Geotechnical Engineering Environmental Engineering Hydrogeology Geological Engineering Materials Testing **Building Science** patersongroup

Terrain Analysis and Hydrogeological Study
Proposed Residential Subdivision
1730 Wilhaven Drive
Ottawa (Cumberland), Ontario

Prepared For:

2183144 Ontario Ltd.

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1.0 INTRODUCTION

1.1 Terms of Reference

Paterson Group (Paterson) was retained by 2183144 Ontario Ltd. to conduct a terrain analysis and hydrogeological study for a proposed rural residential subdivision situated on the North Parts of Lots D & E, Concession 7, RP50R844 Part 2, former Township of Cumberland, now the City of Ottawa, Ontario, having the municipal address of 1730 Wilhaven Drive, hereafter referred to as the subject property. (Refer to Figure 1-Site Location Plan, which can be found in Appendix 5)

The purpose of this study has been to ascertain and assess the specific terrain and hydrogeological conditions which currently exist beneath the subject property as they relate to the suitability of the site for residential development on private services with minimal impact on groundwater resources.

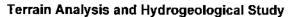
The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and recommendations pertaining to the private services for the subject development as it is understood at the time of writing this report.

1.2 Background

The subject property is located south of the Village of Cumberland, Ontario, along the south side of Wilhaven Drive, east of Frank Kenney Road and immediately west of O'Toole Road. An old farmstead, consisting of a small bungalow, shed and medium sized wood clad barn, is presently situated on the central quadrant of the site with pasture lands to the west and east. A heavily treed area is present immediately south of the building area and extends as a narrow treeline along the southern property limits from east to west. The individual pasture lands are separated by narrow groupings of trees, also.

The subject property encompasses a total area of approximately 21.85 hectares (49.3 acres), based on available property information provided by the City of Ottawa, and is proposed to be developed into 21 individual lots. The average minimum lot size for each of the proposed lots has been assigned at 0.8 hectares (1.98 acres). It is proposed that the subdivision will be serviced by individual onsite wells and septic systems.

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Paterson has conducted extensive hydrogeological investigations in the Ottawa area and is quite familiar with the geology and hydrogeology of the subject area. In addition to local experience, Paterson has reviewed numerous available hydrogeological studies in the area, including available studies in support of neighbouring residential subdivisions.



2.0 METHOD OF STUDY

2.1 Terrain Analysis

As part of this study, a series of test pits were put down on the subject property to delineate the subsurface soil conditions beneath the site. The field investigation was conducted on December 3, 2009. During this investigation a total of 12 test pits were put down across the subject property, using a small track mounted excavator. The test pit locations were selected by Paterson personnel to maximize the lot coverage within the open areas to minimize the inevitable gaps in the subsurface profile resulting from a heavily treed area situated along the south-central quadrant of the site.

All of the test holes were advanced to depths ranging between 2 and 3 m, measured below ground surface (bgs). The test pit locations are denoted with the appropriate symbol on Drawing No. PH1236-1- Test Hole Location Plan, located in Appendix 5.

Each test hole location was recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (where encountered), were carefully recorded as the test holes were advanced. Representative samples of the soils were recovered from the test holes. All samples were classified texturally in the field and sealed in proper containers for further perusal and analysis in our laboratory.

The depths at which the soil samples were recovered from the test holes are shown as "G" on the Soil Profile and Test Data sheets provided in Appendix 1. The locations of the test pits put down on the subject property are referenced on Drawing No. PH1236-1, entitled "Test Hole Location Plan", and is located in Appendix 5 of this report.

Sample Storage

All samples will be stored in the laboratory for a period of one (1) month after issuance of this report. They will then be discarded unless we are otherwise directed.



2.2 Test Well Installation

In order to evaluate the water supply aquifer(s) underlying the site, a total of three (3) test wells, hereafter denoted as TW1 to TW3, inclusive, were constructed across the site. These wells were constructed to compliment an existing drilled well which services the small bungalow in the property. The locations of the wells were selected by Paterson and located in the field by Annis, O'Sullivan, Vollebekk Ltd. Ontario Land Surveyors. Reference should be made to Paterson Drawing No. PH1236-1- Test Hole Location Plan, located in Appendix 5.

A rigorous review of available Water Well Records for the immediate area, published by the Ontario Ministry of the Environment (MOE) was undertaken prior to the placement of the test wells. Overburden thickness, depth of casing, aquifer interception points and reported well yields were reviewed in detail in order to establish a conceptual hydrogeological model for the site.

The Water Well Record for the existing well was obtained directly from Bourgeois Well Drilling who drilled the well in 2003. This well, hereafter denoted as HW, was a significant factor in the development of the conceptual hydrogeological model. A comprehensive well construction protocol was subsequently established based on the conceptual model.

The general well locations were chosen in order to ensure adequate areal coverage across the site, while, at the same time, endeavoring to maintain sufficient proximity such that response could be measured in observation wells during the pumping tests. The test well installation program was carried out by Air Rock Drilling Company Ltd. between November 5, 2009 and November 10, 2009. A engineer from Paterson was present during the creation of the casing hole, installation of the casing and grouting of the annular space for each test well. The Ministry of the Environment (MOE) Water Well Records for each test well appear in Appendix 2.

Construction of TW1

With respect to the construction of TW1, a 228 mm diameter casing hole was advanced using a rotary tri-cone bit through the shallow overburden, to the underlying limestone bedrock. The casing hole was advanced into the bedrock an additional 2.3 m to ensure that each casing was seated into competent (i.e. unfractured) bedrock and that a total casing length of 6.2 m bgs was realized.

A new, 150 mm diameter steel casing, having an approximate length of 6.7 m, was installed in the casing hole, thereby providing for a casing stickup of approximately 0.5m. The annular space was grouted utilizing a neat cement slurry introduced into the

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bottom of the annular space and pumped, using pressure grouting equipment, to the surface of the ground. The return of the cement slurry to the surface of the ground, was visually observed by Paterson staff. As such, the casing installation and grouting of the annular space is considered to be in general compliance with Ontario Regulation 903, the current regulation governing water well construction in the Province of Ontario.

After sufficient set-up time, the open borehole was advanced using a 150 mm diameter air percussion button bit. Several potential aquifer intercepts were encountered during drilling of the open borehole. At each potential intercept, the well contractor repeatedly surged the formation with air and attempted to establish preliminary yield estimates, if water was found. Once the water supply aquifer was encountered, the formation was repeatedly surged with air and allowed to clear. Preliminary well yield was estimated and the well was purged until the water was observed to be in a sand free state.

Following completion of the drilling and purging process, the static water level was allowed to stabilize. Air Rock, in accordance with Ontario Regulation 903, proceeded to chlorinate the well and a one hour constant rate pumping test was carried out within approximately 7 to 10 days following completion of each test well. The rate chosen for the one hour pumping test was based on the preliminary findings of the well contractor at the time of installation and are those which are reflected on the published MOE Water Well Records.

Construction of TW2 and TW3

After TW1 was constructed successfully, thereby validating the well construction protocol and supporting the conceptual hydrogeological model, the remaining test wells were constructed.

