

Geotechnical
Engineering

Environmental
Engineering

Hydrogeology

Geological
Engineering

Archaeological Studies

Materials Testing

patersongroup

Existing Conditions Report:
Hydrogeology:
Cardinal Creek Village
Ottawa (Cumberland), Ontario

Prepared For:
Tamarack Homes

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road Sout
Ottawa (Nepean), Ontario
Canada , KW2 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

November 7, 2012

Report: PH1890-REP.01

TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	
1.0 INTRODUCTION	
1.1 Terms of Reference	1
1.2 Background	1
2.0 PHYSIOGRAPHY	3
3.0 GEOLOGY	
3.1 Surficial Geology	4
3.2 Bedrock Geology	5
3.2.1 Paleozoic Bedrock	6
3.2.2 Karst Features	7
4.0 HYDROGEOLOGICAL SETTING	
4.1 Infiltration Potential and Groundwater Recharge	9
4.2 Groundwater Discharge and Baseflow	10
4.3 Flow Systems	11
4.4 Preferential Pathways for Groundwater Flow	12
5.0 AQUIFER AND GROUNDWATER USE	
5.1 Aquifer Delineation	13
5.2 Aquifer Vulnerability	14
5.3 Water Supply Wells	14
5.4 Construction Precautions for Protecting Existing Offsite Wells	17
6.0 NEXT STEPS	18
7.0 REFERENCES	19

APPENDICES

Appendix 1	Soil Profile and Test Data Sheets
Appendix 2	Published MOE Well Data for Local Water Wells
Appendix 3	References and Supporting Documentation
Appendix 4	Drawing No. PH1890-1: Test Hole Location Plan
	Drawing No. PH1890-2: Preliminary Bedrock Contour Plan
	Drawing No. PH1890-FIG.1: Site Location Plan
	Drawing No. PH1890-FIG.2: Surficial Soils Delineation Plan
	Drawing No. PH1890-FIG.3: Regional Bedrock Mapping and Existing Water Wells Plan

EXECUTIVE SUMMARY

The Hydrogeology Existing Conditions report provides a detailed description of the geology and groundwater conditions present at the proposed Cardinal Creek Village lands. The descriptions provided are based on published mapping and regional reports and augmented with detailed field investigations as part of a comprehensive geotechnical investigation carried out, to date, on the subject lands.

The Cardinal Creek Village consists of a 225 hectare tract of land proposed to undergo urban development east of Cardinal Creek and spanning north and south of Old Montreal Road. Physiographically, the subject property is dominated by low permeable silty clay and marine glacial till surficial soils. Surficial drainage is generally towards the Ottawa River, but drainage is bisected by two (2) tributaries of Cardinal Creek directing surface water and shallow overburden groundwater into the Creek system.

The overburden found on the subject property consists of stiff silty clay and glacial till of marine origins overlying Paleozoic limestone bedrock. Overall estimated saturated hydraulic conductivities of the overburden soils are considered to be low and generally unsuitable for the infiltration of surface water as part of an overall stormwater management plan for the subject property.

The bedrock which underlies the subject property consists of generally flat-lying carbonate sedimentary rock composed of layers of Paleozoic bedrock from the Middle and Upper Ordovician and Oxford Formations. Bedrock contours reveal that surficial topography is dominated by the presence of the bedrock beneath the site.

Karst features were identified on lands in excess of 400m to the west of the subject property and situated along Cardinal Creek. These features are contained within the Bobcaygeon Formation limestone and consist of a tunnel valley system with a unique set of geologic features which comprise an Area of Natural and Scientific Interest (ANSI). Karst features were not identified on the subject property and proposed development activities on the subject property are not anticipated to impact the Karst within the ANSI area. Potential areas for Karst features on the subject lands will be investigated as part of the detailed site investigation program.

Infiltration rates of between 13 mm/year and 126 mm/year can be expected from the existing surficial soils, based on estimated hydraulic conductivities for silty clay and marine glacial till, respectively. The subject property is not considered to be a groundwater recharge area and no continuous overburden groundwater aquifer is defined on the site.

The surficial drainage patterns, identified on the subject property, are such that shallow overburden groundwater can discharge into the bisecting drainage tributaries of Cardinal Creek and may contribute to base flow within these watercourses. However, no evidence of lateral seepage was noted along the upgradient or downgradient faces of the drainage courses at the time of preparation of this report.

The groundwater flow systems present beneath the site consist of an upper and lower bedrock aquifer system. This aquifer system is contained, for the most part, within the Middle and Upper Ordovician Formation bedrock and both aquifer systems are utilized by privately serviced properties abutting the subject property. The upper aquifer system is utilized by water wells constructed to the west of the subject lands and the lower aquifer system is utilized by water wells constructed to the east of the subject lands.

The preferential pathway for groundwater flow is limited to shallow overburden groundwater movement, where present, towards the drainage tributaries and ultimately the Ottawa River.

The upper and lower aquifer systems are not considered to be vulnerable based on DRASTIC analysis. Construction related activities involving blasting of bedrock have been identified as possibly resulting in temporary impact to neighbouring water wells intercepting the upper aquifer system, on a isolated and localized basis. Limits on ground vibrations of 12.5 mm/s have been set on measurements made at offsite neighbouring wells for blasting operations. A comprehensive water well baseline study of neighbouring wells has been recommended to establish baseline water quality and quantity data prior to the construction phase of the development.

Existing water wells have been identified within the limits of the subject lands and have been identified as requiring decommissioning in accordance with existing legislative requirements.

1.0 INTRODUCTION

1.1 Terms of Reference

Paterson Group (Paterson) was commissioned by Tamarack Homes Ltd. (Tamarack) to complete an existing conditions assessment from a hydrogeological perspective for a large tract of land (225 ha) proposed to undergo urban development located east of the City of Ottawa's existing urban boundary and spanning to the north and south of Old Montreal Road.

The purpose of this study has been to combine available background information from numerous literature sources with site specific fieldwork data to prepare a report which summarizes the existing hydrogeological conditions at the site which can be utilized to address potential groundwater impacts on existing adjacent rural development and provide recommendations on proposed development activities.

1.2 Background

The study area, hereafter referred to as the subject property, is identified in Drawing No. PH1890-FIG.1 - Site Location Plan, contained in Appendix 4. Regional Road 174 and the Ottawa River border the northern limits of the site, with Ted Kelly Drive and Frank Kenny Road to the east, and the Cardinal Creek corridor to the west.

Agricultural lands extend to the south beyond the subject property. Rural estate lot development is located beyond the proposed eastern limits of the subject property beyond Frank Kenny Road/Ted Kelly Drive. Moreover, a medium density residential development, also on private services, is located to the west of the subject property beyond Cardinal Creek. A series of low density residential, institutional and commercial land uses are present along Old Montreal Road both adjacent to, and inside the proposed subject property development area.

It is understood that the subject property will be developed as a combination of residential and commercial uses and will be serviced by municipally supplied water and sanitary sewer services. It is further understood that stormwater management will consist of a series of stormwater management facilities ultimately outletting to the Ottawa River and it's tributary, Cardinal Creek.

Paterson has previously completed a Phase I Environmental Site Assessment on the subject property under separate cover. Reference should be made to Paterson Report No. PE2392-1. In addition, Paterson has completed a geotechnical investigation concurrent with this study report. The findings and recommendations of the geotechnical investigation are contained within Paterson Report No. PG1796-1R, dated November 7, 2012. This report draws on the findings of the geotechnical investigation as it relates to the site specific delineation of the thickness and areal extent of the surficial soils within the site boundaries and utilizes the test hole and borehole information obtained from that study.

2.0 PHYSIOGRAPHY

The subject property is primarily dominated by agricultural lands with some remnant forest parcels present along the edges of the property to the south, west and east. The physiography of the site is largely controlled by the underlying rock structures and overlying unconsolidated materials (overburden). The subject property exists as a series of plateau areas separated by defined vertical elevation displacements consistent with escarpment formations.

Drainage on the subject property is considered to be discontinuous to poor within the flat-lying areas within the plateau areas. Most surficial drainage moves towards two (2) drainage tributaries which bisect the direction of surficial flow. Generally the surficial drainage and shallow overburden groundwater flows towards the Ottawa River following the sloping topography, or to the Cardinal Creek network which ultimately outlets into the Ottawa River. Cardinal Creek and its' two (2) related tributaries present on the subject property, are delineated on the Site Location Plan, Paterson Drawing No. PH1890-FIG.1 located in Appendix 4.

3.0 GEOLOGY

The geology of the site is separated into the surficial geology and the bedrock geology. The surficial geology pertains to the unconsolidated material (overburden) present at the ground surface and extending to the face of the underlying bedrock. The bedrock geology pertains to the solid rock forming part of the earth's crust.

3.1 Surficial Geology

The surficial soils in the vicinity of the subject area generally consist of series of silty clay and marine till, generally consistent with marine deposits associated the Champlain Sea.

Based on the borehole program, overburden thickness across the site varies between 1.2 m and greater than 10 m across the site. Using well recognized techniques for the field identification of soils, three (3) unique stratigraphic units were identified in the areas investigated. The soils were classified using the Unified Soil Classification System (USCS) and percolation rates were estimated based on published data correlating soil types to permeability while accounting for variability in the consistency of the soil as identified by the soil morphology. The stratigraphic units are summarized in Table 1, and a detailed description of our findings at each of the test locations is provided on the Soil Profile and Test Data Sheets which appear in Appendix 1.

Based on the findings of the geotechnical investigation, the subject property is generally overlain by two (2) dominant stratigraphic units of marine origin: silty clay and a marine glacial till. A third stratigraphic unit, a silty sand with trace clay was noted in several test holes, but is discontinuous throughout the site and is present in isolated pockets only. The silty sand, where encountered, was present in a thin veneer near the ground surface and was underlain by a stiff to very stiff silty clay. Reference should be made to Paterson Drawing No. PH1890-1 - Test Hole Location Plan in Appendix 4, which has been reproduced from the geotechnical investigation.

A review of the available surficial soils mapping for the area, obtained from the Ontario Geologic Survey reveals that the actual site specific soil conditions compare well with the published mapping. Reference can be made to Paterson Drawing No. PH1890-FIG.2 in Appendix 4 in which the relevant portion of the published mapping as been reproduced.

TABLE 1: SUMMARY OF UNIQUE STRATIGRAPHIC UNITS ENCOUNTERED ON SUBJECT PROPERTY BASED ON FINDINGS OF THE GEOTECHNICAL INVESTIGATION WITHIN THE STUDY AREA				
TERRAIN UNIT	USCS CLASSIFICATION	GENERAL THICKNESS (m)	ESTIMATED PERC. RATE² (min/cm)	IN SITU SATURATED HYDRAULIC CONDUCTIVITY (cm/sec)
1	SW-SC- silty sand trace clay	0.2 to 0.6	25 to 35	4×10^{-5}
2	CH- Silt clay with high plasticity (i.e. "fat clay")	0.8 to more than 9.0	40 to 100	4×10^{-8}
3	GC- Glacial Till	1.0 to more than 5.0	30 to 40	4×10^{-7}

1. Maximum depth of test hole excavation of 10 m below ground surface.
2. Estimated percolation rate based on a cross-referencing of the measured insitu hydraulic conductivity of the soil in each terrain unit against a corresponding percolation rate as summarized in SG6 of the Ontario Building Code (1997).

3.2 Bedrock Geology

A review of the available borehole information reveals that bedrock is present at variable depths across the subject lands. In the southern quadrant of the subject lands, the overburden thins and bedrock outcrops along a southern ridge line where a significant elevation transition occurs. Similarly, the overburden thins again in the northern quadrant along a second ridge line defining another abrupt elevation transition downwards towards the Ottawa River.

A cursory review of the reported bedrock elevations, as depicted in the Preliminary Bedrock Contour Plan- Drawing No. PH1890-2, reveals that the bedrock surface topography strongly influences the surficial topography throughout the site. Moreover, the depth to bedrock varies significantly from the south to the north, with the shallowest areas of overburden cover being limited to the vertical escarpments where bedrock outcrops slightly.

A description of the bedrock geology of the subject property is advanced in the following sections:

3.2.1 Paleozoic Bedrock

The subject property is underlain by generally flat-lying carbonate bedrock of sedimentary origin. Most of the bedrock present beneath the site consists of layers of limestone and similar sedimentary rock of varying thicknesses. These layers of bedrock form part of the sequence of Middle and Upper Ordovician limestone with interbeds of dolostone, shale and quartz sandstone, generally referred to as Ottawa Group.

A thin sliver of the northern most portion of the subject property is underlain by limestone of the Oxford Formation, a Lower Ordovician limestone of the Beekmantown Group. The Oxford transitions from the Middle Ordovician layers by way of a vertical fault. Relevant sections of the bedrock mapping for the immediate vicinity of the subject property have been reproduced from available Ontario Geologic Survey Graphical Information Service data and is presented in Paterson Drawing No. PH1890-FIG.3 in Appendix 4. A brief description of each of the three (3) dominant limestone formations is provided below.

Oxford Formation - Lower Ordovician - Beekmantown Group

The Oxford Formation is the youngest of the Lower Ordovician bedrock strata and consists mainly of brownish grey to green-grey, very fine to medium crystalline dolostone, present in thin to very thick layers. Localized interbedding of shale, quartz sandstone and shaley dolostone is common towards the base of the formation.

Gull River and Bobcaygeon Formations - Middle Ordovician - Ottawa Group

The Gull River Formation is characterized by fine grained light grey to brown limestones with variable and sparse fossil content. Greenish grey to tan-weathered silty dolostone beds become more prevalent towards the base of the formation. Minor shales and thin sandstone beds are also present in localized areas.

The Bobcaygeon Formation is characterized by brown to grey-brown fossiliferous limestone. Thin shale interbeds or partings are prevalent in the upper parts and calarenites and nodal textures are common in the lower part. The Formation was laid down in a shallow, marine, inland sea environment. The Bobcaygeon Formation limestone can be observed at the ground surface as a weathered bedrock outcrop feature along the top of the southern ridge line.

3.2.2 Karst Features

The term karst is generally used to describe a geologic formation shaped by the dissolution of a layer, or layers of soluble bedrock, typically carbonate rock such as limestone or dolostone.

The area to the southwest of the subject property situated at the crossing of Cardinal Creek under Watters Road which is in excess of 400 m beyond the nearest edges of the subject lands, has been identified as an Area of Natural and Scientific Interest (ANSI) due to the presence of Karst Features observed at that location. The primary reference for the detailed description of this ANSI is the Earth Science Inventory Report prepared by the Ontario Ministry of Natural Resources (MNR) in 1991. This document has been appended to this report in Appendix 3. Other references in the summary, below, are summarized in Section 7.0.

The Cardinal Creek Karst represents a karst tunnel valley system by which surface water disappears beneath the surface into an entrance cave, and re-appears at several waterfalls along Cardinal Creek as springs. The main karst features which occur in this system include surface etching and pooling of waters (karren), sink holes, dry stream beds, artesian springs and sinks. A “breakdown collapse” feature was identified in 2008 which is believed to be unique to the Province. This particular feature is described as a large sinkhole (doline) present above the central portion of the cave structure which has been largely sealed by clay.

At the Cardinal Creek Karst, the exposed bedrock was confirmed to be that of Bobcaygeon Formation of the Ottawa Group. Documentation reference in the preparation of the Earth Science Inventory Report suggests that the east-west trending joint sets of the Bobcaygeon Formation were one of the primary factors in the development of the karst system as groundwater was able to flow through these joint sets. It is further opined in these references that the localized nature of the Cardinal Creek valley drainage system is also a critical component in its development.

The approximate area of the Karst formation was accurately delineated by Golder Associates Ltd. (Golder) and presented in a hydrogeological study report for an urban development located to the west-southwest of the subject property (September 2009). The limits of the Karst formation which were presented in the Golder report are reproduced on Paterson Drawing No. PH1890-FIG.3 for reference purposes. It is noted that these delineated limits are located a considerable distance away from the western limits of the subject property and development within site limits is not expected to impact the Karst features contained within that area.

While a segment of the southern quadrant of the subject property is underlain directly by Bobcaygeon Formation limestone, for the most part, the thickness and composition of surficial soils are not conducive to vertical infiltration to any significant extent both directly under or upgradient of the site. Where bedrock outcrops on the site, a cursory assessment by Paterson indicates that the rock is weathered, blocky, with soil filled fractures which do not penetrate vertically to any significant depth below the surface of the ground. As such, based on the understanding of karst development and geohydrology, and based on the extensive visual site investigations carried out by Paterson, the subject property is not considered to be karstic or contain karst features.

4.0 HYDROGEOLOGICAL SETTING

The hydrogeologic conditions for the subject property cover the following critical areas:

- infiltration potentials of surficial soils;
- groundwater recharge and discharge potentials; and
- groundwater flow systems within site boundaries.

The sections provided below reflect the site specific data obtained from the site during the field investigations and from the available information obtained from groundwater impact studies completed by Paterson and others on neighbouring sites.

4.1 Infiltration Potential and Groundwater Recharge

Within the context of hydrogeology, infiltration can be defined as the entry of surface water into the soil together with the associated flow of groundwater away from the ground surface within the unsaturated zone. In a similar context, groundwater recharge is the entry into the saturated zone of water made available at the phreatic surface (i.e. water table surface) together with the associated flow of groundwater away from the phreatic surface within the saturated zone. Moreover, infiltration is only one part of the overall water budget and, as such, surface water which infiltrates into the subsurface does not necessarily become a net addition to the groundwater reservoir which would result in groundwater recharge.

The infiltration potential on the subject property is considered to be low given the nature of the surficial soils described, in detail, in Section 3.1. Surface water infiltrating into the ground surface generally encounters the low permeable silty clay directly beneath the topsoil layer (and silty sand veneer in some locations) which, in turn is underlain by a glacial till of marine origins. Generally speaking, this watershed, like most of those within the Ottawa area, obtain the bulk of groundwater recharge to bedrock aquifers from areas with exposed bedrock with favorable fracturing (ie. interconnected downward strikes) and where overburden deposits consist of thin/thick layers of permeable sands, gravels and thin layers of non-cohesive glacial till. Exposed bedrock in which the surface is massive and unfractured is considered to be relatively impermeable, from a bedrock aquifer recharge perspective. Although the exposed bedrock area, present along the top of the south ridgeline (reference should be made to the Test Hole Location Plan-Drawing No. PH1809-1 for the bedrock location), consists of a weathered, fractured zone at the near surface, the fractures were visually noted to be soil filled and probe results suggest the fractures are limited to the upper few metres of the bedrock. As such, the bedrock, at a depth below the weathering zone, is considered to be competent and of low permeability.

Based on the estimated hydraulic conductivities presented in Table 1 of Section 3.1, the silty clay and glacial till have corresponding infiltration rates of approximately 13 mm/year and 126 mm /year respectively. Where exposed bedrock consists of vertical faces, infiltration potential into the fractured bedrock is considered negligible. Bedrock outcrops which contain compact, cohesive soil filled fractures are typically underlain by competent bedrock of low permeability. As a result, the site is not conducive to the best management practices for stormwater infiltration and recharge on this site should be avoided where possible.

4.2 Groundwater Discharge and Baseflow

Groundwater discharge areas are considered to be the end points of groundwater discharge flow systems. Groundwater discharge areas generally provide baseflow to the surface water courses, which then requires protection and maintenance of groundwater recharge and discharge areas.

Based on the detailed surficial soils information for the subject property, and building on Section 4.1, above, the subject property is not considered to contribute any significant volumes of overburden groundwater recharge and no bedrock aquifer recharge. The direction of topographic relief is northwards towards the Ottawa River, as detailed in Section 2.0, and two (2) tributaries bisect this direction of flow in an east-west direction.

The most northerly tributary, based on the visual observations by Paterson, and from the information obtained from Muncaster Environmental Planning Inc. (Muncaster), has a wetted width of approximately 1.6 m on average with a corresponding average depth of 8 cm. As such, the tributary generally lacks sufficient width to intercept significant overburden groundwater flow throughout most of it's alignment. In situ probing within the centre-line of the northern tributary along it's alignment suggests that the eastern portion of the tributary has a minimum of 300 to 600 mm of silty clay overlying bedrock. Moving west along the central portion of the alignment, the tributary shallows significantly while the thickness of the underlying silty clay/glacial till overburden increases to more than 2 m. No evidence of upward discharge of groundwater was noted at any portion of the northern tributary along the eastern and central portions of the northern tributary alignment.

It is noteworthy to point out that the outlet of the north tributary cascades downward along boulders and some exposed bedrock at Cardinal Creek. Careful observation of the bedrock layers and temperature measurements taken at the cascade area did not indicate the presence of groundwater discharge through the upper bedrock layers.

The south tributary, based on similar visual observations and ancillary information provided by Muncaster, flows over the silty clay and glacial till surficial layers only. As it was detailed in the previous paragraph, Paterson completed probing of the insitu soil beneath the centre-line of the southern tributary. Based on the findings of the insitu works, the southern tributary is underlain by glacial till along the eastern portion of the alignment. Several hundred metres downstream of the start of the southern tributary, the underlying insitu soil transitions to a soft silty clay having a thickness in excess of 2 m. No evidence of upward discharge of groundwater was noted within the tributary during these works.

The surficial topography within the southern tributary identifies it residing within a modest ravine having a differential elevation of approximately 4 m to 5 m to the base of the tributary along the steeper portion of the alignment nearest to Cardinal Creek. As such, the southern tributary acts to intercept most of the overburden groundwater flow originating from the southern lands and may act as a localized discharge area for shallow overburden groundwater. There was no evidence of lateral seepage along the upgradient or downgradient faces of the ravine sidewalls at the time of the field investigation by Paterson. It was noted that the tributary is receiving runoff from both sides of the tributary through channelized drainage corridors. Several of these corridors were noted to have experienced extensive erosion and were included in the limit of hazard lands detailed in the geotechnical investigation (Paterson Report PG1796-1).

4.3 Flow Systems

Based on Paterson's experience in neighbouring sites, combined with the existing information contained within the AECOM (2009) Subwatershed Study, there are two (2) main groundwater flow systems: one flow system in the overburden and another in the bedrock.

Groundwater flows from areas of higher hydraulic pressure to areas of lower hydraulic pressure. The local flow system within the overburden groundwater follows the topographic relief of the site, as does the bedrock groundwater located within the upper portions at, and just below the face of the bedrock.

However, based on the information obtained from numerous hydrogeological studies prepared by Paterson in conjunction with the regional groundwater flow information contained within the J.E. Charon report (Charon, 1974), the direction of flow within the lower bedrock aquifer system is towards the southeast beneath and beyond the subject property.

With respect to hydraulic connection between the overburden groundwater and the lower bedrock aquifer system, the lower bedrock aquifer system is present at considerable depth below the bedrock surface at the southern and eastern quadrants of the subject property. Similarly, based on the published Ontario Ministry of Environment (MOE) Water Well Records (WWR's) for the bedrock wells located along the west of the property, the preferred water supply aquifer intercepted by this group of wells is at a depth of approximately 18 m to 20 m below ground surface.

East of the subject property, the water supply wells intercept the deeper water supply aquifer located within the Middle Ordovician limestone. The depth of aquifer interception in the lower aquifer varies from 25.9 m to more than 99.1 m with the bulk of the water wells intercepting the lower aquifer between 35 m and 75 m below ground surface. A detailed summary of the regional hydrogeology and water well assessment appears in Section 5.3.

Based on the water well record information, previous studies, and on the low permeable surficial soils on the site, it is opined that the overburden groundwater is not capable of infiltrating deep enough into the bedrock to recharge or be hydraulically connected to the lower bedrock aquifer systems due to the existence of such a strong localized direction of groundwater flow to the Ottawa River.

4.4 Preferential Pathways for Groundwater Flow

Given the information provided in the earlier sections of this report, the preferential pathway for groundwater flow is northwards within the overburden groundwater flow system. This flow system is interrupted within the reach of the two (2) bisecting tributaries where the overburden groundwater flow is altered and directed to the tributaries as surface water.

5.0 AQUIFER AND GROUNDWATER USE

5.1 Aquifer Delineation

An aquifer is defined as a geologic formation which are able to hold, transmit and yield enough water to supply production wells completed into them. Based on the published MOE WWR's for the wells located in the immediate vicinity of the subject property (Refer to Paterson Drawing No. PH1890-FIG.3 for water well locations and to the individual water well records located in Appendix 3), there are two (2) usable aquifer systems located within the bedrock in which the water wells intercept. These are the Middle Ordovician bedrock aquifer and the Lower Ordovician bedrock aquifer.

Middle Ordovician Bedrock Aquifer

Based on the reported depth of aquifer intercepts of these wells, an upper bedrock aquifer is present at depths of between 19 m and 30 m below ground surface within the Middle Ordovician Group of both the Gull River and Bobcaygeon Formations. The wells located to the west of the site, along Old Montreal Road, appear to utilize this upper aquifer system. The upper aquifer system has an interpreted direction of groundwater flow towards the Ottawa River, based on works completed by Paterson and Golder Associates Ltd. (Golder) in this area.

To the immediate east and southeast of the subject property, the neighbouring water wells appear to intercept the Middle Ordovician bedrock aquifer at a significantly lower elevation. In this area, the lower aquifer system appears to be present at depths ranging from 35 m below ground surface (bgs) to more than 130 m bgs surface. The upper aquifer appears to be discontinuous throughout the south and east of the subject property.

Lower Ordovician Bedrock Aquifer

Several wells are present, based on the available MOE WWR's, within the Oxford Formation limestone present beyond the fault running along the northern portion of the site and adjacent to the Ottawa River. Several water wells report intercepting a water supply aquifer within the Oxford Formation limestone after first passing through upwards of 30 m of silty clay overburden.

5.2 Aquifer Vulnerability

Given the depth of low permeable surficial soils present within the subject area, combined with the thickness of competent bedrock overlying the confined aquifer systems of both the Middle Ordovician and Lower Ordovician aquifer, these bedrock aquifer systems are considered to be of low intrinsic vulnerability.

It is prudent to note that the works carried out by Paterson on the adjacent estate lot subdivision known as Camelot Estates, where the water wells intercept the lower water supply aquifer system, that the hydraulic pressure exerted on the lower aquifer is such that the aquifer is considered to be confined and hydraulically isolated from the overburden groundwater, where present.

Using the well established DRASTIC methodology to scope the intrinsic vulnerability of the aquifer systems present below the site, one can assess the vulnerability score for each of the aquifer systems. The DRASTIC methodology employs multipliers for each of the categories within the DRASTIC model and gauges the vulnerability of an aquifer system based on the following scores:

- High (>160)
- Moderate (101 to 160)
- Low (<101)

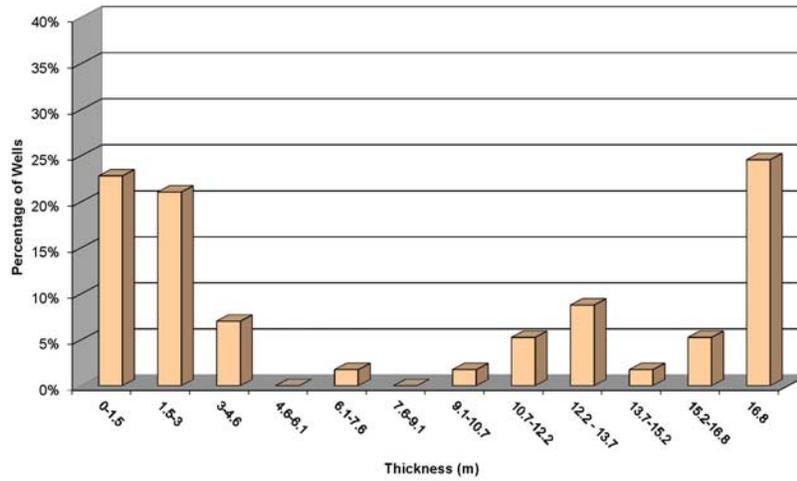
The DRASTIC score for the upper and lower Middle Ordovician bedrock aquifers are of the order of 58 and 73, respectively. Similarly, the Lower Ordovician bedrock aquifer scores of the order of 60. As these scores are well below the score of 101, the bedrock aquifer systems are considered to be of low intrinsic vulnerability.

5.3 Water Supply Wells

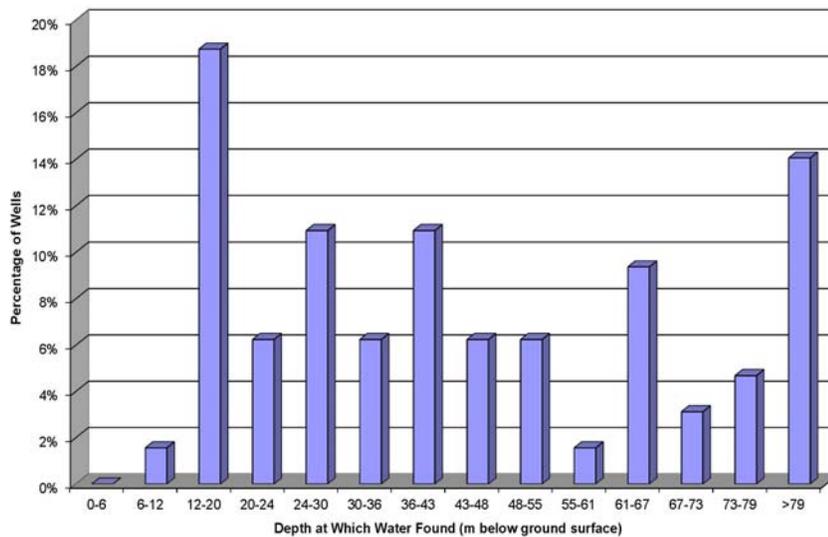
Water supply wells constitute the primary source of drinking water for the neighbouring properties located immediately adjacent to the subject property. The available published water wells for the immediate area are plotted on Paterson Drawing No. PH1890-FIG.3 in Appendix 4.

A review of the regional hydrogeology defined by the neighbouring water well records clearly reveals that approximately 18 of the 64 available published MOE WWR's are in the upper bedrock aquifer and these wells are located either beyond the subject property to the west, or along the western edges of the site boundaries. The remainder of the water well records report intercepting the lower aquifer as the primary water supply aquifer. A summary of the regional hydrogeology is provided in the charts provided below:

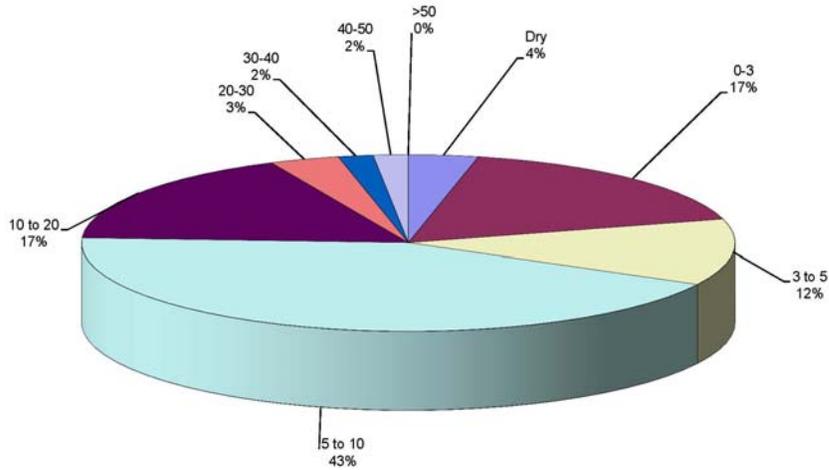
Summary of Overburden Thickness Reported in Surrounding Water Wells



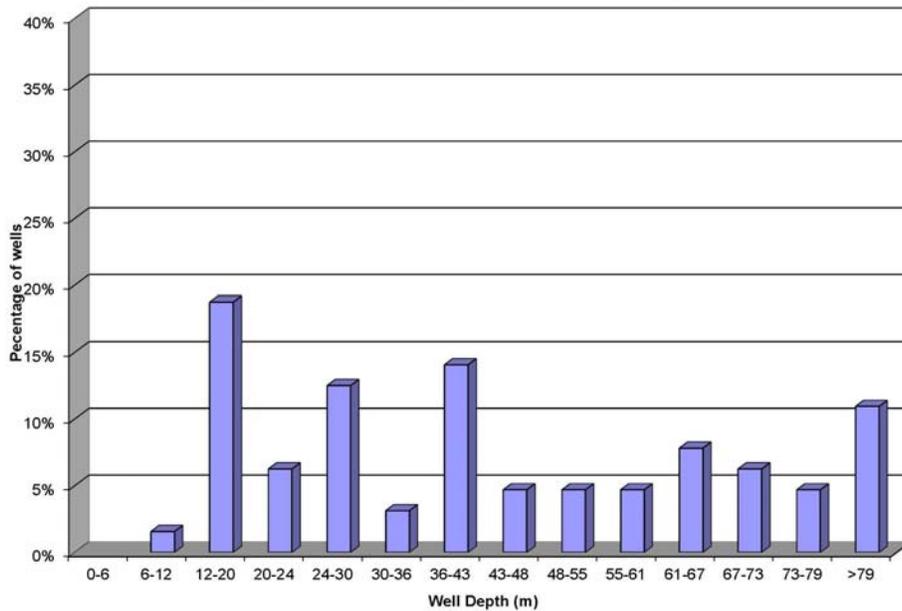
Summary of Reported Aquifer Depths In Surrounding Water Wells



Summary of Well Yields Reported for Surrounding Water Wells
 (Range of Well Yields in Imperial Gallons per Minute)



Summary of Well Depths Reported in Surrounding Water Wells



It is noted that there are a handful of recorded water wells present within the subject property limits. These wells appear to presently/formerly service the existing residences and commercial operations located along Old Montreal Road. It is of critical importance that all existing drilled wells be located and decommissioned in strict accordance with Ontario Regulation 903 (Wells) made under the Ontario Water Resource Act. This will ensure that the water wells do not allow for the potential of short circuiting of contaminants into the upper and lower bedrock aquifer systems.

5.4 Construction Precautions for Protecting Existing Offsite Wells

It was noted in the geotechnical investigation that rock removal is anticipated during the construction phase of the development. Blasting within the shallow bedrock could potentially have a localized impact on the neighbouring water wells utilizing the upper aquifer. Notwithstanding the above, the discontinuous nature of the upper bedrock aquifer, combined with the topographic relief towards the Ottawa River within the site boundaries, will result in only temporary and localized disturbance where encountered. No long term adverse impacts to the upper bedrock aquifer is expected as a result of the proposed development.

A baseline water quality program implemented prior to the start of construction activities is a prudent measure to employ for the neighbouring residences. The baseline water quality and potentiometric head elevations collected from representative wells located in the upper water supply aquifer system will allow for a clear comparative analysis in the event that offsite well users report adverse water quality or quantity issues during the construction phase.

In addition, peak particle velocity limits can be implemented for blasting operations to minimize the potential to adversely affect offsite wells. In most instances, a peak particle velocity of 12.5 mm/s for ground vibrations is specified in accordance with the Noise Pollution Control publication 119 of the Model Municipal Noise Control By-law published by the MOE. Data collected from various sources indicates that a ground vibration limit of 50 mm/s peak particle velocity is adequate to protect wells from any significant damage. There is a possibility, at this limit, that temporary turbidity may be caused, however.

6.0 NEXT STEPS

It is understood that this hydrogeologic assessment will be used in conjunction with other existing conditions reports to develop a constraints and opportunities plan for the proposed development. The following steps are recommended to assist in the long term protection of groundwater quality and groundwater discharge functions:

1. The potential groundwater discharge to the tributaries outletting to Cardinal Creek should be further studied to determine the contribution to base flow conditions. Maintaining natural streambed conditions along the two (2) tributaries on the site may assist in the preservation of baseflow through these features, or augmentation through stormwater management structures, may be prudent.
2. The extent of the vertical limits of fracturing within the exposed bedrock present along both the south and north ridgelines should be subjected to further study. The study methodology should include the coring of the bedrock at depth to further assess the competency of the underlying bedrock and insitu hydraulic conductivity analysis.
3. Existing water wells located on the subject property should be decommissioned in accordance with the governing legislation in order to prevent unconfined and rapid contamination of the upper and lower Middle Ordovician bedrock aquifer systems. The decommissioning should be undertaken prior to the start of the construction phase of the development and under the direct supervision of a qualified Professional Engineer of Ontario or Professional Geoscientist.
4. A comprehensive water well baseline study should be undertaken for all wells located within the immediate vicinity of the subject property. The study should establish representative baseline conditions for water quality and quantity and should accurately identify the well construction methodology of each well and aquifer system it intercepts.

5. A blasting program should be set up where bedrock is to be drilled and blasted as part of the construction phase. The blasting program should act to compliment the water well baseline study and should set monitoring limits on ground vibrations to offsite wells.

Prepared by:

PATERSON GROUP INC.



Robert A. Passmore, P.Eng.
Senior Environmental Engineer



7.0 REFERENCES

Aecom. 2009. Greater Cardinal Creek Subwatershed Study, Existing Conditions Report. 138 p. Plus appendices.

Geoconsult Ltd. (GEO). 1975. Hydrogeology of the Township of Cumberland, Vars, Navan, Cumberland and Sarsfield, with emphasis on Septic Tank Suitability and Groundwater Resources. 51 p. Plus appendices.

Geomorphic Solutions (GS). 2007. Cardinal Creek Geomorphic Assessment, City of Ottawa. 34 p. Plus appendices.

Golder Associates Ltd. (GAL). 2009. Hydrogeological Information Review and Assessment, Russell Findlay Lands, 940 Old Montreal Road, Ottawa, ON. 10p Plus appendices.

Golder Associates Ltd. (GAL). 1990. Erosion Study and Slope Stability Evaluation, Cardinal Creek, Cumberland, ON. 26p. Plus appendices.

Muncaster Environmental Planning Inc. (Muncaster). 2012. Existing Conditions, Natural Environment Features, Cardinal Creek Village. 20p. Plus appendices.

Ontario Ministry of Natural Resources (MNR): 2009. Earth Science Inventory Checklist, Cardinal Creek Karst. 10 p.

