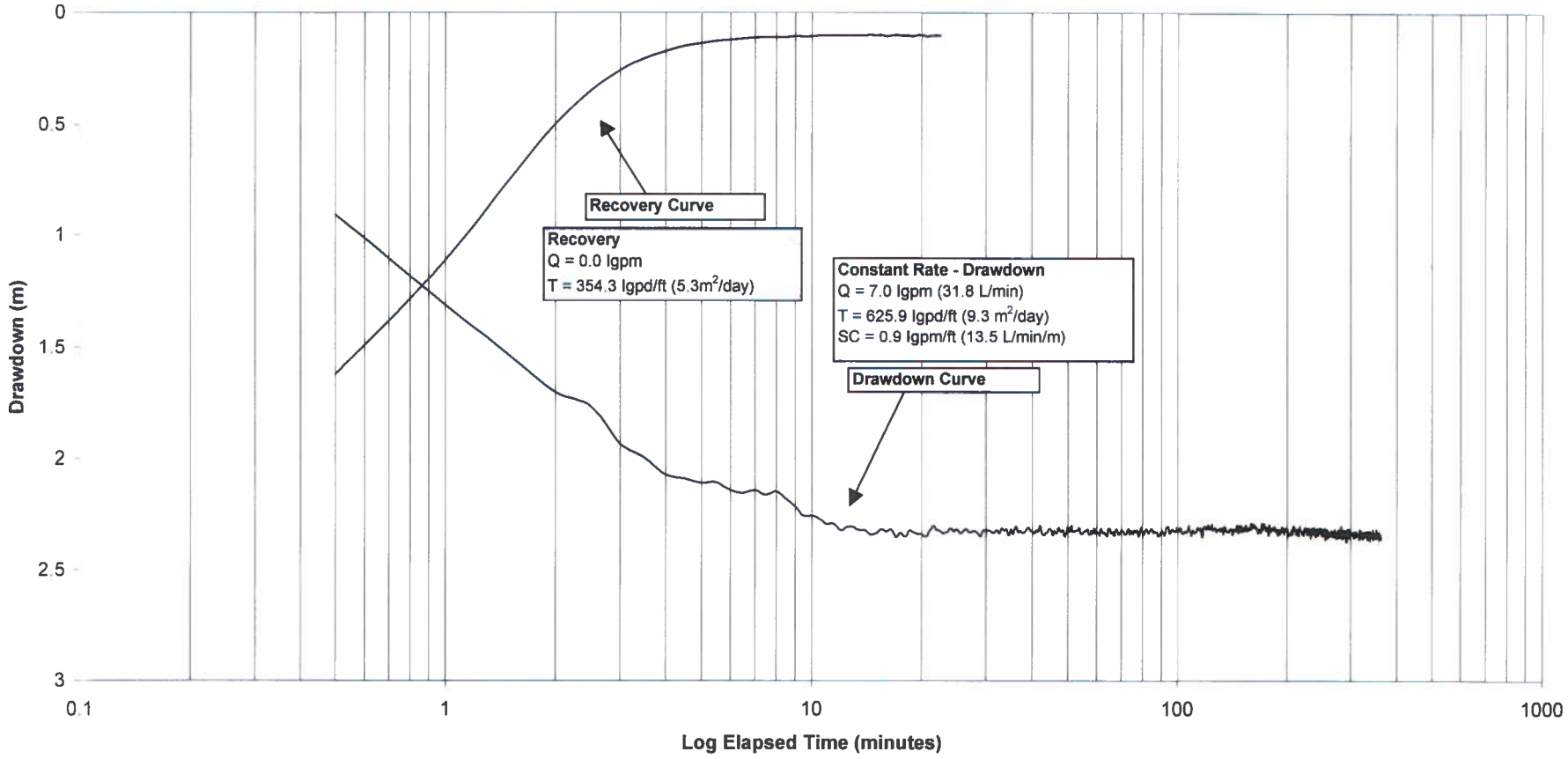
TW-3
Drilled Well - Granite Ridge Estates Phase 2
Static Level = 2.27m below top of pipe