Each of the remaining test wells were constructed utilizing the same construction protocol as had been demonstrated in TW1. In each case, the casing was advanced into the limestone bedrock a sufficient depth in order to ensure that the minimum casing length extended 6.2 m below ground surface.

Open borehole construction, surging and well development activities were carried out in general conformity to the well construction program, as detailed in the construction of TW1. Each well was sufficiently chlorinated and subjected to a one hour constant rate pumping test by Air Rock, prior to Paterson carrying out any detailed testing.



Construction of HW

Based on the MOE Water Well Record, which can be found in Appendix 2, the existing drilled well (HW) was completed with approximately 7.9 m of 150 mm diameter steel casing (7.3 m bgs and a 0.6 m stickup) set into grey limestone bedrock. Cement grout was utilized to seal the annular space.

The open borehole was constructed with a rotary air drilling rig, the same drilling equipment as was utilized by Air Rock for TW1, TW2 and TW3. The well contractor reported drilling through grey limestone bedrock with shale interbeds. An aquifer intercept was encountered at a depth of 18.3 m bgs and the total well depth was reported to be 26 m below ground surface. The overall well depth was confirmed by Paterson personnel during the course of the pumping test program.

2.3 Aquifer Analysis

Each of the four (4) test wells were subjected to a constant rate pumping test set at the pumping rate as recommended by Air Rock during their one hour constant rate pumping test, as noted in Section 2.2. The duration for each test was specified to be the greater of the time in which steady state was achieved, or after six (6) hours of continuous pumping.

TW1, TW2 and TW3 were pumped using a 1.5 HP electric submersible pump and portable generator package supplied by Air Rock. HW was pumped utilizing the existing submersible pump installed in the well. A garden hose was connected to the hose bib on the pressure tank and a constant discharge rate was established. In all cases, the pump discharge line was placed downgradient of the subject well at a sufficient distance in order to minimize the potential for short-circuiting and recharge of the pumped well. Observation wells were closely monitored during each pumping test, in order to attempt to utilize the drawdown data in the observation wells to accurately estimate the aquifer storativity.

During the pumping test, the pumping rate was constantly monitored in order to ensure that the rate did not vary by more than 5%. Furthermore, a series of chemical analyses of the pumped water were carried out at the well head during each pumping test. The parameters tested at the well head included: turbidity, free chlorine residual, total dissolved solids, pH, temperature and electrical conductivity.



Recovery data was collected for each of the test wells following the completion of pumping. Recovery times varied from well to well and were considered to be generally slow. All wells were noted to have at least 95% recovery within 24 hours after the completion of each pumping test.

Pumping test data was analyzed using Aquifer Test v. 2.5 aquifer analysis software package, by Waterloo Hydrogeologic. The following analytical methods were applied (where relevant data was available):

- Transmissivity Parameters: (Theis & Jacob Recovery); and
- Storativity Parameters: Cooper Jacob's Time Drawdown and Theis (Curve Matching).

The results of the aquifer analysis are presented and discussed in Section 7 of this report.

2.4 Topographical Survey

A detailed topographical survey had not been carried out on the subject property at the time of preparation of this report. Rather, the ground surface elevations for the three (3) new test wells were augmented with the detailed topographical information furnished by the City of Ottawa, through their interactive mapping website. The electronic contour mapping was carefully overlain onto the site plan provided by AOV in order to achieve the base mapping illustrated on Drawing No. PH1236-1. The test pit elevations were interpolated from the available topographic information.

2.5 Laboratory Testing

Gradation of Soils

The soil samples recovered from the test holes were returned to our laboratory and visually examined to review the results of the field logging. Four (4) representative samples were selected for grain size analyses in our laboratory. The results of the soil testing are provided on the Grain Size Distribution curves in Appendix 3.

Overburden Groundwater Assessment

The depth at which groundwater infiltration was observed in each of the test pits (where encountered) was recorded as part of the terrain analysis program. In addition, three (3) monitoring wells were installed across the site at TP1, TP9 and TP11, respectively. Groundwater samples were recovered from each of the monitoring wells after providing sufficient time for the groundwater to equalize after being disturbed during the test

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pitting program. These samples were submitted to Exova Accutest Laboratories, located in Ottawa, Ontario, for chemical analysis for relevant nitrogen species (i.e. nitrite and nitrate). The results of this analysis were not available at the time of preparation of this study.

Bedrock Aquifer Groundwater Assessment

Raw water samples were collected from each of the four (4) test wells during the pumping tests. Specifically, one (1) sample was collected after three (3) hours of pumping and one (1) sample was collected at the completion of pumping.

Prior to collection of the water samples, the free chlorine residual was verified to be non detectable. After collection, the water samples were properly stored in a cooler and transported to Exova Accutest Laboratories, located in Ottawa, Ontario. The samples were submitted for comprehensive testing of bacteriological, chemical and physical water quality parameters.

3.0 SITE DESCRIPTION

3.1 Surface Conditions

Further to the establishment of the general description of the subject property in Section1.1 of this report, the subject property is located in a rural area of the former township of Cumberland. The site topography slopes at a modest grade from west to east towards the central to south central quadrant of the site. Drainage is imperfect to fair in the western quadrant.

From the central quadrant, which is heavily treed, the site is flat and the drainage is imperfect to poor. The existing land surface is primarily grassed, with three of the smaller parcels along the eastern quadrant of the site being utilized for field crops (soybeans). The poor crop performance noted during the field investigation in these fields coorborates the poor surficial drainage in this area.

3.2 Surrounding Land Uses with 500 m

The subject property is located in an area of relatively low density development, bound by Wilhaven Drive to the north and O'Toole Road to the east. To the south, agricultural and wooded lands are present. To the west, and beyond Wilhaven Drive to the north, a series of residential developments are present. A series of individual lots developed as rural estates, are situated along the north and south sides of Wilhaven Drive extending from Frank Kenney Road to the subject property. Agricultural lands are present beyond O'Toole Road to the east.

Based on the available information, there are no obvious indicators of potential groundwater contamination present on the surrounding lands within 500 m of the subject property, which may negatively impact the proposed development.



4.0 GEOLOGY

4.1 Surficial Geology

The surficial soils in the vicinity of the subject area generally consist of series of marine deposits associated with the Champlain Sea. Typically, a shallow deposit of medium to fine grained clayey silty sand is present overlying a marine clay of variable thickness and intermittent presence within the subject area. Glacial till, of marine origins, is typically present beneath the shallower deposits and, which in turn, overlies on bedrock.

Based on the test pit excavation program, overburden thickness across the site averages approximately 3 m in depth. Using well recognized techniques for the field identification of soils, four (4) 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, below, and the grain size distribution curves are provided in Appendix 1.

Test pit locations and corresponding stratigraphy of the main soil types are summarized on the Test Hole Locations Plan (Drawing No. PH1236-1 in Appendix 5). The test pit logs are provided in Appendix 1.

To assist in the understanding of the areal coverage of the unit stratigraphic units, a plan (refer to Figure 2 in Appendix 5) has been prepared for illustration purposes.