APPENDIX 1

- **SOIL PROFILE & TEST DATA SHEETS**

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

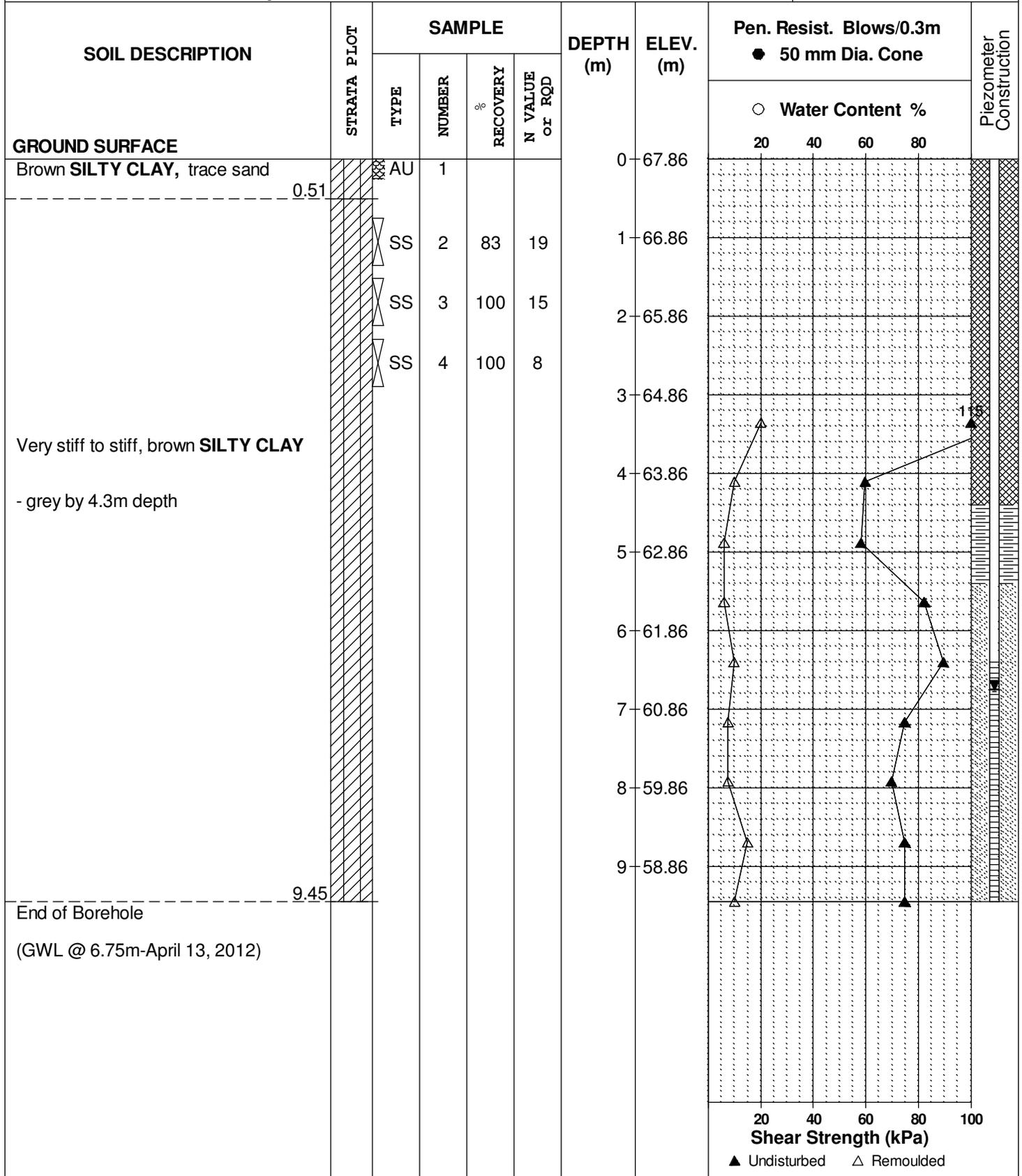
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 1-12**

BORINGS BY CME 55 Power Auger

DATE March 27, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

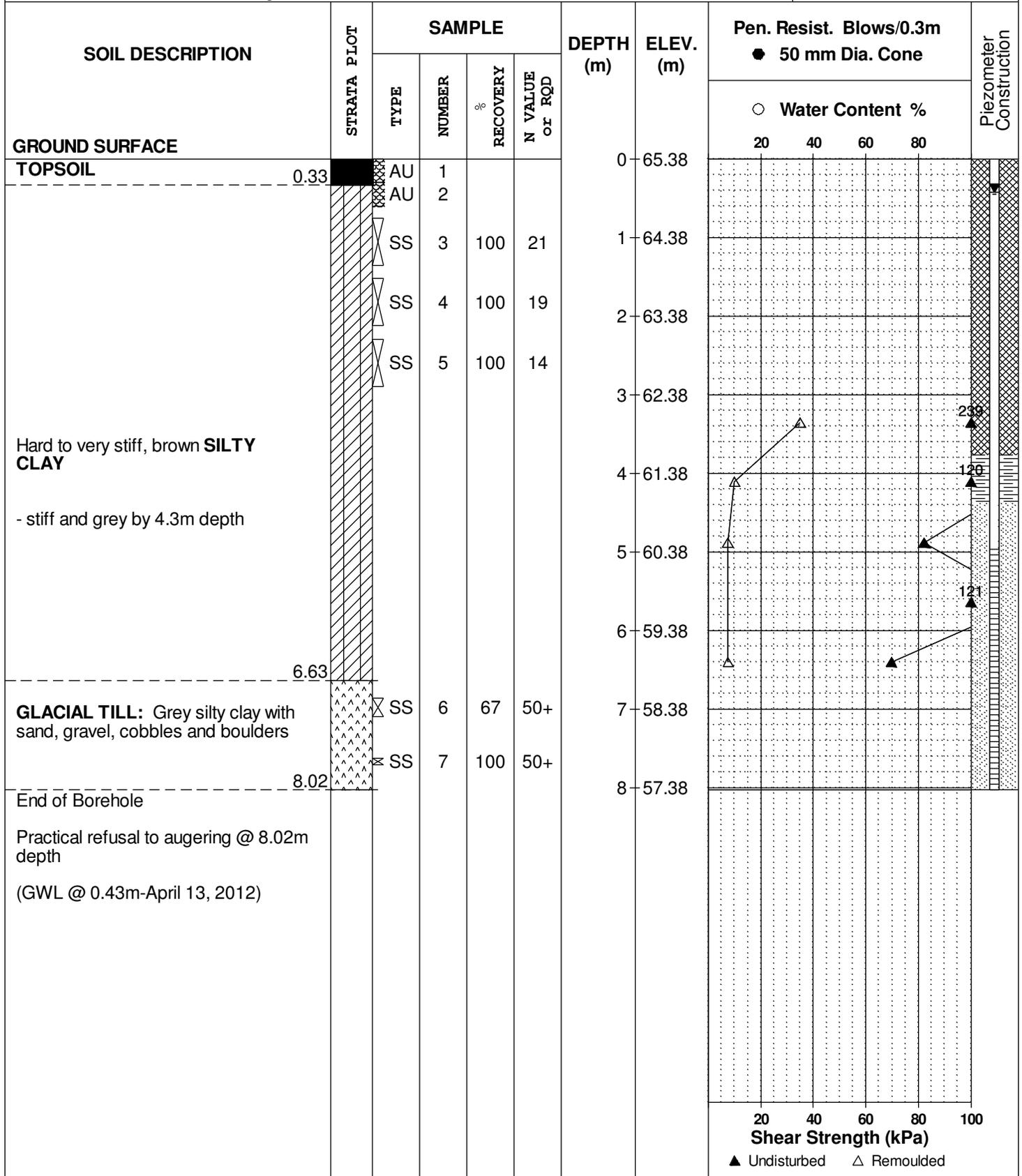
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 3-12**

BORINGS BY CME 55 Power Auger

DATE March 27, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

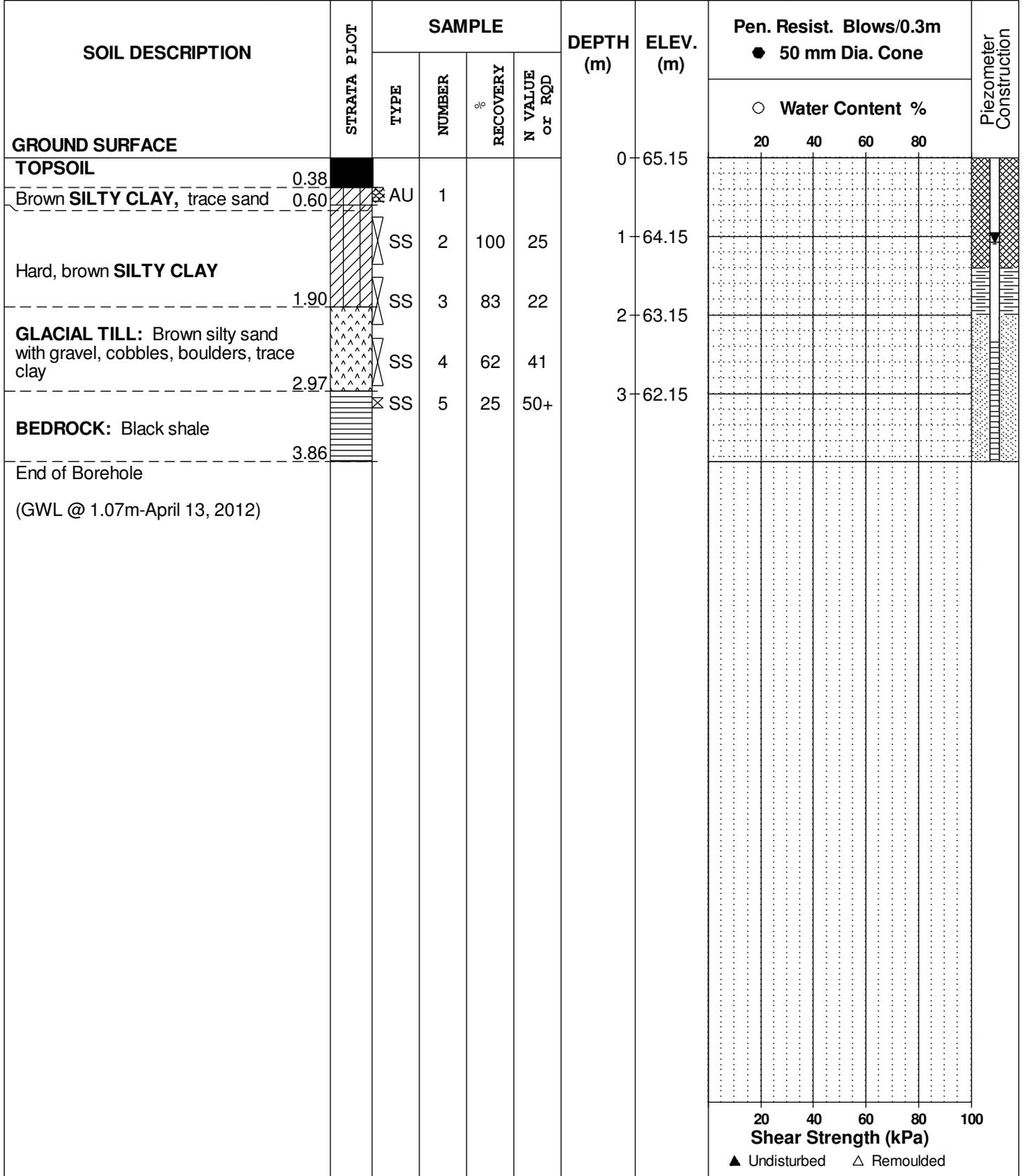
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 4-12**

BORINGS BY CME 55 Power Auger

DATE March 27, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 7-12**

BORINGS BY CME 55 Power Auger

DATE April 5, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE													
TOPSOIL	0.08	AU	1			0	70.88						
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders		SS	2	50	14	1	69.88						
		SS	3	75	66	2	68.88						
		SS	4	100	50+	3	67.88						
End of Borehole	3.25												
Practical refusal to augering @ 3.25m depth (GWL @ 1.42m-April 13, 2012)													
								20	40	60	80	100	
								Shear Strength (kPa)					
								▲ Undisturbed △ Remoulded					

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

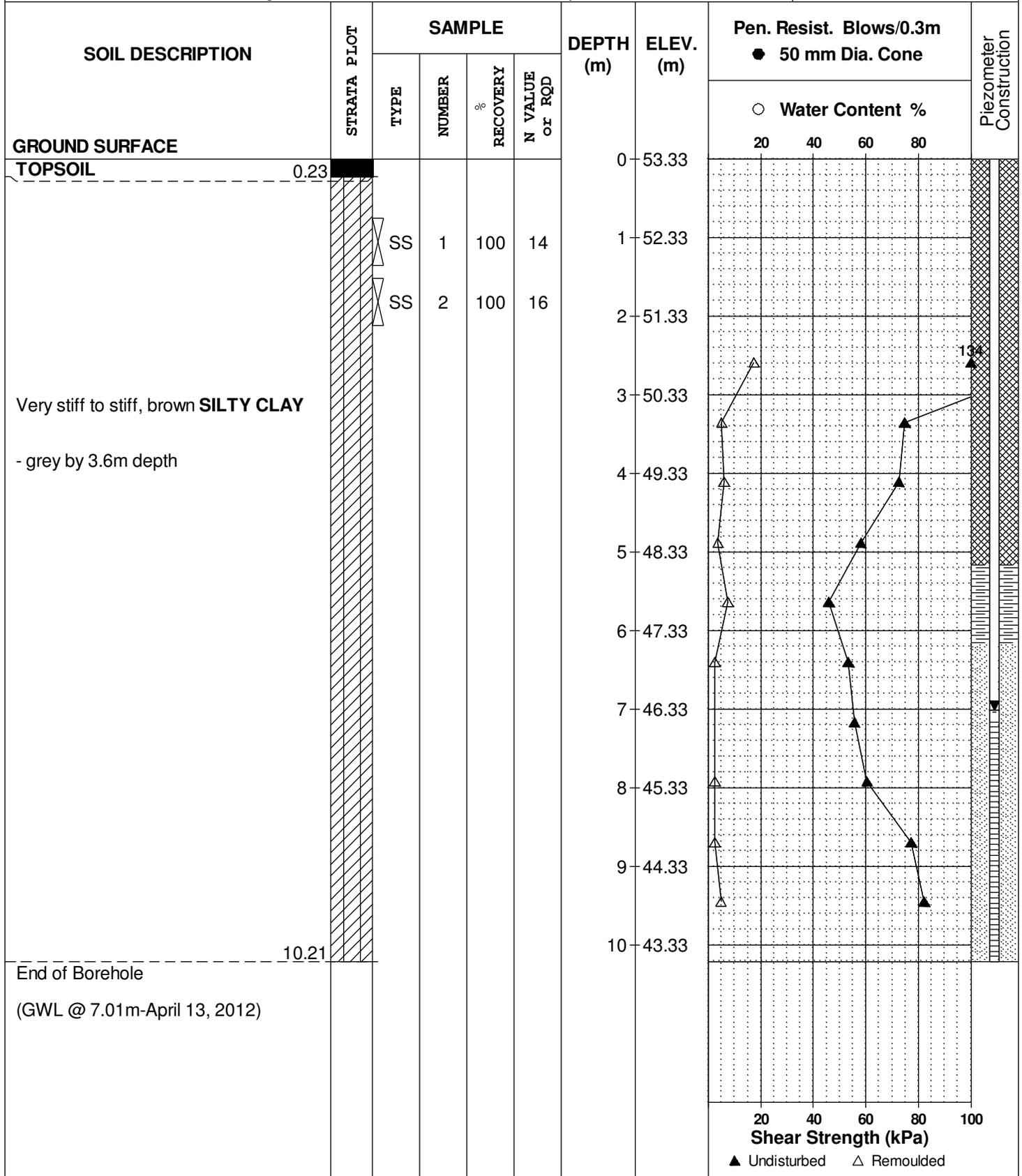
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 9-12**

BORINGS BY CME 55 Power Auger

DATE April 5, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

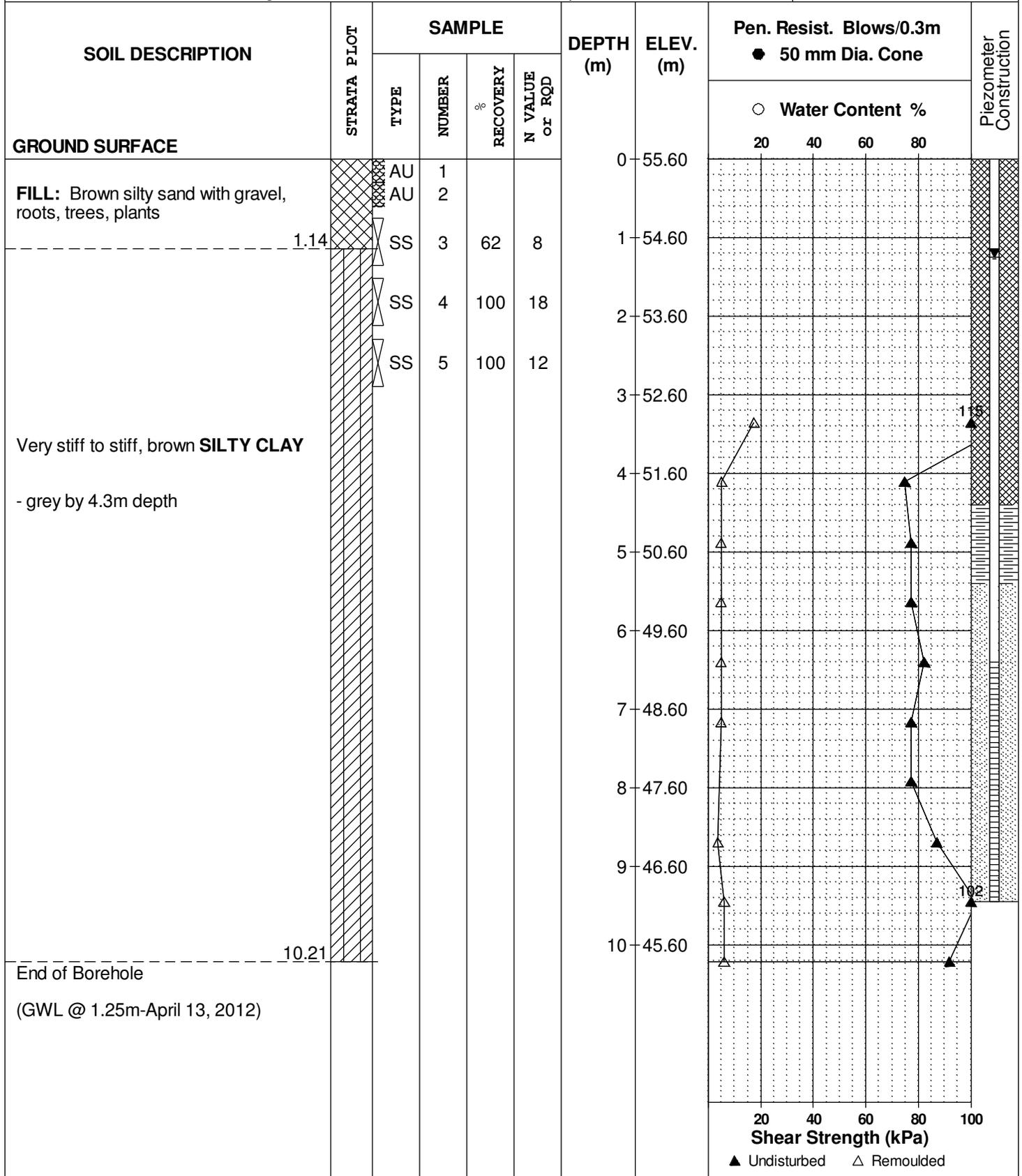
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH10-12**

BORINGS BY CME 55 Power Auger

DATE April 5, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

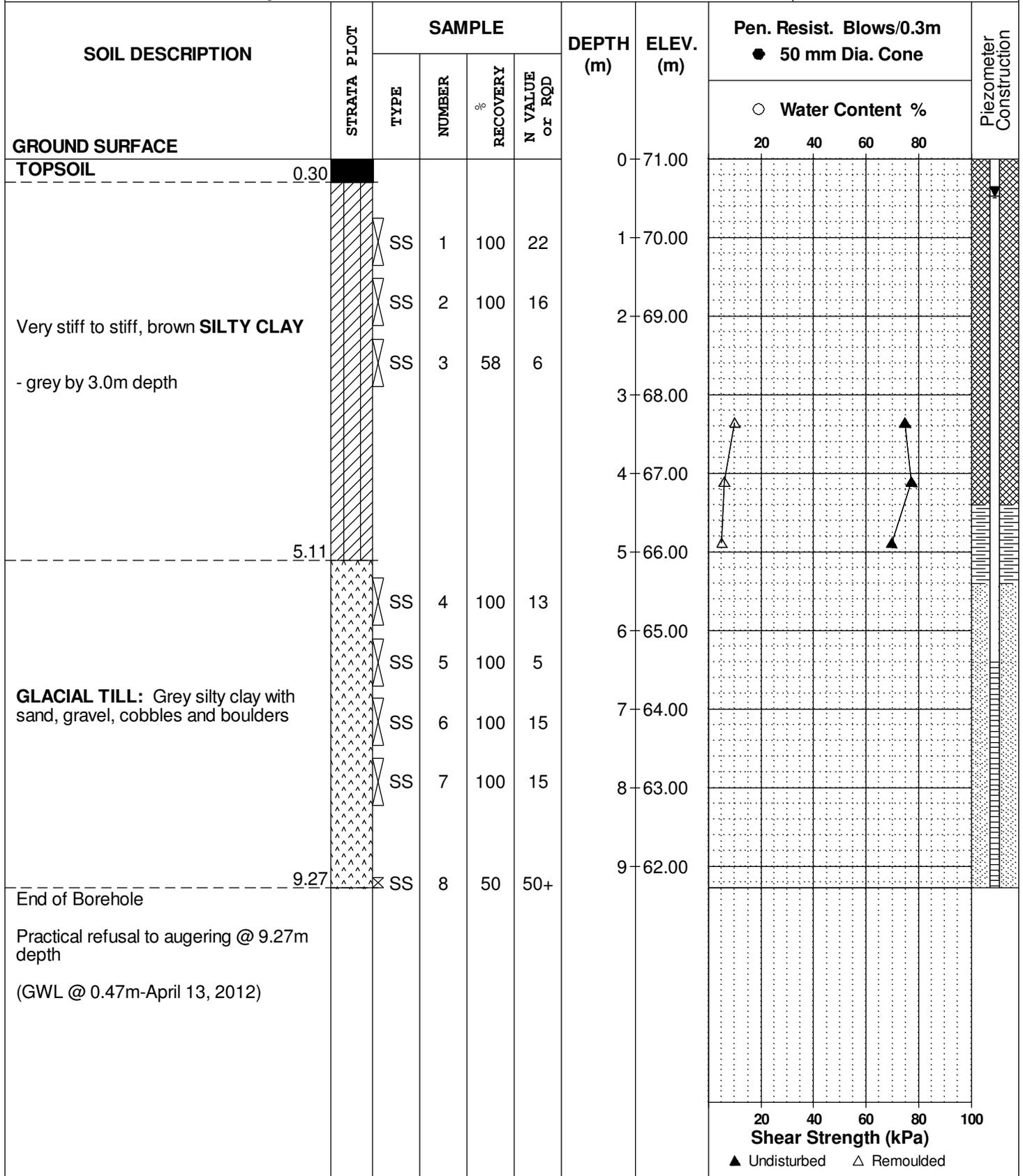
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH12-12**

BORINGS BY CME 55 Power Auger

DATE March 28, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

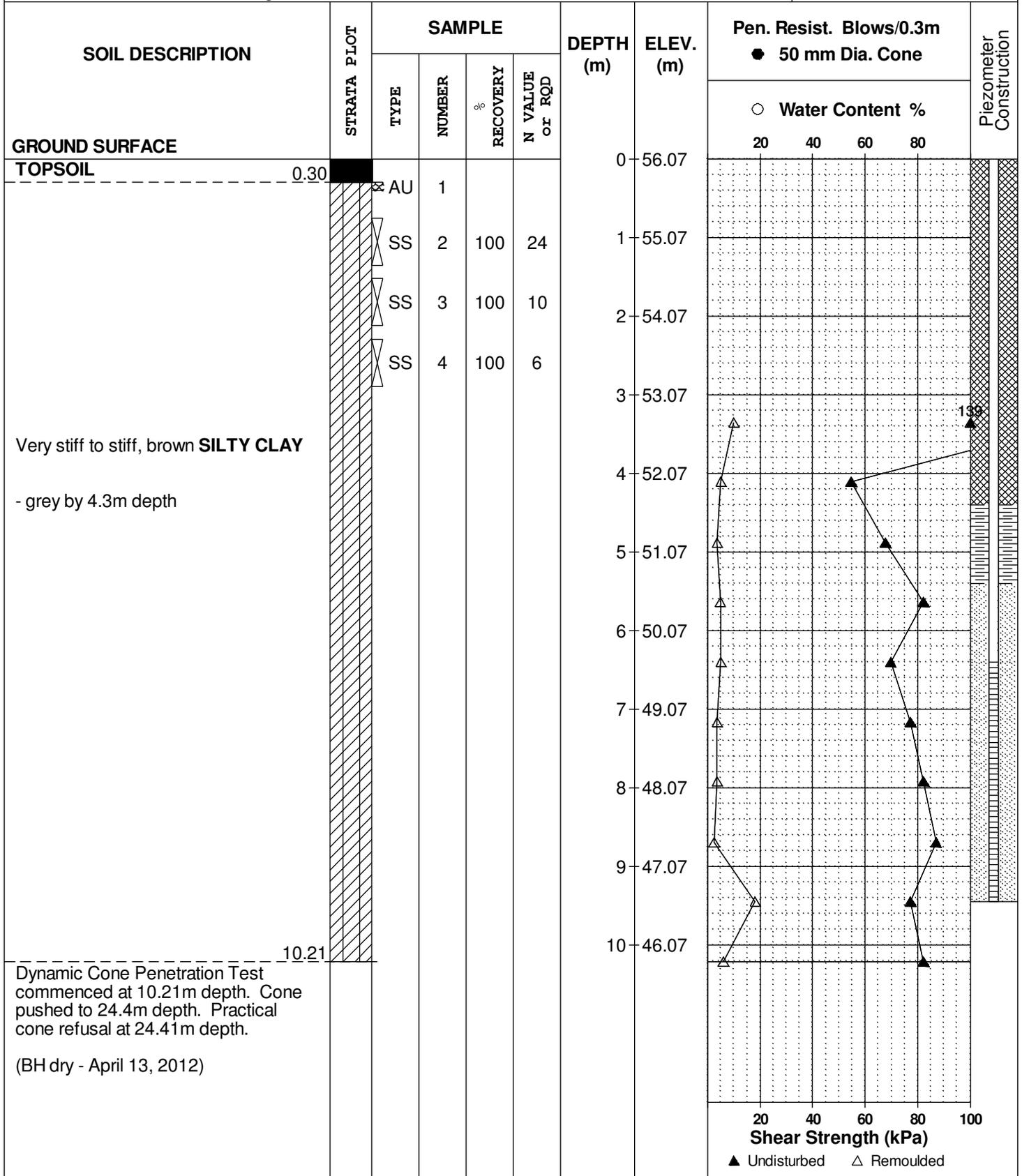
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH16-12**

BORINGS BY CME 55 Power Auger

DATE March 30, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH18-12**

BORINGS BY CME 55 Power Auger

DATE March 30, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	76.69						
TOPSOIL	0.30	AU	1										
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		SS	2	62	12	1	75.69						
		SS	3	71	33	2	74.69						
		SS	4	100	50+								
End of Borehole	2.97												
Practical refusal to augering @ 2.97m depth (GWL @ 2.50m-April 13, 2012)													

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

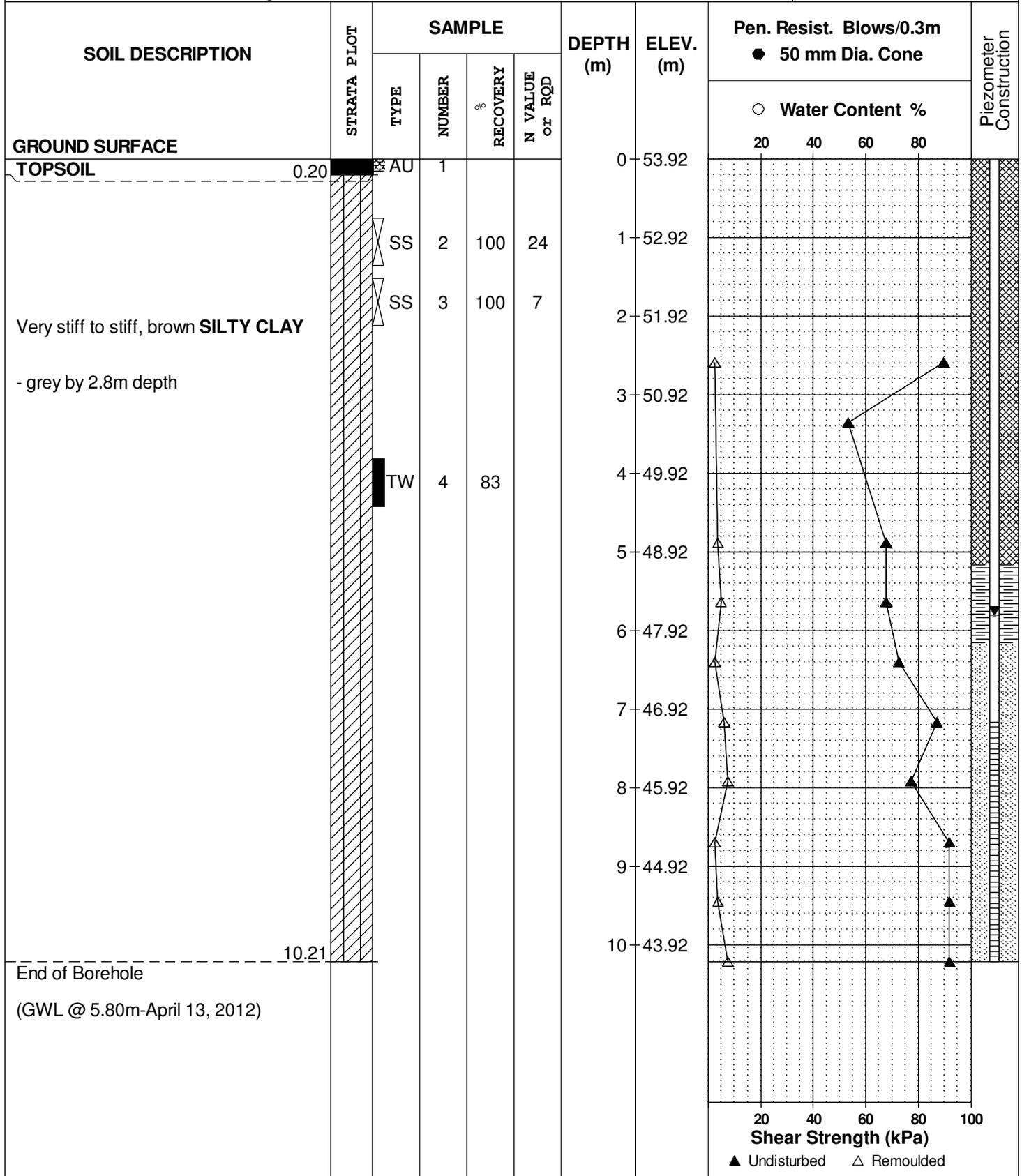
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH19-12**

BORINGS BY CME 55 Power Auger

DATE March 30, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

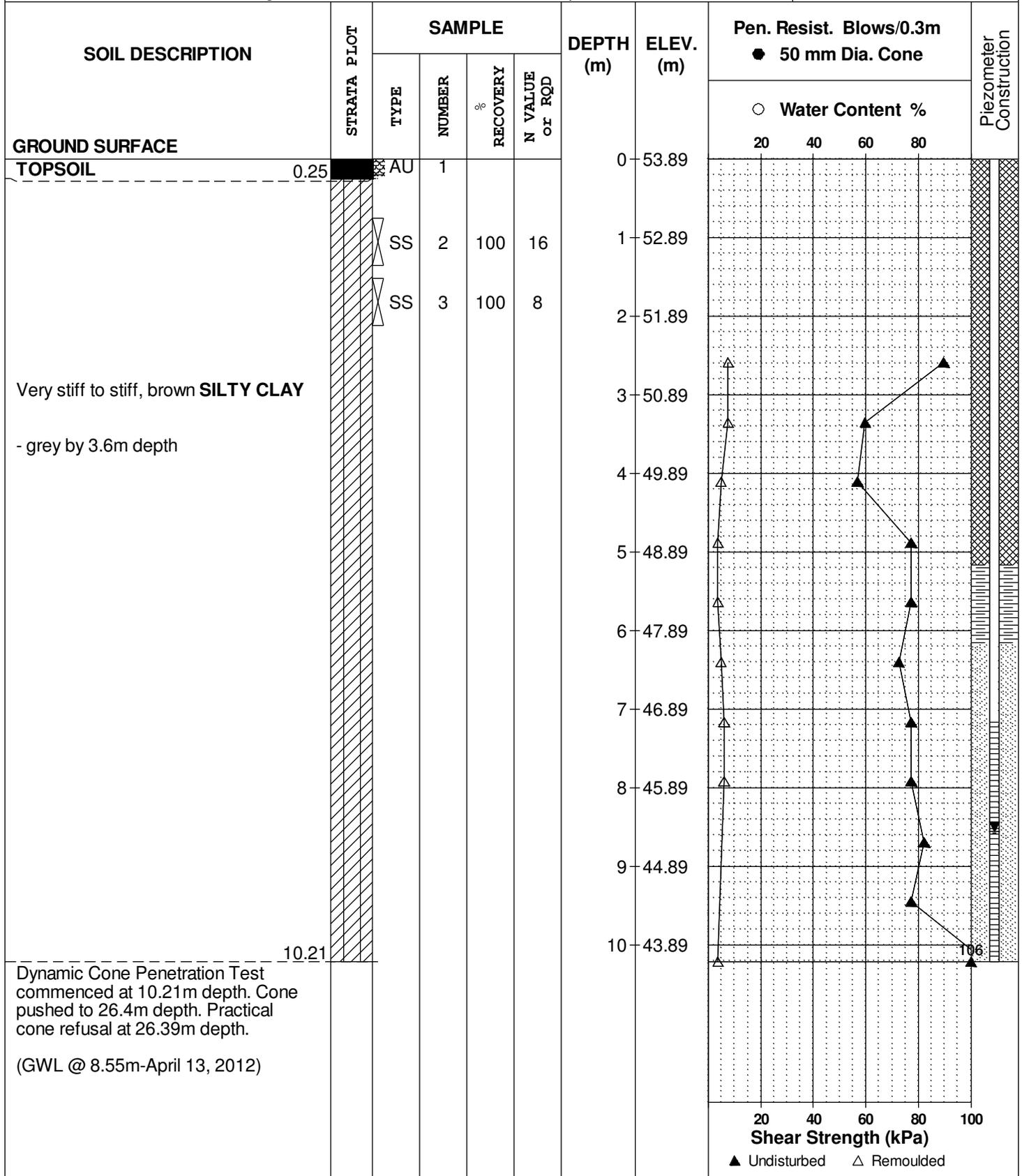
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH21-12**

BORINGS BY CME 55 Power Auger

DATE April 2, 2012



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development - Queen Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH22-12**

BORINGS BY CME 55 Power Auger

DATE April 2, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	78.53						
TOPSOIL	0.30	AU	1										
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders	1.52	SS	2	60	50+	1	77.53						
BEDROCK: Black shale	2.23	SS	3	100	50+	2	76.53						
End of Borehole													
Practical refusal to augering @ 2.23m depth													
(BH dry upon completion)													

○ Water Content %

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)

▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

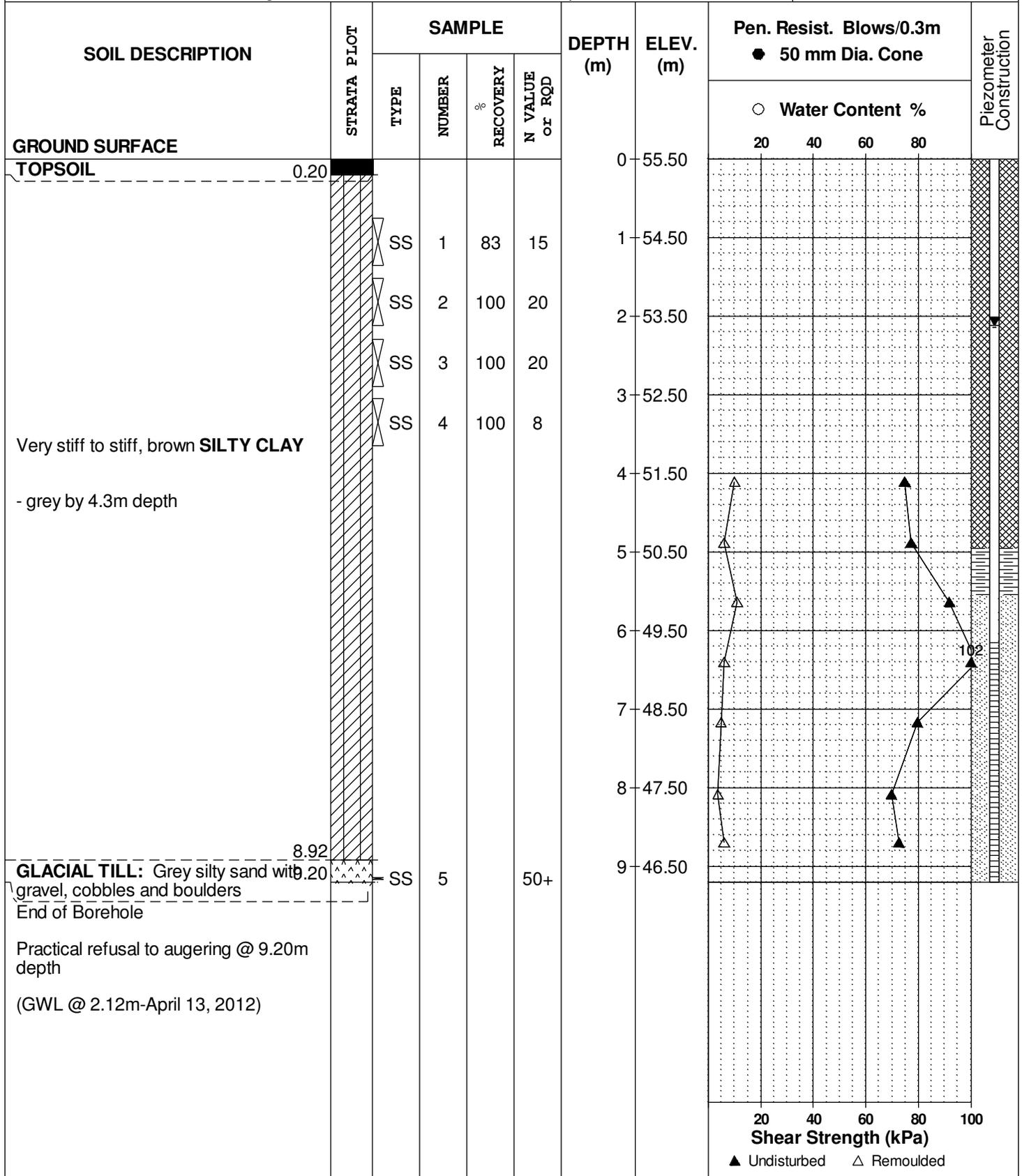
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH23-12**

BORINGS BY CME 55 Power Auger

DATE April 4, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

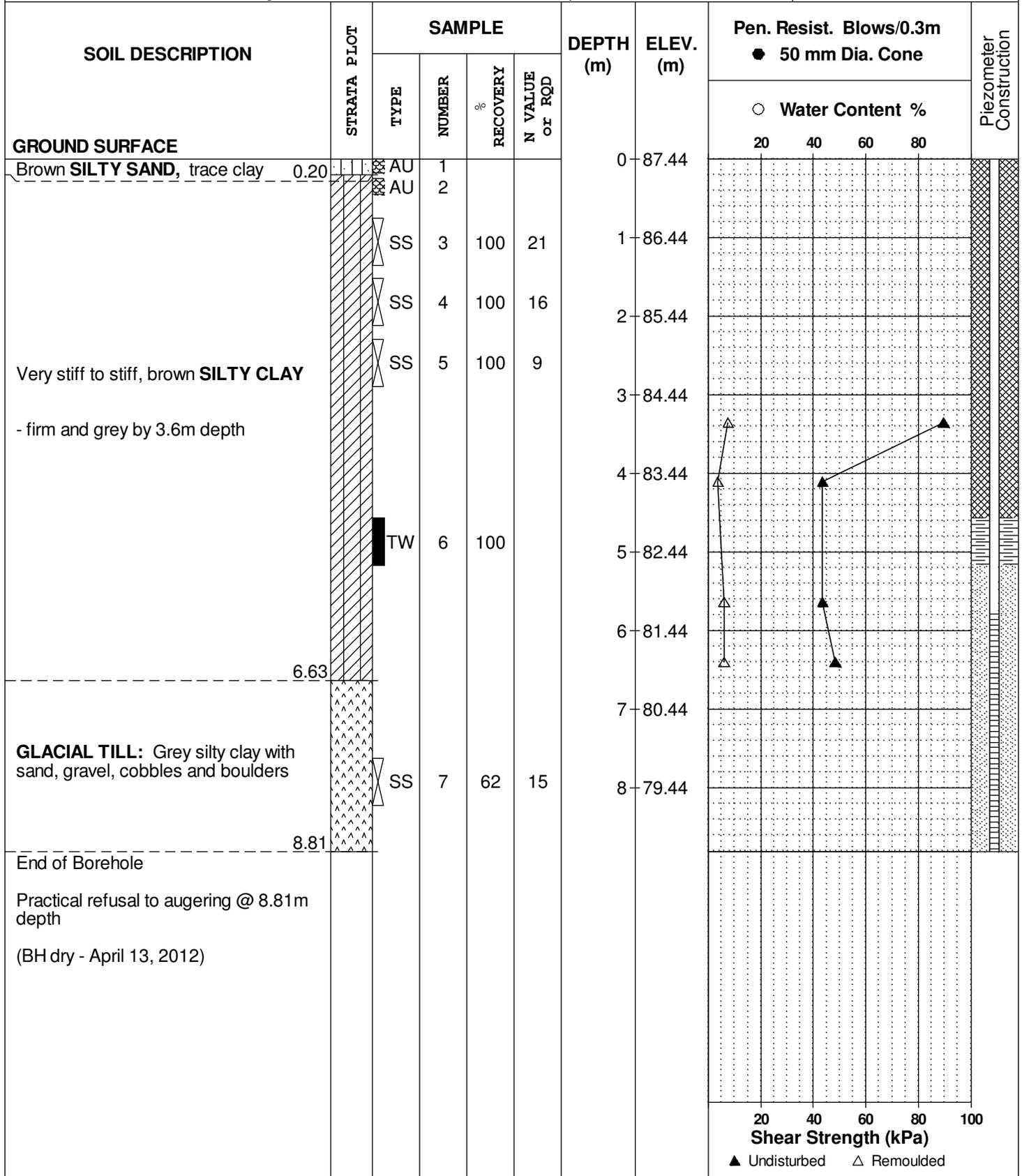
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH24-12**

BORINGS BY CME 55 Power Auger

DATE April 2, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH25-12**

BORINGS BY CME 55 Power Auger

DATE April 2, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	81.91						
TOPSOIL	0.20												
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders		AU	1										
		SS	2	50	25	1	80.91						
		SS	3	20	50+								
		SS	4	67	50+	2	79.91						
		SS	5	71	50+	3	78.91						
End of Borehole	3.35												
Practical refusal to augering @ 3.35m depth (GWL @ 0.66m-April 13, 2012)													
								○ Water Content % 20 40 60 80					
								Shear Strength (kPa) 20 40 60 80 100 ▲ Undisturbed △ Remoulded					