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-13

GEO-LOGIC

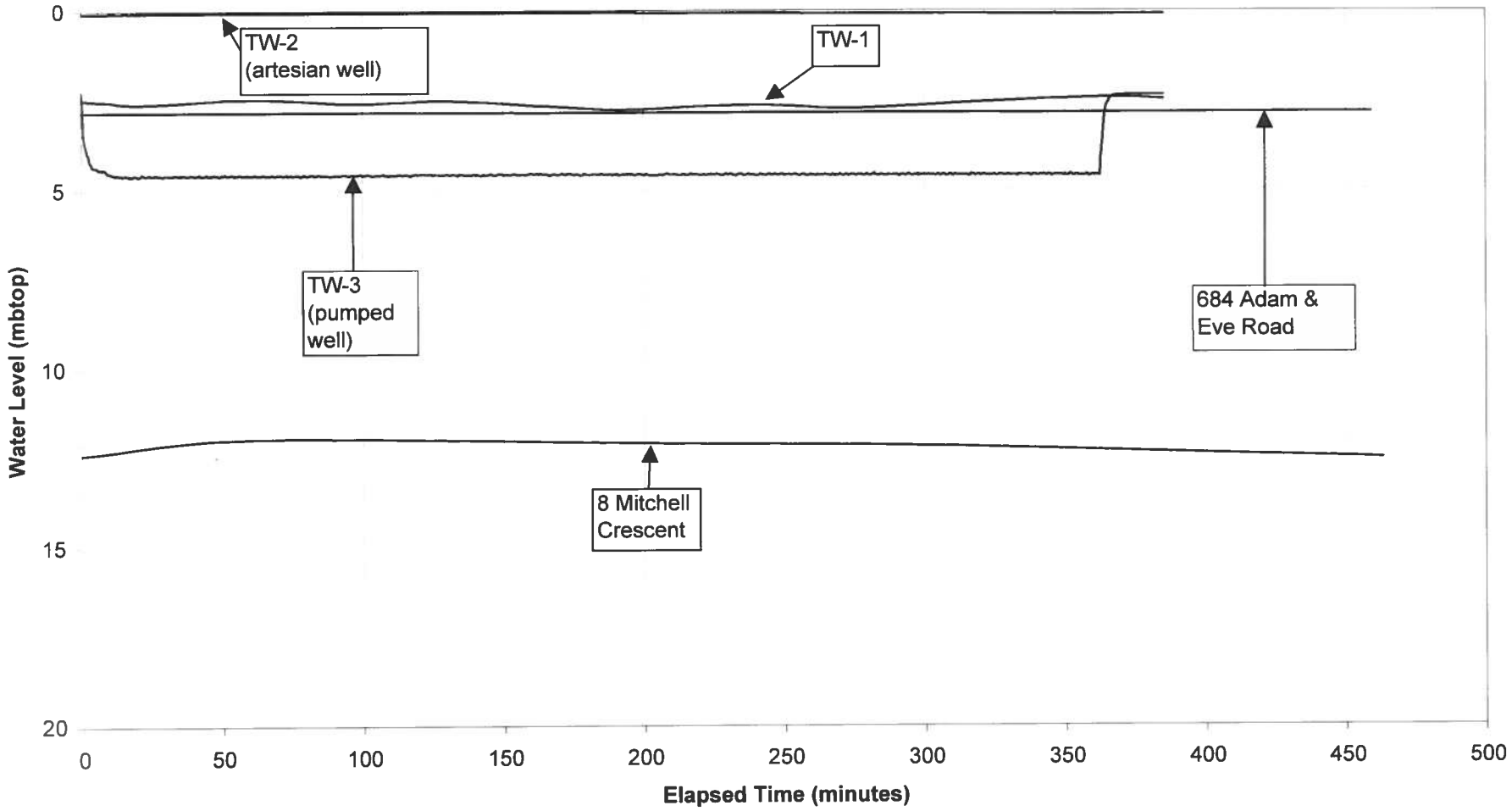
347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