Table 1: Summary of Unique Stratigraphic Units Encountered on Subject Property Based on Test Pit Excavations¹ in Study Area										
Stratigraphic Unit	General Description (USCS Classification)	General Thickness (m)	Estimated Percolation Rate (min/cm)							
1	SC- Clayey silty sand	0.3 to 0.6	25 to 35							
2	CH-CL- Silty Clay	0.4 to 1.0	30 to 40							
3	ML-CH- Clayey silt to sandy silt	0.8 to 2.2	25 to 40							
4	GC- Glacial Till	more than 3 m	30 to 40							

^{1.} Maximum depth of test pit excavation of 3.0 m.

4.2 Bedrock Geology

Published geological mapping (Refer to Figure 3 located in Appendix 5), provided by the Geologic Survey of Canada (2003), and courtesy of Natural Resources Canada, reveals that the site and immediate surroundings are underlain by limestone of the Bobcaygeon formation of the Paleozoic Period. Beyond the Bobcaygeon Formation, to the east and west lies bedrock of the Gull River Formation. Lindsay Formation limestone is present beyond the site to the south.

A cursory review of the MOE Water Well Records also confirms that the significant majority of the wells drilled in the immediate area have been constructed into the limestone of the Bobcaygeon Formation.

5.0 REGIONAL HYDROGEOLOGY

A search of available published MOE Water Well Records for the immediate area surrounding the subject property (upwards of 750 m radius) yielded 43 water well records. Careful analysis of these records excluded 4 records due to incorrect information regarding location and obvious surficial and/or bedrock geology deficiencies, and general lack of defining information, in addition to records noting well decommissioning. In all, a total of 39 Water Well Records were utilized to assess the regional hydrogeology of the area. Of these records, 11 Water Well Records were located on Wilhaven Drive to the immediate west and east of the subject property.

Based on an analysis of the available water well records, the adjacent wells are drilled wells typically intercepting a water supply aquifer within the limestone of the Bobcaygeon. Some of the wells beyond the immediate area were reported to encounter a grey and green limestone which would suggest the Rockliffe Formation was encountered.

Through comparative analysis, the majority of wells within the immediate vicinity of the subject property appear to intercept the water supply aquifer located within the limestone at three (3) different depth ranges. These ranges are:

- 25 m to 27 m;
- 53 m to 77 m; and
- 93 m to 100 m.

A few of the wells were reported to intercept a lower water supply aquifer below the lower depth range. Of these wells, the deepest point of aquifer intercept was reported to be 134 m.

Beyond the immediate subject area, approximately 46 % of the well intercepted a water supply aquifer within the 50 m to 80 m depth range and 32% intercepted a water supply aquifer in the 90 to 100 m range. 11% of the wells were reported to intercept a water supply aquifer at a depth of between 25 to 30 m. 7% of the wells intercepted a water supply aquifer at a depth greater than 100 m.

With respect to well yields, the adjacent wells in the immediate vicinity have reported well yields in the order of 1.5 IGPM to 10 IGPM. Beyond the immediate subject area, well yields are equally variable with appear to have well yields of between 5 and 30 IGPM.

6.0 SITE HYDROGEOLOGY

As previously stated in this report, a total of three (3) test wells were constructed at the subject site during the well construction program (refer to Drawing No. PH1236-1- Test Hole Location Plan in Appendix 5 for well locations) to augment the existing drilled well on the site. Hydrogeological details of the construction of each test well and the house well, based on the MOE Water Well Records, and engineering site notes, are graphically presented in the Generalized Hydrogeological Cross Section of the Subject Property- Drawing No. PH1236-4 in Appendix 5.

A review of Drawing No. PH1236-3 reveals that the hydrogeology of the test well construction is consistent with the other wells constructed in the immediate vicinity of the site. The water supply aquifer located within the Bobcaygeon Formation appears, based on the findings of the pumping test program, which are discussed in detail in Section 7.0 of this report, to consist of a series of individual aquifer intercepts. Based on the resuls of the pumping test program, the individual intercepts do not appear to be interconnected. As such, it is believed that there are at least three (3) distinct aquifers located beneath the subject property. The first is present at a depth of approximately 20 m below ground surface. The next two(2) aquifers are located in the depth ranges of 103m to 106 m bgs and 130 to 131 m bgs, respectively.

Based on the information contained within the water well record for TW3, the lower aquifer appears to be present within the Rockliffe or Lindsay Formations. Both of these formations, especially the Rockliffe formation are younger bedrock with significant shale present throughout the vertical depth. Also, the water quality of aquifers present in these formations are well documented by Paterson and others to have elevated concentrations of iron, and sodium. Hardness is often low in Rockliffe aquifers as a natural softening process occurs within the aquifer which is generally responsible for the elevated sodium levels.

Based on the available data, the potentiometric head pressure on the aquifer is more than 50 m (on average (excluding HW). Using the Bernoulli equation for incompressible flow, and assuming a stationary vertical column of water, the confining force on the water in the aquifer can be calculated as follows:

$$\underline{P}_1 + \underline{V}_1^2 + z_1 = \underline{P}_2 + \underline{V}_2^2 + z_2$$

$$\frac{\partial}{\partial} \quad 2g \quad \frac{\partial}{\partial} \quad 2g$$

where: P= pressure (kNm⁻²)

V= velocity (ms⁻¹)

z = height of water column above datum (m)

 ∂ = specific weight of water (kNm⁻³)

g = acceleration due to gravity (9.81 ms⁻²)



Assuming that the column of water is stationary, $V_1=V_2=0$. Furthermore, using the aquifer depth as the datum, $z_1=0$ m. Assuming P_2 =atmospheric pressure (101.325 kPa) and assuming a water temperature of 10 °C, substituting the known values into the equation and solving for P_1 yields:

The presence of these significant pressures suggests that the aquifer is being acted on by two aquitards, thus creating a confined aquifer. By definition, "a confined aquifer is an aquifer that is confined between two aquitards." (Freeze & Cherry, 1979). As such, the Paleozoic bedrock overlying and underlying the water supply aquifer, is considered to be an aquitard. This, combined with the strong upward gradient as evidenced by static water levels significantly above the surface of the ground, provide sufficient evidence to support the opinion that the water supply aquifers located within the Bobcaygeon Formation at the depth ranges specified above, are present in a confined environment and are isolated from passive surficial impacts.

Direction of Groundwater Flow

Typically, the static water levels in at least three (3) wells intercepting the same water supply aquifer is utilized to provide an interpolated direction of groundwater flow. In this instance, the test wells appear to intercept different aquifers with different confining pressures. As such, the direction of groundwater flow cannot be interpolated in this traditional manner.

Instead, the information gathered from previous hydrogeological studies carried out by Paterson in the area suggest the direction of groundwater flow is north towards the Ottawa River.

7.0 AQUIFER ANALYSIS

The results of the pumping tests performed on the test wells are presented in the following sections.