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development - Queen Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH26-12**

BORINGS BY CME 55 Power Auger

DATE April 3, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	89.45						
TOPSOIL	0.30												
Very stiff, brown SILTY CLAY , trace sand	0.30 - 1.45	SS	1	100	18	1	88.45						
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders	1.45 - 2.16	SS	2	100	50+	2	87.45						
End of Borehole Practical refusal to augering @ 2.16m depth (GWL @ 0.97m-April 13, 2012)	2.16												

○ Water Content %

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)

▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH29-12**

BORINGS BY CME 55 Power Auger

DATE April 3, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	87.20						
TOPSOIL	0.25	AU	1										
Very stiff to stiff, brown SILTY CLAY		SS	2	100	21	1	86.20						
		SS	3	100	20	2	85.20						
		SS	4	100	17	3	84.20						
		SS	5	100	12	4	83.20						
		SS	6	50	34	5	82.20						
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders	3.73	SS	7	4	9	6	81.20						
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	5.26	SS	8	100	50+	7	80.20						
End of Borehole	5.54												
Practical refusal to augering @ 5.54m depth (Piezometer damaged - April 13, 2012)													
								20	40	60	80	100	
								Shear Strength (kPa)					
								▲ Undisturbed	△ Remoulded				

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

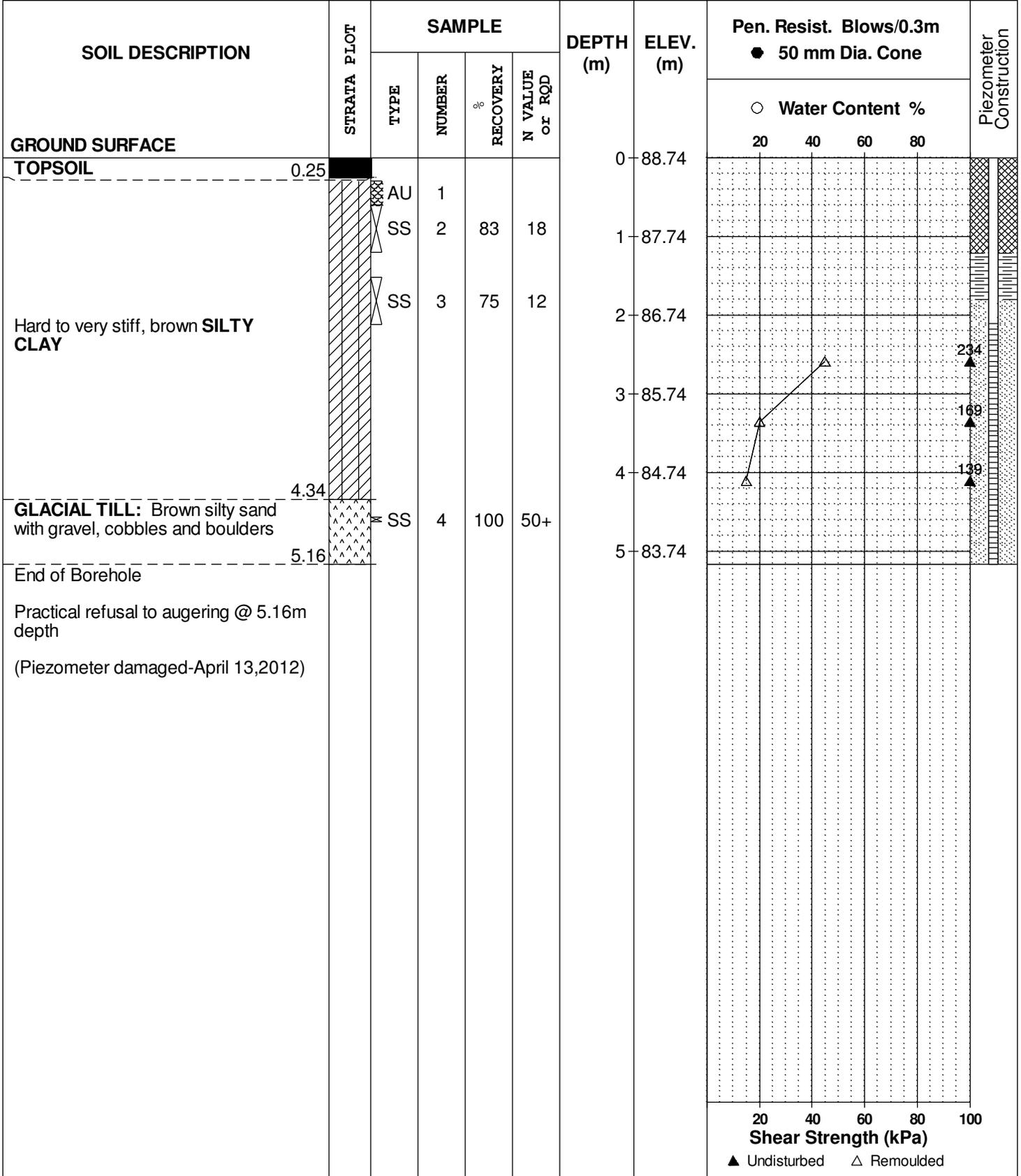
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH30-12**

BORINGS BY CME 55 Power Auger

DATE April 3, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

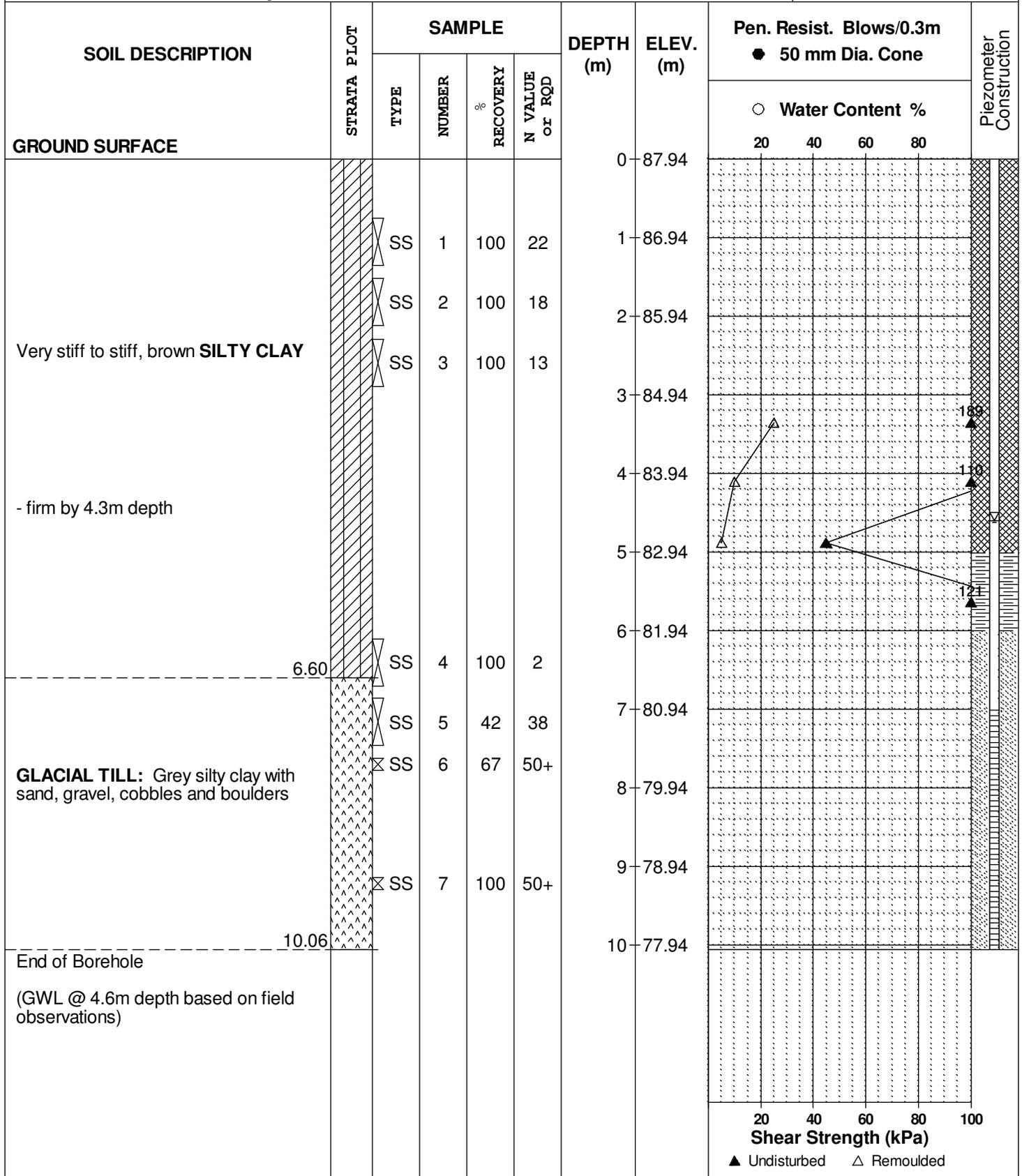
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH32-12**

BORINGS BY CME 55 Power Auger

DATE June 26, 2012



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development - Queen Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH35-12**

BORINGS BY CME 55 Power Auger

DATE June 27, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	90.07						
Hard, brown SILTY CLAY		SS	1	100	23	1	89.07						
		SS	2	76	50+	2	88.07						
<p>GLACIAL TILL: Brown silty clay with sand, gravel, cobbles, boulders</p> <p>End of Borehole</p> <p>Practical refusal to augering at 2.00m depth</p> <p>(GWL @ 1.9m depth based on field observations)</p>						2	88.07						

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development - Queen Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH37-12**

BORINGS BY CME 55 Power Auger

DATE June 26, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	89.42						
Hard, brown SILTY CLAY		SS	1	100	22	1	88.42						
		SS	2	100	16	2	87.42						
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles, boulders		SS	3	75	50+	3	87.42						
End of Borehole Practical refusal to augering at 2.87m depth (GWL @ 2.6m depth based on field observations)													

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

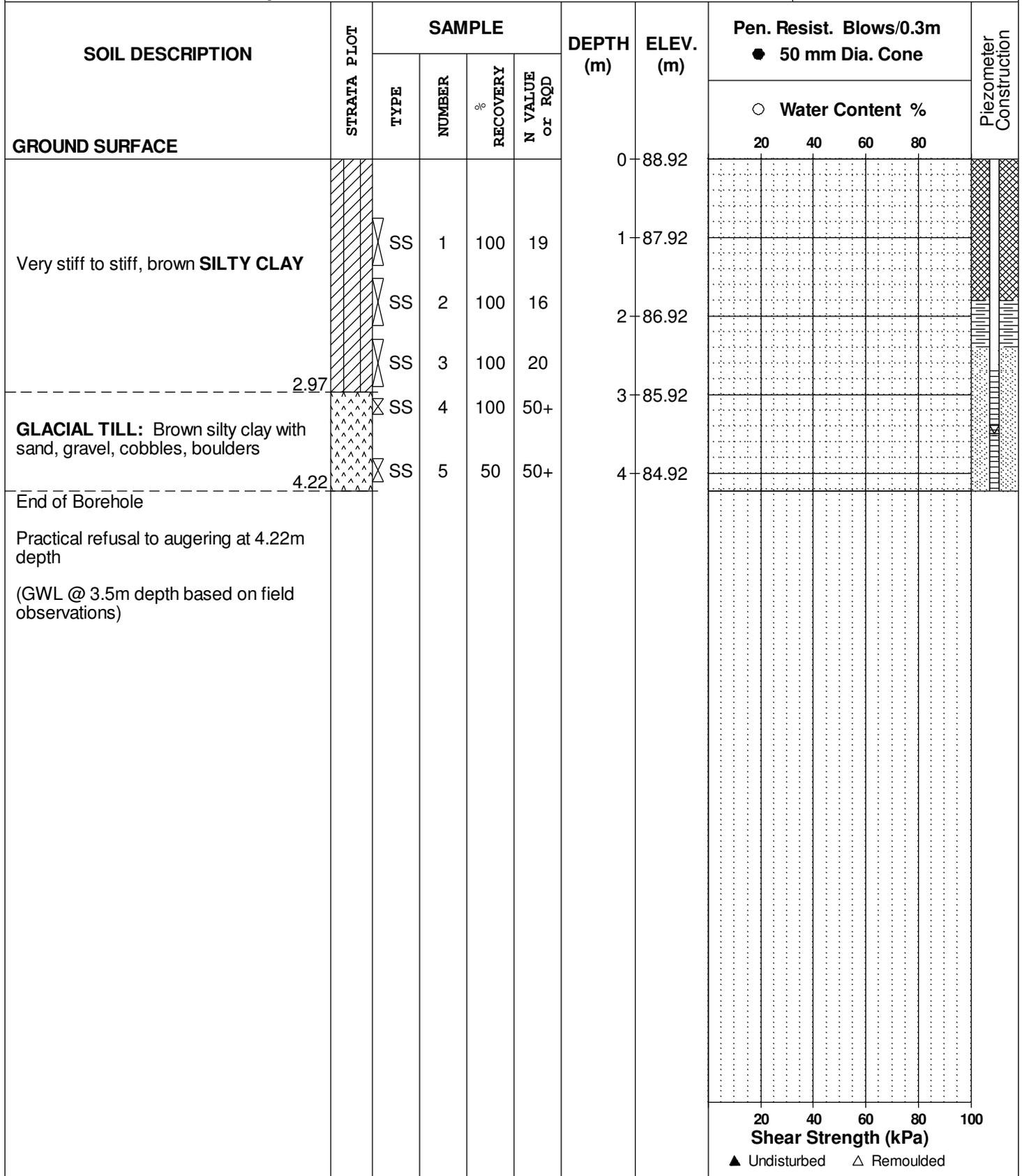
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH38-12**

BORINGS BY CME 55 Power Auger

DATE June 26, 2012



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

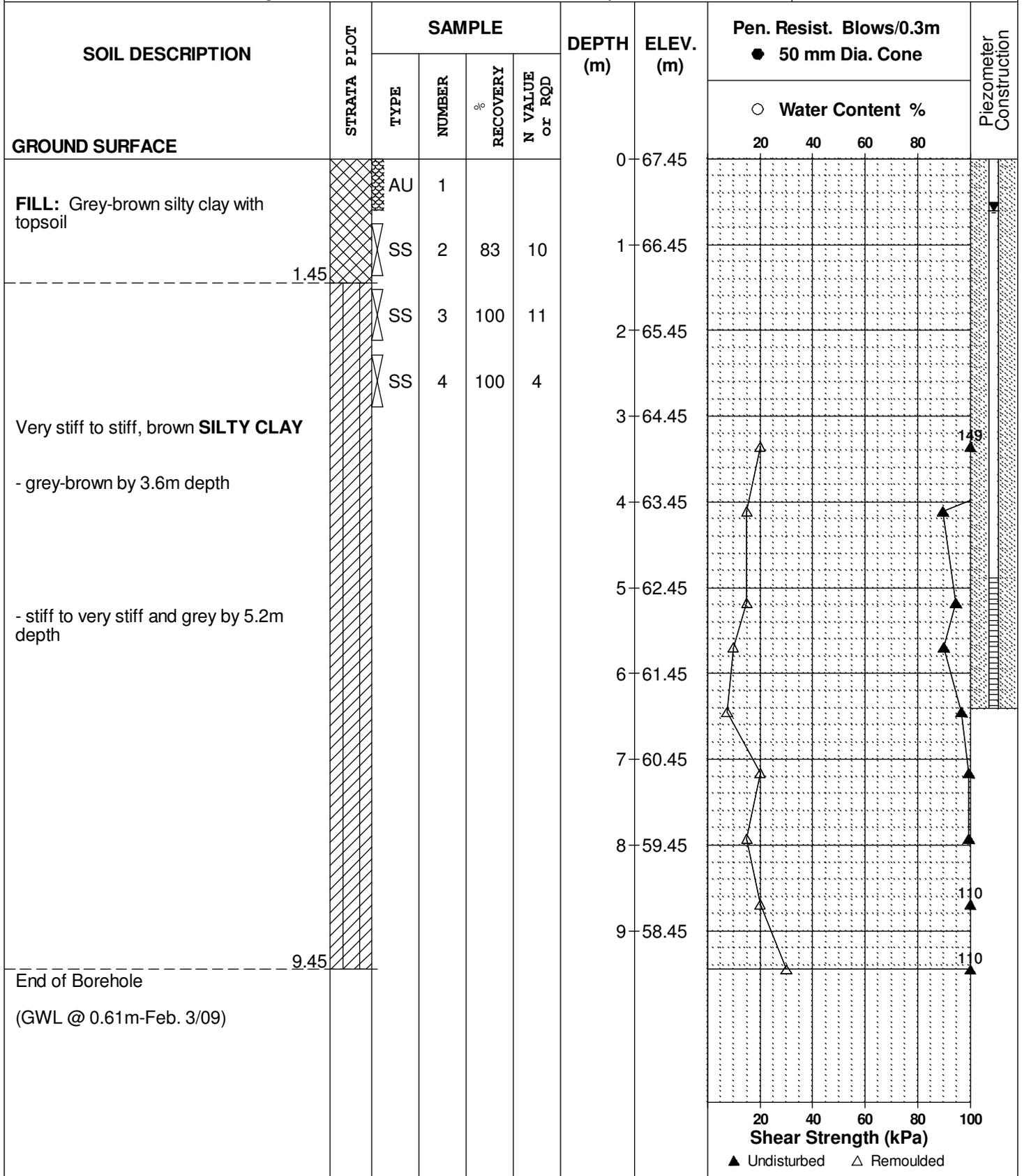
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 1**

BORINGS BY CME 55 Power Auger

DATE January 20, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

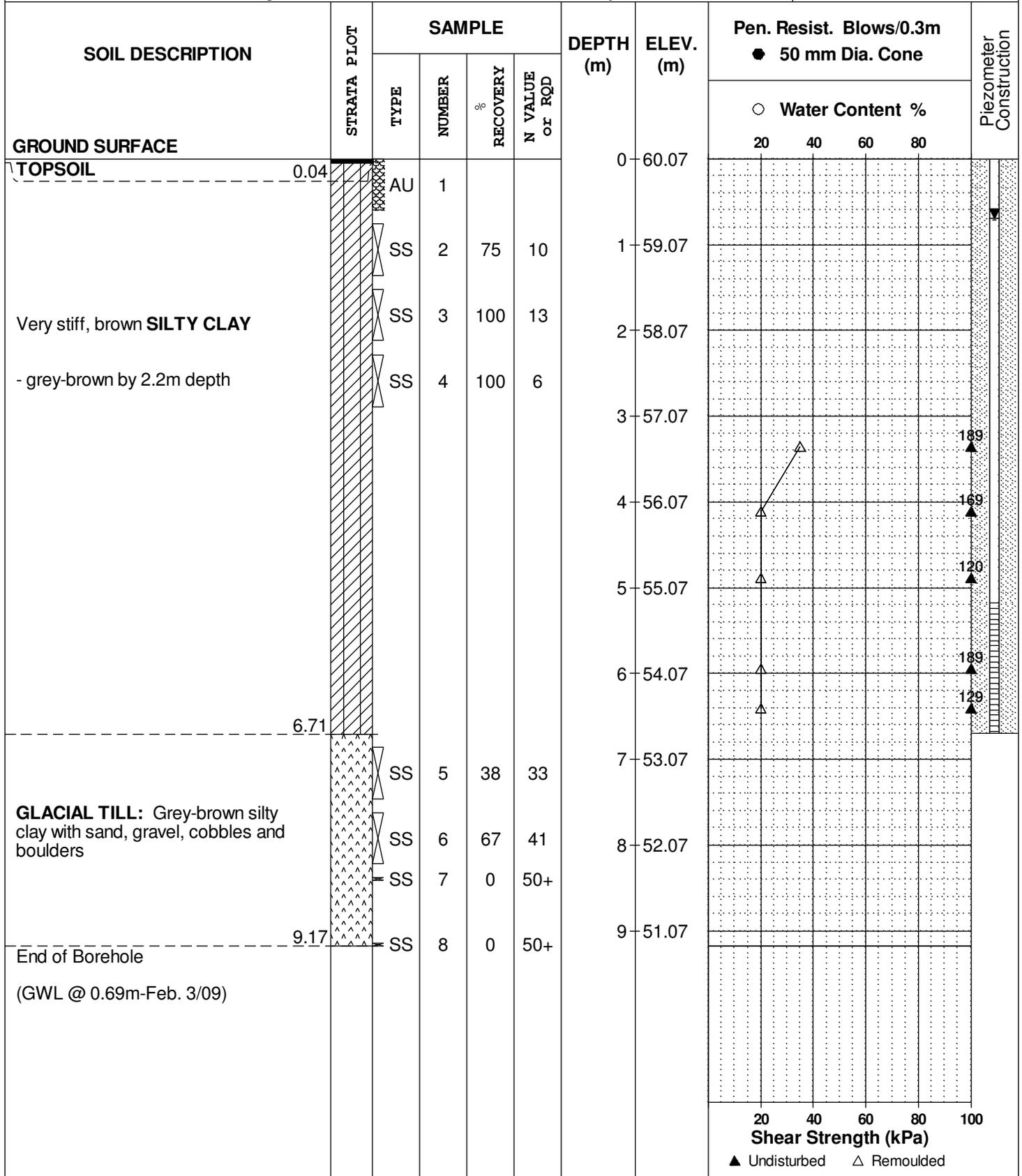
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 2**

BORINGS BY CME 55 Power Auger

DATE January 20, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 3**

BORINGS BY CME 55 Power Auger

DATE January 20, 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	63.94					
TOPSOIL	0.20	AU	1									
Very stiff, brown SILTY CLAY		SS	2	58	12	1	62.94					
	1.60	SS	3	50	50+							
BEDROCK: Weathered black shale												
	2.29	AU	4			2	61.94					
End of Borehole												
Practical refusal to augering @ 2.29m depth												
(BH dry upon completion)												
								20	40	60	80	100
								Shear Strength (kPa)				
								▲ Undisturbed △ Remoulded				

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

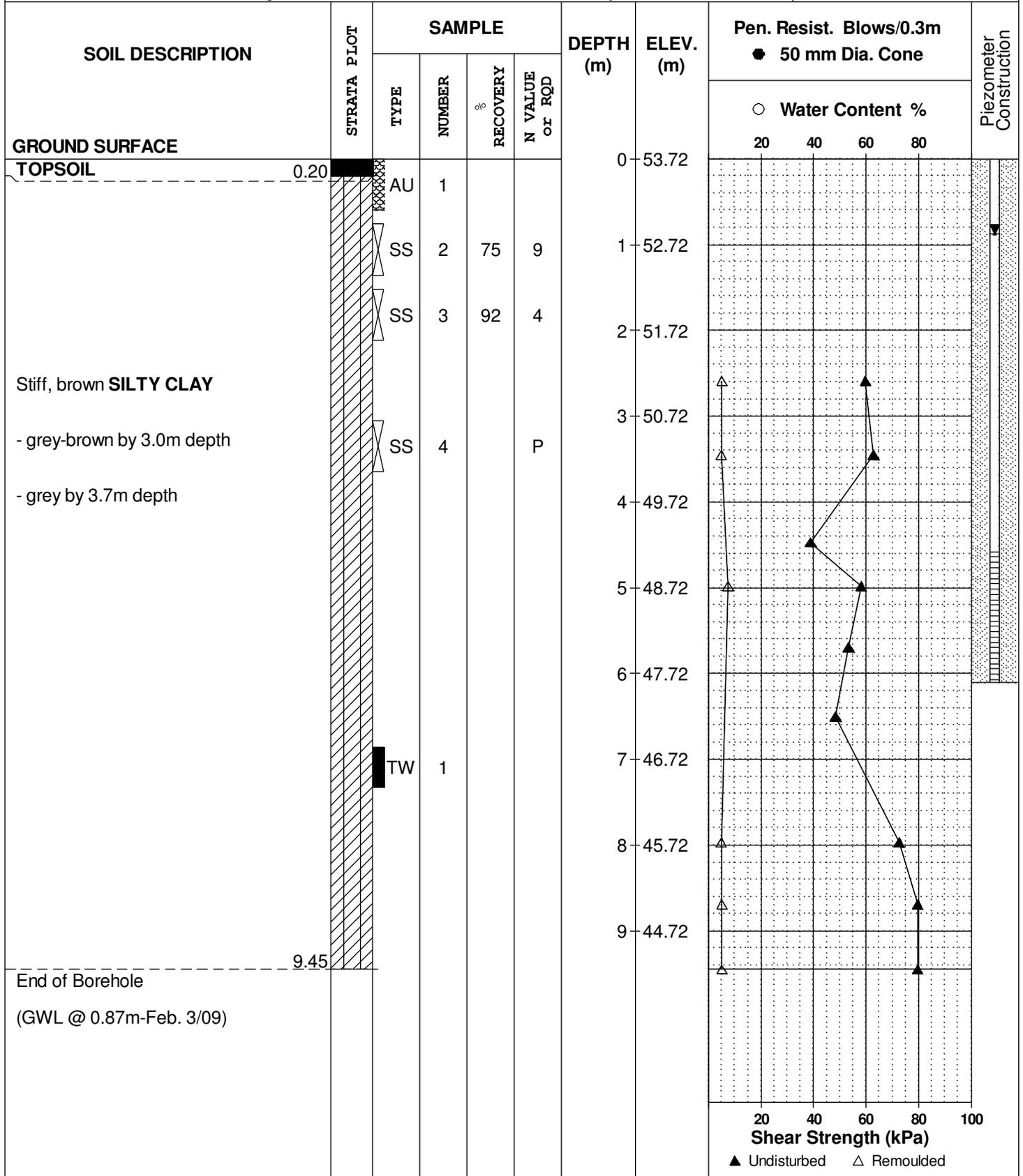
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 4**

BORINGS BY CME 55 Power Auger

DATE January 21, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

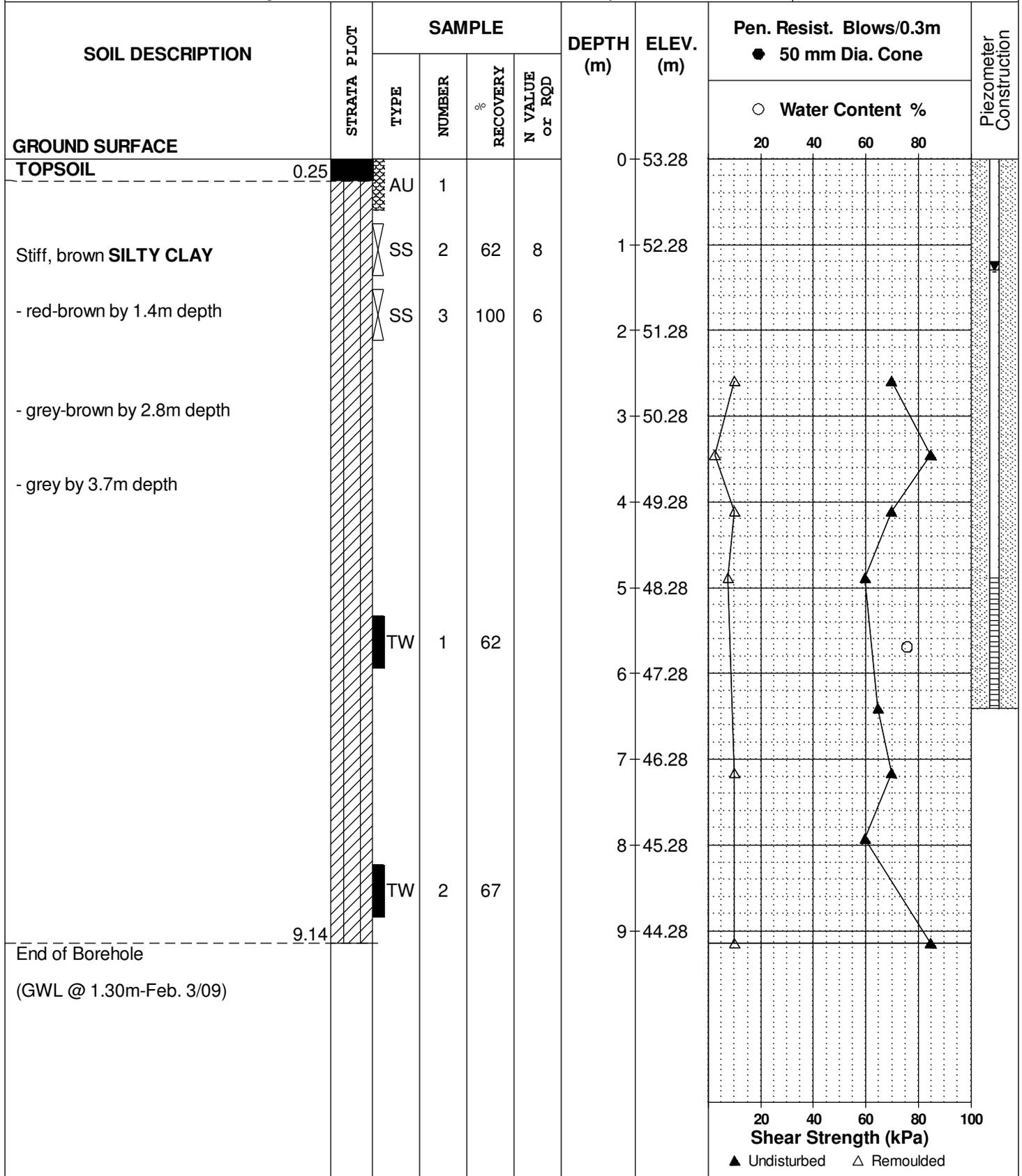
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 5**

BORINGS BY CME 55 Power Auger

DATE January 21, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

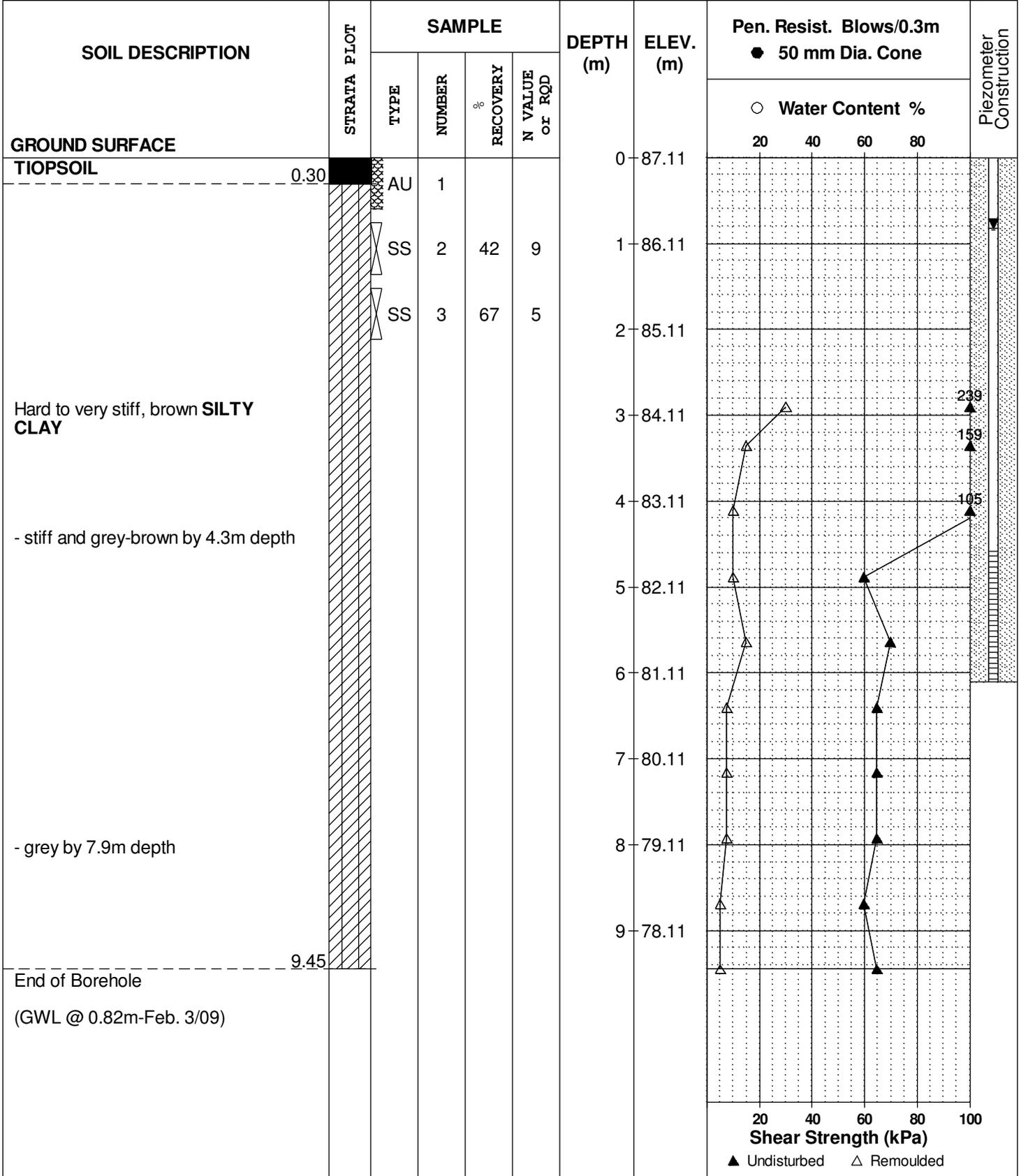
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 8**

BORINGS BY CME 55 Power Auger

DATE January 23, 2009



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Development - Queen Street
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH 9**

BORINGS BY CME 55 Power Auger

DATE January 22, 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	57.53						
TOPSOIL	0.20												
FILL: Brown silty clay with sand and gravel	1.45	AU	1										
		SS	2	50	20	1	56.53						
End of Borehole													
Practical refusal to augering @ 1.45m depth													

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

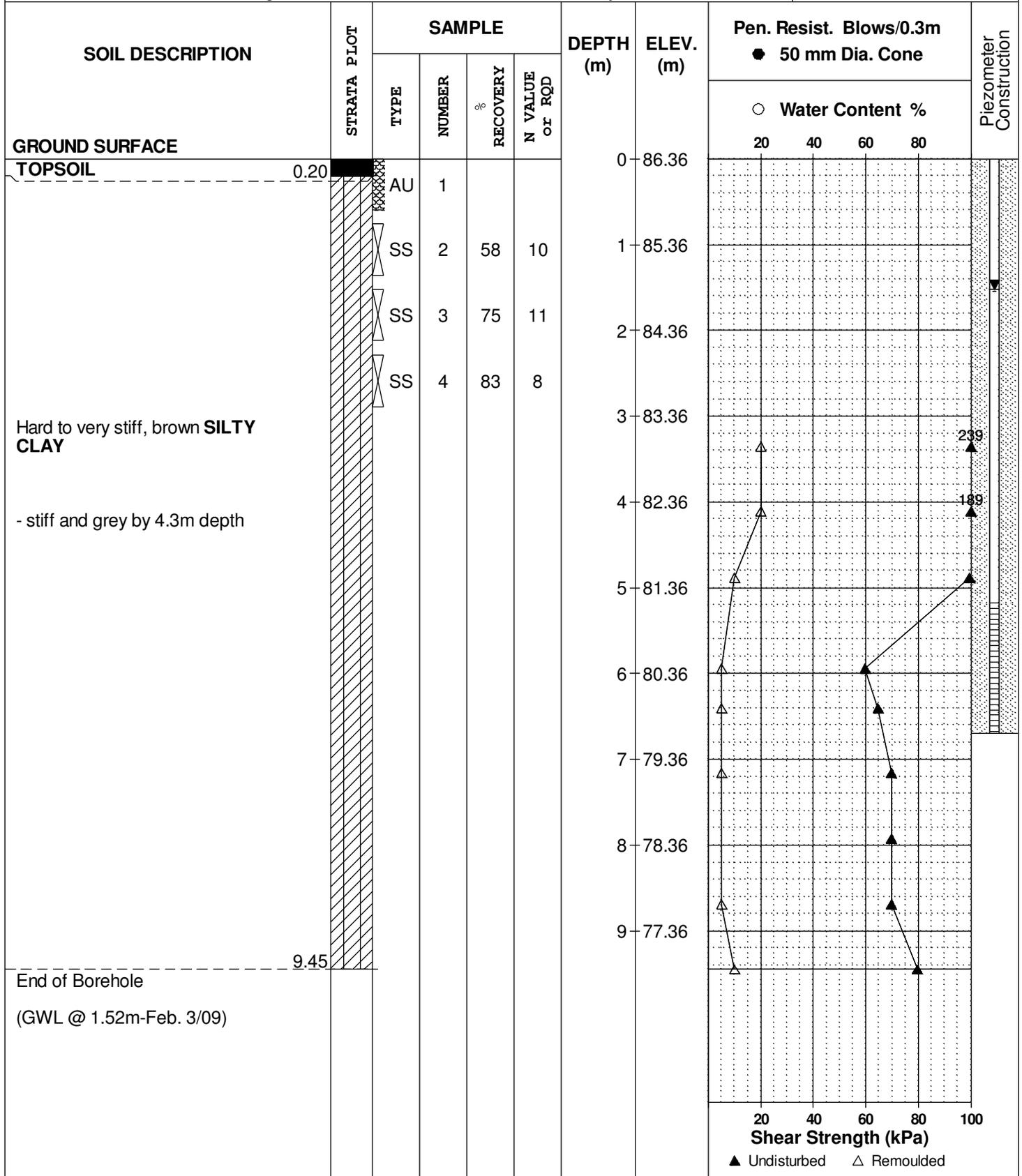
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH10**

BORINGS BY CME 55 Power Auger

DATE January 22, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG1796**

REMARKS

HOLE NO. **BH11**

BORINGS BY CME 55 Power Auger

DATE January 23, 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				Piezometer Construction	
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			20	40	60	80		
GROUND SURFACE						0	89.75						
TOPSOIL													
Very stiff, brown SILTY CLAY with organic matter	0.30 0.69	AU	1										
GLACIAL TILL: Compact to dense, brown silty sand with clay, gravel, cobbles and boulders		SS	2	75	8	1	88.75						
		SS	3	50	20	2	87.75						
		SS	4	80	50+								
End of Borehole Practical refusal to augering @ 2.95m depth	2.95												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

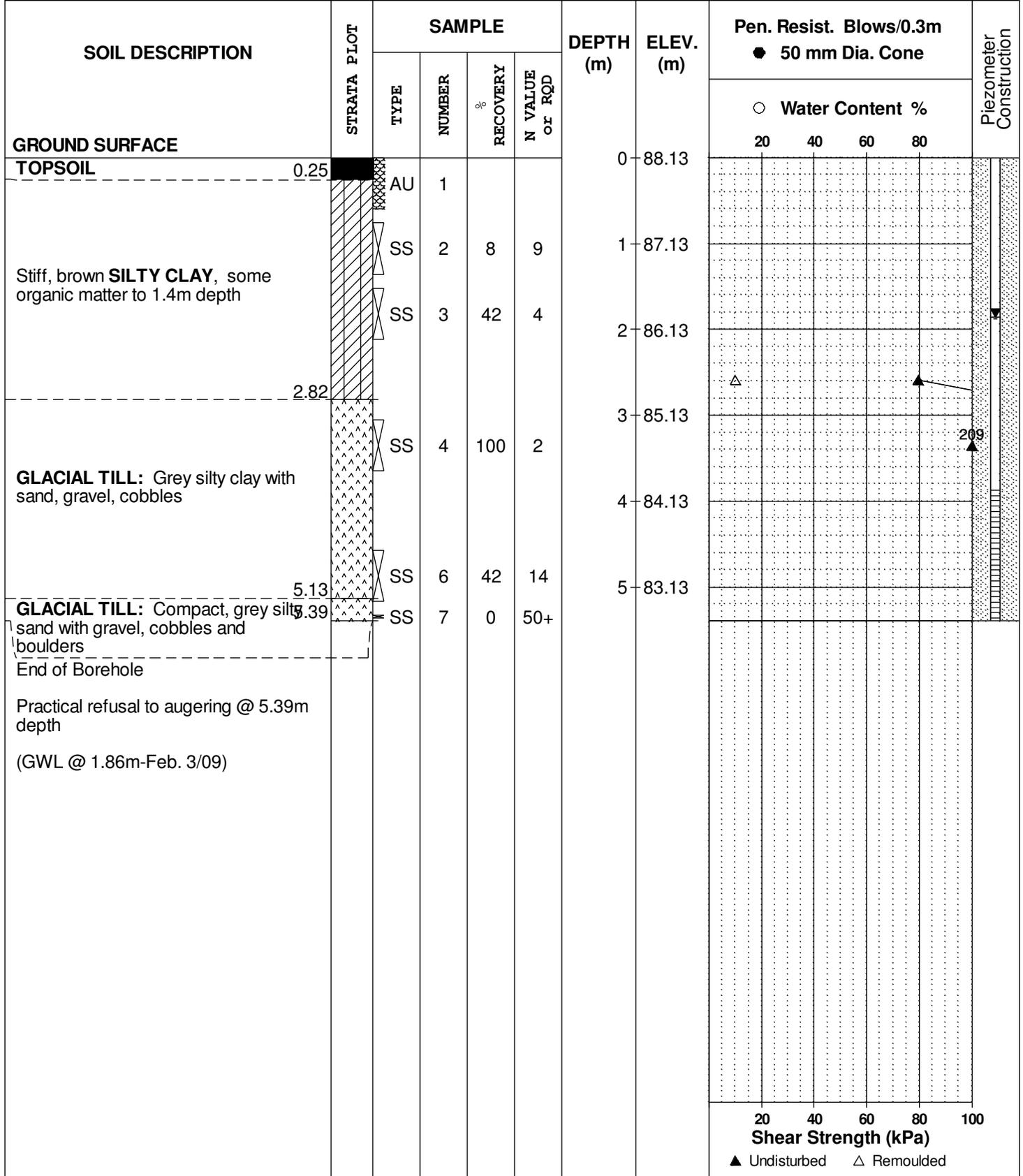
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH15**