CONSTANT RATE TEST: DRAWDOWN AND RECOVERY CURVES VS LOG ELAPSED TIME
TW-3: October 6, 2010



CONSTANT RATE TW-3 Drilled Well - Granite Ridge Estates Phase 2 Static Level = 2.27m below top of pipe	**TIME VERSUS DRAWDOWN** Q = Pumping Rate T = Transmissivity SC = Specific Capacity	DATE: November 2010 LOCATION: Buckhorn, Ontario JOB NUMBER: G023134E1 DRAWING NUMBER: Plate D-14	GEO-LOGIC *347 PIDO ROAD, UNIT 29* *PETERBOROUGH, ON K9J 6X7*

OBSERVATION WELL MONITORING
Pumping at TW-3: October 6, 2010



PUMP HISTORY CURVE

Pumping at TW-3
Drilled Well - Granite Ridge Estates Phase 2

DATE: November 2010
LOCATION: Granite Ridge Estates
JOB NUMBER: G023134E1
DRAWING NUMBER: Plate D-15

GEO-LOGIC INC.

347 PIDO ROAD, UNIT 29
PETERBOROUGH, ON K9J 6X7

APPENDIX E

WATER BALANCE AND NITRATE CALCULATIONS

Appendix E

Water Budget (Thornthwaite Method) - Average Values*

Lindsay Frost (1974 - 2000) **Elevation**: 262.1 masl

Month	T (°C)	I	E (mm)	Daylight Factor	E adj. (mm)	Total Precip. (mm)	Surplus (mm)	Deficit (mm)
January	-8.9	0	0	0.82	0	67.6	67.60	
February	-7.3	0	0	0.82	0	47.5	47.50	
March	-1.9	0	0	1.03	0	58.4	58.40	
April	5.8	1.25	27.34	1.12	30.62	62.5	31.88	
May	12.8	4.15	62.64	1.27	79.55	81.9	2.35	
June	17.4	6.61	86.40	1.28	110.60	83.9	0.00	26.70
July	20.1	8.22	100.50	1.3	130.65	73.4	0.00	57.25
August	18.9	7.49	94.22	1.2	113.07	89.7	0.00	23.37
September	14.2	4.86	69.84	1.04	72.63	91.7	19.07	
October	7.9	2.00	37.78	0.95	35.90	72.9	37.00	
November	1.8	0.21	8.02	0.81	6.50	84.1	77.60	
December	-5.1	0	0	0.78	0	67.9	67.90	
TOTAL	6.3	34.78	486.75		579.51	881.5	409.30	107.31

Therefore, the water surplus is: 302.0 mm

Notes:

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

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

$E=0$ when $T_i<0$ °C

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

$E=-415.85+32.24T_i-0.43T_i^2$ when $T_i>26.5$ °C

$a=6.7\times10^{-7}I^3-7.71\times10^{-5}I^2+1.79\times10^{-2}I+0.49$

a = 1.047523

Appendix E

HYDROGEOLOGIC INVESTIGATION - WATER BALANCE CALCULATIONS

Report G023134E1

AREA

Site Area 18.85 ha

Precipitation	881.5 mm/year	Lindsay Frost (1974 - 2000)
Regional evapotranspiration	579.5 mm/year	
Recharge available	302.0 mm/year	

PRE-DEVELOPMENT

Estimated Site Area	18.85 ha
Estimated Site Area	188500 m^2
Water Surplus	56925.2 m^3/year
Estimated Infiltration Factor	0.63
Recharge available for infiltration	189.4 mm/year
Expected Annual Infiltration	35705.8 m^3/year
Expected Daily infiltration	97.8 m^3/day
Infiltration Rate	0.00113 m^3/sec
Run off coefficient	0.37275862
Estimated run off	21219.3 m^3/year
EXPECTED SITE INFILTRATION	35705.8 m^3/year
EXPECTED SITE RUNOFF	21219.3 m^3/year

PRE-DEVELOPMENT FEATURES

Total Area	Area (ha)	Infil. Factor	Product
Undeveloped area	16.90	0.59	9.97
Pond	1.95	0.95	1.9
	18.85		11.8
		0.63	