7.1 Aquifer Characteristics

The aquifer characteristics determined from the compilations of the pumping tests for the four (4) test wells are summarized below:

Table 2: Summary of Aq PumpingTest Da			•	•						
	Test Well Number									
Parameter	TW1	TW2	TW3	HW						
Transmissivity ¹ (m ² /d)	0.5	10.2	1.5	3.3						
Storativity ²	N/A	N/A	3.8x 10 ⁻⁴	N/A						
Pumping Rate (L/min)	15.2	19.1	15.2	30						
Available Drawdown (m)	150	58	81	18.2						
Maximum Drawdown (m)	77.8	5.1	8.9	5.2						
% Drawdown	52%	9%	11%	29%						
Specific Capacity (L/min/m drawdown)	0.2	3.7	1.7	5.8						
20 Year Safe Yield(m³/day)	5.1 x 10 ¹	4.0 x 10 ²	8.4 x 10 ¹	1.3 x 10 ²						

- Transmissivity values calculated from numerical averages of values derived from the Theis & Jacobs Recovery method of analysis. In the case of TW3, transmissivity was calculated as the numerical average of the three (3) analytical results through the use of observation well data.
- Storativity values calculated based on the numerical averages of all storativity values obtained from both Theis and Cooper & Jacobs Time-Drawdown analytical methods.

7.2 Groundwater Geochemistry Assessment

Table 3, presented in this section, summarize the overall laboratory geochemistry of the water supply aquifers located beneath the subject property. Data obtained from well head monitoring during the pumping tests is summarized, graphically, in Figures 4 through 7, in Appendix 5.



Table 3: Summa for Ori	ary of He ginal Te			hetic/O	peratio	n Objec	tive Pa	rameters	•
Parameter	Units	T₩ No.	1	TW No.2	2	TW	/ No.3	НW	
	<u> </u>	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour
Microbiological Parame	eters (Health))							
Escherichia Coli	ct/100 mL	0	0	0	0	0	0	N/A N/a	
nFaecal Coliforms	ct/100 mL	0	0	0	0	0	0	N/A	-
Faecal Streptococcus	ct/100 mL	2	11	0	0	2	0	N/A	
Heterotrophic Plate Count	ct/1 mL	135	291	>500	>500	181	11	N/A	
Total Coliforms	ct/100 mL	0	60	0	0	11	0	N/A	N/A
Chemical Parameters (Healt	th)						•		
Fluoride	mg/L	0.12	0.16	1.94	1.96	0.61	0.63	0.11	N/A
Nitrite	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	N/A
Nitrate	mg/L	0.41	0.42	<0.10	<0.10	<0.10	<0.10	<0.10	N/A
Chemical Parameters with A	esthetic Ob	jectives/ C	perational	Guidelines		•		,	
Alkalinity	mg/L	408	403	212	213	244	244	257	258
Chloride	mg/L	718	666	153	153	304	305	24	25
Colour	TCU	<2	<2	<2	<2	10	5	7	<2
DOC	mg/L	1.7	1.5	0.9	0.9	1.7	1.6	1.6	1.3
Hydrogen Sulfide	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	0.01
рН		7.81	7.85	8.18	8.18	7.88	7.93	7.74	7.76
Sulphate	mg/L	121	117	295	287	768	784	19	20
Hardness	mg/L	808	662	166	157	687	691	274	277
Sodium	mg/L	382	418	272	266	345	340	4	4
Iron	mg/L	5.51	0.73	<0.03	<0.03	1.55	0.06	0.78	0.50
Manganese	mg/L	0.15	0.06	<0.01	<0.01	0.04	0.03	0.04	0.04
Total Dissolved Solids	mg/L	2080	1980	975	962	2180	2220	377	382
Turbidity (lab)	NTU	81.7	15.4	0.7	0.3	19.4	1.3	15.1	6.7

Note: Additional General Chemical Parameters have not been summarized in this section as they have not been deemed relevant to this analysis. The data can be found on the individual laboratory reports in Appendix 3.

7.3 Aquifer Analysis Summary

Water Quantity Assessment

Using the procedure summarized in the document entitled, "Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment", prepared by the Ontario Ministry of the Environment, last revised August 2006, an analysis of the suitability of the aquifer to supply the proposed development can be completed. Using the values contained with in Procedure D-5-5, the per-person water requirement is set at 450 L/day. The peak demand, which occurs over a 120 minute period each day, equates to a peak demand rate of 3.75 L/min per person. Procedure D-5-5 suggest the utilization of the number of bedrooms plus one, to determine the minimum number of people per house. As the proposed development will likely witness three bedroom single family homes, using the Procedure D-5-5 methodology, the number of persons would be four (4) and the total peak demand rate is calculated to be 15 L/min.

Analysis of Table 3 in Section 7.1, reveals that the pumping rates chosen for each of the pumping wells are at or above this minimum pumping rate. Furthermore, all of the test wells were reported to have utilized less than 50% of the available drawdown during the pumping tests. This information, combined with the calculated 20 year long term safe yield values, suggests, in our professional opinion, that the specified well yields are representative of the yields which residents of the development are likely to obtain from future wells put down on the site.

Water Quality

A review of the water quality analysis data, received to date, for the test wells reveals that the raw water meets all health related parameters of the Ontario Drinking Water Standards (ODWS), with the exception of TW1. Moreover, it appears to be consistent with the surrounding water quality, based on other works carried out by Paterson, and, as such, is considered to be indicative of future, long term water quality.

Total coliforms and faecal streptococcus counts were noted to increase during the pumping test period. The laboratory was approached to discuss this anomaly and it uncertain whether or not the sample results may have been mixed up. As such, retesting of TW1 will be necessary and could not be completed prior to the preparation of this report.



With respect to aesthetic objectives and operational guidelines, the water contains modestly elevated concentrations of chloride, colour, hardness, iron, sodium and TDS. The laboratory turbidity levels were slightly elevated in the test wells also.

Observed levels of **colour** were noted to be below the aesthetic objective of 5 True Colour Units (TCU) at the completion of the pump tests for all of the test wells. Given that the iron and manganese concentrations in these wells were elevated, the colour is anticipated to be primarily a function of these ions, especially considering the low concentrations of tannin & lignin, and can be adequately removed using the same treatment devices. In the case of TW3, the colour may be indicative of the Rockliffe aquifer itself.

Iron (Fe) concentrations were observed to be above the aesthetic objective of 0.3 mg/L in only TW1 after the completion of the pumping tests. Similarly, manganese (Mn) concentrations were observed to be above the aesthetic objective of 0.05 mg/L in TW1. At the measured concentrations for both iron and manganese, common point of use water treatment devices, designed specifically for residential flows, will be more than adequate to significantly reduce these concentrations to aesthetic objective levels.

Sodium (Na) concentrations in TW1, TW2 and TW3 were noted to be elevated. The sodium concentration did not show significant reductions during the pumping tests. Although sodium is not toxic and no maximum acceptable concentration has been set, concentrations above 20 mg/L require that the Medical Officer of Health be notified so that this information may be passed on to local physicians for use in treatment of those requiring a sodium-restricted diet.

Hardness, an operational guideline, does not appear in the ODWS. Rather it appears in the Technical Support Documents for Drinking Water Standards, Objectives and Guidelines (Technical Support Documents) as a parameter with an operational guideline of 100 mg/L. At the measured concentrations, the water is considered to be hard to very hard. TW2 and the HW reported hardness concentrations below the reasonable treatable limit of 500 mg/L specified in Table 3 of the guidance document, entitled, "Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment", published by the MOE in 1995.