BORINGS BY CME 55 Power Auger

DATE January 26, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

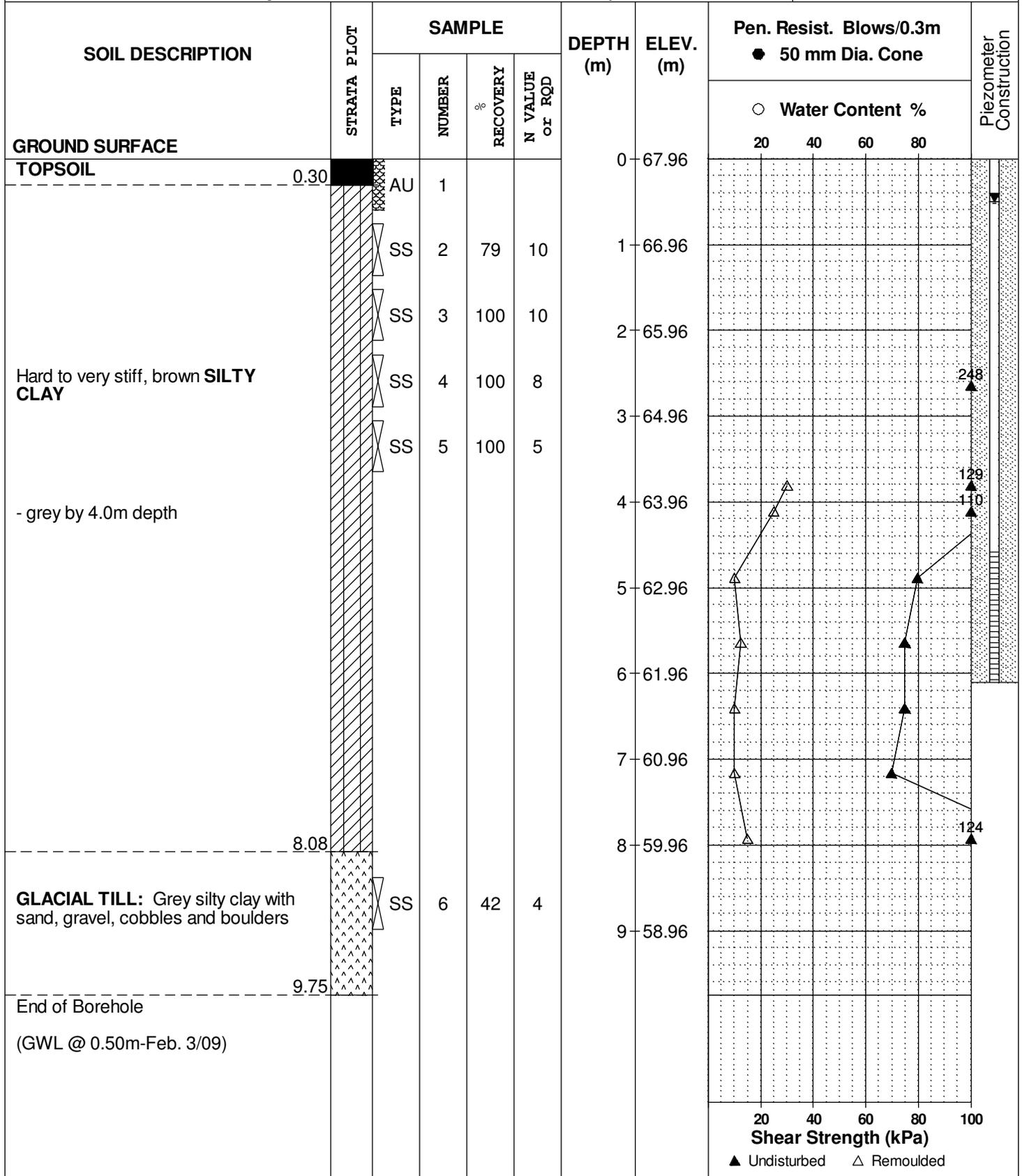
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH16**

BORINGS BY CME 55 Power Auger

DATE January 26, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

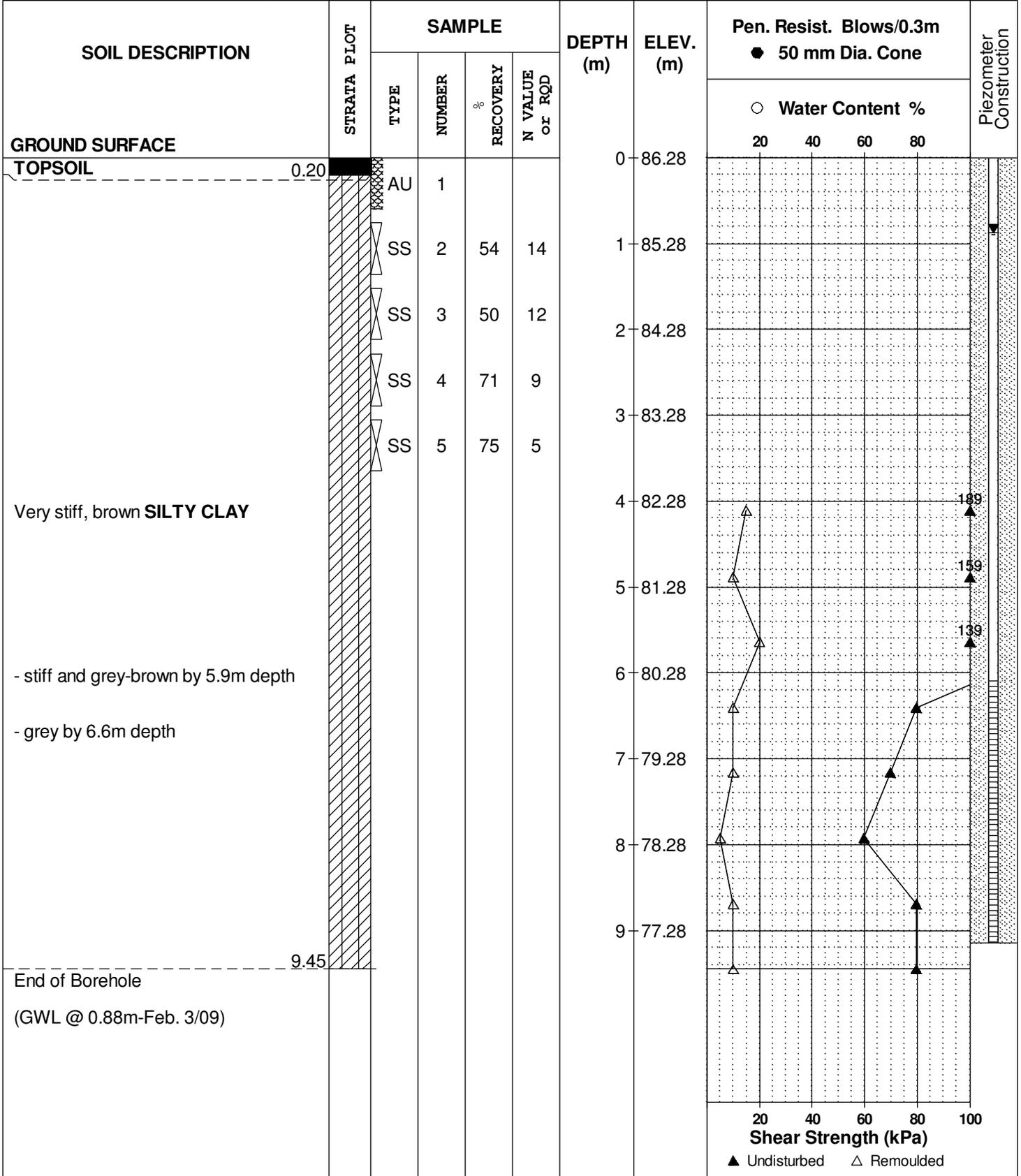
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH17**

BORINGS BY CME 55 Power Auger

DATE January 23, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

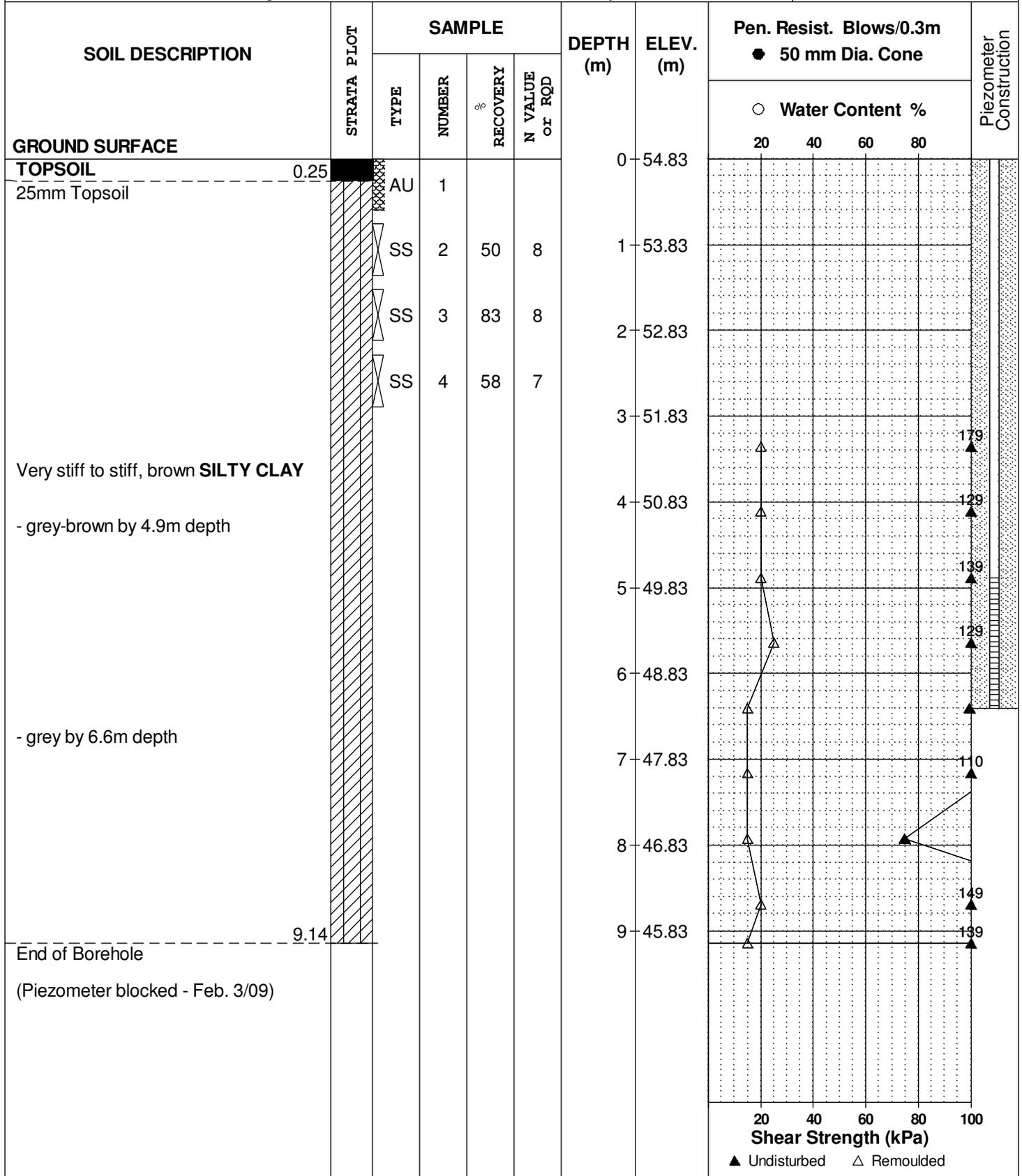
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH18**

BORINGS BY CME 55 Power Auger

DATE January 19, 2009



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

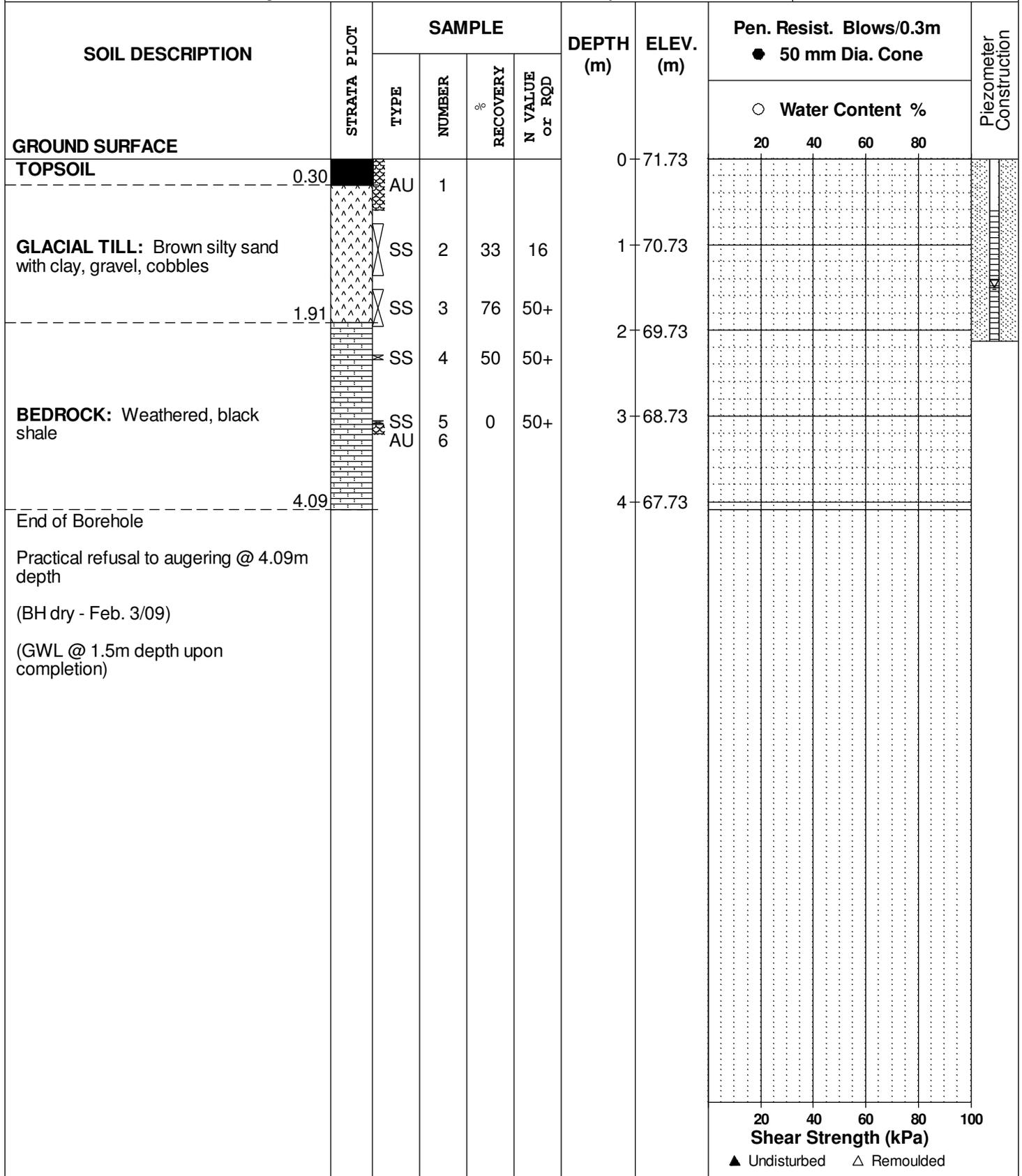
FILE NO. **PG1796**

REMARKS

HOLE NO. **BH19**

BORINGS BY CME 55 Power Auger

DATE January 22, 2009



APPENDIX 2

- PUBLISHED MOE WELL DATA



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

(11) 1518331 MUNICIPALITY 15011 COUNTY OF 01

COUNTY OR DISTRICT: Carleton TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland CON. BLOCK, TRACT, SURVEY, ETC: 108.0.F1 DATE COMPLETED: 03/06/83
ADDRESS: Pierre St. Cumberland, Ont.
ELEVATION: 374.99 RC: 4 BASIN CODE: 4 R6

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MCST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	23
blue	clay			23	60
grey	limestone			60	65
grey	"			65	66

31 0023505 0060305 0066315
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0066 10-13	<input checked="" type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL
15-18	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
6 1/2	<input checked="" type="checkbox"/> STEEL	1/8	0066
6 1/2	<input type="checkbox"/> GALVANIZED		
6 1/2	<input type="checkbox"/> CONCRETE		
6 1/2	<input type="checkbox"/> OPEN HOLE		

60 SCREEN

SIZE OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT FEET	MATERIAL AND TYPE	LEMENT GROUT LEAD PACKER, ETC.

71 PUMPING TEST

PUMPING TEST METHOD: PUMP BAILER

PUMPING RATE: 0024 GPM

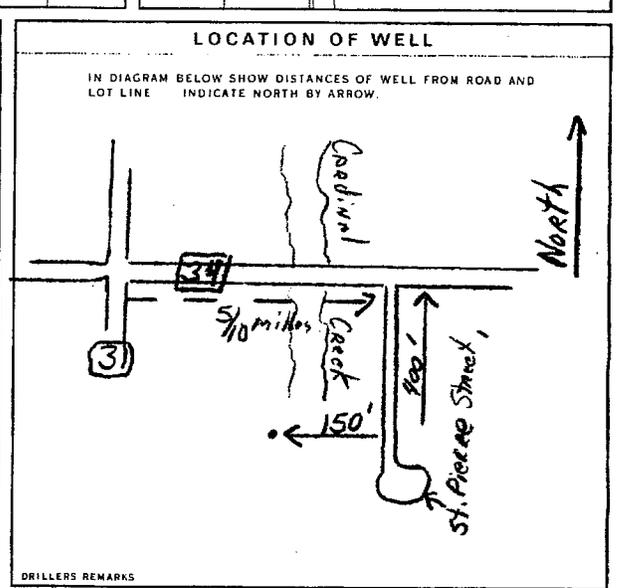
DURATION OF PUMPING: 01 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING PUMPING
050	060	050 (15 min), 050 (30 min), 050 (45 min), 050 (60 min)

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: 060 FEET

RECOMMENDED PUMPING RATE: 0024 GPM



FINAL STATUS OF WELL: WATER SUPPLY

WATER USE: DOMESTIC

METHOD OF DRILLING: ROTARY (AIR)

CONTRACTOR: G. Charbonneau & Son Drilling Ltd 1504
ADDRESS: R.R. 2, Box 194, Orleans, Ont. K1C 1T1
NAME OF DRILLER OR BORER: Raymond Charbonneau
SIGNATURE OF CONTRACTOR: [Signature]
SUBMISSION DATE: 03/06/83

OFFICE USE ONLY

CONTRACTOR: 1504 DATE RECEIVED: 05/08/83

DATE OF INSPECTION: [Blank] INSPECTOR: [Blank]



of the Environment

Ontario

WATER WELL RECORD

The Ontario Water Resources Act

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

11

1518202

MUNICIP 15011

CON 8F

01

COUNTY OR DISTRICT: **Ottawa-Carleton** TOWNSHIP/BOROUGH/CITY/TOWN/VILLAGE: **Cumberland** LOT: **028**
 CON. BLOCK/TRACT/SURVEY ETC: **1 O.F.I** DATE COMPLETED: **03 03 83**
 ADDRESS: **1, Cumberland, Ont.** DAY: **03** MO: **03** YEAR: **83**
 METERING: **37599** RC: **4** ELEVATION: **027.0** RC: **4** BASIN CODE: **26**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	17
blue	clay			17	59
grey	gravel		fine gravel	59	61
grey	limestone			61	66



(31) **0017505** **0059305** **0061231** **0066215**

(32) _____

(41) **WATER RECORD**

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL

(51) **CASING & OPEN HOLE RECORD**

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6.25	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	1.88	+1	61.8
6.0	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			0066
6.25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			61.8 - 66

(61) **PLUGGING & SEALING RECORD**

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER ETC.
10-13		
18-21		
26-29		

(71) **PUMPING TEST**

PUMPING TEST METHOD: 1 PUMP 2 BAILER

PUMPING RATE: **0030** GPM

DURATION OF PUMPING: 01 15-18 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
029	065	15 MINUTES: 029 30 MINUTES: 029 45 MINUTES: 029 60 MINUTES: 029

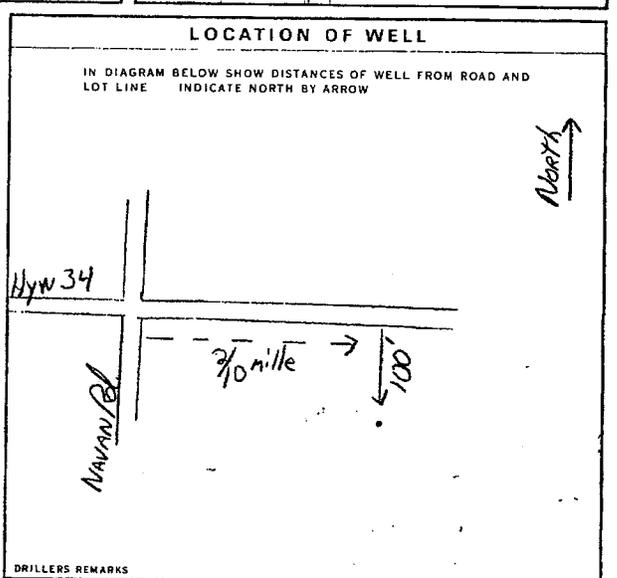
PUMP INTAKE SET AT: **50** FEET

WATER AT END OF TEST: 1 CLEAR 2 CLOUDY

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: **050** FEET

RECOMMENDED PUMPING RATE: **0025** GPM



FINAL STATUS OF WELL

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

WATER USE 01

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

METHOD OF DRILLING 4

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

CONTRACTOR

NAME OF WELL CONTRACTOR: **G. Charbonneau + Son Drilling Ltd** LICENCE NUMBER: **1504**

ADDRESS: **R.R. 2, Box 194, Orleans, Ont. K1C 1T1**

NAME OF DRILLER OR BORER: **Raymond Charbonneau** LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: **03 03 83**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **1504** DATE RECEIVED: **02 05 83**

DATE OF INSPECTION: _____ INSPECTOR: _____

REMARKS: _____



1517346

MUNICIPALITY

CORPORATION

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

Header section containing County or District (CUMBERLAND), Township (CUMBERLAND), Con. Block, Tract, Survey, Etc. (CON # 1 OLD SAVER), Date Completed (DAY 27 MO 08 YR 80), and various identification numbers.

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS). Table with columns: GENERAL COLOUR, MOST COMMON MATERIAL, OTHER MATERIALS, GENERAL DESCRIPTION, DEPTH - FEET (FROM, TO). Rows include: 0-7 DYG, 7-40 GREY CLAY, 40-58 BLUE CLAY, 58-63 BROWN SAND, 63-66 BLACK GRAVEL, 66-70 GREY LIMESTONE.

Section 31: A row of small boxes for recording various data points, including 000723, 0040205, 0058305, 0063614, 0066811, 0070215.

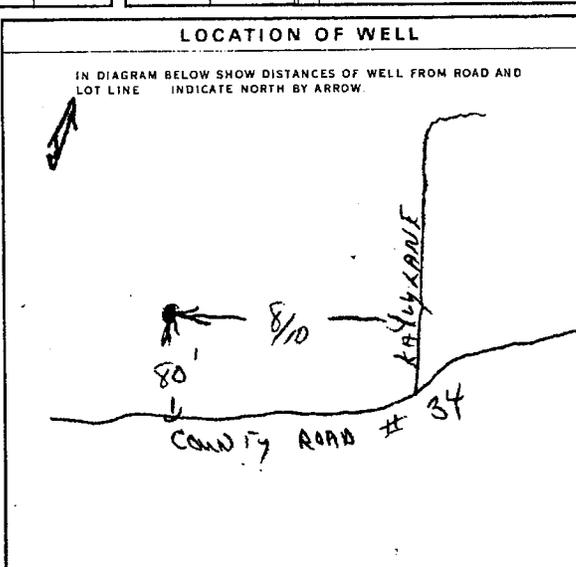
Section 41: WATER RECORD. Table with columns: WATER FOUND AT - FEET, KIND OF WATER (FRESH, SALTY, SULPHUR, MINERAL). Rows for 0-10, 10-15, 15-20, 20-25, 25-30, 30-35.

Section 51: CASING & OPEN HOLE RECORD. Table with columns: INSIDE DIAM INCHES, MATERIAL, WALL THICKNESS INCHES, DEPTH - FEET (FROM, TO). Includes handwritten notes like '1.88' and '0066'.

Section 52: SCREEN. Table with columns: SIZE(S) OF OPENING (SLOT NO.), DIAMETER INCHES, LENGTH FEET, MATERIAL AND TYPE, DEPTH TO TOP OF SCREEN FEET.

Section 61: PLUGGING & SEALING RECORD. Table with columns: DEPTH SET AT - FEET (FROM, TO), MATERIAL AND TYPE, CEMENT GROUT LEAD PACKER, ETC.

Section 71: PUMPING TEST. Includes Pumping Test Method (PUMP, BAILER), Pumping Rate (0010 GPM), Duration of Pumping (01 HOURS, 30 MINS), Water Levels During (040, 055, 047, 055, 053, 053 FEET), and Recommended Pump Type (SHALLOW, DEEP).



Final Status of Well, Water Use, and Method of Drilling. Includes checkboxes for 'WATER SUPPLY', 'DOMESTIC', 'CABLE TOOL', etc.

CONTRACTOR INFORMATION. Includes Name of Well Contractor (MAURICE CAYER LTD), Address (CASSELLMAN ONT.), Name of Driller or Borer, and Signature of Contractor (Maurice Cayer).

OFFICE USE ONLY. Includes Date Received (020980), Date of Inspection, and Inspector (M).



WATER WELL RECORD

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

11

1517987

MUNICIPALITY 15015

COM. OF. 0F

LOT 23-27 01

COUNTY OR DISTRICT **CARLETON Place** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE **Cumberland** CON. BLOCK, TRACT, SURVEY, ETC. **1** LOT **027**

DATE COMPLETED **11-13**
DAY **12** MO **Nov** YR **82**

ING **38699** RC **4** ELEVATION **0235** RC **4** BASIN CODE **26**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
gray	clay			0	38
gray	hard pan			38	50
gray	limestone			50	71

31 9938205 0050214 00711215

<p>41 WATER RECORD</p> <table border="1"> <tr> <th>WATER FOUND AT - FEET</th> <th>KIND OF WATER</th> </tr> <tr> <td>10-13 0064</td> <td>1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL</td> </tr> <tr> <td>13-18</td> <td>1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL</td> </tr> <tr> <td>20-23</td> <td>1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL</td> </tr> <tr> <td>23-28</td> <td>1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL</td> </tr> <tr> <td>30-33</td> <td>1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL</td> </tr> </table>	WATER FOUND AT - FEET	KIND OF WATER	10-13 0064	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL	13-18	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL	20-23	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL	23-28	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL	30-33	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL	<p>51 CASING & OPEN HOLE RECORD</p> <table border="1"> <tr> <th>INSIDE DIAM. INCHES</th> <th>MATERIAL</th> <th>WALL THICKNESS INCHES</th> <th>DEPTH - FEET</th> </tr> <tr> <td>10-11 6 1/2</td> <td>1 STEEL</td> <td>1/8</td> <td>0-13-16</td> </tr> <tr> <td>13-16 6 1/2</td> <td>1 GALVANIZED 2 CONCRETE 3 OPEN HOLE</td> <td>1/8</td> <td>0-20-22</td> </tr> <tr> <td>17-18</td> <td>1 STEEL</td> <td>1/8</td> <td>20-22</td> </tr> <tr> <td>24-25</td> <td>1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE</td> <td>1/8</td> <td>27-30</td> </tr> </table>	INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	10-11 6 1/2	1 STEEL	1/8	0-13-16	13-16 6 1/2	1 GALVANIZED 2 CONCRETE 3 OPEN HOLE	1/8	0-20-22	17-18	1 STEEL	1/8	20-22	24-25	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE	1/8	27-30	<p>61 PLUGGING & SEALING RECORD</p> <table border="1"> <tr> <th>DEPTH SET AT - FEET</th> <th>MATERIAL AND TYPE</th> <th>CEMENT GROUT LEAD PACKER ETC.</th> </tr> <tr> <td>10-15</td> <td></td> <td></td> </tr> <tr> <td>18-21</td> <td></td> <td></td> </tr> <tr> <td>26-29</td> <td></td> <td></td> </tr> </table>	DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER ETC.	10-15			18-21			26-29		
WATER FOUND AT - FEET	KIND OF WATER																																													
10-13 0064	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL																																													
13-18	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL																																													
20-23	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL																																													
23-28	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL																																													
30-33	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL																																													
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET																																											
10-11 6 1/2	1 STEEL	1/8	0-13-16																																											
13-16 6 1/2	1 GALVANIZED 2 CONCRETE 3 OPEN HOLE	1/8	0-20-22																																											
17-18	1 STEEL	1/8	20-22																																											
24-25	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE	1/8	27-30																																											
DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER ETC.																																												
10-15																																														
18-21																																														
26-29																																														

71 PUMPING TEST METHOD

1 PUMP 2 SAUER 10 PUMPING RATE 00/6 GPM 01 15-16 HOURS 00 17-18 MINS

19-21 STATIC LEVEL 030 FEET 22-24 WATER LEVEL END OF PUMPING 040 FEET

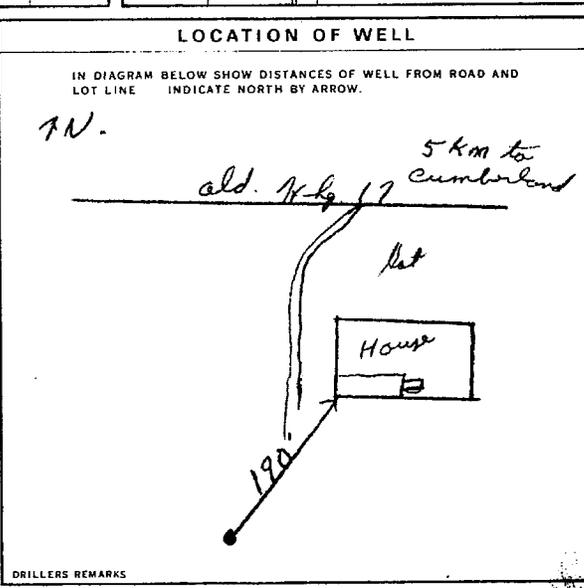
25 WATER LEVELS DURING

15 MINUTES	20 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
035	038	040	040	040

30-41 PUMP INTAKE SET AT 71 FEET 42 WATER AT END OF TEST

43-45 RECOMMENDED PUMP SETTING 065 FEET 46-49 RECOMMENDED PUMPING RATE 00/2 GPM

50-53 RECOMMENDED PUMP TYPE 1 SHALLOW 2 LOOP 3 OTHER



FINAL STATUS OF WELL 1

WATER USE 01

METHOD OF DRILLING 1

CONTRACTOR NAME OF WELL CONTRACTOR **Maurice Cayer Ltd** LICENCE NUMBER **1517**

ADDRESS **Casselman Ont.**

NAME OF DRILLER OR BORER

SIGNATURE OF CONTRACTOR **Maurice Cayer** SUBMISSION DATE DAY _____ MO _____ YR _____

OFFICE USE ONLY

DATE RECEIVED **29 11 82**

CONTRACTOR **1517**

DATE OF INSPECTION

INSPECTOR **OP/Lm**

REMARKS



Ontario

The Ontario Water Resources Act WATER WELL RECORD

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

11

1516401

MUNICIP. 15011

CON. 9F

LOT 01

COUNTY OR DISTRICT Carleton Place	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Cumberland	CON., BLOCK, TRACT, SURVEY, ETC. 105	LOT 25-27 028
R.R. 1, Cumberland, Ont.		DATE COMPLETED DAY 12 MO. 07 YR. 77	
38499	4	ELEVATION 021.5	4
		BASIN CODE 26	

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	19
blue	clay			19	39
grey	gravel			39	40
blue	slate			40	50

MOE
VF-18

31	00191505	0039305	0040211	0050319
32				

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
10-13	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	0 0041
17-18	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		20-23
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		27-30

SCREEN

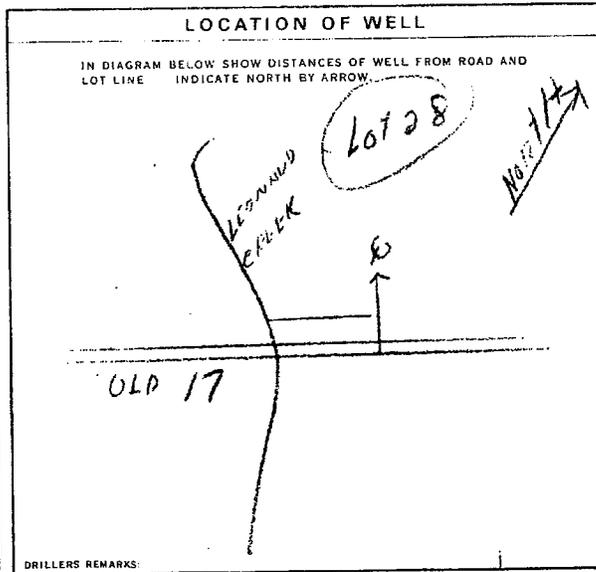
SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
	34-38	39-40
MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN FEET
		41-44

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.
FROM TO		
10-13	14-17	
18-21	23-25	
26-28	30-33	80

71 PUMPING TEST

PUMPING TEST METHOD 1 <input checked="" type="checkbox"/> PUMP 2 <input type="checkbox"/> BAILER	10 PUMPING RATE 0006	11-14 DURATION OF PUMPING 15-16 HOUR 01 17-18 MIN.
19-21 STATIC LEVEL 024 FEET	22-24 WATER LEVEL END OF PUMPING 045 FEET	25 WATER LEVELS DURING PUMPING 15 MINUTES 024 30 MINUTES 024 45 MINUTES 024 60 MINUTES 024
IF FLOWING, GIVE RATE	38-41 PUMP INTAKE SET AT GPM 45	42 WATER AT END OF TEST 1 <input checked="" type="checkbox"/> CLEAR 2 <input type="checkbox"/> CLOUDY
RECOMMENDED PUMP TYPE <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP	43-45 RECOMMENDED PUMP SETTING 045 FEET	46-49 RECOMMENDED PUMPING RATE 0006 GPM



FINAL STATUS OF WELL

1 WATER SUPPLY
2 OBSERVATION WELL
3 TEST HOLE
4 RECHARGE WELL

5 ABANDONED - INSUFFICIENT SUPPLY
6 ABANDONED - POOR QUALITY
7 UNFINISHED

WATER USE

1 DOMESTIC
2 STOCK
3 IRRIGATION
4 INDUSTRIAL
5 OTHER

6 COMMERCIAL
7 MUNICIPAL
8 PUBLIC SUPPLY
9 COOLING OR AIR CONDITIONING
10 NOT USED

METHOD OF DRILLING

1 CABLE TOOL
2 ROTARY (CONVENTIONAL)
3 ROTARY (REVERSE)
4 ROTARY (AIR)
5 AIR PERCUSSION

6 BORING
7 DIAMOND
8 JETTING
9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR
G. Charbonneau+Son Drilling Ltd 1504

ADDRESS
R.R. 2, Box 194, Orleans, Ont. K1C 1T1

NAME OF DRILLER OR BORER
L. Bourgeois

SIGNATURE OF CONTRACTOR
G. Charbonneau

LICENCE NUMBER
1504

SUBMISSION DATE
DAY **12** NO. **7** YR. **77**

OFFICE USE ONLY

DATA SOURCE
1

CONTRACTOR
1504

DATE RECEIVED
100278

DATE OF INSPECTION
1

INSPECTOR
h

REMARKS

P
WI



The Ontario Water Resources Act WATER WELL RECORD

316
Hd
6e
01

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

11

1516407

MUNICIP. 15011

COU. OF

COUNTY OR DISTRICT Caledon	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Cumberland	CON. BLOCK, TRACT, SURVEY, ETC. 103	LOT 028
DATE COMPLETED DAY 29 MO 08 YR. 77			48-53
ELEVATION 376.99		BASIN CODE 4 26	II III IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	11
blue	clay			11	40
grey	gravel			40	42
grey	slate			42	46
black	slate			46	48
grey	slate			48	50

MOE
VF-18

31	0011505	0040305	0042211	0046219	0048819	0050219
32						

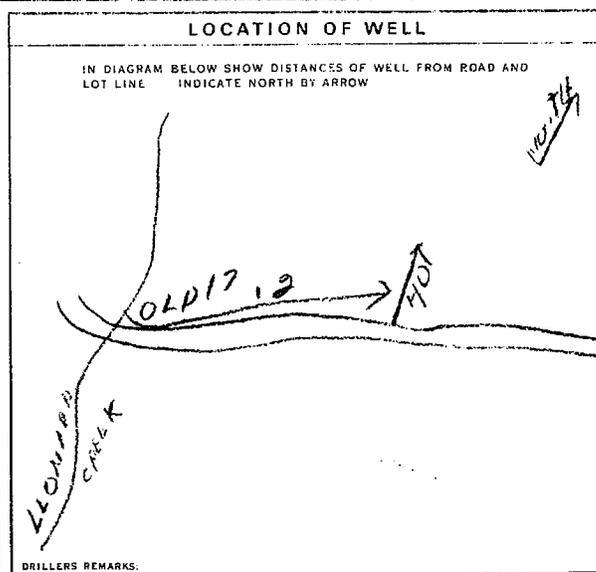
WATER RECORD	
WATER FOUND AT - FEET	KIND OF WATER
0050	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

CASING & OPEN HOLE RECORD				
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6 1/2	STEEL	188	0	0043
06	GALVANIZED			
	CONCRETE			
	OPEN HOLE			

SCREEN	SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

PLUGGING & SEALING RECORD			
DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)	
FROM	TO		
10-13	16-17		
16-21	22-25		
26-29	30-33		

PUMPING TEST METHOD		PUMPING RATE		DURATION OF PUMPING	
1 <input checked="" type="checkbox"/> PUMP	2 <input type="checkbox"/> BAILER	0007	GPM 01	00	HOURS 00
WATER LEVEL END OF PUMPING		WATER LEVELS DURING			
19-21	003 FEET	22-24	030 FEET	26-28	003 FEET
29-31	003 FEET	32-34	003 FEET	35-37	003 FEET
PUMP INTAKE SET AT		WATER AT END OF TEST			
30 FEET		1 <input checked="" type="checkbox"/> CLEAR 2 <input type="checkbox"/> CLOUDY			
RECOMMENDED PUMP TYPE		RECOMMENDED PUMP SETTING		RECOMMENDED PUMPING RATE	
1 <input checked="" type="checkbox"/> SHALLOW 2 <input type="checkbox"/> DEEP		030 FEET		0004 GPM	



FINAL STATUS OF WELL	
1 <input checked="" type="checkbox"/> WATER SUPPLY	5 <input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY
2 <input type="checkbox"/> OBSERVATION WELL	6 <input type="checkbox"/> ABANDONED, POOR QUALITY
3 <input type="checkbox"/> TEST HOLE	7 <input type="checkbox"/> UNFINISHED
4 <input type="checkbox"/> RECHARGE WELL	

WATER USE	
1 <input checked="" type="checkbox"/> DOMESTIC	5 <input type="checkbox"/> COMMERCIAL
2 <input type="checkbox"/> STOCK	6 <input type="checkbox"/> MUNICIPAL
3 <input type="checkbox"/> IRRIGATION	7 <input type="checkbox"/> PUBLIC SUPPLY
4 <input type="checkbox"/> INDUSTRIAL	8 <input type="checkbox"/> COOLING OR AIR CONDITIONING
9 <input type="checkbox"/> OTHER	9 <input type="checkbox"/> NOT USED

METHOD OF DRILLING	
1 <input type="checkbox"/> CABLE TOOL	4 <input type="checkbox"/> BORING
2 <input type="checkbox"/> ROTARY (CONVENTIONAL)	7 <input type="checkbox"/> DIAMOND
3 <input type="checkbox"/> ROTARY (REVERSE)	8 <input type="checkbox"/> JETTING
4 <input checked="" type="checkbox"/> ROTARY (AIR)	9 <input type="checkbox"/> DRIVING
5 <input type="checkbox"/> AIR PERCUSSION	

LICENCE NUMBER 1 + Son Drilling Ltd. 1504
24, Orleans, Ont. K1C 1T1
LICENCE NUMBER
SUBMISSION DATE DAY 29 MO 8 YR. 77

DATA SOURCE 1	CONTRACTOR 1504	DATE RECEIVED 700278
DATE OF INSPECTION	INSPECTOR	
REMARKS:		P WI



1513136

WATER RESOURCES DIVISION 56 No. 760 JAN 19 1965 ONTARIO WATER RESOURCES COMMISSION

UTM 18Z 463260 E

Ottawa front 5R 501376210N

Elev. 1021.5

Basin 255 Russell O.F. Cont. lot 28 Township, Village, Town or City 314/6e Cumberland

Con. lot, from Ottawa R. Lot 28 Date completed 20 September 1964 (day month year)

Address Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 50'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 2"

Pumping Test

Static level 25
Test-pumping rate 8 G.P.M.
Pumping level 40'
Duration of test pumping 2 hrs.
Water clear or cloudy at end of test clear
Recommended pumping rate 8 G.P.M.
with pump setting of 40 feet below ground surface

Well Log

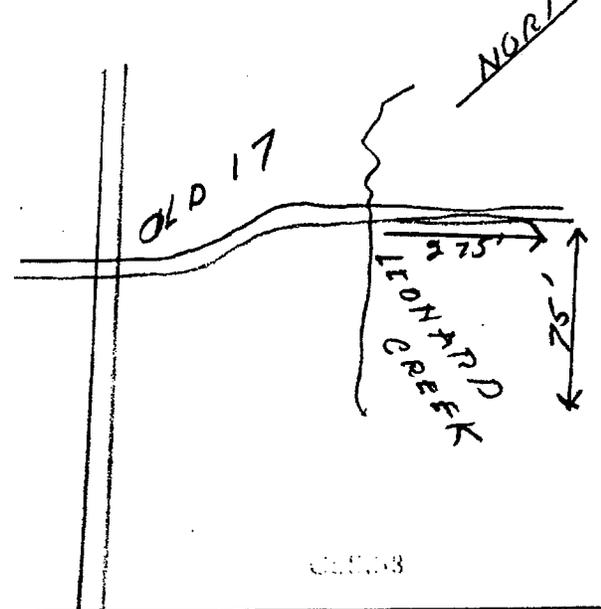
Water Record

Table with columns: Overburden and Bedrock Record, From ft., To ft., Depth(s) at which water(s) found, Kind of water (fresh, salty, sulphur)

For what purpose(s) is the water to be used? domestic
Is well on upland, in valley, or on hillside? hillside
Drilling or Boring Firm G.Charbonneau, Diamond & Cable Drilling,
Address R.R. # 1, Box 194, Orleans, Ont.
Licence Number 1418
Name of Driller or Borer G.Charbonneau
Address Orleans, Ont. R.R. # 1.
Date 20 September, 1964.
Signature of Gerard Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



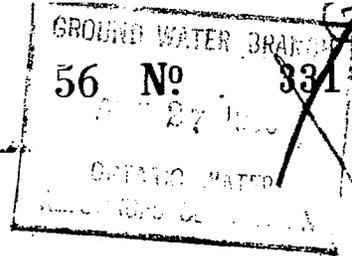
UTM 1182 416314210 E

OTTAWA FRONT

C5R 510317171610 N



1513134



The Ontario Water Resources Commission Act

Elev. 176 R 2021418

WATER WELL RECORD

Basin 215 County or District Russell O.F. Cont. Lot 28 Township, Village, Town or City 316/6e Cumberland

Contact from Ottawa R. Lot Part of lot 28 Date completed August 13, 1963 (day month year)

Address R.R.# 1, Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 56'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 2"

Pumping Test

Static level 32'
Test-pumping rate 8 G.P.M.
Pumping level 45
Duration of test pumping 2 hrs.
Water clear or cloudy at end of test clear
Recommended pumping rate 8 G.P.M.
with pump setting of 45 feet below ground surface

Well Log

Water Record

Table with 5 columns: Overburden and Bedrock Record, From ft., To ft., Depth(s) at which water(s) found, Kind of water (fresh, salty, sulphur). Rows include blue clay (0-53) and grey limestone (53-66).