Infiltration Factor Determination - Pre-Development	Value	Selected
Topography		
Flat land, average slope <0.6 m/km	0.3	
Rolling land, average slope 2.8 to 3.8 m/km	0.2	
Hilly land, average slope 28 to 47 m/km	0.1	0.12
Soils		
Tight impervious clay	0.1	
Medium combinations of clay and loam	0.2	0.35
Open sandy loam	0.4	
Cover		
Cultivated land	0.1	0.12
Woodland	0.2	
	Total	0.59

POST-DEVELOPMENT (no mitigation techniques)

Estimated Site Area	18.85 ha
Estimated Site Area	188500 m^2
Water Surplus	60668.9 m^3/year
Estimated Infiltration Factor	0.53
Recharge available for infiltration	321.9 mm/year
Expected Annual Infiltration	32449.7 m^3/year
Expected Daily infiltration	88.9 m^3/day
Infiltration Rate	0.00103 m^3/sec
Run off coefficient	0.47
Estimated run off	28219.2 m^3/year
\ Run off (vs pre-development)	6999.9 m^3/year
EXPECTED SITE INFILTRATION	32449.7 m^3/year
% Difference (pre- vs post-)	-9.1% **Decrease from Pre-Development Conditions**
EXPECTED SITE RUNOFF	28219.2 m^3/year
% Difference (pre- vs post-)	33.0% **Increase from Pre-Development Conditions**

WATER SURPLUS CALCS

Consider evaporation only for impervious surfaces

(assume 50% loss to evaporation)

Estimated Site Area	2.7 ha	Estimated Site Area	16.2 ha
Estimated Site Area	26980 m^2	Estimated Site Area	161520 m^2
Water Surplus	11891.4 m^3/year	Water Surplus	48777.5 m^3/year

Overall, water surplus will increase due to asphalt and roof surfaces and less uptake of water by plants.

WATER SURPLUS CALCS

Evapotranspiration for all other areas

SITE SPECIFIC DEVELOPMENT FEATURES

Total Area	Area (ha)	Infil. Factor	Product
Asphalt surfaces	2.25	0	0
Lawns (#1)	3.76	0.65	2.4
Lawns (#2)	10.00	0.55	5.5
Gravel driveways	0.096	0.45	0.04
Pond Block	1.95	0.95	1.9
Open Space	0.35	0.7	0.2
House footprint	0.45	0	0.0
	18.85		10.1
		0.53	

Infiltration Factor Determination - Post-Development	***(#1) Lots 5-7, 13, 16-20*** Value	Selected	***(#2) Lots 1-4, 8-12, 14-15, 21-32*** Value	Selected
Topography				
Flat land, average slope <0.6 m/km	0.3		0.3	
Rolling land, average slope 2.8 to 3.8 m/km	0.2	0.2	0.2	
Hilly land, average slope 28 to 47 m/km	0.1		0.1	0.1
Soils				
Tight impervious clay	0.1		0.1	
Medium combinations of clay and loam	0.2		0.2	
Open sandy loam	0.4	0.3	0.4	0.3
Cover				
Cultivated land	0.1		0.1	
Woodland	0.2	0.15	0.2	0.15
	Total	0.65	Total	0.55

Notes:

1. Assume 1500 sq. ft house footprint
2. Assume that road and roof water is lost
3. Assume some compaction of soil due to equipment
4. Assume gravel driveways 3 m by 10 m
5. Sidewalks not considered in calculations
5. Patios not considered in calculations