With respect to turbidity, the field turbidity was measured at regular intervals through the pumping tests for each of the test wells. With the exception of

TW1, the turbidity fell below 5 NTU after the completion of the pumping test. The field measured turbidity for TW1 was reported to be significantly lower than the laboratory turbidity. This phenomenon has been experienced in many instances where iron and/or manganese are present in moderate concentrations. As the raw water is collected, air is allowed to enter the water stream and air is in the sample bottles prior to collection. As a result, a series of reduction-oxidation reactions take place with the iron and manganese resulting in the precipitation of iron oxide and/or manganese oxide. The higher the pumping rate and longer the sample is stored prior to the laboratory analysing the sample, the greater the precipitation of these oxides.

With respect to Total Dissolved Solids (TDS), the Technical Support Documents state an aesthetic objective of 500 mg/L. Based on the fundamentals of groundwater chemistry, it is typical that ions of calcium, chloride, magnesium, sodium and sulphate, and hardness account for more than 90% of the TDS concentration measured in groundwater. TDS is a gross measurement of dissolved material and the aesthetic objective set out in the Technical Support Documents reflects both the tendency to have balanced water and the minimization of ionic concentrations that could affect the palatability of the water.

In accordance with Procedure D-5-5, Table 3 does not reflect a maximum concentration considered reasonably treatable for TDS. Rather, Procedure D-5-5 requires written rationale that corrosion, encrustation, or taste problems will not occur. The Langelier Saturation Index (LSI) indicates the corrosivity of water. The LSI is explained in the Table 8 below:

জ্ঞানত জড় কা হিন্তু গ্রহ	ার্টিটিটিটি প্রসায়ের কোনো নকা লেটিয়ার বিভাগিত নির্বাচিত নির্বাচিত নির্বাচিত
LSI Vainte	লে <u>টির</u> নরিকুট্র
less than -0.5	Water is corrosive
between -0.5 and +0.5	Water is in equilibrium
higher than +0.5	Water has high scale potential

The LSI value for the water in the aquifer intercepted by TW1 is **+0.93** based on the field measured pH and temperature, and the laboratory analyses for calcium, alkalinity and TDS. Based on the calculated LSI, the water is in equilibrium with a significant potential for creation of scale but is not corrosive.



7.4 Water Conditioning Considerations

As the water within the preferred zone of aquifer interception contains elevated hardness and, to a lesser extent, iron, the raw water can be suitably conditioned to remove these two aesthetic parameters. A standard residential grade water softener can be installed to remove both the hardness and iron concentrations in the raw water. Regeneration rates may be slightly higher given the concentration of iron in a few of the test wells, however the iron concentrations are not anticipated to substantially contribute to a reduction in resin capacity.

As the water is considered to be very hard, it is recommended that should a water softener be selected for installation, that consideration be made to installing a separate tap for drinking water which bypasses the softener.

With respect to the slightly increased turbidity in both the field and laboratory samples, as there is no need for water treatment to control bacteriological parameters, the turbidity values are considered to be within the acceptable range of values contained within Procedure D-5-5. It is anticipated that extended well development, at a rate of not more than 5 L/min for at least 24 hours, will be sufficient to remove any residual turbidity resulting from well construction for each newly constructed well at the site.

In summary, the water quality from the test wells indicates that there are, indeed, three distinctly different aquifers located beneath the site. The deepest aquifers, intercepted by TW3 and TW1, specifically, have the least desirable aesthetic water quality. HW, which intercepts the shallowest aquifer, has the most desirable aesthetic water quality. TW2, which, based on the water quality and aquifer response, appears to be influenced by another aquifer. The reported aquifer intercept point for TW2 was between 103 and 106 m bgs. This, based on the hydrogeological cross section (refer to PH1236-3 in Appendix 5), shows a similar intercept elevation as in the case of TW1. While TW1 and TW2 share some similar water geochemistry markers, they are significantly different. This suggests that there may be mixing of multiple aquifers taking place in TW2. This hypothesis is furthered by the fact that the drawdown curve for TW2 (refer to Appendix 4) shows gapping which would suggest the test well is influenced by another aquifer of lower yield.

7.5 Potential Well Interference

It is anticipated that a series of individual water supply wells, in addition to the existing test wells, will be constructed at the subject property in order to provide individual water supplies for each lot. As these wells are anticipated to intercept aquifers located in Bobcaygeon Formation, and considering the inherent intermittent nature of pumping, potential well interference with offsite uses is anticipated to be negligible. This is further corroborated by the 20 year safe yield estimates established earlier in this report.

As the pumping is anticipated to be intermittent with several wells in operation at any given time, with the expectation of 100% recovery within a few hours of termination of pumping, a potential well interference model was created to reflect a hypothetical worst case scenario for drawdown at the site. The model, assumes series of wells, located along concentric circular spacings extending outward from one central well, each pumping continuously at a rate of 2000 L/day (average peak water demand) over a period of 20 years. The analytical model is presented in Appendix 4.

In the long term model, the maximum anticipated drawdown, based on a total of 29 wells pumping continuously for 20 years at 2,000L/day, is 15.50m. As the average anticipated well depth is approximately 100 m, this drawdown represents a removal of 15% of the available drawdown. Given that a conservative, but reasonable Transmissivity value was utilized (3.2 m²/day (HW)) and the overall conservative approach of the model, this drawdown is considered to be an acceptable worst case scenario.

In the second model, a single well having an average available drawdown of 24 m was modelled to be pumped at 50,000L for 24 hours. This is the maximum allowable volume of pumping before a Permit to Take Water is required by the MOE. In this model, again a transmissivity of 3.3 m²/day and a storativity of 3.8 x 10⁻⁴ was chosen. At a radial distance of 50 m, a distance approximately one half of the closest distance between future adjacent wells, a drawdown of 3.31 m is anticipated. This corresponds to a reduction in available drawdown of only 3%.

Given the very conservative nature of the models presented above, it is opined that the potential well interference between wells, and beyond the property limits is acceptable in the worst case scenario models. Considering the intermittent pumping, rapid recovery values and significant 20 year safe yield estimates, actual drawdown in offsite wells is anticipated to be negligible.

8.0 DEVELOPMENT RECOMMENDATIONS

The following sections outline the recommendations for development which have been formulated from the data collected in this study.

8.1 Site Development

Based on the results of our study, this site is considered to be suitable for the development of the 21 lots as described in Section 1.0 of this report. The on-site sewage disposal needs can be accommodated with standard Class 4 sewage systems consisting of a septic tank and fully raised leaching bed, as per Part 8 of the Ontario Building Code. Furthermore, an adequate water supply aquifer of sufficient quality and quantity is located beneath the subject property and can be intercepted by private wells drilled in accordance with Ontario Regulation 903.

8.2 Lot Development Plan

One objective of the hydrogeological study is to enhance development and minimize the effects of sewage systems on the surrounding environment. This is achieved through prevention of the accumulation of surface water, by ensuring the proper construction of water supply wells and sewage systems, and by coordinating the overall positioning of the services to maximize separations. A minimum separation of 18 m for fully-raised systems is required between a well and a Class 4 sewage system. Clearance distances also apply to wells and septic systems located on neighbouring lots.

The proposed Lot Development Plan (Drawing No. PH1236-2) in Appendix 5 shows the proposed lot development plan for the site. The purpose of this drawing is to show that a typical home and private services will fit onto the proposed lot, and can meet all pertinent regulations without causing environmental constraints. The houses shown in this drawing covers a plan area of 160 m², assuming a four (4) bedroom, two-storey 300 m² (3,500 ft²) home, with a garage of 50 m², and is serviced by a sewage system with the capacity of 3,000 L/day. In actuality, the daily sewage flows will likely be significantly lower than this value.