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

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

Drilling or Boring Firm G. Charbonneau, Cable & Diamond Drilling

Address R.R.# 1, Box 194, Orleans, Ont.

Licence Number 1025

Name of Driller or Borer G. Charbonneau

Address R.R.# 1, Orleans, Ont.

Date August 13, 1963

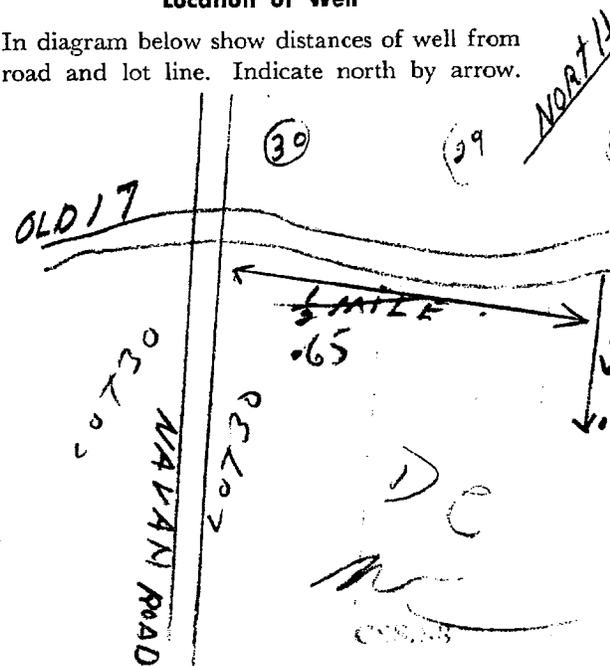
Signature of Gerard Charbonneau (Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

OWRC COPY

Location of Well

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



UTM 1182 41613121410 E



1513133

GROUND WATER BRANCH 56 WATER 332
FEB 21 1964
ONTARIO WATER RESOURCES COMMISSION
Cumberland

0511 5101314161010 N

The Ontario Water Resources Commission Act

Elev. 719 21019

WATER WELL RECORD

County or District Russell O.F. Con I Lot 28 Township, Village, Town or City 316/6e Cumberland

Con. ~~SPENCER RIVER~~ Lot 28 Date completed 28 November 1963 (day month year)

Address R. R. # 1, Cumberland, Ont.

Casing and Screen Record

Pumping Test

Inside diameter of casing 2"
Total length of casing 30'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 2"

Static level 15'
Test-pumping rate 8 G.P.M.
Pumping level 20'
Duration of test pumping 2 hrs.
Water clear or cloudy at end of test clear
Recommended pumping rate 5 G.P.M.
with pump setting of 20' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record

	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
blue clay	0	28	38'	fresh
grey limestone	28	38		

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

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

Drilling or Boring Firm G. Charbonneau, Diamond & Cable Drilling,

Address R. R. # 1, Box 194, Orleans, Ont.

Licence Number 1025

Name of Driller or Borer G. Charbonneau

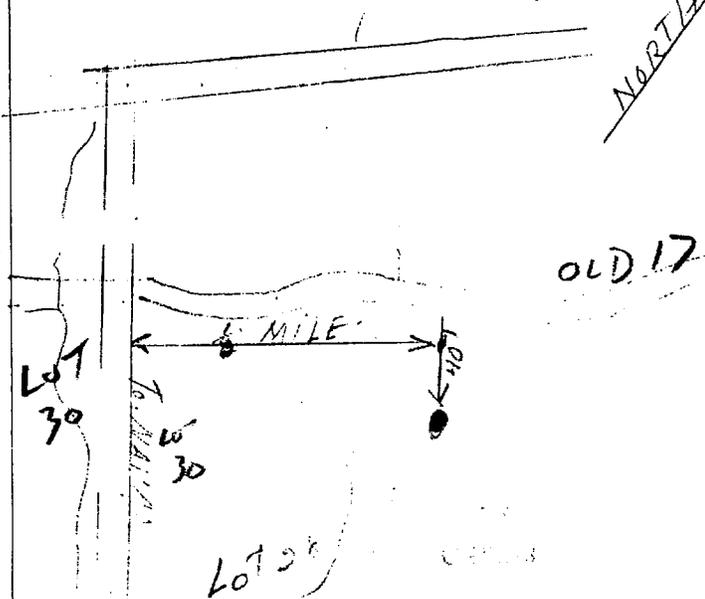
Address R. R. # 1, Orleans, Ont.

Date 28 November 1963

Gerald Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



UTM 1824649110E



1513107

56 No 329

5R 503881919N

The Ontario Water Resources Commission Act

Elev. 5R 02474

WATER WELL RECORD

County or District Russell Township, Village, Town or City Cumberland

Con. 1st from Ottawa R. Lot. 23 Date completed 14 September 1967
(day month year)

Address Cumberland, Ont.

Casing and Screen Record

Pumping Test

Inside diameter of casing 5"
Total length of casing 62'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 5"

Static level 4'
Test-pumping rate 10 G.P.M.
Pumping level 20'
Duration of test pumping 2 hrs.
Water clear or cloudy at end of test clear
Recommended pumping rate 6 G.P.M.
with pump setting of 20' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth (s) at which water (s) found	Kind of water (fresh, salty, sulphur)
blue clay & bolders	0	40		
hard pan	40	62	62	fresh

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

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

Drilling or Boring Firm

G. Charbonneau, Diamond & Cable Drilling,

Address R.R. 1, Box 194, Orleans, Ont.

Licence Number 2593

Name of Driller or Borer G. Charbonneau

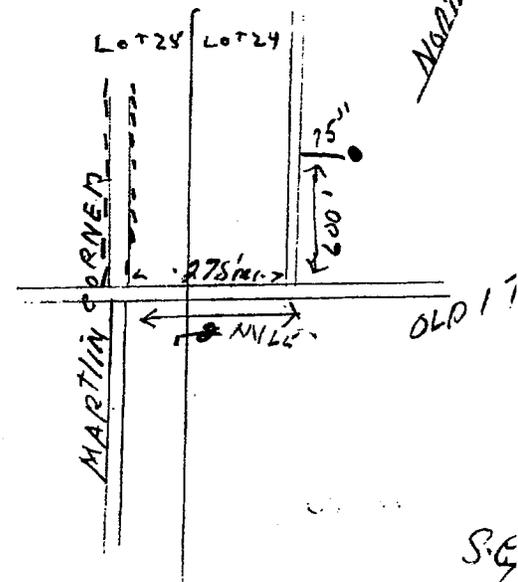
Address R.R. 1, Orleans, Ont.

Date 14 September 1967.

G. Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



S.E.

UTM 18Z 464440E

9R 5038625N

Elev. 9R 02810

Dist. 25

D.F. Cont. Ret. 24



1513111

56 No 328

RECEIVED APR - 3 1952 GEOLOGICAL BRANCH DEPARTMENT OF MINES

The Well Drillers Act Department of Mines, Province of Ontario

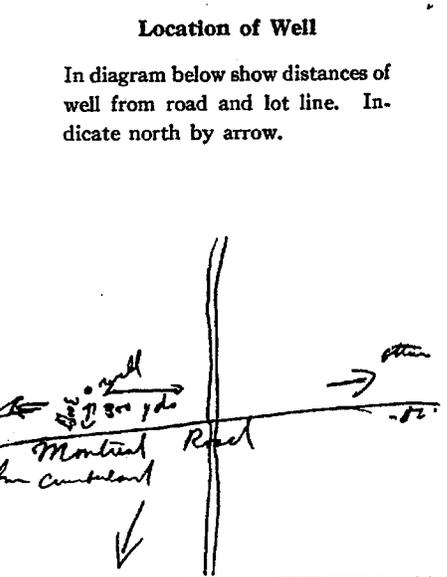
Water Well Record

Township, Village, Town or City... Cumberland... Date Completed... Cost of Well (excluding pump)...

Table with 2 columns: Pipe and Casing Record, Pumping Test. Includes fields for casing diameter, length, screen type, pumping level, etc.

Water Record section with fields for Kind (fresh or mineral), Quality, Appearance, Purpose, and a table for Depth(s) to Water Horizon(s), Kind of Water, and No. of Feet Water Rises.

Well Log table with columns: Overburden and Bedrock Record, From, To. Includes handwritten entries like '12 feet Clay' and '81 feet sandstone rock'.



Situation: Is well on upland, in valley, or on hillside? level... Drilling Firm: Gordon & Mulvey... Name of Driller: Mrs. Renaud... Address: 427 Claven St... Signature of Licensee: Gordon & Mulvey Per M.R.



WATER WELL RECORD

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED

2. CHECK CORRECT BOX WHERE APPLICABLE

11

5601286

MUNICIP.

CON.

05

01

COUNTY OR DISTRICT
Carleton Place

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE
Cumberland

CON., BLOCK, TRACT, SURVEY, ETC.
1st. from Ottawa R.

LOT
025



Cumberland, Ont.

DATE COMPLETED

DA *04* MO *05* YR *70*

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
grey	clay			0	8
black	muck			8	12
blue	clay & boulders			12	70
grey	limestone		1513128	70	85

31	<i>0008495</i>	<i>0012803</i>	<i>0070413</i>	<i>0085215</i>
32				

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
10-13	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
15-18	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
10-11	<input checked="" type="checkbox"/> STEEL	188	0	72
17-18	<input type="checkbox"/> STEEL			0072
24-25	<input type="checkbox"/> STEEL			0085

SCREEN

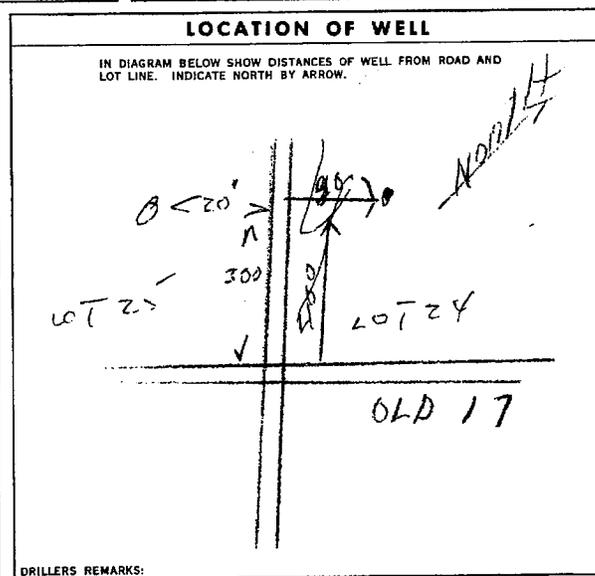
SIZE (S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET		MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
FROM	TO	
10-13	14-17	
18-21	22-25	
28-29	30-33	

71 PUMPING TEST

<input type="checkbox"/> PUMP	<input checked="" type="checkbox"/> BAILER	10 PUMPING RATE	11-14 DURATION OF PUMPING
		<i>0006</i>	<i>02</i> HOURS <i>00</i> MINS.
19-21	22-24	25	15-16
010 FEET	050 FEET	025 FEET	035 FEET
			045 FEET
			045 FEET
38-41	42-45	43-45	46-49



FINAL STATUS OF WELL

<input checked="" type="checkbox"/> WATER SUPPLY	<input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY
<input type="checkbox"/> OBSERVATION WELL	<input type="checkbox"/> ABANDONED, POOR QUALITY
<input type="checkbox"/> TEST HOLE	<input type="checkbox"/> UNFINISHED
<input type="checkbox"/> RECHARGE WELL	

WATER USE

<input checked="" type="checkbox"/> DOMESTIC	<input type="checkbox"/> COMMERCIAL
<input type="checkbox"/> STOCK	<input type="checkbox"/> MUNICIPAL
<input type="checkbox"/> IRRIGATION	<input type="checkbox"/> PUBLIC SUPPLY
<input type="checkbox"/> INDUSTRIAL	<input type="checkbox"/> COOLING OR AIR CONDITIONING
<input type="checkbox"/> OTHER	<input type="checkbox"/> NOT USED

METHOD OF DRILLING

<input checked="" type="checkbox"/> CABLE TOOL	<input type="checkbox"/> BORING
<input type="checkbox"/> ROTARY (CONVENTIONAL)	<input type="checkbox"/> DIAMOND
<input type="checkbox"/> ROTARY (REVERSE)	<input type="checkbox"/> JETTING
<input type="checkbox"/> ROTARY (AIR)	<input type="checkbox"/> DRIVING
<input type="checkbox"/> AIR PERCUSSION	

CONTRACTOR

NAME OF WELL CONTRACTOR	LICENCE NUMBER
<i>G. Charbonneau, Diamond & Cable Drilling, 1504</i>	
ADDRESS	
<i>R. R. 2, 194, Orleans, Ont.</i>	
NAME OF DRILLER OR BORER	LICENCE NUMBER
<i>J. C. Piché</i>	
SIGNATURE OF CONTRACTOR	SUBMISSION DATE
<i>G. Charbonneau</i>	DA <i>1</i> MO <i>5</i> YR <i>70</i>

OFFICE USE ONLY

DATA SOURCE	58 CONTRACTOR	59-62 DATE RECEIVED	63-68
<i>1</i>	<i>1504</i>	<i>230271</i>	
DATE OF INSPECTION	INSPECTOR		

A043498

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only			
MUN	CON	LOT	
Well Owner's Information and Location of Well Information			
First Name	Last Name	Mailing Address (Street Number/Name, RR, Lot, Concession)	
Tamarack Developments Corp		3137 Albion Road South	
County/District/Municipality	Township/City/Town/Village	Province	Postal Code
Ottawa	Ottawa	Ontario	K1V 8Y3
Address of Well Location (County/District/Municipality)		Township	Lot
Ottawa-Carleton		Chumberland	23
RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.	
#101 King Arthur St	Chumberland	Pamcor-1034 S/L	
GPS Reading	NAD	Zone	Posting
	813	18	464945
		Northing	Easting
		503889	7109060
		Uplift/Make/Model	Mode of Operation:
			<input type="checkbox"/> Undifferentiated <input checked="" type="checkbox"/> Averaged
			<input type="checkbox"/> Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth Metres	
				From	To
	Clay			0	5.79
	Grey limestone			5.79	73.15

Hole Diameter Depth Metres From To 0 73.15 14.91 Diameter Centimetres 15.88	Construction Record Inside diam centimetres Material Wall thickness centimetres Depth Metres From To 0 12.50		Test of Well Yield Pumping test method Draw Down Time Water Level Recovery min Metres min Metres Subpump Pump intake set Static Level 32.00 42.50 (metres) 60.76 Pumping rate (litres/min) 1 35.00 1 37.00 45.72 Duration of pumping (hrs + min) 2 35.70 2 38.10 Final water level end of pumping (metres) 3 36.60 3 37.40 Recommended pump type 4 37.20 4 36.80 Recommended pump depth (metres) 5 37.75 5 36.35 Recommended pump rate (litres/min) 10 37.40 10 35.50 45.72 15 40.25 15 35.80 If flowing give rate - (litres/min) 20 40.80 20 34.80 25 41.14 25 34.30 If pumping discontinued, give reason. 30 41.45 30 33.95 40 42.00 40 33.20 50 42.10 50 33.00 60 42.80 60
	Water Record Water found at Metres Kind of Water 56.7 Fresh Sulphur Gas Salt Minerals Other 70.71 Fresh Sulphur Gas Salty Minerals Other: After test of well yield, water was Chlorinated <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
	Screen Outside diam Steel Fibreglass Plastic Concrete Galvanized Slot No. No Casing or Screen Open hole <input checked="" type="checkbox"/>		

Plugging and Sealing Record Depth set at - Metres From To 11.39 0 Material and type (bentonite slurry, neat cement slurry) etc. Neat Cement Slurry Volume Faced (cubic metres) .207		Annular space <input checked="" type="checkbox"/> Abandonment <input type="checkbox"/>
Method of Construction Cable Tool <input type="checkbox"/> Rotary (air) <input type="checkbox"/> Diamond <input type="checkbox"/> Digging <input type="checkbox"/> Rotary (conventional) <input type="checkbox"/> Air percussion <input checked="" type="checkbox"/> Jetting <input type="checkbox"/> Other <input type="checkbox"/> Rotary (reverse) <input type="checkbox"/> Boring <input type="checkbox"/> Driving <input type="checkbox"/>		
Water Use Domestic <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Public Supply <input type="checkbox"/> Other <input type="checkbox"/> Stock <input type="checkbox"/> Commercial <input type="checkbox"/> Not used <input type="checkbox"/> Irrigation <input type="checkbox"/> Municipal <input type="checkbox"/> Cooling & air conditioning <input type="checkbox"/>		
Final Status of Well Water Supply <input checked="" type="checkbox"/> Recharge well <input type="checkbox"/> Unfinished <input type="checkbox"/> Abandoned (Other) <input type="checkbox"/> Observation well <input type="checkbox"/> Abandoned, insufficient supply <input type="checkbox"/> Dewatering <input type="checkbox"/> Test Hole <input type="checkbox"/> Abandoned, poor quality <input type="checkbox"/> Replacement well <input type="checkbox"/>		

Location of Well In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. 	
Audit No.	Date Well Completed
Z 48599	2006 08 23
Was the well owner's information package delivered?	Date Delivered
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2006 07 08

Well Contractor/Technician Information Name of Well Contractor Business Address (street name, number, city etc.) Name of Well Technician (last name, first name) Signature of Technician/Contractor		Well Contractor's Licence No. 1119 Well Technician's Licence No. T3058 Date Submitted 0609 27
--	--	--

Ministry Use Only Date Source Date Received Remarks		Contractor 1119 Date of Inspection OCT 11 2006 Well Record Number
---	--	---

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

7017173
A014145

Well Owner's Information and Location of Well Information

Ministry Use Only
MUN 15011 CON CON 01 LOT 29

RR#/Street Number/Name: OTTAWA City
1369- Gernold St
City/Town/Village: Cumberland 29 (Cnc 1)
Orleans
Site/Compartment/Block/Tract etc.: 05, Charbonneau Plan
GPS Reading: NAD 83 Zone 18 Easting 463009 Northing 5032350
Unit Make/Model: Ingersoll Mode of Operation: Undifferentiated Averaged
Differentiated, specify: UTM

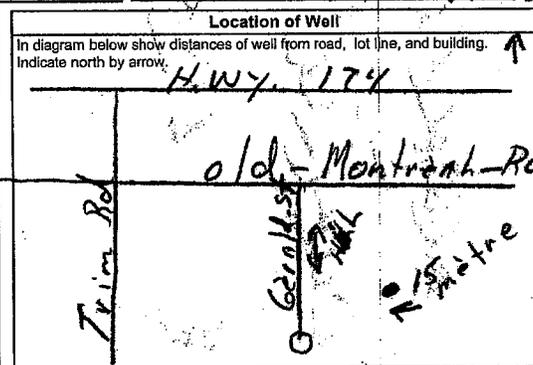
Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
Red	Clay		Soft	0	6.66
Grey	Clay		Dense	6.66	32.42
Grey	Gravel		Soft	32.42	36.36
Grey	SAND		Porous	36.36	37.87

Hole Diameter			Construction Record				Test of Well Yield					
Depth From	Metres To	Diameter Centimetres	Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To	Pumping test method	Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
0	6.06	22.23	15.55	Plastic	0.48	0	36.36	Submersible	21.00	22.21	22.05	22.03
Water Record			Screen				If flowing give rate - (litres/min)					
Water found at: 36.36 m			Outside diam: 15.23 m				20 22.06, 25 21.83, 30 21.78, 40 21.68, 50 21.56, 60 21.42					

Plugging and Sealing Record

Depth set at - Metres From To: 0 6.06
Material and type (bertronite slurry, neat cement slurry) etc.: Cement Grout
Volume Placed (cubic metres): 80 Kg



Method of Construction

Water Use

Final Status of Well

Water Supply: Domestic, Industrial, Commercial, Municipal, Public Supply, Not used, Cooling & air conditioning

Audit No. Z 141771 Date Well Completed 2004 11 25
Was the well owner's information package delivered? Yes No

Well Contractor/Technician Information

Name of Well Contractor: DAN-WATER-Well-Drilling
Business Address: ST. ALBERT - ON
Well Contractor's Licence No.: 6006
Name of Well Technician (last name, first name): Desnoyers Louis
Well Technician's Licence No.: T-625
Signature of Technician: [Signature]
Date Submitted: 2004 11 26

Ministry Use Only

Data Source: Contractor
Date Received: DEC 03 2004
Date of Inspection: 2004 11 26
Well Record Number: 1535293

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Well Owner's Information and Location of Well Information

MUN 150/11 CON 01F LOT 08

First Name: Margard Builders Last Name: Mailing Address: 29 Cleopatra Dr, Unit 101
 County/District/Municipality: Nepean Township/City/Town/Village: Nepean Province: Ontario Postal Code: K2G0B6 Telephone Number: (include area code)

Address of Well Location (County/District/Municipality): Ottawa Carleton Township: Cumberland Lot: 28+29 Concession: 1
 RR#/Street Number/Name: Old Montreal Rd City/Town/Village: Cumberland Site/Compartment/Block/Tract etc: Part 1-3 Plan 50R-7211

GPS Reading: NAD 83 Zone 18 Easting 463376 Northing 503806 Unit Make/Model: Magellan Mode of Operation: Undifferentiated Averaged Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
	clay			0	10.4
	sand + gravel + boulders			10.4	13.7
	grey limestone	clark brown shale		13.7	89.9

Hole Diameter			Construction Record				Test of Well Yield					
Depth From	Metres To	Diameter Centimetres	Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To	Pumping test method	Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
0	28.95	14.59	15.88	Steel .48	0	15.2	0	Subpump	21.48	49.48	1	47.27
Water Record			Screen				Pumping test method details					
Water found at Metres: 82.9 Kind of Water: Fresh			Outside diam: 14.6				Pump intake set at - (metres): 21.48					
Water found at Metres: 88.4 Kind of Water: Fresh			Slot No.:				Pumping rate (litres/min): 18.9					
After test of well yield, water was: Clear and sediment free			No casing or screen				Duration of pumping: 1 hrs + 2 min					
Chlorinated: Yes			Open hole				Final water level and of pumping: 47.48 metres					
							Recommended pump type: Deep					
							Recommended pump depth: 85.3 metres					
							Recommended pump rate: 22.15 litres/min					
							If flowing give rate - (litres/min): 37.46					
							If pumping discontinued, give reason:					

Plugging and Sealing Record

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
14.6	11.6	Cement Slurry	0.3814
11.6	0	bentonite slurry	0.6810

Method of Construction

Cable Tool Rotary (air) Diamond Digging
 Rotary (conventional) Air percussion Jetting Other
 Rotary (reverse) Boring Driving

Water Use

Domestic Industrial Public Supply Other Church
 Stock Commercial Not used
 Irrigation Municipal Cooling & air conditioning

Final Status of Well

Water Supply Recharge well Unfinished Abandoned, (Other)
 Observation well Abandoned, insufficient supply Dewatering
 Test Hole Abandoned, poor quality Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Air Koch Drilling Ltd Well Contractor's Licence No.: 1119
 Business Address (street name, number, city etc): RR#1 Richmond, Ont
 Name of Well Technician (last name, first name): Purcell Shannon Well Technician's Licence No.: 10122
 Signature of Technician/Contractor: x [Signature] Date Submitted: 2004 06 07

Location of Well

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

Audit No. Z 04951 Date Well Completed: 2004 05 13
 Was the well owner's information package delivered? Yes No Date Delivered: 2004 05 19

Ministry Use Only

Data Source: Contractor 1119
 Date Received: JUL 06 2004 Date of Inspection: _____
 Remarks: _____ Well Record Number: 1534786

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

A004812

page ___ of ___

Well Owner's Information and Location of Well Information

MUN 150117 CON CON LOT 01

First Name: Taggart Last Name: Investments Ltd Mailing Address (Street Number/Name, RR, Lot, Concession): 225 Metcalfe St, Suite 708
 County/District/Municipality: Ottawa, Ont Township/City/Town/Village: Ottawa, Ont Province: Ontario Postal Code: K2P 1P9 Telephone Number (include area code):
 Address of Well Location (County/District/Municipality): Ottawa, Ontario Township: Cumberland Lot: 23 Concession: 1
 RR#/Street Number/Name: Old Montreal Rd City/Town/Village: Cumberland Site/Compartment/Block/Tract etc.:
 GPS Reading: NAD 83 Zone 18 Easting: 5028619 Northing: 2038619 Unit Make/Model: maquellan Mode of Operation: Undifferentiated Averaged Differentiated, specify

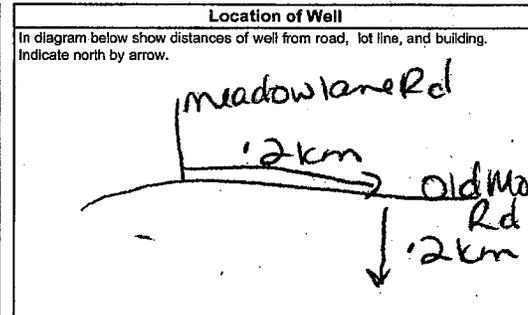
Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
grey	clay			0	0.61
	limestone			0.61	103.6

Hole Diameter		Construction Record				Test of Well Yield Data Rec'd			
Depth From	Metres To	Depth From	Metres To	Pumping test method	Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres	
0	103.6	15.88	6.7	1	32.02	30.87	1	31.78	
				2	32.02		2	37.85	
				3	32.04		3	37.73	
				4	32.07		4	37.61	
				5	32.55		5	37.5	
				10	33.94		10	37.08	
				15	35.30		15	36.97	
				20	36.10		20	36.70	
				25	36.86		25		
				30	37.12		30	36.54	
				40	37.62		40		
				50	37.55		50	36.03	
				60	38.35		60	36.90	

Plugging and Sealing Record

Depth set at - Metres: 6.1 0 Material and type (bentonite slurry, neat cement slurry) etc.: Cement Slurry Volume Placed (cubic metres): 0.1362



Method of Construction

Cable Tool Rotary (air) Diamond Digging
 Rotary (conventional) Air percussion Jetting Other
 Rotary (reverse) Boring Driving

Water Use

Domestic Industrial Public Supply Other
 Stock Commercial Not used
 Irrigation Municipal Cooling & air conditioning

Final Status of Well

Water Supply Recharge well Unfinished Abandoned, (Other)
 Observation well Abandoned, insufficient supply Dewatering
 Test Hole Abandoned, poor quality Replacement well

Test well # 3

Audit No. Z 04921 Date Well Completed: 2004 04 23
 Was the well owner's information package delivered? Yes No NA

Well Contractor/Technician Information

Name of Well Contractor: Air Koch Drilling Ltd Licence No.: 1119
 Business Address (street name, number, city etc.): R2 #1 Richmond, Ont
 Name of Well Technician (last name, first name): Shannon Purcell Licence No.: 72122
 Signature of Technician/Contractor: x Shannon Purcell Date Submitted: 2004 07 16

Ministry Use Only

Data Source: Contractor 1119
 Date Received: JUL 21 2004 Date of Inspection:
 Remarks: Well Record Number: 1534793



WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK CORRECT BOX WHERE APPLICABLE

11

15601297

MUNICIP. 156003

CON. OF

10 15 20 25 30

COUNTY OR DISTRICT
Carleton Russell

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE
Cumberland

CONTR. BLOCK, TRACT, SURVEY, ETC.
1st from Ottawa R. OFI 025



Cumberland, Ont.

DATE COMPLETED
DAY 23 MO 05 YR. 70

THING 0137989 RC 14 ELEVATION 0300 RC 51 BASIN CODE 25

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
grey	loose rock & boulders			0	10
grey	limestone			10	150
			1513129		

31 09/02/12/13 0150215

32

41 WATER RECORD

WATER FOUND AT FEET	KIND OF WATER
0150	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIA. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
06	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	0 TO 20-23
	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		20-23 TO 27-30

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER	LENGTH

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE

71 PUMPING TEST METHOD

10 PUMPING RATE 0010 GPM

11-14 DURATION OF PUMPING 02 HOURS 00 MINS

15-17-18 PUMPING RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
030 FEET	040 FEET	15 MINUTES 040 FEET 30 MINUTES 040 FEET 45 MINUTES 040 FEET 60 MINUTES 040 FEET

30-41 PUMP INTAKE SET AT 50 FEET

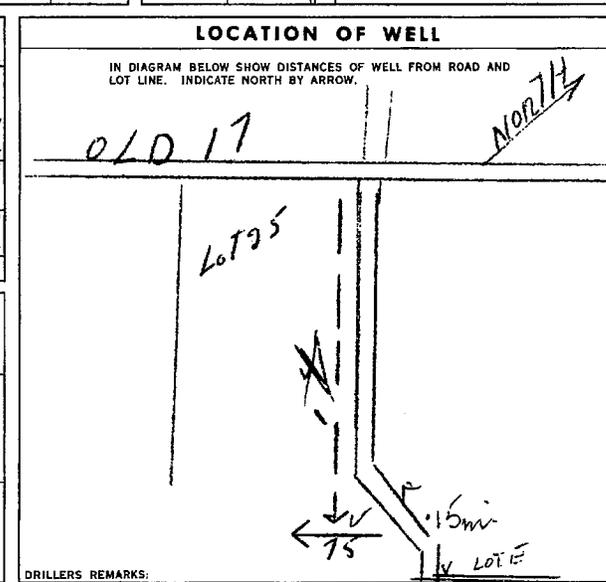
42 WATER AT END OF TEST CLEAR CLOUDY

RECOMMENDED PUMP TYPE SHALLOW DEEP

RECOMMENDED PUMP SETTING 060 FEET

RECOMMENDED PUMPING RATE 0006 GPM

50-53 001-0 GPM/FT. SPECIFIC CAPACITY



54 FINAL STATUS OF WELL

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

58-56 WATER USE 01

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

57 METHOD OF DRILLING

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

DRILLERS REMARKS:

OFFICE USE ONLY

DATA SOURCE 1 CONTRACTOR 1504 DATE RECEIVED 12/30/24

DATE OF INSPECTION INSPECTOR P/K

REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR G. Charbonneau, Diamond & Cable Drilling, 1504

ADDRESS R. R. 2, Box 194, Orleans, Ont.

NAME OF DRILLER OR BORER J. C. Piché

SIGNATURE OF CONTRACTOR [Signature]

SUBMISSION DATE DAY 23 MO 5 YR 70

1184 464300
 4R 5013818101



5601084

WATER RESOURCES
 FEB 5 1969
 ONTARIO WATER
 RESOURCES COMMISSION
 1513118

Rev. 5R 0275T The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Russell Township, Village, Town or City Cumberland
 Const. from OET Lot part of lot 25 Date completed 22 December 1968
 (day month year)
 address Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing 6"
 Total length of casing 22'
 Type of screen
 Length of screen
 Depth to top of screen
 Diameter of finished hole 6"

Pumping Test

Static level 85'
 Test-pumping rate 18 G.P.M.
 Pumping level 85'
 Duration of test pumping 3 hrs.
 Water clear or cloudy at end of test clear
 Recommended pumping rate 6 G.P.M.
 with pump setting of 100 feet below ground surface

Well Log

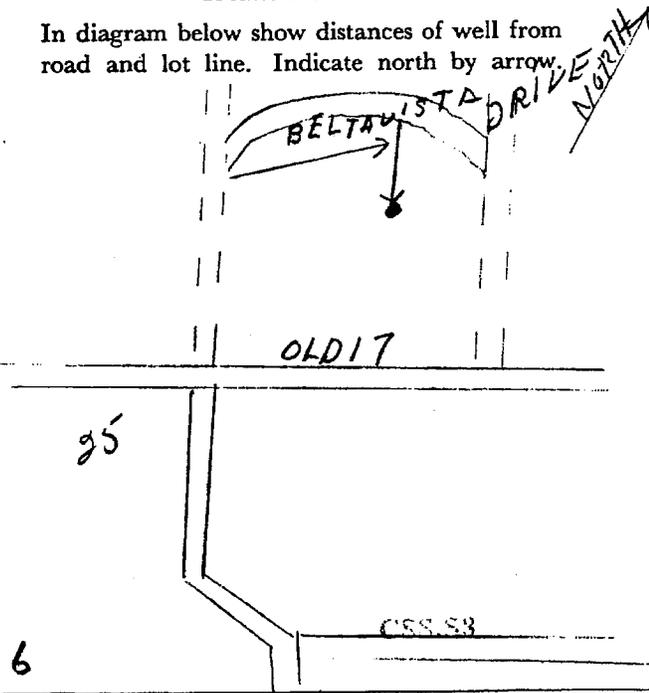
Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
clay & loose rock	0	4	255	fresh
soft grey limestone	4	245		
white sand stone	245	255		

For what purpose(s) is the water to be used? domestic
 Is well on upland, in valley, or on hillside? hillside
 Drilling or Boring Firm.....
G. Charbonneau, Diamond & Cable Drilling,
 Address R. R. 1, Box 194, Orleans, Ont.
 Licence Number 3039
 Name of Driller or Borer G. Charbonneau
 Address R. R. 1, Orleans, Ont.
 Date 22 December, 1968
Gérard Charbonneau
 (Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



IM

1182 4644 **RECORDED** *Lot 24*



5601088

1513117

4R 50381801

The Ontario Water Resources Commission Act

5R 12175

WATER WELL RECORD

County or District Russell Township, Village, Town or City Cumberland

Con. 1st. from Ottawa R. Lot 24 Date completed 29 June 1968
(day month year)

Address Cumberland

Casing and Screen Record

Inside diameter of casing 6 1/2"
 Total length of casing 20'
 Type of screen
 Length of screen
 Depth to top of screen
 Diameter of finished hole 6"

Pumping Test

Static level 5'
 Test-pumping rate 6 G.P.M.
 Pumping level 60'
 Duration of test pumping 2 hrs.
 Water clear or cloudy at end of test clear
 Recommended pumping rate 6 G.P.M.
 with pump setting of 60 feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
blue clay	0	3	100	fresh
loose rock	3	7		
grey limestone	7	100		

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

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

Drilling or Boring Firm

G. Charbonneau, Diamond & Cable Drilling,

Address R. R. 1, Box 194, Orleans, Ont.

Licence Number 3039

Name of Driller or Borer Jim Presley

Address R. R. 2, Arnprior, Ont.

Date 29 June 1968

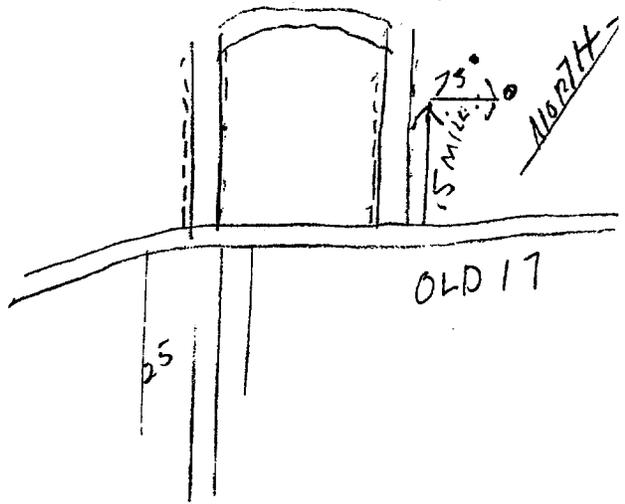
Richard Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Form 7 5M 60-20912

OWRC COPY

Location of Well

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



19

CSS.S3



5607KAC

31 G
11 W

GROUND WATER BRANCH
AUG 15 1961
ONTARIO WATER
RESOURCES COMMISSION
Cumberland

The Ontario Water Resources Commission Act WATER WELL RECORD

County or District Russell Township, Village, Town or City Cumberland
Con. 1st, from Ottawa R. Lot S. 1 lot 25 Date completed August 1st, 1961
(day month year) 15 13 125
Address Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing 2"
Total length of casing 25'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 2"

Pumping Test

Static level 75'
Test-pumping rate 3 G.P.M.
Pumping level 85'
Duration of test pumping 3 hrs.
Water clear or cloudy at end of test clear
Recommended pumping rate 3 G.P.M.
with pump setting of 85' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
<u>boulders & gravel</u>	<u>0</u>	<u>10</u>	<u>210'</u>	<u>fresh</u>
<u>grey limestone</u>	<u>10</u>	<u>210</u>		

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

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

Drilling or Boring Firm G. CHARBONNEAU

DIAMOND DRILLER - ARTESIAN WELLS
MODERN HOME BUILDERS

Address ORLEANS, ONT.
R.R. 1 Navan 9R-25

Licence Number 224

Name of Driller or Borer G. Charbonneau

Address R. R. # 1, Orleans, Ont.