POST-DEVELOPMENT WITH MITIGATION ENHANCEMENT TECHNIQUES INCLUDED

Estimated Site Area	18.85 ha
Estimated Site Area	188500 m^2
Water Surplus	60668.9 m^3/year
Estimated Infiltration Factor	0.57
Recharge available for infiltration	321.9 mm/year
Expected Annual Infiltration	34731.6 m^3/year
Expected Daily infiltration	95.2 m^3/day
Infiltration Rate	0.00110 m^3/sec
Run off coefficient	0.43
Estimated run off	25937.3 m^3/year
\ Run off (vs pre-development)	4718.0 m^3/year
EXPECTED SITE INFILTRATION	34731.6 m^3/year
\ SITE INFILTRATION (vs. pre-dev	-974.2 m^3/year
% Difference (pre- vs post-)	-2.7% **Decrease from Pre-Development Conditions**
EXPECTED SITE RUNOFF	25937.3 m^3/year
\ SITE RUN OFF (vs. pre-dev)	4718.0 m^3/year
% Difference (pre- vs post-)	22.2% **Increase from Pre-Development Conditions**

SITE SPECIFIC DEVELOPMENT FEATURES

Total Area	Area (ha)	Infil. Factor	Product
Asphalt surfaces	2.25	0.2	0.45
Lawns (#1)	3.76	0.65	2.44
Lawns (#2)	10.00	0.55	5.50
Gravel driveways	0.096	0.45	0.04
Pond Block	1.95	0.95	1.9
Open Space	0.35	0.7	0.2
House footprint (#1)	0.13	0.65	0.1
House footprint (#2)	0.32	0.55	0.2
	18.85		10.8
		0.57	

Infiltration Factor Determination - Post + Mitigation	***(#1) Lots 5-7, 13, 16-20*** Value	Selected	***(#2) Lots 1-4, 8-12, 14-15, 21-32*** Value	Selected
Topography				
Flat land, average slope <0.6 m/km	0.3		0.3	
Rolling land, average slope 2.8 to 3.8 m/km	0.2	0.2	0.2	
Hilly land, average slope 28 to 47 m/km	0.1		0.1	0.1
Soils				
Tight impervious clay	0.1		0.1	
Medium combinations of clay and loam	0.2	0.3	0.2	0.3
Open sandy loam	0.4		0.4	
Cover				
Cultivated land	0.1		0.1	
Woodland	0.2	0.15	0.2	0.15
	Total	0.65	Total	0.55

Notes:

1. Assume 1500 sq. ft house footprint
2. Assume that roof drains to rear lawn
3. Assume some compaction of soil due to equipment
4. Assume gravel driveways 3 m by 10 m
5. Sidewalks not considered in calculations
5. Patios not considered in calculations
6. Assume asphalt has 10% infiltration and also runoff to side margins (additional 10%)

Therefore, the Site will see a minor DECREASE in infiltration and an INCREASE in surface water runoff due to the development. The net changes to the groundwater balance (i.e. infiltration) will be insignificant and groundwater baseflow will be maintained.

Appendix E

Recharge Calculations for Nitrate Assessment

Recharge Calculations

TOTAL		
Average Annual Water Surplus	302.0	mm/yr
Total Area Considered	18.85	ha
Infiltration Factor	0.57	
Average annual recharge rate	172.9	mm/yr
Total Average annual recharge rate	4736.5	L/ha/day
Daily recharge volume	89283.21	L/day

Recharge rate based on excavation*	225	mm/yr	
Average recharge rate	198.9	mm/yr	Average using infiltration factor and test pits
Average recharge volume	102740.9	L/day	

Note: *Geo-Logic completed 8 test pits where sand was generally observed. The annual average recharge rates for sand is 225 mm

Nitrate Assessment

Background nitrate	0.5	mg/L	From analytical testing of monitoring well
Nitrate	40	mg/L	Constant
Effluent	32000	L/day	Constant
Lots	32	lots	Number of lots proposed
Onsite dilution	102740.9	L/day	Daily recharge volume
Nitrate in recharge	0.0	mg/L	

Projected Nitrate Level = Background + (Sewage Nitrate+Dilution Nitrate)/(Onsite Dilution+Effluent)

Where: Sewage = Nitrate * Effluent

Dilution Nitrate = Onsite Dilution * Nitrate in recharge (assumed to be zero)

Projected Nitrate Level = 10.0 mg/L

Background nitrate samples:		[Nitrate]	
Monitoring well		0.5	mg/L
	Average	0.5	mg/L