In all instances, careful, site specific analysis of the soil morphology in the area of each proposed leaching bed is required during the design stages of the leaching bed in order to determine if sufficient soil exists to facilitate the use of native soil for subgrade preparation. Detailed soil morphology should only be determined by a qualified geotechnical specialist.

It is not the intent of the Lot Development Plan (Drawing No. PH1236-2) to restrict placement of a dwelling on each lot. While the actual configuration and position of the home may change, the relative position of the home, sewage system and well should be maintained. In all cases, the separation criteria for the immediate and neighbouring lots should be followed.

The required separation distance from a fully raised leaching bed to a surface water body or drilled well is 18 m. Furthermore, in accordance with Ontario Regulation 903, all drilled wells, in addition to the prescribed separation distances to the sewage system, must also be located a minimum of 15 m from a potential source of contamination. (i.e. fuel oil tanks, Regional Roads, etc.)

8.3 Predictive Impact Assessment

Hydrogeolocial Sensitivity

In accordance with Section 5.0 of the MOE publication, entitled, "Procedure D-5-4 Technical Guidelines for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment", the groundwater impacts from on-site sewage systems must be addressed in a step-wise manner. In order to establish the initial step, it is essential to demonstrate whether or not the site is considered hydrogeologically sensitive.

Given the significant confining pressures exerted by the aquifer combined with the substantial thickness of competent bedrock present beneath the study area, the subject property is not considered hydrogeologically sensitive.

Isolation of Supply Aquifer

As established in Section 6.0 of this report, the supply aquifer is considered to be a confined aquifer with the overburden material and bedrock acting as an aquitard. By definition, "..the term aquitard has been coined to describe the less-permeable beds in a stratigraphic sequence." (Freeze & Cherry, 1979). The upper layers of the limestone bedrock are considered to be an aquitard, which explains the confining pressure and Theis like response to pumping. Analysis of the available MOE Water Well Records within a 500 m radius of the site indicate significant thicknesses of limestone are present between the surface of the ground and the depth of the water supply aquifer on most, if not all of the drilled wells, combined with the absence of nitrates in the water supply aquifer our opinion, supports the belief that the hydrogeological isolation extends well beyond the property limits.



Nitrate Impact Assessment

In accordance with the interpretation of the City of Ottawa relating to MOE Procedure D-5-4 and D-5-5, the minimum proposed lot size is shall be at least 0.8 ha. As such, there is no requirement to carry out a nitrate impact assessment. Moreover, it has been sufficiently demonstrated that the water supply aquifer is hydrogeologically isolated from surface activities and that the isolation extends a significant distance beyond the property in all directions. As such, regardless of the minimum proposed lot size, there is no requirement, as specified in Procedure D-5-4, to continue the stepwise evaluation.

8.4 Sewage System Design

Sewage systems must be designed according to Part 8 of the Ontario Building Code (OBC). The OBC sets out minimum design and construction standards for all approved classes of sewage systems. It is proposed that this site be serviced with traditional Class 4 sewage systems consisting of a septic tank and separate leaching bed.

OBC requirements state that the there must be a minimum of 900 mm of suitable soil or leaching bed fill present between the base of the absorption trenches and the high groundwater table, bedrock or soil with a percolation rate greater than 50 min/cm. Given the moderately low permeability of the clayey sand and silty sand within the overburden soils, combined with the flat topography, most Class 4 absorption trench style leaching beds are expected to be fully raised above the existing ground surface. An imported sand mantle having a minimum thickness of 250 mm and extending a minimum of 15 m beyond the absorption trenches in the direction of effluent flow will also be required.

Based on OBC design sewage flow tables, a large 4 bedroom luxury residence with a finished floor area of 300 m² may produce in the order of 3,000 L/day of sewage effluent per day. Based on the quality of the sand deposits available in the local pits, imported sand is anticipated to have a percolation rate (a.k.a. T-time) of between 6 and 8 min/cm. Considering the design flows and percolation rate of the available imported sand, a tile length of 140 metres is required. The Lot Development Plan (PH1236-2) illustrates the size of such tile beds, complete with minor alternative configurations due to irregular lot shapes and other constraints. The sewage system should be placed down slope from any nearby wells, where possible.



The sewage system layouts detailed in Drawing No. PH1236-2 are shown to be fully raised leaching beds with a 15 m imported sand mantle. With due consideration to the low permeable terrain unit which dominates the subject property, the Lot Development Plan (Drawing No. PH1236-2) has been prepared to illustrate that the maximum foreseeable size of leaching bed utilized on any given lot, can be easily accommodated. Moreover, the purpose of the drawing is to illustrate that adequate space exists on each lot to accommodate such a sewage system. The end, or toe, of the mantles will be required to be unobstructed and free draining; the existing topsoil layer is likely to receive the polished effluent from the toe.

8.6 Well Design

Drilled wells, completed in the bedrock aquifer, should be used for the water supply in this development. The wells should be drilled by a licensed well contractor experienced in the study area, and should be completed in accordance with Ontario Regulation 903, as amended.

A minimum well yield of 3 IGPM is recommended for an average residence and is considered to be easily obtainable on this site. As it is desirable to drill the future wells to achieve the highest quality water, the wells should be drilled to a depth of not more than 30 m before first surging and flushing the well in order to maximize exposure to the upper aquifer. Moreover, it may be prudent to utilize a cable tool to construct the future wells as the inherent nature of the pounding of a cable tool is known to maximize the fracturing within limestone bedrock to open up a formation in a manner which a rotary drill cannot.

The casing hole should be constructed such that the hole extends into sound bedrock such that the casing penetration is at least 2 m into the bedrock and the casing length, measured below ground surface, should not be less than 6 m.

The casing should be fitted with an appropriate drive shoe prior to installation and the annular space should be grouted with cement grout delivered from the bottom of the annular space to the ground surface using a method permitted by Ontario Regulation 903, as amended. The creation of the casing hole, the installation of the casing and the grouting of the annular space should be inspected by a qualified Professional Engineer from Paterson Group Inc.

Creation of the open borehole should continue until the borehole reaches a depth of not more than 30 m below ground surface before first surging and purging the well as described above..

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Terrain Analysis and Hydrogeological Study



1730 Wilhaven Drive, Ottawa (Cumberland), Ontario

The well should be developed by surging or pumping until the water is developed to a sand free state at the time of construction in accordance with Ontario Regulation 903. If the water is observed to be cloudy at the completion of the prescribed well development, extended well development should be performed until all visible turbidity is removed.

Chlorine should be introduced at the completion of well development in sufficient quantity to produce a free chlorine residual of at least 50 mg/L (ppm). The chlorine should be mixed with the standing water in the casing using a procedure that will result in the thorough vertical mixing of the chlorine over the entire depth of the well.

The well should be completed with a submersible pump, pitless adaptor and vermin proof well cap. All such mechanical work connected to the well is to be completed by a qualified well contractor possessing a valid Class 4 pump installer's license. After completion of the mechanical work in the well, the well should be disinfected as described above.