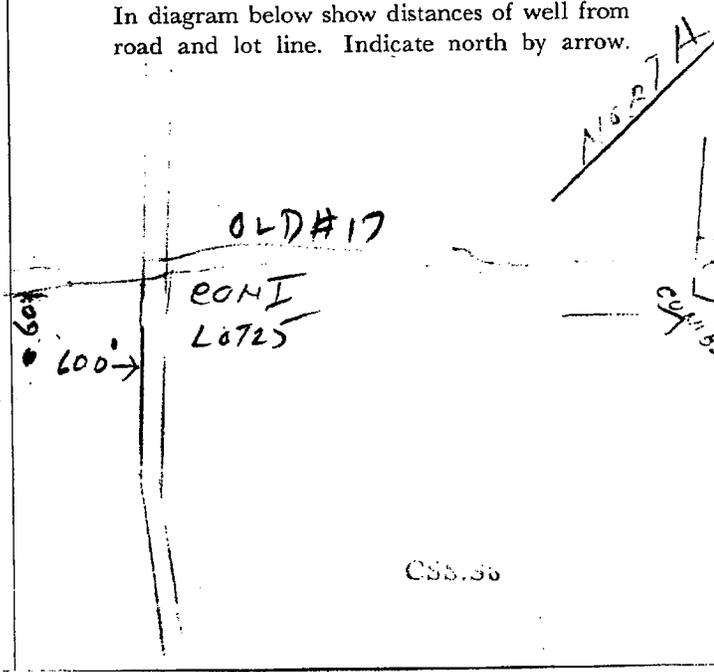
Date August 1st, 1961

G. Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M Sets 60-5930

Location of Well

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



OWRC COPY

CSS-36

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

Address of Well Location (County/District/Municipality) **Ottawa Carleton** Township **Cumberland** Lot **28** Concession **1**
 RR#/Street Number/Name **1154 Old Montreal Rd** City/Town/Village **Cumberland** Site/Compartment/Block/Tract etc.
 GPS Reading NAD Zone Easting Northing Unit Make/Model Mode of Operation: Undifferentiated Averaged Differentiated, specify

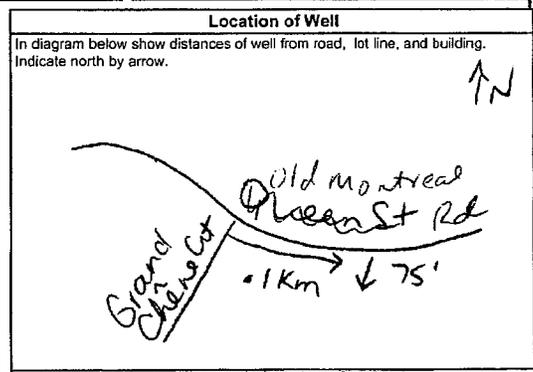
Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Metres To
	brown + grey clay			0	16.8
	grey limestone			16.8	85.3

Hole Diameter			Construction Record				Test of Well Yield					
Depth From	Metres To	Diameter Centimetres	Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Metres To	Pumping test method	Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
0	85.3	15.24	15.88	Steel <input checked="" type="checkbox"/> Fibreglass <input type="checkbox"/> Plastic <input type="checkbox"/> Concrete <input type="checkbox"/> Galvanized <input type="checkbox"/>	.48	0	18.3	Subpump	1	30.57	1	59.3
Water Record			Screen				Test of Well Yield (continued)					
Water found at Metres	Kind of Water		Outside diam	Steel <input type="checkbox"/> Fibreglass <input type="checkbox"/> Plastic <input type="checkbox"/> Concrete <input type="checkbox"/> Galvanized <input type="checkbox"/>	Slot No.	Pumping rate (litres/min) 1 15.1 Duration of pumping 2 33.20 2 57.4 Final water level and of pump 3 33.90 3 56.4 Recommended pump type 4 34.5 4 55.5 Recommended pump depth 5 35.3 5 54.9 Recommended pump rate 10 38.2 10 52.4 If flowing give rate - (litres/min) 15 41.1 15 50.4 20 43.4 20 48.6 25 46.3 25 47.5 If pumping discontinued, give reason. 30 48.58 30 45.08 40 54.10 40 41.10 50 56.80 50 35.0 60 59.30 60 36.84						
37.5	Fresh <input type="checkbox"/> Sulphur <input type="checkbox"/> Salty <input checked="" type="checkbox"/> Minerals <input type="checkbox"/> Other: NOT		No Casing or Screen									
85.3	Fresh <input type="checkbox"/> Sulphur <input type="checkbox"/> Salty <input checked="" type="checkbox"/> Minerals <input type="checkbox"/> Other: NOT		<input checked="" type="checkbox"/> Open hole									
After test of well yield, water was <input checked="" type="checkbox"/> Clear and sediment free <input type="checkbox"/> Other, specify NOT TESTED												
Chlorinated <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No												

Plugging and Sealing Record Annular space Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
17.7	14.6	Cement slurry	0.1907
14.6	0	Bentonite slurry	0.2712



Method of Construction

Cable Tool Rotary (air) Diamond Digging
 Rotary (conventional) Air percussion Jetting Other
 Rotary (reverse) Boring Driving

Water Use

Domestic Industrial Public Supply Other
 Stock Commercial Not used
 Irrigation Municipal Cooling & air conditioning

Final Status of Well

Water Supply Recharge well Unfinished Abandoned, (Other)
 Observation well Abandoned, insufficient supply Dewatering
 Test Hole Abandoned, poor quality Replacement well

Audit No. **Z 04889** Date Well Completed **2004** **09** **02**

Was the well owner's information package delivered? Yes No Date Delivered **2004** **09** **02**

Well Contractor/Technician Information

Name of Well Contractor **Arkoach Driving Ltd** Well Contractor's Licence No. **1119**
 Business Address (street name, number, city, etc.) **Rte 1 Richmond, Ont**
 Name of Well Technician (last name, first name) **Shannon Purcell** Well Technician's Licence No. **10122**
 Signature of Well Contractor **[Signature]** Date Submitted **2004** **10** **10**

Ministry Use Only

Data Source Contractor: **1119**

Date Received **JUN 07 2004** Date of Inspection **2004** **MM** **DD**

Remarks **CSN** Well Record Number **1534641**



GROUND WATER
 NOV 15 1961
 785
 ONTARIO WATER RESOURCES COMMISSION
 1513132

UTM 118Z 4632610E

15R 50375110N

Elev. 17R 5125

WATER WELL RECORD

Basin 25 County or District Passel of Conl Rr 28 Township, Village, Town or City Cumberland Ont

Coaxial 3 ft From Tubot 28 Date completed Aug 17 / 61 (day month year)

Address Cumberland Ont

Casing and Screen Record

Inside diameter of casing..... 2"
 Total length of casing..... 75'
 Type of screen
 Length of screen.....
 Depth to top of screen.....
 Diameter of finished hole 2"

Pumping Test

Static level..... 40'
 Test-pumping rate 12 12 G.P.M.
 Pumping level..... 60'
 Duration of test pumping..... 2 Hrs
 Water clear or cloudy at end of test Clear
 Recommended pumping rate..... 12 G.P.M.
 with pump setting of..... 60' feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Blue Clay	0	70'		
Gravel Sand	70'	73'		
Grey Limestone	73'	87'	87'	Fresh

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

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

Drilling or Boring Firm.....

G. CHARBONNEAU
 DIAMOND DRILLER ARTESIAN WELLS
 MODERN HOME BUILDERS
 ORLEANS, ONT.
 R.R. 1 Navan 9R-23

Licence Number..... 224

Name of Driller or Borer..... G C

Address.....

Date Aug 17/61

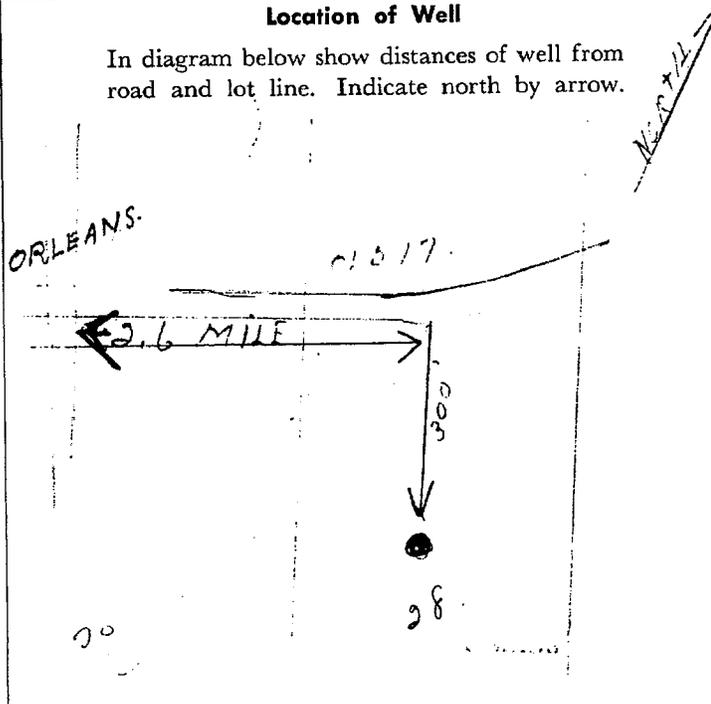
Gerard Charbonneau
 (Signature of Licensed Drilling or Boring Contractor)

Form 7 15M Sets 60-5930

OWRC COPY

Location of Well

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





Ministry
of the
Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

1519450

MUNICIPALITY OF 15011 OF 01

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

COUNTY OR DISTRICT: Ottawa Carleton
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland
CON., BLOCK, TRACT, SURVEY, ETC.: CON. 1.05.
OWNER (SURNAME FIRST): [REDACTED] ADDRESS: Bella Vista, Cumberland, Ont.
DATE COMPLETED: DAY 20 NO. 12 YR. 84

GRID COORDINATES:
EASTING: 46459.9
NORTHING: 50389.99
ELEVATION: 027.0
BASIN CODE: 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	12
gray	gravel			12	19
gray	limestone			19	215

31 0012505 0019211 021515

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0205	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
06	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	41 (0044)
06	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input checked="" type="checkbox"/> OPEN HOLE		44 (0215)

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE
10-13	14-17
18-21	22-25
26-29	30-33

71 PUMPING TEST

PUMPING TEST METHOD: 1 PUMP 2 BAILER

PUMPING RATE: 0030 GPM

DURATION OF PUMPING: 15-18 HOURS 00

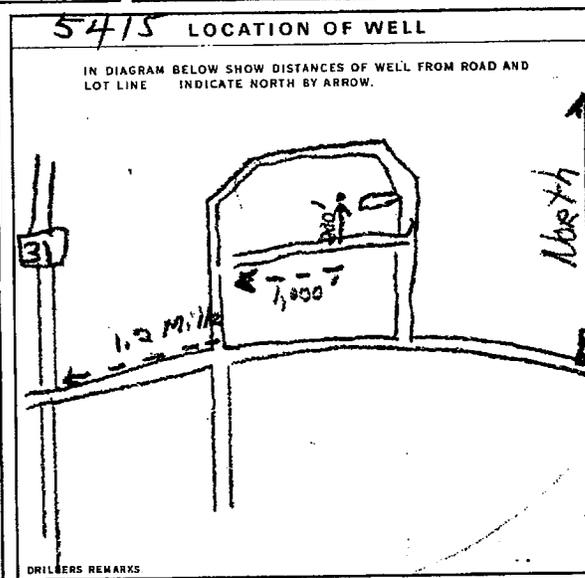
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
120 FEET	200 FEET	15 MINUTES: 120 FEET 30 MINUTES: 120 FEET 45 MINUTES: 120 FEET 60 MINUTES: 120 FEET

PUMP INTAKE SET AT: 165 FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: 165 FEET

RECOMMENDED PUMPING RATE: 0030 GPM



FINAL STATUS OF WELL

1 WATER SUPPLY
2 OBSERVATION WELL
3 TEST HOLE
4 RECHARGE WELL

5 ABANDONED, INSUFFICIENT SUPPLY
6 ABANDONED, POOR QUALITY
7 UNFINISHED

WATER USE

1 DOMESTIC
2 STOCK
3 IRRIGATION
4 INDUSTRIAL
5 OTHER

6 COMMERCIAL
7 MUNICIPAL
8 PUBLIC SUPPLY
9 COOLING OR AIR CONDITIONING
10 NOT USED

METHOD OF DRILLING

1 CABLE TOOL
2 ROTARY (CONVENTIONAL)
3 ROTARY (REVERSE)
4 ROTARY (AIR)
5 AIR PERCUSSION

6 BORING
7 DIAMOND
8 JETTING
9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: G. Charbonneau & Son Drilling Ltd. 1504
ADDRESS: R.R. 2, Box 194, Orleans, Ont. K1G 1T1
NAME OF DRILLER OR BORER: Raymond Charbonneau
SIGNATURE OF CONTRACTOR: [Signature]

LICENCE NUMBER: [REDACTED]

DATE OF INSPECTION: [REDACTED]

INSPECTOR: [REDACTED]

REMARKS: [REDACTED]

DATE: 20 NO. 12 YR. 84

OFFICE USE ONLY

CONTRACTOR: 1504
DATE RECEIVED: 13 02 85

REMARKS: [REDACTED]



WATER WELL RECORD

31611d

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

11 1519772

MUNICIPALITY 15011 CON. OF 01

COUNTY OR DISTRICT **OTT. CARLETON** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE **CUMBERLAND** CON., BLOCK, TRACT, SURVEY, ETC. **LOT 25-27**
CARLETON RUSSEL ADDRESS **CUMBERLAND** **PM LOT 25 CON 1 05 024** DATE COMPLETED 41-53
 DAY **19** MO **04** YR **77**

ZONE EASTING NORTHING RC BASIN CODE
 18 464599 5038899 4 0290 4 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
BROWN	TOP SOIL			0	7
GREY	LIMESTONE			7	38
BLACK	SLATE			38	54
GREY	LIMESTONE			54	202

31 0007602 0038215 0051819 0002115

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-13	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

DEPTH - FEET	MATERIAL	WALL THICKNESS - INCHES
10-11	1 <input checked="" type="checkbox"/> STEEL	
11-12	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	
12-13	1 <input checked="" type="checkbox"/> STEEL	
13-16	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	
17-18	1 <input checked="" type="checkbox"/> STEEL	
18-19	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	
20-23	1 <input checked="" type="checkbox"/> STEEL	
24-25	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	
26-27	1 <input checked="" type="checkbox"/> STEEL	
28-30	2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	

SCREEN SIZES OF OPENING SLIT NO. 1 DIAMETER 31-33 LENGTH 34-38 DEPTH TO TOP OF SCREEN 41-44

61 PLUGGING & SEALING RECORD

DEPTH (SLIT) - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER ETC.
10-12		
18-21		
26-28		

71 PUMPING TEST

PUMPING TEST METHOD 1 PUMP 2 BAUER

PUMPING RATE 0004 GPM DURATION OF PUMPING 01 HOURS 30 MIN.

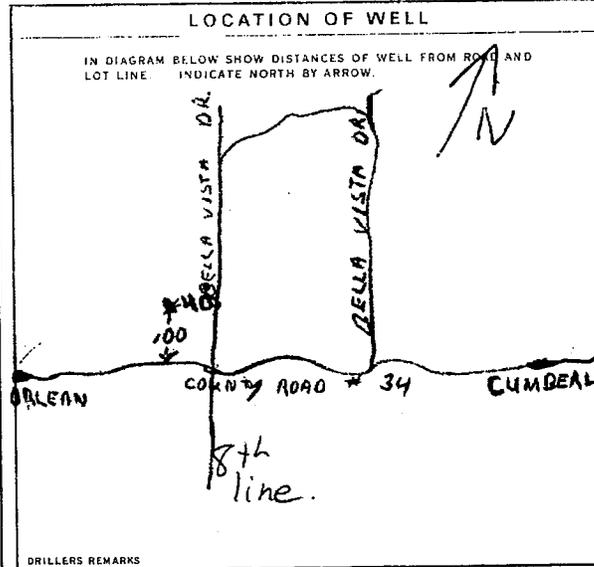
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING
100 FEET	195 FEET	15 MINUTES: 125 FEET 30 MINUTES: 150 FEET 45 MINUTES: 175 FEET 60 MINUTES: 195 FEET

PUMP INTAKE SET AT 195 FEET

RECOMMENDED PUMP TYPE SHALLOW DEEP

RECOMMENDED PUMP SETTING 195 FEET

RECOMMENDED PUMPING RATE 0003 GPM



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

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

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

CONTRACTOR NAME OF WELL CONTRACTOR **CAYER WELL DRILLER** LICENCE NUMBER **1517**
 ADDRESS **CASSELLMAN**
 NAME OF DRILLER OR BORER
 SIGNATURE OF CONTRACTOR *Maurice Cayer* SUBMISSION DATE

OFFICE USE ONLY DATA SOURCE **1** CONTRACTOR **1517** DATE RECEIVED **160827**
 DATE OF INSPECTION **8/5/78** INSPECTOR **Ken DN.**
 REMARKS: **Changed From 560 2022**



WATER WELL RECORD

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

11

1527663

15011

MUNICIPALITY: *Bloomington Field Station*

COUNTY OR DISTRICT: *Carleton Place* TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: *Carleton Place* COM. BLOCK, TRACT, SURVEY, ETC: *Arbuckle St* LOT: *1241*

DATE COMPLETED: DAY *2* MO *Dec* YR *93*

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
<i>brown</i>	<i>Fill</i>	<i>boulders</i>	<i>Hard</i>	<i>0</i>	<i>12</i>
<i>black</i>	<i>shale</i>		<i>Hard</i>	<i>12</i>	<i>180</i>

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER					
<i>165</i>	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS	<input type="checkbox"/> GAS	
	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS	<input type="checkbox"/> GAS	
	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS	<input type="checkbox"/> GAS	
	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS	<input type="checkbox"/> GAS	
	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERALS	<input type="checkbox"/> GAS	

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
<i>6 1/2</i>	<input checked="" type="checkbox"/> STEEL	<i>1.89</i>	<i>0</i>	<i>44</i>
<i>6 7/8</i>	<input checked="" type="checkbox"/> STEEL		<i>44</i>	<i>180</i>

SCREEN

SIZE(S) OF OPENING (SLOT NO 1):

DIAMETER: _____ INCHES

LENGTH: _____ FEET

MATERIAL AND TYPE: _____

DEPTH TO TOP OF SCREEN: _____ FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUP / LEAD PACKER, ETC.
<i>0</i>	<i>44</i>	<i>asphalt grout</i>

71 PUMPING TEST

PUMPING TEST METHOD: PUMP BAILER

PUMPING RATE: *2* GPM

DURATION OF PUMPING: *1 1/2* HOURS

STATIC WATER LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING PUMPING				
<i>15</i>	<i>170</i>	15 MINUTES: <i>87</i>	30 MINUTES: <i>125</i>	45 MINUTES: <i>160</i>	60 MINUTES: <i>170</i>	

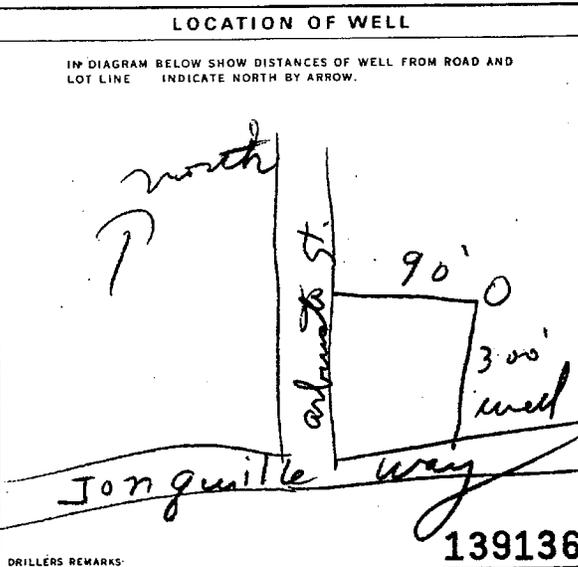
IF FLOWING, GIVE RATE: _____

PUMP INTAKE SET AT: _____ FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: *168* FEET

RECOMMENDED PUMPING RATE: *2* GPM



FINAL STATUS OF WELL

WATER SUPPLY

OBSERVATION WELL

TEST HOLE

RECHARGE WELL

ABANDONED, INSUFFICIENT SUPPLY

ABANDONED POOR QUALITY

UNFINISHED

DEWATERING

WATER USE

DOMESTIC

STOCK

IRRIGATION

INDUSTRIAL

OTHER

COMMERCIAL

MUNICIPAL

PUBLIC SUPPLY

COOLING OR AIR CONDITIONING

NOT USED

METHOD OF CONSTRUCTION

CABLE TOOL

ROTARY (CONVENTIONAL)

ROTARY (REVERSE)

ROTARY (AIR)

AIR PERCUSSION

BORING

DIAMOND

JETTING

DRIVING

DIGGING

OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: *Gilles Bourgeois*

WELL CONTRACTOR'S LICENCE NUMBER: *1414*

ADDRESS: *St A. Robert ave*

NAME OF WELL TECHNICIAN: *S. Am...*

WELL TECHNICIAN'S LICENCE NUMBER: _____

SIGNATURE OF TECHNICIAN/CONTRACTOR: *Gilles Bourgeois*

SUBMISSION DATE: DAY *2* MO *Dec* YR *93*

OFFICE USE ONLY

DATA SOURCE: _____

CONTRACTOR: *1414*

DATE RECEIVED: *FEB 01 1994*

DATE OF INSPECTION: _____

INSPECTOR: _____

REMARKS: _____



WATER WELL RECORD

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

11 1528301 MUNICIPAL 150W CON# 1528301 08

COUNTY OR DISTRICT: [redacted] TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland DATE COMPLETED: 27 94
 CON. BLOCK TRACT, SURVEY ETC.: 8 DAY: 2 MO: Nov YR: 94
 ELEVATION: [redacted] ESTATE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
grey	fill		Hard	0	16
gray	limestone		Hard	16	230

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER		
219	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR
			<input type="checkbox"/> MINERALS
			<input type="checkbox"/> GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6 1/4	STEEL	1.88	0	49
6 3/8	STEEL		44	230

SCREEN

SIZE OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

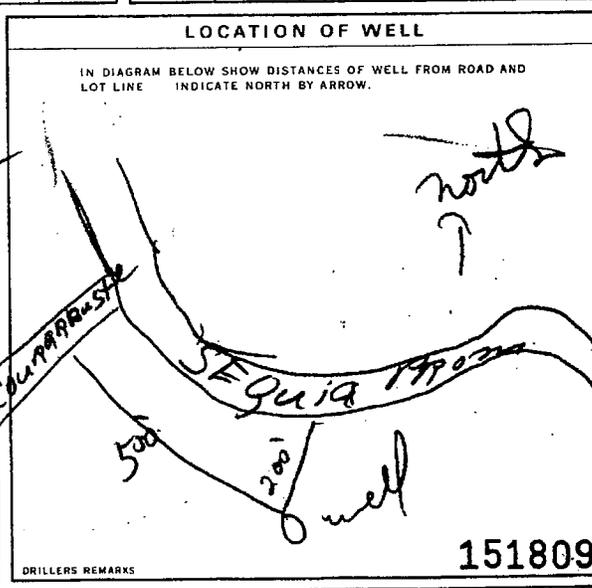
61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	(CEMENT GROUT LEAD PACKER, ETC.)
0-17	4 1/2	Cement grout
18-21		grout

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
<input checked="" type="checkbox"/> PUMP <input checked="" type="checkbox"/> BAILEY	4 GPM	15-18 HOURS 0 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
40 FEET	220 FEET	15 MINUTES 150 FEET	30 MINUTES 125 FEET	45 MINUTES 90 FEET	60 MINUTES 40 FEET



FINAL STATUS OF WELL: WATER SUPPLY

WATER USE: DOMESTIC

METHOD OF CONSTRUCTION: CABLE TOOL

DRILLERS REMARKS: 151809

CONTRACTOR: Gilles Bourgeois, 1414

WELL CONTRACTOR'S LICENCE NUMBER: 1414

DATE RECEIVED: NOV 10 1994

CONTRACTOR: Gilles Bourgeois, St Albans

WELL TECHNICIAN: Jacques Raymond, 0234

SUBMISSION DATE: DAY 2 MO Nov YR 94

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

11

1531367

Municipality **15011** Con. **09**

County or District: **Ottawa-Carleton** Township/Borough/City/Town/Village: **Cumberland** Con block tract survey, etc.: **105** Lot: **24**
 Address: **Cumberland Dr** Date completed: **26** day **07** month **00** year

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
grey	Sandy clay limestone			0	8
				8	340

31
32

41 WATER RECORD

Water found at - feet	Kind of water
288	<input checked="" type="checkbox"/> Fresh <input type="checkbox"/> Sulphur <input checked="" type="checkbox"/> Salty <input type="checkbox"/> Minerals <input type="checkbox"/> Gas
	<input type="checkbox"/> Fresh <input type="checkbox"/> Sulphur <input type="checkbox"/> Salty <input type="checkbox"/> Minerals <input type="checkbox"/> Gas
	<input type="checkbox"/> Fresh <input type="checkbox"/> Sulphur <input type="checkbox"/> Salty <input type="checkbox"/> Minerals <input type="checkbox"/> Gas
	<input type="checkbox"/> Fresh <input type="checkbox"/> Sulphur <input type="checkbox"/> Salty <input type="checkbox"/> Minerals <input type="checkbox"/> Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
6 1/4	<input checked="" type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input type="checkbox"/> Open hole <input type="checkbox"/> Plastic	188	0	22
8 3/4	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input checked="" type="checkbox"/> Open hole <input type="checkbox"/> Plastic		0	20
6	<input type="checkbox"/> Steel <input type="checkbox"/> Galvanized <input type="checkbox"/> Concrete <input checked="" type="checkbox"/> Open hole <input type="checkbox"/> Plastic		20	340

SCREEN

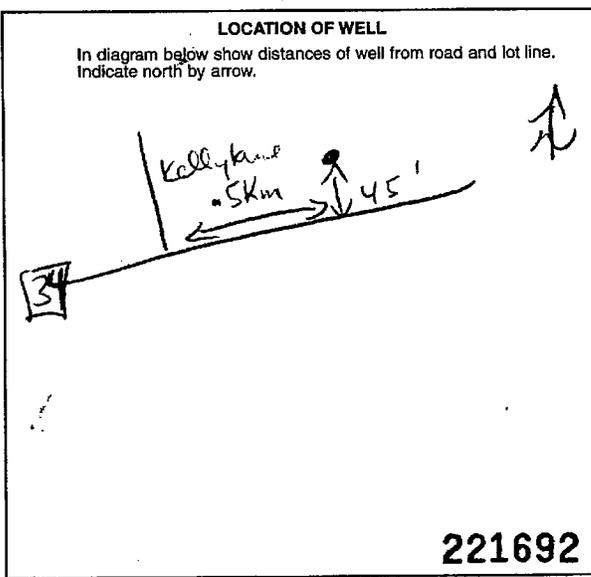
Sizes of opening (Slot No.)	Diameter inches	Length feet

61 PLUGGING & SEALING RECORD

Depth set at - feet		Material and type (Cement grout, bentonite, etc.)
From	To	
2	22	Cement grout

71 PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
<input checked="" type="checkbox"/> Pump <input type="checkbox"/> Bailor		
Static level	Water levels during	Recovery
107 feet	15 minutes: 288 feet 30 minutes: 276 feet 45 minutes: 264 feet 60 minutes: 252 feet	
If flowing give rate	Pump intake set at	Water at end of test
	300 feet	<input type="checkbox"/> Clear <input checked="" type="checkbox"/> Cloudy
Recommended pump type	Recommended pump setting	Recommended pump rate
<input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Deep	300 feet	1 GPM



FINAL STATUS OF WELL

<input checked="" type="checkbox"/> Water supply	<input type="checkbox"/> Abandoned, insufficient supply	<input type="checkbox"/> Unfinished
<input type="checkbox"/> Observation well	<input type="checkbox"/> Abandoned, poor quality	<input type="checkbox"/> Replacement well
<input type="checkbox"/> Test hole	<input type="checkbox"/> Abandoned (Other)	
<input type="checkbox"/> Recharge well	<input type="checkbox"/> Dewatering	

WATER USE

<input checked="" type="checkbox"/> Domestic	<input type="checkbox"/> Commercial	<input type="checkbox"/> Not use
<input type="checkbox"/> Stock	<input type="checkbox"/> Municipal	<input type="checkbox"/> Other
<input type="checkbox"/> Irrigation	<input type="checkbox"/> Public supply	
<input type="checkbox"/> Industrial	<input type="checkbox"/> Cooling & air conditioning	

METHOD OF CONSTRUCTION

<input type="checkbox"/> Cable tool	<input checked="" type="checkbox"/> Air percussion	<input type="checkbox"/> Driving
<input type="checkbox"/> Rotary (conventional)	<input type="checkbox"/> Boring	<input type="checkbox"/> Digging
<input type="checkbox"/> Rotary (reverse)	<input type="checkbox"/> Diamond	<input type="checkbox"/> Other
<input type="checkbox"/> Rotary (air)	<input type="checkbox"/> Jetting	

Name of Well Contractor: **Air-Root Drilling Co Ltd** Well Contractor's Licence No.: **1119**
 Address: **R.R. # 2 Jasper, Ont**
 Name of Well Technician: **Shannon Percell** Well Technician's Licence No.: **T2122**
 Signature of Technician/Contractor: **[Signature]** Submission date: **14 08 00**

MINISTRY USE ONLY

Data source	Contractor	Date received
	1119	SEP 15 2000
Date of inspection	Inspector	
Remarks	CSS.ES0	

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

11

1532633

Municipality 15011 OF Con. 01

County or District: OTTAWA Carleton
 Township/Borough/City/Town/Village: Carleton Place
 Con block tract survey, etc.: S019-166 Lot: 1
 Address: 1547 Sequoia Dr.
 Date completed: 15/12/01
 Northing: 17, 18, 19, 20, 21, 22, 23, 24
 Elevation: 25, 26, 27, 28, 29, 30, 31
 Basin Code: ii, iii, iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet	
				From	To
Brown	Clay	Boulder	house	0	5
Grey	Limestone		Hard	5	195

31
32

41 WATER RECORD

Water found at - feet	Kind of water
150	1 <input checked="" type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 14 2 <input type="checkbox"/> Salty 6 <input type="checkbox"/> Minerals 19
15-18	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 19 2 <input type="checkbox"/> Salty 6 <input type="checkbox"/> Minerals 24 5 <input type="checkbox"/> Gas 29
20-23	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 24 2 <input type="checkbox"/> Salty 6 <input type="checkbox"/> Minerals 29 5 <input type="checkbox"/> Gas 34
25-28	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 29 2 <input type="checkbox"/> Salty 6 <input type="checkbox"/> Minerals 34 5 <input type="checkbox"/> Gas 39
30-33	1 <input type="checkbox"/> Fresh 3 <input type="checkbox"/> Sulphur 34 2 <input type="checkbox"/> Salty 6 <input type="checkbox"/> Minerals 39 5 <input type="checkbox"/> Gas 44

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet	
			From	To
6 1/2	1 <input checked="" type="checkbox"/> Steel 12 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic	1 1/2	0	40
6	1 <input type="checkbox"/> Steel 18 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input checked="" type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic		40	195
	1 <input type="checkbox"/> Steel 20 2 <input type="checkbox"/> Galvanized 3 <input type="checkbox"/> Concrete 4 <input type="checkbox"/> Open hole 5 <input type="checkbox"/> Plastic			27-30

54 SIZES OF OPENING (Slot No.)

Slot No.	Diameter inches	Length feet

Material and type: _____
 Depth at top of screen: _____ feet

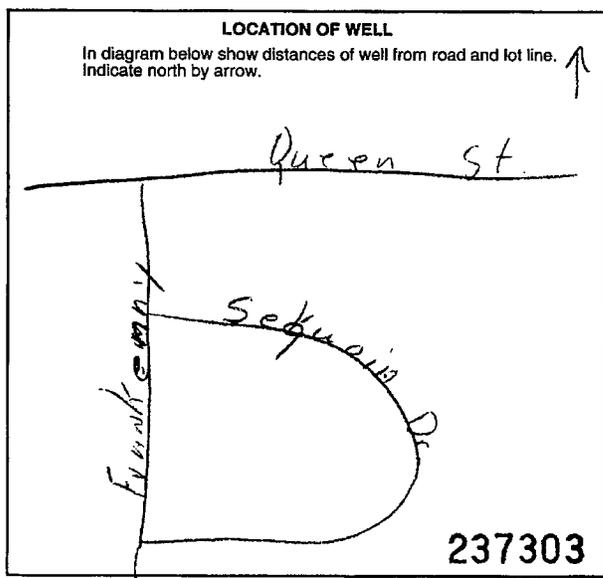
61 PLUGGING & SEALING RECORD

Annular space Abandonment

Depth set at - feet	Material and type (Cement grout, bentonite, etc.)
0 10-13 14-17	Cement grout
18-21 22-25	30
26-29 30-33 80	

71 PUMPING TEST

Pumping test method: 1 Pump 2 Bailer
 Pumping rate: 2 1/2 GPM
 Duration of pumping: 3 Hours 40 Mins
 Water level end of pumping: 20 feet
 Water levels during: 15 minutes: 190 feet, 30 minutes: 150 feet, 45 minutes: 50 feet, 60 minutes: 40 feet
 If flowing give rate: _____ GPM
 Pump intake set at: 195 feet
 Water at end of test: Clear Cloudy
 Recommended pump type: Shallow Deep
 Recommended pump setting: 190 feet
 Recommended pump rate: 2 GPM



FINAL STATUS OF WELL

1 Water supply 5 Abandoned, insufficient supply 9 Unfinished
 2 Observation well 6 Abandoned, poor quality 10 Replacement well
 3 Test hole 7 Abandoned (Other)
 4 Recharge well 8 Dewatering

WATER USE

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

METHOD OF CONSTRUCTION

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

Name of Well Contractor: D&K-WATER well Drilling
 Well Contractor's Licence No.: 6006
 Address: St Albert out
 Name of Well Technician: Louis Desnoyers
 Well Technician's Licence No.: 1-625
 Signature of Technician/Contractor: _____
 Submission date: 03/01/2002
 day mo yr

MINISTRY USE ONLY

Data source: 6006
 Date received: JAN 10 2002
 Date of inspection: _____
 Inspector: _____
 Remarks: CSS.ES2



Ministry of the Environment
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

11

1518166

MUNICIPALITY

159111

CONTRACTOR

09

01

COUNTY OR DISTRICT: **Ottawa-Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON. BLOCK, TRACT, SURVEY ETC.: **150** LOT: **024**

DATE COMPLETED: DAY **02** NO. **11** YR. **82**

ADDRESS: **Rowland Dr. Cumberland, Ont.**

GRID COORDINATES: NG **038899** BC **4** ELEVATION **0200** BC **4** BASIN CODE **26**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	hardpan			0	4
grey	slate			4	130
brown	slate			130	150
grey	"			150	190
brown	"			190	210
grey	"			210	245
brown	"			245	260
grey	"			260	293

MOE
VF-18

31 **000414** 32 **0130214** 33 **0150619** 34 **0190219** 35 **0210619** 36 **0245219**

37 **0260419** 38 **0293219**

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0293	1 <input checked="" type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
28-28	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

DEPTH - FEET	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
0-16	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	225	0	0019
17-18	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			20-23
24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			27-30

SCREEN

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

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.
10-13		
18-21		
26-29		

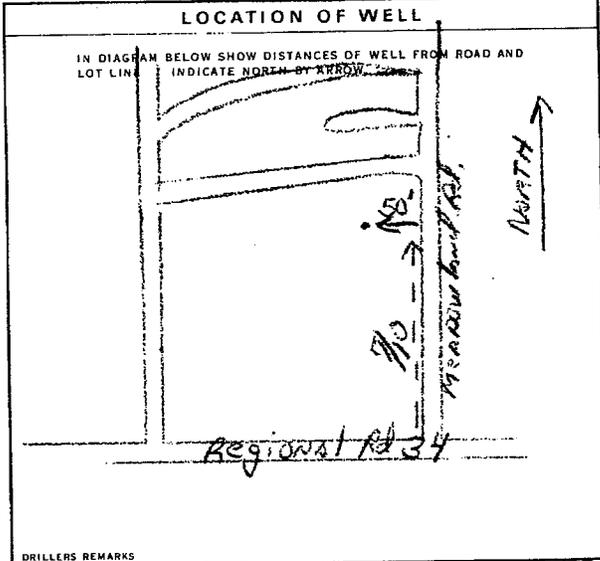
71 PUMPING TEST

PUMPING TEST METHOD: **air** PUMPING RATE: **0009** GPM DURATION OF PUMPING: **01** HOURS **00** MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING PUMPING			
015	200	15 MINUTES: 100	30 MINUTES: 055	45 MINUTES: 020	60 MINUTES: 015

IF FLOWING, GIVE RATE: _____ PUMP INTAKE SET AT: **200** FEET WATER AT END OF TEST: **1** CLEAR **2** CLOUDY

RECOMMENDED PUMP TYPE: SHALLOW DEEP RECOMMENDED PUMP SETTING: **200** FEET RECOMMENDED PUMPING RATE: **0007** GPM



FINAL STATUS OF WELL

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

WATER USE **01**

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

METHOD OF DRILLING **4**

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

CONTRACTOR

NAME OF WELL CONTRACTOR: **G. Charbonneau+Son Drilling Ltd 1504** LICENCE NUMBER: _____
 ADDRESS: **R.R. 2, Box 194, Orleans, Ont. K1C 1T1**
 NAME OF DRILLER OR BORER: **L. Bourgeois** LICENCE NUMBER: _____
 SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: DAY **2** NO. **11** YR. **82**

OFFICE USE ONLY

DATA SOURCE: _____ CONTRACTOR: **1504** INSPECTED: **05 04 83**
 DATE OF INSPECTION: _____ INSPECTOR: _____
 REMARKS: _____



The Ontario Water Resources Act WATER WELL RECORD

2161...

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

11 1516925 MUNICIPALITY 15011 CON. 0F 01

COUNTY OR DISTRICT: Carleton
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland
CON., BLOCK, TRACT, SURVEY, ETC.: 105
DATE COMPLETED: 28-04-78
DAY 25 MO. 04 YR. 78
ELEVATION: 377.99
BASIN CODE: 4 38

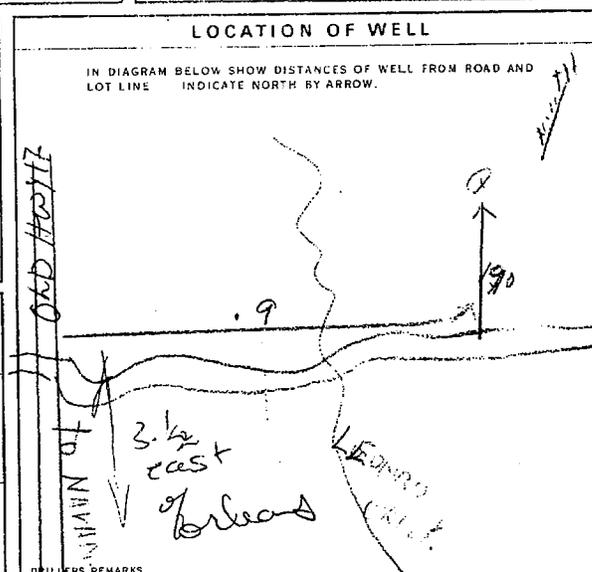
LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	10
blue	clay			10	49
brown	rock	slate		49	55
grey	limestone			55	140
brown	slate			140	150

31 0010505 0049305 005561219 01140215 0150619

41 WATER RECORD WATER FOUND AT - FEET: 0150 KIND OF WATER: 1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL		51 CASING & OPEN HOLE RECORD INSIDE DIAM. INCHES: 6 1/2 MATERIAL: 1 <input checked="" type="checkbox"/> STEEL WALL THICKNESS INCHES: 188 DEPTH - FEET: FROM 0 TO 0048		61 PLUGGING & SEALING RECORD DEPTH SET AT - FEET: 10 MATERIAL AND TYPE: 10-12 16-17 18-21 22-25 26-29 30-33	
--	--	--	--	--	--

71 PUMPING TEST

PUMPING TEST METHOD: 1 PUMP 2 BAILER
 PUMPING RATE: 0020 GPM
 DURATION OF PUMPING: 00 HOURS 00 MINS
 STATIC LEVEL: 060 FEET
 WATER LEVEL END OF PUMPING: 140 FEET
 WATER LEVELS DURING:
 15 MINUTES: 070 FEET
 30 MINUTES: 060 FEET
 45 MINUTES: 060 FEET
 60 MINUTES: 060 FEET
 PUMP INTAKE SET AT: 110 GPM
 WATER AT END OF TEST: 42 FEET
 RECOMMENDED PUMP TYPE: SHALLOW DEEP
 RECOMMENDED PUMP SETTING: 110 FEET
 RECOMMENDED PUMPING RATE: 0011 GPM
 GPM / FT. SPECIFIC CAPACITY: _____



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

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

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

CONTRACTOR: NAME OF WELL CONTRACTOR: Charbonneau + Son Drilling Ltd 1504
 ADDRESS: R.R. 2, Box 194, Orléans, Ont. K1C 1T1
 NAME OF DRILLER OR BORER: Léo Bourgeois
 SIGNATURE OF CONTRACTOR: [Signature]
 SUBMISSION DATE: DAY 25 MO. 04 YR. 78

OFFICE USE ONLY

DATA SOURCE: 1
 CONTRACTOR: 1504
 DATE RECEIVED: 28 02 79
 DATE OF INSPECTION: _____
 INSPECTOR: _____
 REMARKS: _____
 P
 WI



Ontario

Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

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

11 1517246 MUNICIPALITY 150111 COPY OF 191

COUNTY OR DISTRICT: **CLERK** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **CUMBERLAND** CON. BLOCK, TRACT, SURVEY ETC: **109 O.F.1** DATE COMPLETED: **088**

Cumbersland, Ont. DAY: **13** NO: **12** YR: **79**

GRID: 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

COORDINATES: 10-11: **037699** 11-12: **19** 12-13: **0200** 13-14: **4** 14-15: **26**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)				
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	DEPTH - FEET	
			FROM	TO
yellow	clay		0	13
blue	clay		13	60
grey	gravel		60	70
grey	sand	gravel	70	80
grey	boulders	gravel	80	95
brown	slate		95	144
blue	slate			

31 0013505 0060305 0070211 008022811 009521311 0144119

32 0144100

41 WATER RECORD WATER FOUND AT - FEET: 0144 KIND OF WATER: 10-13: <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL 15-18: <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL 20-23: <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL 23-26: <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL 30-33: <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL		51 CASING & OPEN HOLE RECORD INHOLE DIAM INCHES: 06 MATERIAL: <input checked="" type="checkbox"/> STEEL WALL THICKNESS INCHES: 188 DEPTH - FEET: 0 TO 082 17-18: <input type="checkbox"/> GALVANIZED 20-23: <input type="checkbox"/> CONCRETE 24-25: <input type="checkbox"/> OPEN HOLE		61 PLUGGING & SEALING RECORD DEPTH SET AT - FEET: FROM TO MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.) 10-13: 14-17 18-21: 22-25 26-29: 30-33	
--	--	---	--	--	--

71 PUMPING TEST METHOD 1 PUMP 2 BAILER

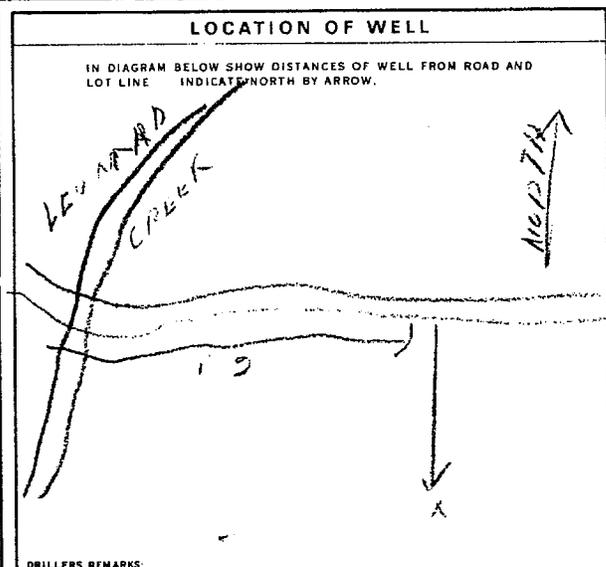
PUMPING RATE: **0008** GPM DURATION OF PUMPING: **02** HOURS **00** MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING			
19-21: 075 FEET	22-24: 095 FEET	15 MINUTES: 075 FEET	30 MINUTES: 075 FEET	45 MINUTES: 075 FEET	60 MINUTES: 075 FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: **095** FEET

RECOMMENDED PUMPING RATE: **0004** GPM



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

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

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

CONTRACTOR NAME OF WELL CONTRACTOR: **G. Charbonneau + Fils Drilling Ltd** LICENCE NUMBER: **1504**

ADDRESS: **R.R.2, Box 194, Orléans, Ont. K1C 1T1**

NAME OF DRILLER OR BORER: **Raymond Charbonneau** LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: *[Signature]* SUBMISSION DATE: **DAY 13 NO. 12 YR. 79**

OFFICE USE ONLY

DATA SOURCE: **1504** CONTRACTOR: **200280**

DATE OF INSPECTION: **1/5** INSPECTOR: **Km**

REMARKS:



The Ontario Water Resources Act WATER WELL RECORD 316/11 w

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

1513933-11 15011 0F 01

COUNTY OR DISTRICT: **Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON., BLOCK, TRACT, SURVEY, ETC.: **lot from Ottawa B.** LOT: **025**

R. 1, Cumberland DATE COMPLETED: DAY **19** MO **09** YR. **73**

WELL NO. **038587** RC **4** ELEVATION **0395** RC **5** BASIN CODE **26**

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	hardpan			0	6
brown	slate			6	80
grey	limestone			80	200
brown	slate			200	270

OWRC
b-9

31 0006614 0080619 0200215 0230619
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER			
0230	<input checked="" type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
15-18	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
20-23	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
25-28	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL
30-33	<input type="checkbox"/> FRESH	<input type="checkbox"/> SALTY	<input type="checkbox"/> SULPHUR	<input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06	<input checked="" type="checkbox"/> STEEL	1/8	0	23.16
06	<input type="checkbox"/> GALVANIZED			0021
	<input type="checkbox"/> CONCRETE			0230
	<input type="checkbox"/> OPEN HOLE			

SCREEN

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

61 PLUGGING & SEALING RECORD

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

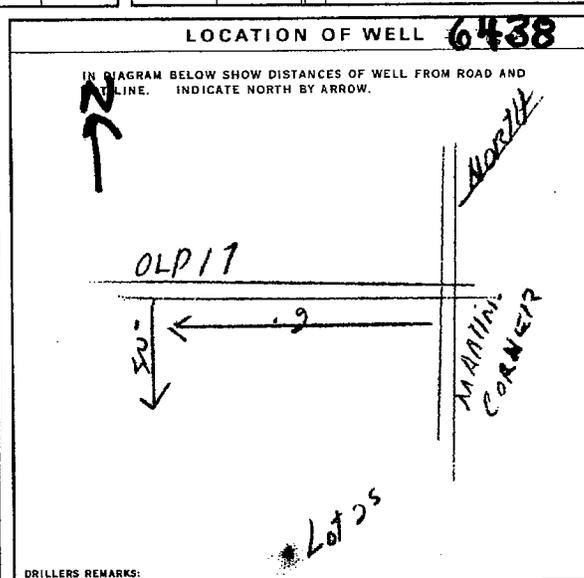
71 PUMPING TEST

PUMPING RATE: **0004** GPM. DURATION OF PUMPING: **01** HOURS **00** MINS.

STATIC LEVEL	WATER LEVELS DURING PUMPING			
030 FEET	15 MINUTES: 200 FEET	30 MINUTES: 150 FEET	45 MINUTES: 100 FEET	60 MINUTES: 050 FEET

PUMP INTAKE SET AT: **200** FEET. WATER AT END OF TEST: **050** FEET.

RECOMMENDED PUMP TYPE: SHALLOW DEEP. RECOMMENDED PUMP SETTING: **200** FEET. RECOMMENDED PUMPING RATE: **0004** GPM.



FINAL STATUS OF WELL: **1**

WATER USE: **01**

METHOD OF DRILLING: **4**

CONTRACTOR: **G. Charbonneau, Diamond & Cable Drilling 1504**

ADDRESS: **R. R. 2, Box 194, Orleans, Ont.**

NAME OF DRILLER OR BORER: **Leo Bourgeois**

SIGNATURE OF CONTRACTOR: *G. Charbonneau*

SUBMISSION DATE: DAY **19** MO **9** YR. **73**

OFFICE USE ONLY

DATA SOURCE: **1504** CONTRACTOR: **1504** DATE RECEIVED: **180374**

DATE OF INSPECTION: **180374** INSPECTOR: **180374**

REMARKS: **CSC:38**

P W



The Ontario Water Resources Act WATER WELL RECORD

319/11d

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

1513951

MUNICIP.

CON.

COUNTY OR DISTRICT: **Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON., BLOCK, TRACT, SURVEY, ETC.: **0.F.1** LOT: **25**

in Bella Vista, Cumberland, Ont. DATE COMPLETED: DAY **10** MO **07** YR **73**

ING: **0.38** RC: **16** ELEVATION: **10.275** RC: **4** BASIN CODE: **2.5**

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	hardpan			0	4
brown	shale			4	12
brown slate				12	90
grey	limestone			90	150
brown	slate			150	220

31 **0.946/1A** **0.012/1.7** **0.020/1.9** **10.1502/1.6** **0.220/1.9**

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0-220	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06	STEEL	188	0	221
17-18	STEEL		20-23	
24-25	STEEL		27-30	

SCREEN

SIZE (S) OF OPENING (SLOT NO. 1)	DIAMETER INCHES	LENGTH FEET
	31-33	34-38
		39-40

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

PUMPING RATE: **0.018** GPM

DURATION OF PUMPING: **0.1** HOURS **0.0** MINS

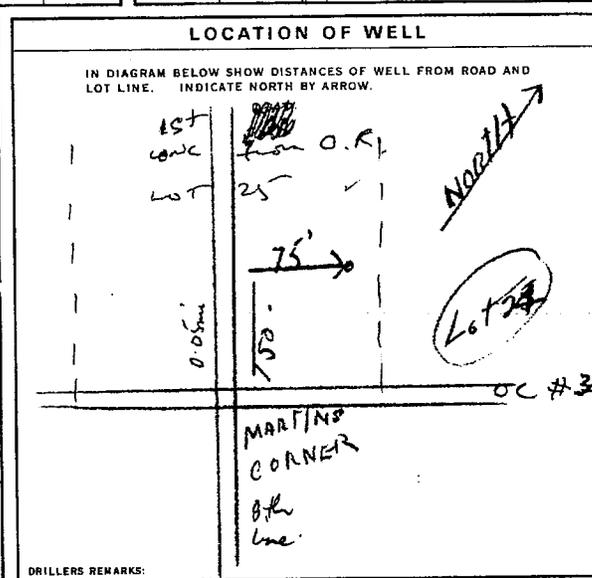
STATIC LEVEL	WATER LEVELS DURING	RECOVERY
100	15 MINUTES: 140	1 <input type="checkbox"/> PUMPING 2 <input checked="" type="checkbox"/> RECOVERY
150	30 MINUTES: 130	
	45 MINUTES: 120	
	60 MINUTES: 110	

PUMP INTAKE SET AT: **160** FEET

RECOMMENDED PUMP TYPE: **DEEP**

RECOMMENDED PUMP SETTING: **160** FEET

RECOMMENDED PUMPING RATE: **0.018** GPM



FINAL STATUS OF WELL

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

WATER USE

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

METHOD OF DRILLING

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

CONTRACTOR

NAME OF WELL CONTRACTOR: **G. Charbonneau, Diamond & Cable Drilling 1504** LICENCE NUMBER: _____

ADDRESS: **R.R. 2, Box 194, Orleans, Ont.**

NAME OF DRILLER OR BORER: **Leo Bourgeois** LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: *Leo Bourgeois* SUBMISSION DATE: **10** MO **7** YR **73**

OFFICE USE ONLY

DATA SOURCE: _____ 58 CONTRACTOR: **1504** 59-62 DATE RECEIVED: _____ 63-68 80

DATE OF INSPECTION: _____ INSPECTOR: *K*

REMARKS: _____

P *K*

WI



The Ontario Water Resources Act. WATER WELL RECORD

31-G/11-W

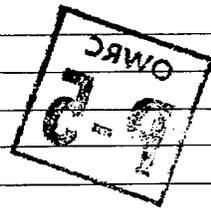
1. PRINT ONLY IN SPACES PROVIDED
2. CHECK CORRECT BOX WHERE APPLICABLE

11 1514504 15,011 OF 01

COUNTY OR DISTRICT: Carleton
 TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland
 CON., BLOCK, TRACT, SURVEY, ETC.: 75 I OF 02A
 DATE COMPLETED: DAY 23 MO. 04 YR. 74
 R. 1, Cumberland, Ont.
 3,868.2 4 0305 15 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	hardpan			0	3
grey	shale			3	10
brown	slate			10	125
grey	limestone			125	150
brown	slate			150	250
grey	limestone			250	305

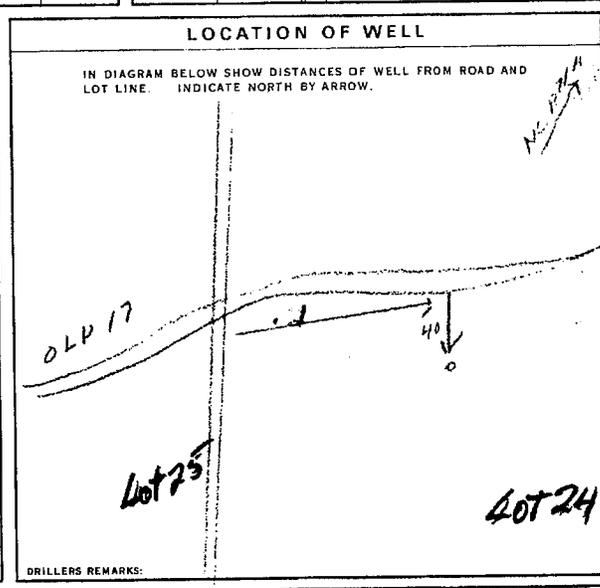


31 0003614 0010317 0125619 0150215 0250619 0305215

41 WATER RECORD WATER FOUND AT - FEET: 0305 10-13: <input checked="" type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL 13-18: <input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL 18-23: <input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL 23-28: <input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL 28-33: <input type="checkbox"/> FRESH <input type="checkbox"/> SALTY <input type="checkbox"/> SULPHUR <input type="checkbox"/> MINERAL	51 CASING & OPEN HOLE RECORD <table border="1"> <thead> <tr> <th>INSIDE DIAM. INCHES</th> <th>MATERIAL</th> <th>WALL THICKNESS INCHES</th> <th>DEPTH - FEET</th> </tr> </thead> <tbody> <tr> <td>10-11</td> <td><input checked="" type="checkbox"/> STEEL</td> <td>250</td> <td>0-0021</td> </tr> <tr> <td>11-16</td> <td><input checked="" type="checkbox"/> GALVANIZED</td> <td></td> <td></td> </tr> <tr> <td>16-17</td> <td><input type="checkbox"/> CONCRETE</td> <td></td> <td></td> </tr> <tr> <td>17-18</td> <td><input type="checkbox"/> OPEN HOLE</td> <td></td> <td></td> </tr> <tr> <td>18-19</td> <td><input type="checkbox"/> STEEL</td> <td></td> <td>0305</td> </tr> <tr> <td>19-24</td> <td><input type="checkbox"/> GALVANIZED</td> <td></td> <td></td> </tr> <tr> <td>24-25</td> <td><input type="checkbox"/> CONCRETE</td> <td></td> <td></td> </tr> <tr> <td>25-26</td> <td><input checked="" type="checkbox"/> OPEN HOLE</td> <td></td> <td></td> </tr> <tr> <td>26-27</td> <td><input type="checkbox"/> STEEL</td> <td></td> <td></td> </tr> <tr> <td>27-28</td> <td><input type="checkbox"/> GALVANIZED</td> <td></td> <td></td> </tr> <tr> <td>28-29</td> <td><input type="checkbox"/> CONCRETE</td> <td></td> <td></td> </tr> <tr> <td>29-30</td> <td><input type="checkbox"/> OPEN HOLE</td> <td></td> <td></td> </tr> </tbody> </table>	INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	10-11	<input checked="" type="checkbox"/> STEEL	250	0-0021	11-16	<input checked="" type="checkbox"/> GALVANIZED			16-17	<input type="checkbox"/> CONCRETE			17-18	<input type="checkbox"/> OPEN HOLE			18-19	<input type="checkbox"/> STEEL		0305	19-24	<input type="checkbox"/> GALVANIZED			24-25	<input type="checkbox"/> CONCRETE			25-26	<input checked="" type="checkbox"/> OPEN HOLE			26-27	<input type="checkbox"/> STEEL			27-28	<input type="checkbox"/> GALVANIZED			28-29	<input type="checkbox"/> CONCRETE			29-30	<input type="checkbox"/> OPEN HOLE			61 PLUGGING & SEALING RECORD <table border="1"> <thead> <tr> <th>DEPTH SET AT - FEET</th> <th>MATERIAL AND TYPE</th> <th>CEMENT GROUT LEAD PACKER, ETC.</th> </tr> </thead> <tbody> <tr> <td>10-13</td> <td></td> <td></td> </tr> <tr> <td>13-18</td> <td></td> <td></td> </tr> <tr> <td>18-23</td> <td></td> <td></td> </tr> <tr> <td>23-28</td> <td></td> <td></td> </tr> <tr> <td>28-33</td> <td></td> <td></td> </tr> </tbody> </table>	DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.	10-13			13-18			18-23			23-28			28-33		
INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET																																																																					
10-11	<input checked="" type="checkbox"/> STEEL	250	0-0021																																																																					
11-16	<input checked="" type="checkbox"/> GALVANIZED																																																																							
16-17	<input type="checkbox"/> CONCRETE																																																																							
17-18	<input type="checkbox"/> OPEN HOLE																																																																							
18-19	<input type="checkbox"/> STEEL		0305																																																																					
19-24	<input type="checkbox"/> GALVANIZED																																																																							
24-25	<input type="checkbox"/> CONCRETE																																																																							
25-26	<input checked="" type="checkbox"/> OPEN HOLE																																																																							
26-27	<input type="checkbox"/> STEEL																																																																							
27-28	<input type="checkbox"/> GALVANIZED																																																																							
28-29	<input type="checkbox"/> CONCRETE																																																																							
29-30	<input type="checkbox"/> OPEN HOLE																																																																							
DEPTH SET AT - FEET	MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.																																																																						
10-13																																																																								
13-18																																																																								
18-23																																																																								
23-28																																																																								
28-33																																																																								

71 PUMPING TEST

PUMPING TEST METHOD: PUMP BAILER
 PUMPING RATE: 0004 GPM
 DURATION OF PUMPING: 01 HOURS 00 MINS
 STATIC LEVEL: 030 FEET
 WATER LEVEL END OF PUMPING: 280 FEET
 WATER LEVELS DURING: 225 FEET, 200 FEET, 175 FEET
 IF FLOWING, GIVE RATE: 300 GPM
 PUMP INTAKE SET AT: 300 FEET
 WATER AT END OF TEST: 125 FEET
 RECOMMENDED PUMP TYPE: SHALLOW DEEP
 RECOMMENDED PUMP SETTING: 300 FEET
 RECOMMENDED PUMPING RATE: 0004 GPM
 GPM./FT. SPECIFIC CAPACITY: 000.0



FINAL STATUS OF WELL

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

WATER USE 01

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

METHOD OF DRILLING 4

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

CONTRACTOR

NAME OF WELL CONTRACTOR: G. Charbonneau & Son Drilling Ltd. LICENCE NUMBER: 1504
 ADDRESS: R. R. 2, Box 194, Orléans, Ont. K0A 2V0
 NAME OF DRILLER OR BORER: L. Bourgeois LICENCE NUMBER:
 SIGNATURE OF CONTRACTOR: [Signature] SUBMISSION DATE: DAY 23 MO. 4 YR. 74

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 1504 2 30175
 DATE OF INSPECTION: INSPECTOR:
 REMARKS:
 P V
 WI



Ontario

The Ontario Water Resources Act WATER WELL RECORD

31-G/6w

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

11

1514535

MUNICIPALITY 15011

CONTRACTOR 028

LOT 01

COUNTY OR DISTRICT: **Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON., BLOCK, TRACT, SURVEY, ETC.: **6077 OF 1** LOT: **028**

DATE COMPLETED: DAY **30** MO. **10** YR. **74**

ADDRESS: **R. 1, Cumberland, Ontario**

GRID COORDINATES: XING **038370** YC **4** ELEVATION **0200** RC **5** BASIN CODE **126**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
yellow	clay			0	15
blue	clay			15	119
brown	shale			119	125
brown	slate			125	175
grey	limestone			175	185

CMARC
P-9

31 0015506 0119305 0125617 0175617 0186215

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0185	1 <input checked="" type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
15-19	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06 1/4	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	0	0129
06	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input checked="" type="checkbox"/> OPEN HOLE			0185
24-28	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE			27-30

SCREEN

SIZES OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
	34-38	39-40

MATERIAL AND TYPE: _____ DEPTH TO TOP OF SCREEN: _____

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17
18-21	22-25
28-29	30-33

71 PUMPING TEST

PUMPING TEST METHOD: 1 PUMP 2 BAILER

10 PUMPING RATE: 0010 GPM

11-14 DURATION OF PUMPING: 01 HOURS 30 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING PUMPING	RECOVERY
027 FEET	070 FEET	027 FEET (15 MIN), 027 FEET (30 MIN), 027 FEET (45 MIN), 027 FEET (60 MIN)	

17 FLOWING, GIVE RATE: _____

18-21 PUMP INTAKE SET AT: 110 FEET

22-25 WATER AT END OF TEST: 1 CLEAR 2 CLOUDY

26-29 RECOMMENDED PUMP TYPE: SHALLOW DEEP

30-33 RECOMMENDED PUMP SETTING: 110 FEET

34-37 RECOMMENDED PUMPING RATE: 0010 GPM

38-41 GPM./FT. SPECIFIC CAPACITY: 000.2

LOCATION OF WELL 6-37

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

Highway 17 TRANS CANADA

WELL OF I

Highway 34

FINAL STATUS OF WELL: 1 WATER SUPPLY 2 OBSERVATION WELL 3 TEST HOLE 4 RECHARGE WELL

5 ABANDONED, INSUFFICIENT SUPPLY 6 ABANDONED, POOR QUALITY 7 UNFINISHED

WATER USE: 02

1 DOMESTIC 2 STOCK 3 IRRIGATION 4 INDUSTRIAL

5 COMMERCIAL 6 MUNICIPAL 7 PUBLIC SUPPLY 8 COOLING OR AIR CONDITIONING 9 NOT USED

METHOD OF DRILLING: 4

1 CABLE TOOL 2 ROTARY (CONVENTIONAL) 3 ROTARY (REVERSE) 4 ROTARY (AIR) 5 AIR PERCUSSION

6 BORING 7 DIAMOND 8 JETTING 9 DRIVING

CONTRACTOR: G. Charbonneau & Son Drilling Ltd. LICENCE NUMBER: 1504

ADDRESS: R. R. 2, Box 194, Orleans, Ont. KOA 2W0

NAME OF DRILLER OR BORER: L. Bourgeois LICENCE NUMBER: _____

SIGNATURE OF CONTRACTOR: _____ SUBMISSION DATE: DAY 30 MO. 10 YR. 74

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 1504 DATE RECEIVED: 230175

DATE OF INSPECTION: _____ INSPECTOR: _____

REMARKS: _____

P WI

08558



Ontario

WATER WELL RECORD

31 9/16 e.

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

11

17514989

MUNICIPALITY 15011

OF

01

COUNTY OR DISTRICT: **Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON. BLOCK, TRACT, SURVEY, ETC: **Old Survey OFF** LOT: **027**

Box 141 Cumberland, Ontario DATE COMPLETED: DAY **26** MO **09** YR **75**

WELL NO. **037909** RC **4** ELEVATION **0282** RC **4** BASIN CODE **26**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	clay			0	17
blue	clay			17	68
grey	hardpan	boulders	packed	68	76
grey	limestone		soft	76	298

31 0017605 0068305 00762141379 029821585

32

41 WATER RECORD		51 CASING & OPEN HOLE RECORD		61 PLUGGING & SEALING RECORD	
WATER FOUND AT - FEET	KIND OF WATER	INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
0165	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL	6 06	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE	188	FROM 0 TO 0078
		5 78	4 <input checked="" type="checkbox"/> OPEN HOLE		78 298
		06	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE		0298
			4 <input type="checkbox"/> OPEN HOLE		

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

PUMPING RATE: 0003 GPM

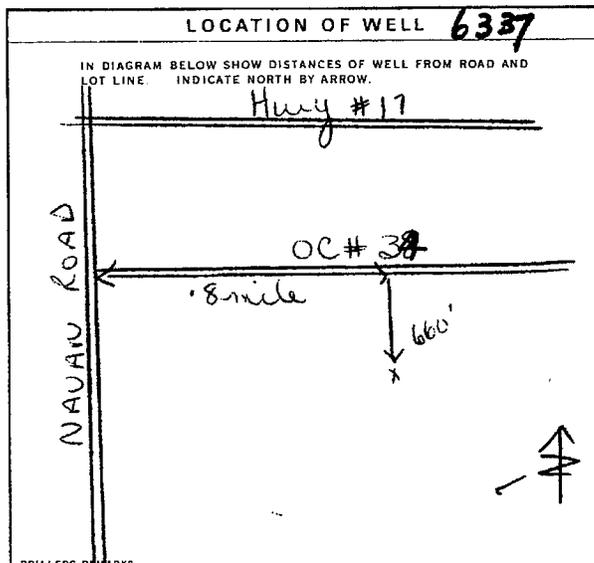
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING PUMPING			
075 FEET	175 FEET	15 MINUTES: 175 FEET	30 MINUTES: 175 FEET	45 MINUTES: 175 FEET	60 MINUTES: 175 FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: 175 FEET

RECOMMENDED PUMPING RATE: 0003 GPM



FINAL STATUS OF WELL: 1 WATER SUPPLY

WATER USE: 1 DOMESTIC

METHOD OF DRILLING: 5 AIR PERCUSSION

CONTRACTOR: Capital Water Supply Ltd. LICENCE NUMBER: 1858

ADDRESS: Box 490 Stittsville, Ontario

NAME OF DRILLER OR BORER: D. McDougall

SIGNATURE OF CONTRACTOR: [Signature]

OFFICE USE ONLY: DATA SOURCE 1 CONTRACTOR 1558 DATE RECEIVED 061075

DATE OF INSPECTION: 14 June 76 INSPECTOR: [Signature]

REMARKS: P. WI



WATER WELL RECORD

The Ontario Water Resources Act

31/9/11

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

11 1513927 150111 101

COUNTY OR DISTRICT: **Carleton** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON., BLOCK, TRACT, SURVEY, ETC.: **1-0-F LOT 25-27 pt. D24**

DATE COMPLETED: DAY **14** MO. **06** YR. **73**

CONTRACTOR: **Cumberland, Ont.**

NG: **238790** RC: **102963** ELEVATION: **14** BASIN CODE: **251**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)					
GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
brown	hardpan			0	6
brown	shale			6	20
brown	slate			20	80
gray	limestone			80	240
brown	slate			240	330

31 0006171 0006171 0006171 0006171 0006171

32

41 WATER RECORD		51 CASING & OPEN HOLE RECORD		61 PLUGGING & SEALING RECORD		
WATER FOUND AT - FEET	KIND OF WATER	INSIDE DIA. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	DEPTH SET AT - FEET
0330	1 <input checked="" type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL	06	1 <input checked="" type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE	188	0 0022	
19-21	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL	12-18	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		20-25	
25-28	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL	24-25	1 <input type="checkbox"/> STEEL 2 <input type="checkbox"/> GALVANIZED 3 <input type="checkbox"/> CONCRETE 4 <input type="checkbox"/> OPEN HOLE		27-30	
30-33	1 <input type="checkbox"/> FRESH 2 <input type="checkbox"/> SALTY 3 <input type="checkbox"/> SULPHUR 4 <input type="checkbox"/> MINERAL					

71 PUMPING TEST METHOD: 1 PUMP 2 BAILEY

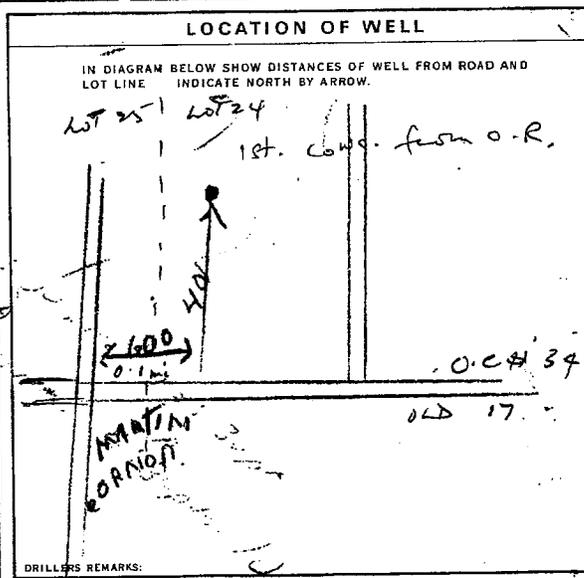
WATER LEVELS END OF PUMPING: 19-21: 080 FEET, 22-24: 130 FEET

WATER LEVELS DURING PUMPING: 15-18: 090 FEET, 19-21: 130 FEET, 22-24: 130 FEET, 25-28: 130 FEET

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: 200 FEET

RECOMMENDED PUMPING RATE: 600 GPM



FINAL STATUS OF WELL: 1 WATER SUPPLY 2 OBSERVATION WELL 3 TEST HOLE 4 RECHARGE WELL

WATER USE: 1 DOMESTIC 2 STOCK 3 IRRIGATION 4 INDUSTRIAL

METHOD OF DRILLING: 1 CABLE TOOL 2 ROTARY (CONVENTIONAL) 3 ROTARY (ADVANCED) 4 ROTARY (AIR) 5 AIR PERCUSSION

CONTRACTOR: **G. Charbonneau, Diamond & Cable Drilling** LICENCE NUMBER: **1304**

ADDRESS: **R. R. 2, Box 194, Orleans, Ont.**

NAME OF DRILLER OR BORER: **Leo Bourgeois** LICENCE NUMBER: **1304**

SIGNATURE OF CONTRACTOR: *Leo Bourgeois* SUBMISSION DATE: DAY **14** MO. **06** YR. **73**

OFFICE USE ONLY: DATA SOURCE: **1** CONTRACTOR: **1504** DATE RECEIVED: **1,80374**

DATE OF INSPECTION: **1,80374** INSPECTOR: **K**

REMARKS: **P-R**



5601101
3/6/6W

1517077
~~1517077~~
1513151

The Ontario Water Resources Commission Act

WATER WELL RECORD

Now: Region Ottawa ~~Central~~ **Carleton Russell** Township, Village, Town or City **RUSSELL & PRESCOTT**
 County or District **Carleton Russell** Date completed **15 June 1969**
 Con. **1st FREDONIA W. RIVER Lot PT 29** (day month year)
 Address: **ORLEANS ONT**

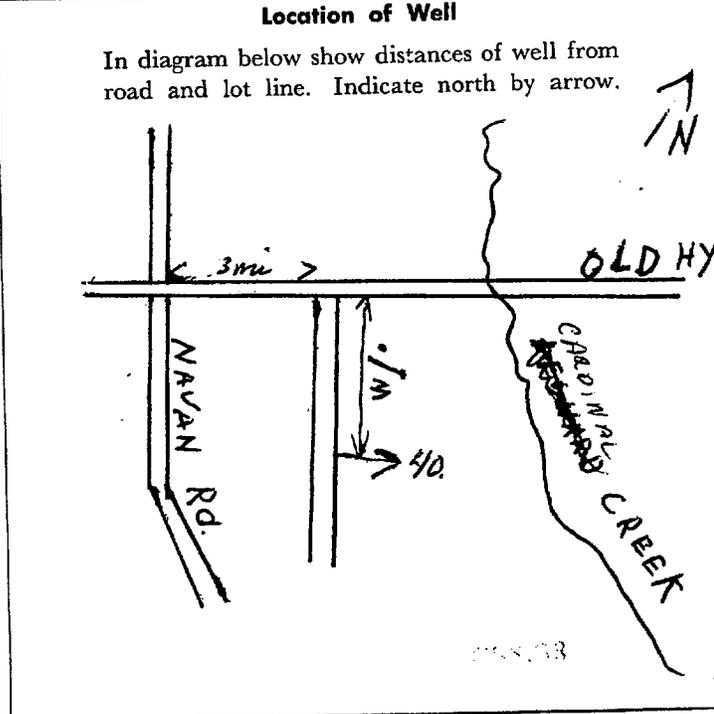


Casing and Screen Record		Pumping Test	
Inside diameter of casing..... 3		Static level..... 66	
Total length of casing..... 126		Test-pumping rate..... 6 G.P.M.	
Type of screen..... -		Pumping level..... 75	
Length of screen..... -		Duration of test pumping..... 2 hrs	
Depth to top of screen..... -		Water clear or cloudy at end of test..... Clear	
Diameter of finished hole..... 2		Recommended pumping rate..... 6 G.P.M.	
		with pump setting of..... 75 feet below ground surface	

DIVISION OF
WATER RESOURCES
AUG 25 1969
ONTARIO WATER
RESOURCES COMMISSION

Well Log	Water Record			
	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Overburden and Bedrock Record				
Clay	0	105	128	Fresh
Boulders & Sand	105	123		
Limestone	123	130		
11M 1 8 2 4 6 3 0 2 0 R				
4R 5 0 3 7 2 2 0 W				

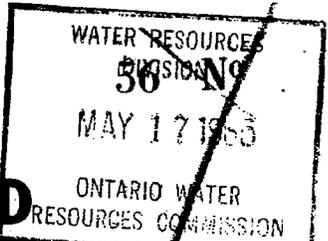
For what purpose (s) is this water to be used?
 ev. **6R | 0 | 2 | 2 | 5**
 Is well on upland, in valley, or on hillside? **House Hillside**
 Drilling or Boring Firm..... **F. R. COSSETTE**
 Address..... **1510 BASELINE Rd OTTAWA 5**
 Licence Number..... **3182**
 Name of Driller or Borer..... **Same**
 Address..... **Same**
 Date..... **June 15 - 1969**
F. R. Cossette
 (Signature of Licensed Drilling or Boring Contractor)



UTM 483 476321610^E



15131354



762

19^R 51037161912^N The Ontario Water Resources Commission Act

Elev. 197^R 2072115

WATER WELL RECORD

Basin 25 | Russell O.F. Con I Rd 28 Township, Village, Town or City 314/6e Twp. of Cumberland

County or District Ontario | 1.0F Lot 28 Date completed March 24, 1965
(day month year)

Address RR #1, Cumberland, Ont.

Casing and Screen Record

Pumping Test

Inside diameter of casing 6 1/4
Total length of casing 26'
Type of screen
Length of screen
Depth to top of screen
Diameter of finished hole 6"

Static level 30'
Test-pumping rate 14 G.P.M.
Pumping level 60'
Duration of test pumping 3 hrs.
Water clear or cloudy at end of test Clear
Recommended pumping rate 6 G.P.M.
with pump setting of 70 feet below ground surface

Well Log

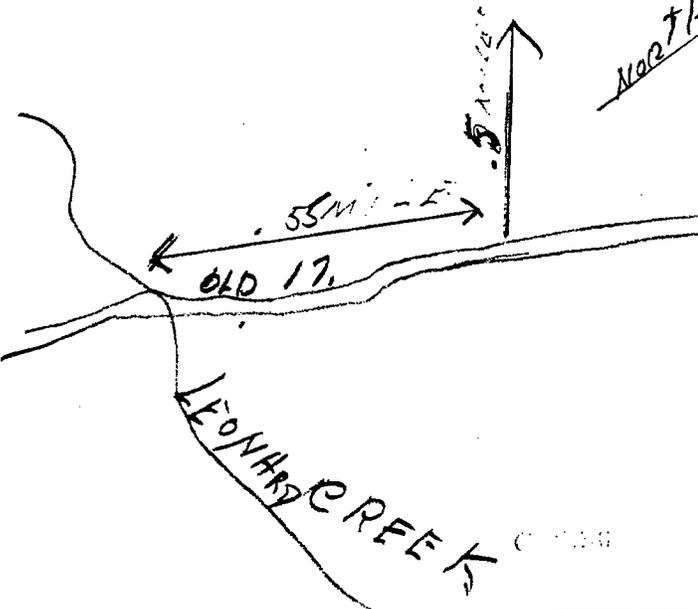
Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
<u>Broken rock and clay</u>	<u>0</u>	<u>8</u>		
<u>Grey Limestone</u>	<u>8</u>	<u>180</u>		
<u>White sand stone</u>	<u>180</u>	<u>183</u>	<u>183</u>	<u>Fresh</u>

For what purpose(s) is the water to be used? Domestic & green house
Is well on upland, in valley, or on hillside? Upland
Drilling or Boring Firm G. Charbonneau
..... Diamond & Cable Drilling
Address RR #1, Box 194, Orleans, Ont.
Licence Number 1331
Name of Driller or Borer Bruck Stacey,
Address RR #1, Jasper, Ont.
Date March 24, 1965
Geirid Charters
(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



Form 7 15M-60-4138

OWRC COPY

UTM 1182 4464 9179 E

519/62



1512687

56.1 No. 463

SR 51031819410N

The Ontario Water Resources Commission Act

Elev. 5 RJ 03113

WATER WELL RECORD

Basin 25 County or District Russell

Township, Village, Town or City Cumberland

Con. 1st from Ottawa B. Lot E.

Date completed 14 January 1966 (day month year)

Address... Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing..... 8"

Total length of casing..... 12'

Type of screen

Length of screen.....

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level..... 10'

Test-pumping rate 6 G.P.M.

Pumping level..... 90'

Duration of test pumping..... 2 hrs.

Water clear or cloudy at end of test..... clear

Recommended pumping rate..... 6 G.P.M.

with pump setting of..... 90 feet below ground surface

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
boulders & gravel	0	6		
grey limestone	6	105	125	fresh
		125		

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

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

Drilling or Boring Firm..... G. Charbonneau, Diamond & Cable Drilling,

Address..... R.R. #1, Box 194, Orleans, Ont.

Licence Number 2156

Name of Driller or Borer Bruce Stacey

Address..... R.R. 4, Jasper, Ont.