The grading around the well casing should be slightly elevated to direct surface runoff away from the well. The casing should project approximately 400 mm above the mounded soil within 3 m in all directions from the casing.



9.0 CONCLUSIONS

Based on the information contained within the body of this report, the following conclusions can be drawn:

- 1. The subject property is located in a relatively flat to slightly sloping setting with all areas exhibiting poor to imperfect drainage characteristics.
- There is minimal potential impacts from surrounding land uses within 500 m of the site, based on available information. Moreover, offsite impacts from the proposed density of residential development are considered to be negligible
- 3. The surficial geology of the subject property generally consists of a mixture of silty sand to silty clay deposits overlying bedrock over the subject area. The soils types and areal delineation are consistent with available soils mapping.
- 4. The bedrock geology beneath the site consists of limestone of the Bobcaygeon Formation. The Bobcaygeon formation is bordered on the west and east by younger bedrock of the Rockliffe and Gull River Formations respectively. The direction of groundwater flow is interpreted to be north towards the Ottawa River.
- 5. The construction of the test wells on the subject property appear have intercepted at least three (3) individual water supply aquifers of suitable quantity. The quality of the shallowest aquifer is such that it is the preferred aquifer for future wells.
- 6. The most consistent zones of aquifer intercept of the test wells and neighbouring wells is between 25 m to 27 m, 53 m to 77 m and 93 m to 100 m below ground surface.
- 7. Significant confining pressures are present on the water supply aquifer at the interception points. An adequate quantity of water is present in all of the encountered aquifers, however the highest well yields were reported in TW2 and HW. Water quality of the upper aquifer, based on the analyses conducted in this report, is considered to be excellent for domestic use.
- Potential well interference with neighbouring, offsite wells, is considered to be minimal and, based on the aquifer parameters determined by this study, the anticipated water demand from this subdivision will have minimal impact on the safe yield of the water supply aquifers.
- 9. Sewage systems, containing fully raised leaching beds, are easily accommodated on each of the proposed lots.
- 10. The subject property is suitable for development as a residential subdivision at the proposed density. Impacts to the neighbouring low density residential development area is expected to be minimal, at best.



10.0 RECOMMENDATIONS

Based on the information presented in the body of this report, the following recommendations can be made:

- In accordance with the intent of Procedure D-5-5, the Medical Officer of Health
 must be notified where sodium concentrations in the new wells exceed 20
 mg/L. This requirement is specified in order for the information to be
 disseminated to local physicians in order to treat persons with sodium reduced
 dietary needs.
- If the use of water softeners are considered, it is recommended that a separate
 water supply tap be installed. This tap should bypass the water softener to
 prevent the increased sodium concentration which will result by softening the
 water with sodium chloride.
- Wells should be constructed such that the casing hole extends into sound bedrock such that the casing penetration is at least 2 m into the bedrock and the casing length, measured below ground surface, should not be less than 6 m. The annular space should be grouted in a manner consistent with the construction of the test wells detailed in this study.
- 4. The preferred zone of aquifer interception for future wells should be set at approximately 25 m to 27 m measured below the ground surface. Wells should be constructed with cable tool drill to a depth of not more than 100 m before aggressive surging and purging has taken place.
- 5. The creation of the casing hole, installation of the casing, and grouting of the annular space, should be inspected by a qualified Professional Engineer of Ontario. Furthermore, it is recommended that a qualified Professional Engineer of Ontario oversee the construction of the open borehole in order to ensure well depths do not exceed those recommended in this study. All well construction must be carried out by a qualified, and experienced well technician.
- TW1 should be chlorinated and resampled to ensure the well is free of microbiological parameters.
- 7. Wells should be developed to a sand free state in order to ensure that the residual turbidity created by the well drilling activities is completely purged from the well. Additional well development, prior to placing the well into use, is strongly recommended in order to provide adequate development of the formation and remove extraneous rock debris from the aquifer pathways.

Proposed Residential Subdivision First Line Road, Ottawa (Rideau), Ontario

In summary, it is our professional opinion that this site is suitable for development as a residential subdivision at the proposed lot density. The hydrogeological recommendations contained within this report, if followed, will ensure that the development takes place in an effective manner, with a minimal impact on the natural environment.

PATERSON GROUP INC.

Robert A. Passmore, P.Eng. Hydrogeologist



Stephen J. Walker, P.Eng. Senior Hydrogeologist



APPENDIX 1

- □ SOIL PROFILE & TEST DATA SHEETS
- □ SYMBOLS AND TERMS

patersongroupconsulting

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

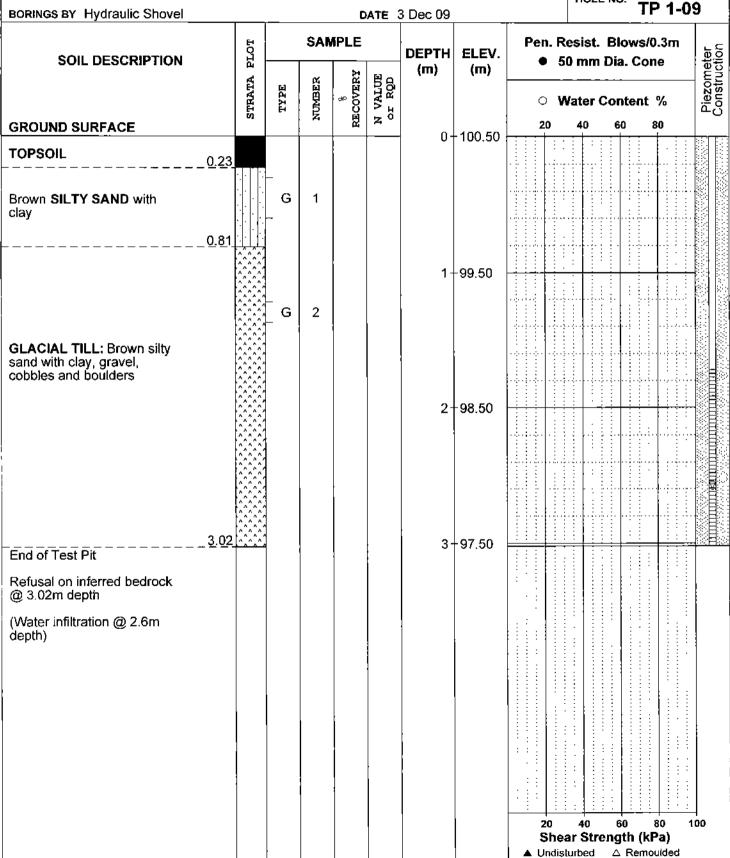
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REMARKS

HOLE NO.

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patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

▲ Undisturbed

△ Remoulded

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

PH1236

REMARKS

FILE NO.