Date..... 14 January 1966

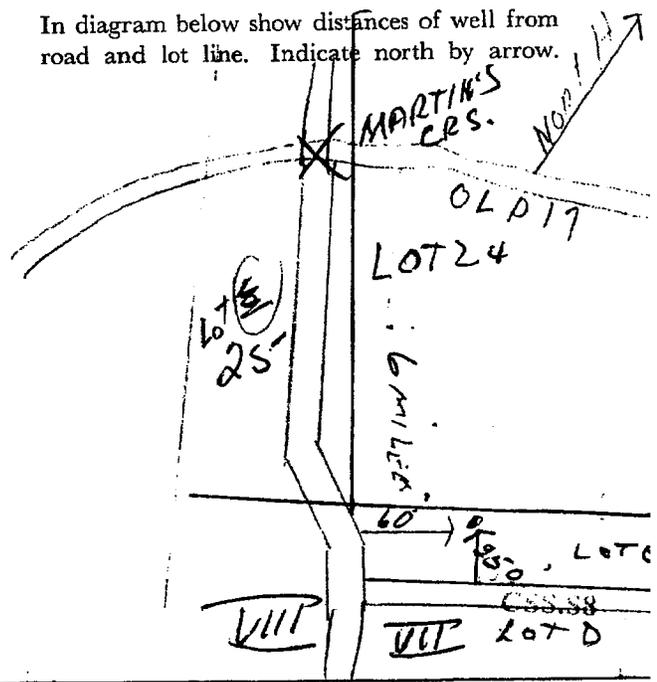
Jean Charbonneau
 (Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4188

OWRC COPY

Location of Well

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





The Ontario Water Resources Act WATER WELL RECORD

31040

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

11

1512412

MUNICIP. 1512412

CON. 05

191

COUNTY OR DISTRICT: [redacted] TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **Cumberland** CON., BLOCK, TRACT, SUBDIV., ETC.: **1 OF** LOT: **024**

DATE COMPLETED: 48-53 DAY: **03** MO: **07** YR.: **72**

R. R. 1, Cumberland, Ont.

NG: **38750** RC: **14** ELEVATION: **0290** RC: **5** BASIN CODE: **135**

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET	
				FROM	TO
grey	hardpan			0	7
brown	rock slate			7	20
blue	rock			20	60
grey	limestone			60	212

31 0007214 0020019 0060330 0212215

32

41 WATER RECORD

WATER FOUND AT DEPTH	KIND OF WATER
0212	1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
15-18	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
20-23	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
25-28	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL
30-33	1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIA. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
06	<input checked="" type="checkbox"/> STEEL	250	0	25
17-18	<input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE		20-23	0023
24-25	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE		27-30	0212

SCREEN

SIZES OF OPENING (SLOT NO.)	DIAMETER	LENGTH
	INCHES	FEET
		DEPTH TO TOP OF SCREEN

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE
FROM TO	(CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17
16-21	22-25
26-28	30-33

71 PUMPING TEST METHOD

1 PUMP 2 BAILER

PUMPING RATE: 0006 GPM

DURATION OF PUMPING: 02 HOURS 00 MINS

WATER LEVELS DURING PUMPING:

15 MINUTES: 160 FEET	30 MINUTES: 158 FEET	45 MINUTES: 160 FEET	60 MINUTES: 160 FEET
----------------------	----------------------	----------------------	----------------------

IF FLOWING, GIVE RATE: 100 FEET 310 FEET

PUMP INTAKE SET AT: 130 FEET

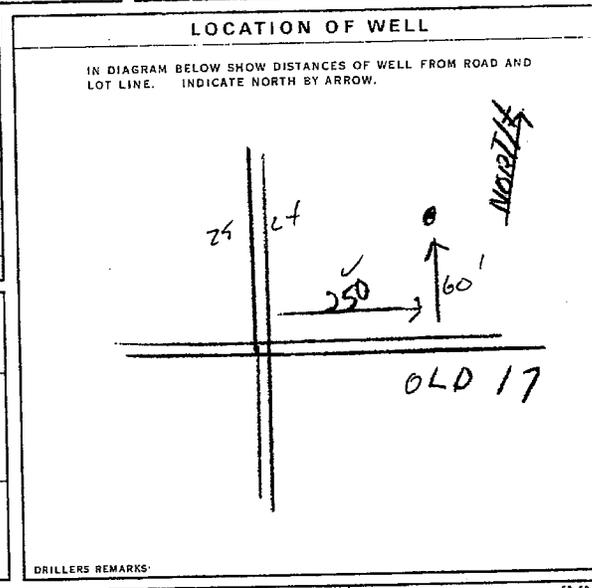
WATER AT END OF TEST: CLEAR

RECOMMENDED PUMP TYPE: SHALLOW DEEP

RECOMMENDED PUMP SETTING: 200 FEET

RECOMMENDED PUMPING RATE: 0006 GPM

50-53 007.0 GPM./FT. SPECIFIC CAPACITY



FINAL STATUS OF WELL: 1 WATER SUPPLY

WATER USE: 01 DOMESTIC

METHOD OF DRILLING: 1 CABLE TOOL

CONTRACTOR: G. Charbonneau, Diamond & Cable Drilling 055

ADDRESS: R. R. 2, Box 194, Orleans, Ontario

NAME OF DRILLER OR BORER: Leo Bourgeois

SIGNATURE OF CONTRACTOR: [Signature]

SUBMISSION DATE: DAY 3 MO 7 YR 72

OFFICE USE ONLY

DATA SOURCE: 1

CONTRACTOR: 1504

DATE RECEIVED: 240473

DATE OF INSPECTION: [blank]

INSPECTOR: [Signature]

REMARKS: [blank]

P R

WI

APPENDIX 3

- REFERENCES AND SUPPORTING DOCUMENTATION

EARTH SCIENCE INVENTORY CHECKLIST

PART ONE: SUMMARY PAGE

NAME Cardinal Creek Karst ANSI	OLL ID	MAP NAME	NTS NUMBER 31 G/6	UTM REFERENCE 463500 5037500
OBM NUMBER COUNTY City of Ottawa TOWNSHIP Cumberland LOT CONCESSION AREA hectares OWNERSHIP AERIAL PHOTOGRAPHS YEAR ROLL FLIGHT LINE NUMBERS 1991 37 4532 31-33	LAT. E 'N LONG. E 'W ELEVATION MAX. MIN.		Location Map <div style="text-align: center; font-size: 2em; font-weight: bold; margin-top: 50px;">MAP</div>	
BASEMAPS: Docket 454752	MNR REGION Southeast	MNR DISTRICT Kemptville	PARK ZONE Southern	
EARTH SCIENCE FEATURES Bedrock Geology - Paleozoic limestone of the Doboaygeon formation; this unit hosts the karst features; Surficial Geology – Up to 20m banks of Champlain Sea clay deposits over discontinuous, thin, silty and stony till; southeast-trending glacial movement indicators; Karst Features – a complex system of caves and chambers with interconnected springs; notable occurrence of “breakdown collapse” features.				
SIGNIFICANCE Breakdown Collapse Features are considered to be provincially significant as they have not been reported elsewhere in the province. All other features described above are associated with, and enhance, the karst system here.				
SENSITIVITY Natural erosion of steep clay banks occurs, as well as internal modifications of karst features; human impacts which affect the karst system here include landfill, storm-water and other water management, garbage, tree felling into the creek valley, with the potential to alter karst hydrology and features, and the plugging of cavities. Intensive housing developments surround the natural areas where the karst occurs, and have likely already modified the hydrology of the karst system.				
RECOMMENDATIONS That a new earth science ANSI be defined to incorporate the main (core) Cardinal Creek Karst, containing the caves, chambers and surface sinkholes. It still needs to be determined where there are features that may be required to maintain the existing functionality of the hydrology of the karst. The boundary follows property lines owned by the City of Ottawa for ease of locating the site.				
MAJOR REFERENCES Williams 1991; Johnson et al. 1992; Beaupre and Schroeder 1991				
DATE COMPILED 1 April 2009		COMPILER PSG Kor		



Ministry of Natural Resources
 Ministère des Richesses naturelles

Ontario

Ontario Ministry of Natural Resources Ontario Parks
 300 Water Street, Peterborough, Ontario K9J 8N1



PART TWO: DETAILED INFORMATION

PROTECTION HISTORY AND SETTING

The Cardinal Creek karst site was first identified to MNR District staff in 1991 (or earlier) as a "geologic site of interest" by a high school teacher and a university professor from the Ottawa area (names not recorded). At that time, the site was treated as a candidate (i.e. unconfirmed), regionally- to provincially- significant (yet to be determined) earth science ANSI. It resurfaced as a provincially significant candidate earth science ANSI in a consultant's report in 2001 (see earth science checksheet: Gorrell 2001). Although identified as a provincially significant ANSI, it was noted that the nature and extent of the karst system was largely unknown to the scientific community at that time, and required more study to determine its core values.

The creek flowing through the karst area here is sometimes called Leonard Creek, whereas the Cardinal Creek karst site is also known locally as Cumberland Cave (Quebec) and Orleans Cave (Ontario). This should not to be confused with Cumberland Caves #1 and #2 which occur further downstream along the Ottawa River.

The Cardinal Creek valley formed within the relatively flat-lying Chaplain Sea basin after its retreat from the region, and formed a drainage-way to the proto-Ottawa River. The valley is characterised by a meandering course, very steep banks, deep ravines, and a largely bedrock substrate. The karst area can be roughly divided into two main areas, separated by the major gravel road works along Watters Road. A southern portion includes that main cave system, whereas the northern portion includes the main valley and springs system of the karst. Most of the interest and descriptions on the site has focussed on the cave system.

DETAILED EARTH SCIENCE FEATURES

Introduction:

Two sketches of the main features of the karst system are attached (Figures 1, 2). These are representational in nature, and are not to scale (Marcus Buck, caver and karst expert, pers.com. 2008). The surficial and subterranean features of the karst system are described in some detail by Beaupre and Schroeder (1991), based on extensive observations and measurements during field work. Some of their results are referenced and summarized here.

The Cardinal Creek Karst represents a karst tunnel valley system by which groundwater disappears beneath the surface into an entrance cave, and re-appears at several waterfalls along Cardinal Creek as springs, until it re-emerges at the foot of the system. Groundwater is partially controlled with a storm sewer, which directs runoff into the karst cave entrance. A natural dry channel (part of a man-made berm?) may also feed this system during periods of high run-off. Water run-off in the system may be fed by an artificial pond held up by a small dam upstream of this entrance cave.

The following descriptions are based on a review of the existing literature specific to the Cardinal Creek karst system, speaking with karst and groundwater (hydrogeologists) experts, and two reconnaissance field visits in early spring and midsummer 2008 by the present author (Kor 2008).

The Cardinal Creek Karst site incorporates features which are probably Holocene in age (they were formed in the last 10 000 years), and which are covered by the "Postglacial and Holocene Events Environment" and, more significantly, the "Karst Landforms Processes and Environments" as outlined and described in the *Earth Science Framework* (Davidson 1981). There is some discussion that the karst may have been inherited during the Holocene, suggesting that the system was formed during an earlier time.

Bedrock Geology:

The bedrock exposed at the site consists of the Middle Ordovician Bobcaygeon Formation of the Ottawa Group (Johnson et al. 1992). It is made up of pure, fossiliferous, coarse-grained, massive to thick-bedded limestone, with thin shale partings (Photo 3). The Bobcaygeon Formation was laid down in a shallow, marine, inland sea environment. Important joint sets, roughly east-west in orientation, occur within the bedrock that are utilized by underground water in the development of the karst system. The bedrock is generally buried beneath up to 20 metres of insoluble, glaciomarine silt and clay.

Surficial Geology:

Till and shallow to deepwater marine sediments are overlain by deltaic sand and gravel formed along the western shores of the Champlain Sea. Following glacial retreat, the valley of Cardinal Creek entrenched itself into the clay plain of the Champlain Sea. The eroding banks of the valley expose these sediments and their history.

Glacial striae on the area's bedrock surface indicate a roughly south-southeast ice movement direction. Striae and features related to water erosion are present on some of the exposed bedrock surfaces in the creek valley (Figure 3). They are best exposed on the bedrock surface at the base of the clay bluff just north of the Watters Road bridge. Here it is overlain by glacial till.

The oldest sedimentary deposit in the valley is a thin- to discontinuous, stony, silty clay diamict (till) with erratic boulders of Paleozoic and Precambrian origins. It can be seen lying directly on top of the bedrock surface in the valley. It was likely modified once the Champlain Sea inundated the Ottawa River valley. In some places it is absent; in others, it can be seen to overly directly on bedrock. Its presence suggests that it was deposited at the base of the glacial ice at a time when the karst was still forming, which in turn suggests that the karst may have been inherited; i.e., that it may be older than postglacial (i.e., preglacial or interglacial). After the last glaciation, once Cardinal Creek cut through the surficial sediments down to bedrock, it opened up the cave entrances to the karst system.

The banks of the creek are dominated by treed and exposed sections of glaciomarine, silty clay representing deposition in deep water conditions in the Champlain Sea, which inundated the Ottawa River valley once the glacial ice cover was removed. The clays are grey, thinly laminated, non-fossiliferous, and non-calcareous. The clays are susceptible to slumping, most of which likely occurs during heavy runoff conditions (like spring melting and severe storm events).

The upper surface of the creek valley exposes a discontinuous layer of sand and gravel material which are thought to have been deposited as a delta along the western shores of

the sea. All the described sediments are likely exposed in the unvegetated walls of the Cardinal Creek valley.

Karst Features:

The main karst features which occur in the system at Cardinal Creek include karren (surface etching and pooling by waters), dry stream beds, sinks (all of which are impenetrable due to clayey plugs of sediment), springs (mainly impenetrable artesian types, some of which have been buried or otherwise impacted by slumping from upslope materials), and sinkholes (also known as dolines). These features occur mainly in the clay plain south of Watters Road.

In addition, Buck (pers.com. 2008) noted the presence of a "breakdown collapse" structure which is not known to be present in other karst systems of the province. These occur in the main cave section of the system south of Watters Road. He indicates that this feature consists of a large suffosion doline above the central portion of the cave system on the surface. Inside the cave, the breakdown is largely sealed by clay that has settled in from above creating an effective hydraulic constriction. There are a number of examples of large collapse dolines over collapsed cave roofs (e.g., Bonnechere Cave, Ottawa River Caves, Dewdney's Caves, Puzzle Lake Cave, possibly Warsaw Caves, etc), but this may be the only such site where the surface expression is entirely within overburden, with no bedrock exposed. The closest example of such a feature is Tyendinaga Cave, which is a straight passage terminating in breakdown at either end.

The caves are transitory in shape and scale. The upstream caves consist of a group of short, straight small galleries with walls of collapsed limestone blocks and debris. The central portion of the caves consists of two, sub-parallel, horizontal galleries. Finally, the southern portion of the cave consists of a vadose maze, in which intersecting cavities form a grid pattern of limestone cavities. These caves probably focus groundwater into springs which exit, among other places, along the banks of Cardinal Creek north of Watters Road.

None of the other core features in themselves are notably representative, as they commonly occur frequently in other karst systems, including in protected areas of the province (e.g., the Eramosa Karst site and many Bruce Peninsula sites). The karst features of the site are well-described by Beaupre and Schroeder 1991). A sketch diagram is presented showing the character of the main cave system south of Watters Road. This map (Figure 2) is not to scale.

DETAILED SIGNIFICANCE

The evaluation of significance of the Cardinal Caves Karst site is partially based on discussions with experts in this very specialized field of study (i.e., karst). In this case, the input by consultants Marcus Buck and Daryl Cowell is here credited. (any errors in the presentation of this checksheet are mine).

The evaluation of significance is also based on a comparison of similar features elsewhere. Karst terranes have recently been studied in more detail (notably by the Ontario Geological Survey) because of (among other criteria) their impacts on land use planning. As such, the Cardinal Creek karst features were compared in quality, condition, complexity and special features with other known sites in Ontario.

Despite the noted impacts (see Detailed Sensitivity section), there is one feature that is not known to be represented elsewhere in the province that may still be intact (not confirmed; Buck pers.com. 2008). There is a large “breakdown collapse” in the centre of the main cave with a large suffosion doline above it on the surface. Inside the cave, the breakdown is largely sealed by clay that has settled in from above, creating an effective hydraulic constriction. There are a number of examples of large collapse dolines over collapsed cave roofs (e.g., Bonnechere Cave, Ottawa River Caves, Dewdney’s Caves, Puzzle Lake Cave, etc) but there may not be any other site where the surface expression is entirely within overburden with no bedrock exposed. The closest example may be Tyendinaga Cave which is a straight passage terminating in breakdown collapse structures at either end. However, it is a fossil cave that may be pre-glacial in origin.

Furthermore, there are some complexities in the cave geometry upstream from the breakdown collapse structures that strongly suggest maze-development in response to the breakdown constriction. These phenomena are well-described in the literature. A constriction, in this case created by collapse of the cave roof and plugging by infilling overburden, causes a localized area of steep hydraulic gradients that leads to rapid enlargement of completing flow routes. This leads to development of new passages around the constriction. There is no indication that the downstream impacts at the presumed original springs have had an impact to the hydraulics in the upstream portion of the cave. Therefore, the form and function of this feature are still intact. This is considered to be a valid argument for assessing this site as provincially significant (Buck pers.com. 2008).

The small valley created by Cardinal Creek in post-Champlain Sea time has value as an indicator of the hydraulic function of the downstream end of the karst system. This area may be significantly impacted, both physically and functionally, by the construction along Watters Road. Despite its high scenic qualities, the geological valleys of the valley system north of Watters Road is considered to be locally significant. Studies of groundwater patterns in the area (if undertaken in the future) may enhance the significance of the northern portion of the site.

The bedrock exposures in the area of the site, being primarily limestone of the Bobcaygeon Formation, are not well-exposed along the creek, and are better represented in other protected sites in the region. Similarly, the surficial deposits encompassed by the site, including the till and glaciomarine clay and silt, are well represented in other protected areas in the region. However, these features do contribute to the “story” of the karst development in the Cardinal Creek valley.

Besides the presence of provincially significant karst features and systems, the Cardinal Creek Karst site is located in an urban area, and as such has excellent educational and recreational potential. It is a scenic, interesting landscape that is well worth preserving for public enjoyment and education. It is also a relatively large and complex cave (being roughly the 12th longest cave in the province), with an estimated length of some 340 metres. There is still much to learn from the hydrology, geology and geomorphology of this cave, so the potential for scientific study is also emphasized here. The valley and springs portion of the site (north of Watters Road) is of high scenic value.

The site is of great interest to the caving community as it is considered to be an excellent caving site. The main cave is reputed to be about the 12th longest in Ontario. Although sketch maps exist for the site, there has been recent interest by the caving community to

properly map the system. It may be one of the most-visited caves by cave specialists in the Ottawa area (Buck, pers.com. 2008).

DETAILED SENSITIVITY

The site is not pristine. It has been impacted by human activities in the form of a culvert, an artificial berm, an abandoned water well, collapsed roof materials, and the burial of a spring have all been reported or noted in the past, in and around the cave system (undocumented). The construction of Watters Road and its corridor cut a wide swatch through the middle portion of the site, and are responsible for most of the observed impacts. In addition, steep banks of clay and silt have been eroded by foot traffic throughout the site. Natural slumping of the unstable clays and silts are also ongoing, and may be enhanced by foot traffic.

Buck (pers.com. 2008) indicates that there have been at least three key impacts to the karst. First, the sinkpoint (and upstream entrance) has been landscaped so its geomorphology has been impacted. Also, Watters Road has likely buried one of the original springs, which has implications regarding the hydraulics and hydrology of the cave system. Finally, the nature of recharge to the cave may have been altered as a result of the landscaping at the sinkpoint, although it is not clear exactly how this may have occurred. Beaupre and Schroeder (1991) suggest that these disturbances generally have not impacted the form and function of the karst along Cardinal Creek.

DETAILED RECOMMENDATIONS

It is recommended that the Cardinal Creek Karst site be confirmed as a **Provincially Significant** earth science ANSI. The recommended boundary of the ANSI site consists of that portion of the main (core) cave and karst system south of Watters Road. It includes lands entirely owned by the City of Ottawa, and excludes most of the impacts made by Watters Road and the existing housing lot near the caves. It also does not encompass the Cardinal Creek valley north of Watters Road at this time. The recommended boundary is presented in Figure 4.

REFERENCES

Beaupre, M. and Schroeder, J. (Speltech Inc.) 1991. The Cumberland Cave and Karst System. A Geological and Geomorphological Study; consultant's report for Tamarack Developments Corporation; 46p. + photos and diagrams.

Buck, M.J. and Cowell, D.W. 2008. Evaluation and Revision of the Karst Process Theme for Ontario's Earth Science Framework; consultant's report for Ontario Parks, Planning and Research, Peterborough, Ontario; Open File Earth Science Report 0802, 16p. + tables and diagrams.

Johnson, M.D., Armstrong, D.K., Sanford, B.V., Telford, P.G. and Rutka, M.A. 1992. Paleozoic and Mesozoic Geology of Ontario; Chapter 20 in: Geology of Ontario, Special Volume 4, Part 2; pp.907-1008.

Williams, D.A., Rae, A.M. and Wolf, R.R. 1984. Paleozoic geology of the Ottawa area, southern Ontario; Ontario Geological Survey, Map 2716, scale 1:50 000.

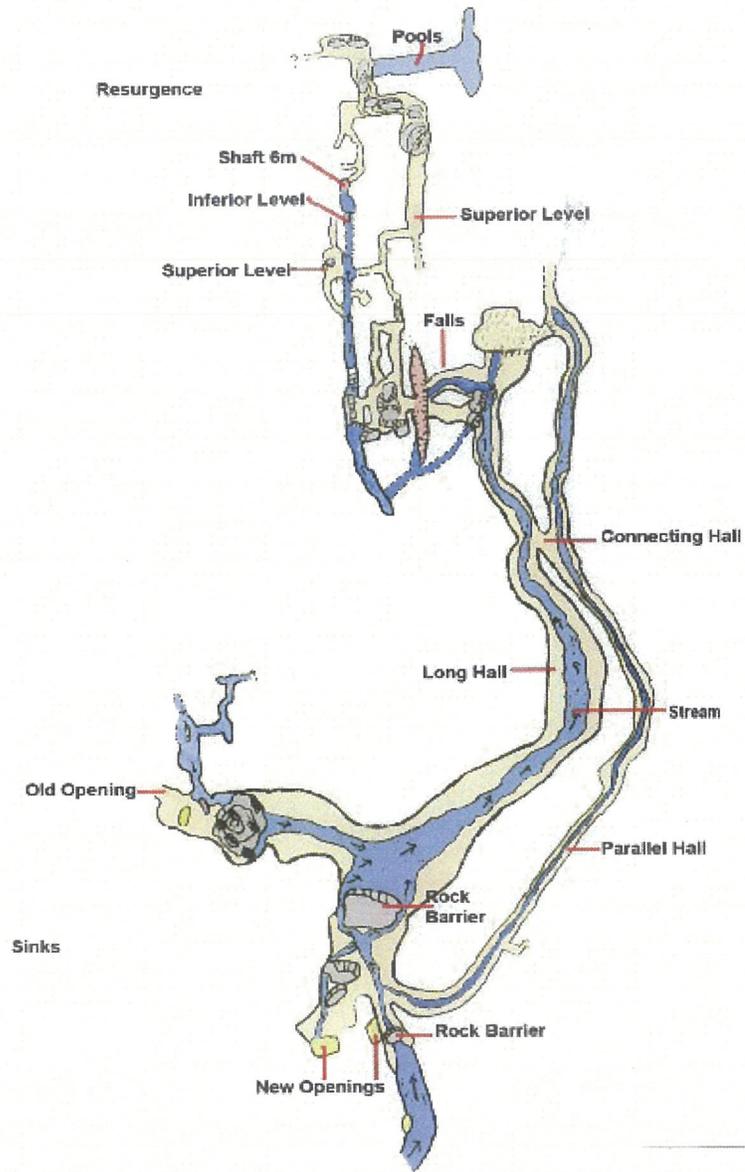


Figure 2. Sketch map of main cave system. North to the right.



Figure 3. Water-carved surface of the Paleozoic limestone bedrock, above the first falls near the Watters Road bridge, within the City of Ottawa right-of-way lands.

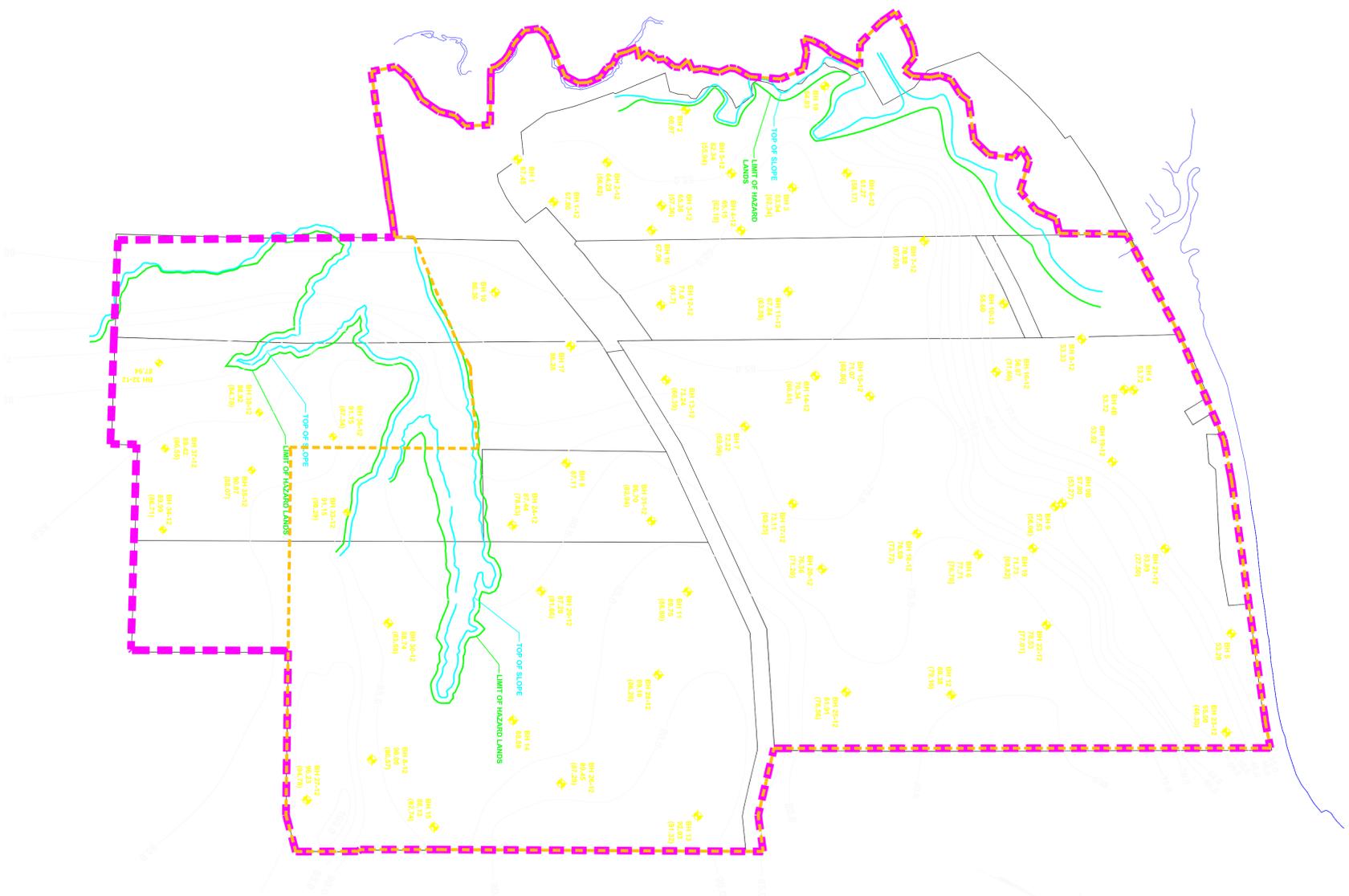


Figure 4. Cardinal Creek Karst ANSI boundary consists of the property line enclosing the City of Ottawa lands designated as PIN 145260100 (central portion of map).

APPENDIX 4

DRAWINGS & FIGURES

- PH1890-1 - TEST HOLE LOCATION PLAN
- PH1890-2 - PRELIMINARY BEDROCK CONTOUR PLAN
- PH1890-FIG.1: SITE LOCATION PLAN
- PH1890-FIG.2: SURFICIAL SOILS DELINEATION
- PH1890-FIG.3: REGIONAL BEDROCK MAPPING AND WATER WELL DELINEATION



- LEGEND:**
- BOREHOLE LOCATION
 - 71.07 GROUND SURFACE ELEVATION (m)
 - (88.88) INFERRED BEDROCK SURFACE ELEVATION (m)
 - (68.20) PRACTICAL REFUSAL TO AUGERING SURFACE ELEVATION (m)
 - 55.0 — BEDROCK SURFACE CONTOUR (m)
 - STUDY AREA
 - URBAN GROWTH BOUNDARY

GENERAL NOTES:

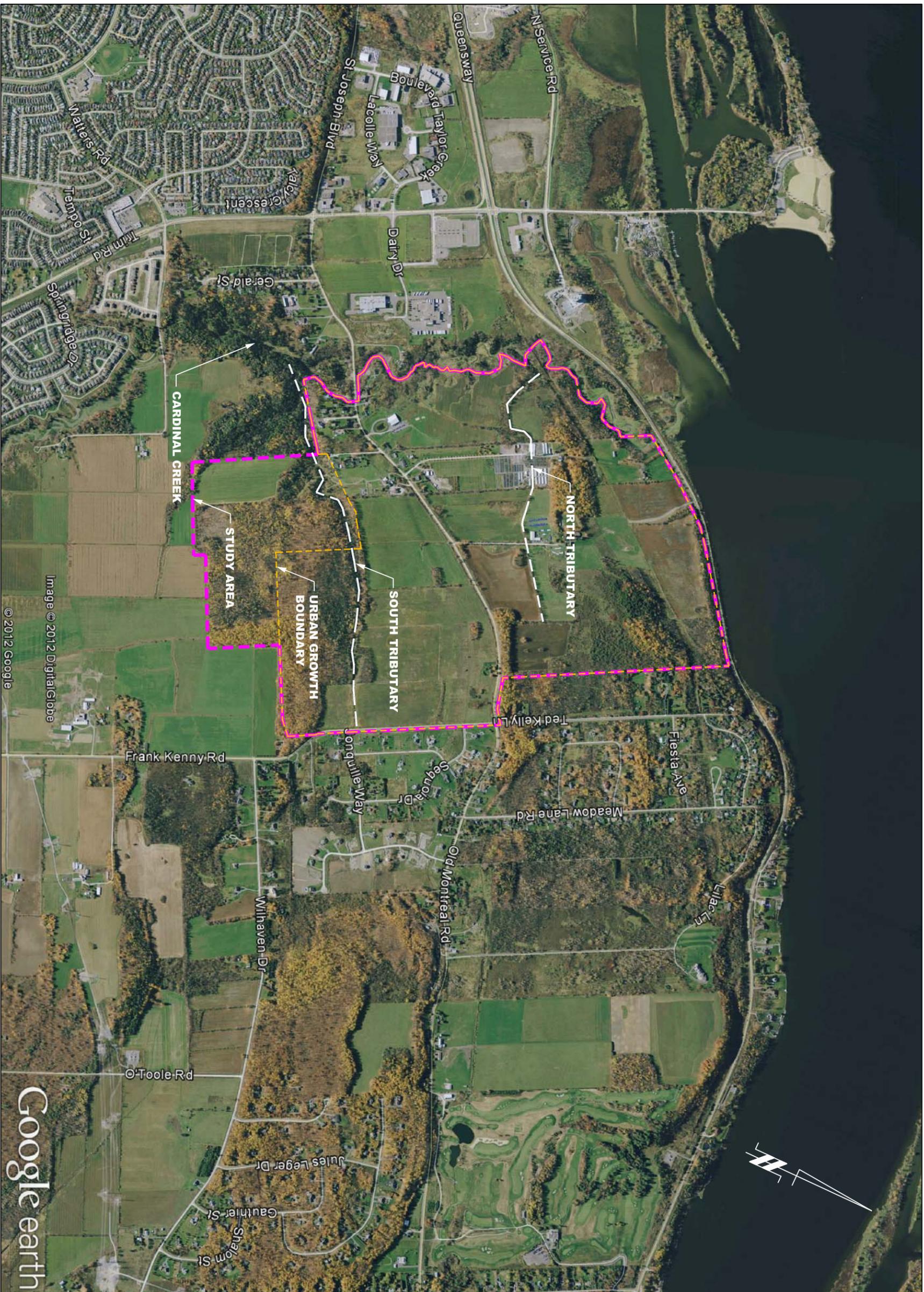
1. BEDROCK CONTOURS HAVE BEEN INTERPOLATED FROM BEST AVAILABLE INFORMATION AND ARE APPROXIMATE ONLY.
2. BASE PLAN, TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS PROVIDED BY STANTEC GEOMATICS.

NO.	REVISIONS	DATE	INITIAL
0	ISSUED FOR REPORT NO. PH1890-02-01	07/11/2012	BA

paterson group
 consulting engineers
 154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SCALE:	DATE:
1:4000	NOV. 7, 2012

TAMARACK HOMES
CARDINAL CREEK VILLAGE
OTTAWA, ONTARIO
DWG. NO. PH1890-2
PRELIMINARY BEDROCK CONTOUR PLAN



- LEGEND:
- - - STUDY AREA
 - - - URBAN GROWTH BOUNDARY

Client:
TAMARACK HOMES

Consultant:
paterson group
consulting engineers

Project:
CARDINAL CREEK VILLAGE
OTTAWA, ONTARIO

Drawing:
SITE LOCATION PLAN

Scale:	N.T.S.	Seal:	
Date:	NOV. 07, 2012		
Drawn by:	RAP		
Checked by:	AVS		
File:	PH1890		
Drawing No.:	PH1890-FIG.1		

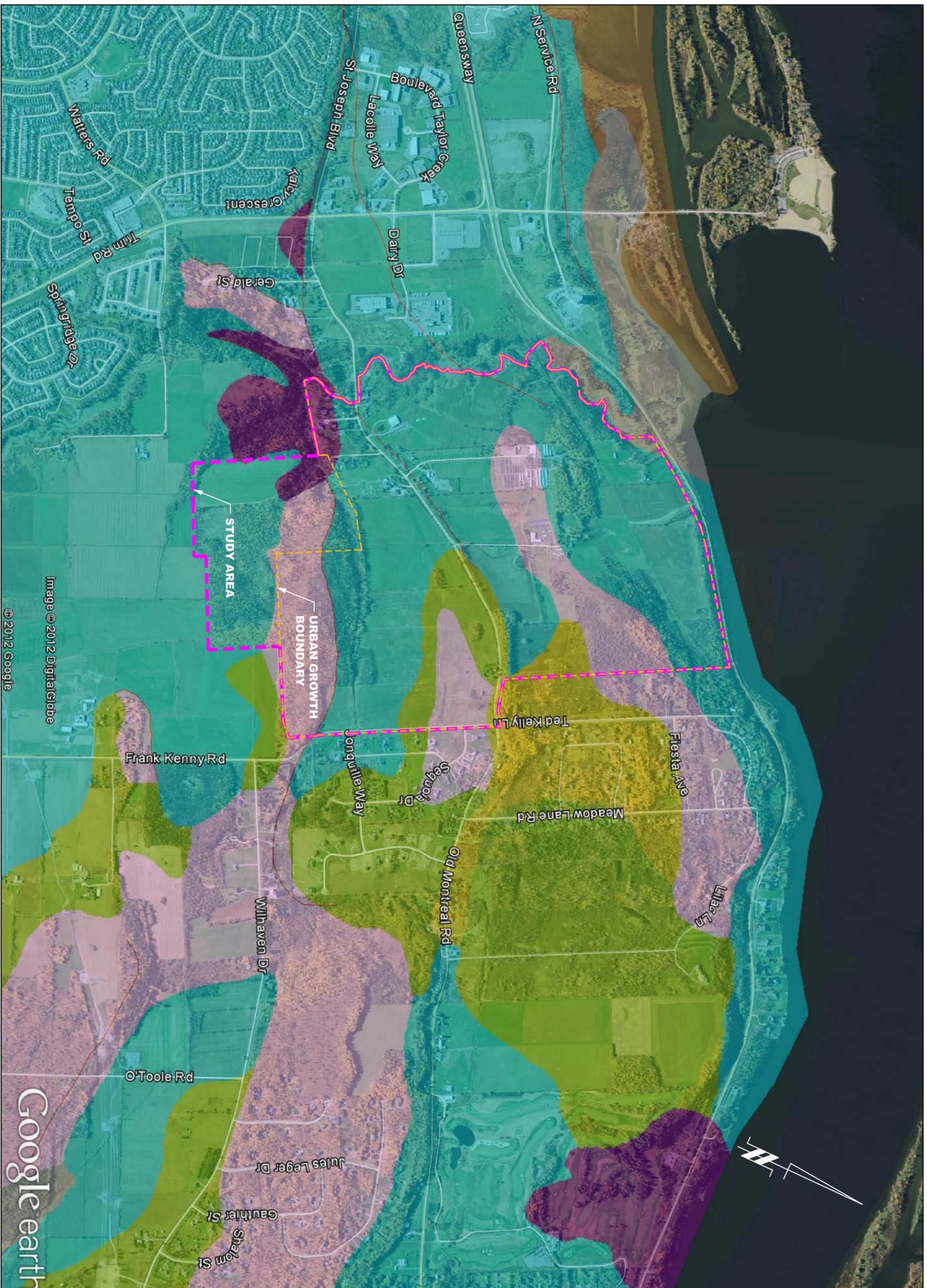


Image © 2012 DigitalGlobe
 © 2012 Google

NOTE: INFORMATION REPRODUCED FROM ONTARIO GEOLOGICAL SURVEY G.I.S. OVERLAY FOR GOOGLE EARTH
 REFERENCE SHOULD BE MADE TO SITE SPECIFIC GEOTECHNICAL INVESTIGATION FINDINGS BY PATERSON GROUP INC.

LEGEND:

- MODERN ALLUVIAL DEPOSITS
- ORGANIC DEPOSITS
- FINE-TEXTURED
GLACIOMARINE DEPOSITS
- COARSE-TEXTURED
GLACIOMARINE DEPOSITS
- PALEOZOIC BEDROCK
- TILL
- COLLUVIAL DEPOSITS
- STUDY AREA
- URBAN GROWTH BOUNDARY

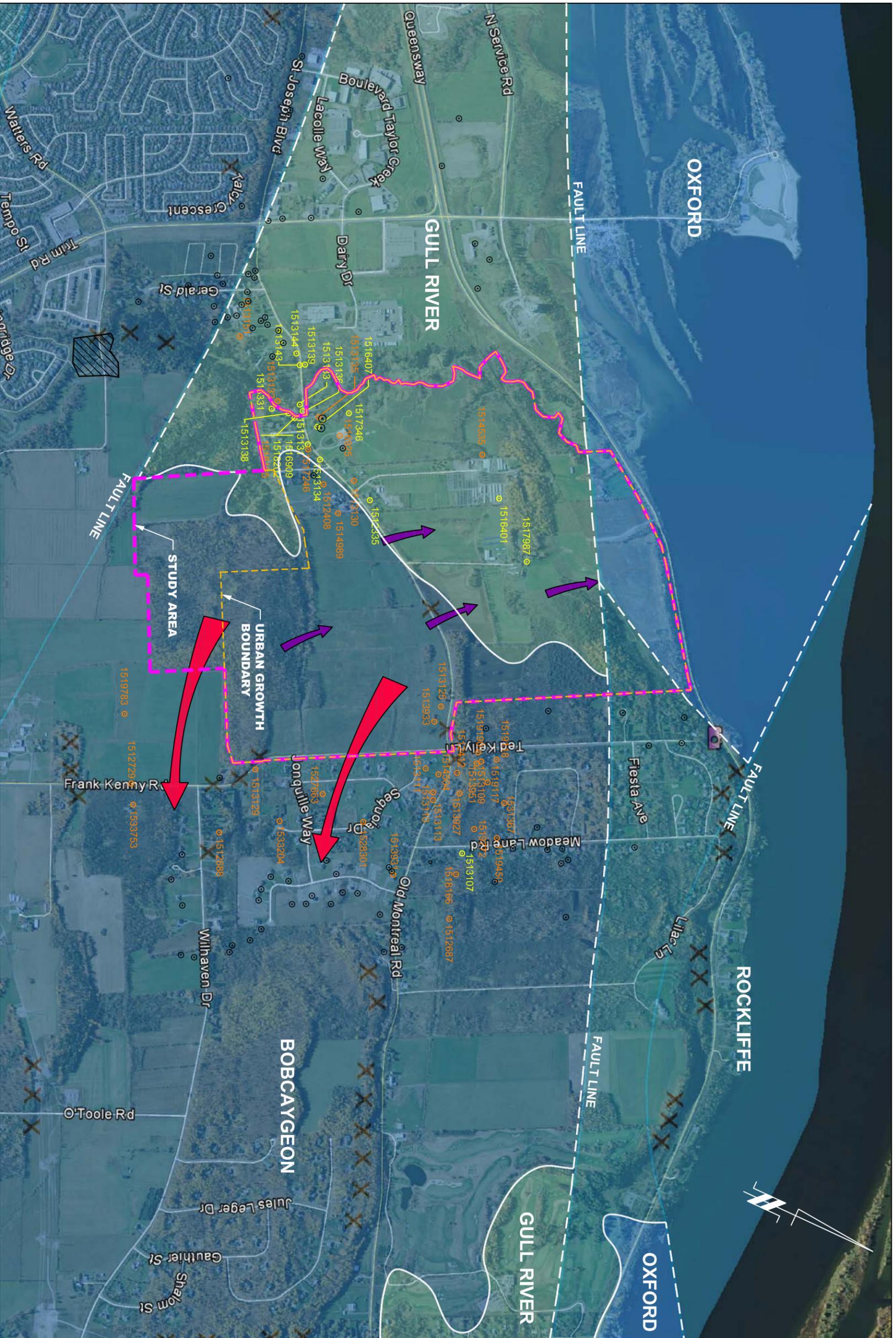
Client:
TAMARACK HOMES

Consultant:
paterSONgroup
 consulting engineers

Project:
**CARDINAL CREEK
 VILLAGE**
 OTTAWA, ONTARIO

Drawing:
**SURFICIAL SOIL
 DELINEATION MAPPING**

Scale:	N.T.S.	Seal:
Date:	NOV. 07, 2012	
Drawn by:	RAP	
Checked by:	AVS	
File:	PH1890	
Drawing No.:	PH1890-FIG.2	



NOTE: BEDROCK INFORMATION REPRODUCED FROM ONTARIO GEOLOGICAL SURVEY G.I.S. OVERLAY FOR GOOGLE EARTH
 WATER WELL INFORMATION REPRODUCED FROM THE ONTARIO GROUND WATER INFORMATION NETWORK (GIN)

LEGEND:

- OXFORD
- ROCKLIFFE
- GULL RIVER
- BOBCAYGEON
- APPROXIMATE LOCATION OF KARST AREA (2009) - AS PER GOLDER ASSOCIATES LTD. REPORT No. 09-1127-0086
- UPPER AQUIFER WATER WELL (<80ft) (PUBLISHED MOE RECORDS)
- LOWER AQUIFER WATER WELL (>80ft) (PUBLISHED MOE RECORDS)
- WATER WELL RECORD (PUBLISHED MOE RECORDS)
- LOCAL DIRECTION OF GROUNDWATER FLOW
- REGIONAL FLOW IN BEDROCK AQUIFER

Client:

TAMARACK HOMES

Consultant:

paterersongroup
 consulting engineers

Project:

CARDINAL CREEK VILLAGE
 OTTAWA, ONTARIO

Drawing:

REGIONAL BEDROCK MAPPING

Scale:

N.T.S.

Seal:

Date: NOV. 07, 2012

Drawn by: RAP

Checked by: AVS

File: PH1890

Drawing No.:

PH1890-FIG.3