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SOIL DESCRIPTION	PLOT	SAMPLE			DEPTH ELEV.			esist. Blows/0.3m 0 mm Dia. Cone	eter 101	
GROUND SURFACE	STRATA	TYPE	NUMBER	RECOVERY	N VALUE OF ROD	(m)	(m)	• W	Vater Content %	Piezometer
TOPSOIL	25		-			0	99.25	20	40 60 80	
Brown SILTY CLAY	25	G	1			1-	98.25			<u> </u>
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders	22 ^^^^^ 	G	2	į						
GLACIAL TILL: Coarse sand with gravel, clay, cobbles and boulders						2-	97.25			
End of Test Pit (Water infiltration @ 0.9m depth)	14 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \									
									40 60 80 1 Strength (kPa)	⊣ 100

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO. PH1236 REMARKS HOLE NO. TO GO

BORINGS BY Hydraulic Shovel			_	_		ATE	3 Dec 09			TP 3-09	9		
SOIL DESCRIPTION		SOIL DESCRIPTION		PLOT		SAN	MPLE	1	DEPTH (m)	ELEV.	1	esist. Blows/0.3m 0 mm Dia. Cone	eter
GROUND SURFACE		STRATA	TYPE	NUMBER	* RECOVERY	N VALUE	(,	(111)	O W	Vater Content %	Piezometer Construction		
TOPSOIL				_			0-	99.10			_		
Brown SILTY CLAY, some sand	0.25		_ _ G	1									
GLACIAL TILL: Grey-brown silty clay with sand, gravel and cobbles	0.60	(2) (2) (2) (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	_ _ _	2									
			_ G	3			1-	-98.10					
GLACIAL TILL: Brown silty sand with clay, gravet, cobbles and boulders	^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^										Ā		
			G -	4			2-	-97.10					
E 1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	_2.72	^^^^											
End of Test Pit					İ								
(Water infiltration @ 1.6m depth)													
			:										
								-					
									20 Shear ▲ Undistu	40 60 80 10 r Strength (kPa) irbed △ Remoulded	0		

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

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Elevations interpolated based on topographic information supplied by the City of

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REMARKS

Ollawa.

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

BORINGS BY Hydraulic Shovel						DATE :	3 Dec 09			HOLE NO. TP 4	-09
SOIL DESCRIPTION		PLOT		SAN	/PLE	1	DEPTH	ELEV.		esist. Blows/0.3m 0 mm Dia. Cone	ster
i 		STRATA	TYPE	NUMBER	RECOVERY	N VALUE of RQD	(m)	(m)		/ater Content %	Piezometer Construction
GROUND SURFACE					PK PK	<u> </u>	0-	100.50	20	40 60 80	:
TOPSOIL	_0.25										
Brown SILTY CLAY, some sand and gravel	_0.71		_ G	1							
		``^^^^ `^^^^ `^^^^	_ G	2			1-	-99.50			
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders					,		2-	-98.50			₽
End of Test Pit	_2.34	^^^^									
Refusal on inferred bedrock surface @ 2.34m depth											
(Water infiltration @ 1.6m depth)									20 Shea ▲ Undistu	40 60 80 r Strength (kPa)	100

patersongroup Consulting Engineers

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

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BORINGS BY Hydraulic Shovel					\ATE '	3 Dec 09			HOLE NO. TP 5-	 09
SOIL DESCRIPTION	PLOT		SAN	/PLE	AIE	DEPTH		1	esist. Blows/0.3m 0 mm Dia. Cone	
	STRATA F	TYPE	NUMBER	* RECOVERY	N VALUE	(m)	(m)	_	Vater Content %	Piezometer Construction
GROUND SURFACE	S S		Z	E.	2 °	_	00.00	20	40 60 80	-0
TOPSOIL 0.2	2					U-	-99.80 			:
Brown SILTY SAND with clay		G	1							
Red-brown SILTY CLAY		G	2							
	\^^^^					1 -	98.80			. ♀
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders	\^^^\ \^^^\ \^^^\ \^^^\									
	^^^^^					2-	-97.80			
2.5	\^^^^ \^^^^ 9\^^^^		i							
End of Test Pit (Water infit/ration @ 1.0m depth)										
depth)										
					ļ			20 Shea ▲ Undistr	r Strength (kPa)	100

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO.

PH1236

REMARKS

HOLE NO.

SOIL DESCRIPTION The state of	BORINGS BY Hydraulic Shovel					ATE	3 Dec 09	•		TP 6-09	9
TOPSOIL Brown SILTY CLAY, some sand Interlayered SAND and SILTY CLAY - grey by 2.3m depth GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth) GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth)	SOIL DESCRIPTION	PLOT		SAI	_		-	1	1		eter ction
Brown SiLTY CLAY, some sand Interlayered SAND and SiLTY CLAY Interlayered SAND and SiLTY CLAY - grey by 2.3m depth GLACIAL Till: Grey sity 2.74 clay with sand, gravel, icobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth)	GROUND SURFACE	STRATA	TYPE	NUMBER	RECOVERY	N VALUE of RQD					Piezom Constru
Interlayered SAND and SILTY CLAY - grey by 2.3m depth GLACIAL TILL: Grey silty 2.74 clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth) GLACIAL TILL: Grey silty 2.74 cobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth)	Brown SILTY CLAY , some	30	G	1							
- grey by 2.3m depth GLACIAL TILL: Grey silty 2.74 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Interlayered SAND and		_ _ G	2			1 - 1 -	+98. 6 0			Ϋ́
End of Test Pit (Water infiltration @ 1.5m depth)	- grey by 2.3m depth	- * * * * *					2-	-97.60		A	
20 40 60 80 100	GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 1.5m	- * * * * *	G	3					20		o O

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO.

PH1236

REMARKS									HOLE NO.	
BORINGS BY Hydraulic Shovel					ATE :	3 Dec 09	1		TP 7-09	9
SOIL DESCRIPTION	PLOT		SAN	NPLE	<u> </u>	DEPTH	1 1		esist. Blows/0.3m 0 mm Dia. Cone	eter
	STRATA	TYPE	NUMBER	8 RECOVERY	N VALUE	(m)	(m)		Vater Content %	Piezometer Construction
GROUND SURFACE	တ်		\	<u> </u>	z 5			20	40 60 80	140
TOPSOIL			<u> </u>			0-	99.20			
Brown SANDY SILT, trace clay	3									
1_0	7					1-	-98.20			ӯ
		G G	1							
GLACIAL TILL: Brown fine to coase sand with gravel, cobbles and boulders						2-	-97.20 -			
- grey by 2.1m depth										
End of Test Pit (Water infiltration @ 1.1m depth)										
								20 Shea	40 60 80 10	00
								Snea ▲ Undistu	r Strength (kPa) urbed △ Remoulded	

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO.

PH1236

			0	ATE :	3 Dec 09			HOLE N	ິ TP 8-0	
						· · · ·		L		פּי
PLOT		SAN	APLE	Г	DEPTH				lows/0.3m a. Cone	eter
	TYPE	UMBER	COVERY	VALUE F RQD	(,,,,	(111)				Piezometer Construction
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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO.

PH1236

BORINGS BY Hydraulic Shovel					ATE :	3 Dec 09			HOLE NO.	TP 9-0	9
SOIL DESCRIPTION	PLOT			APLE >		DEPTH (m)	ELEV.		esist. Blov 0 mm Dia. (·	neter
	STRATA	TYPE	NUMBER	- 8 RECOVERY	N VALUE of RQD			0 V	Water Conte	 ent %	Piezometer Construction
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TOPSOIL0_28											
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Firm, brown SILTY CLAY		G	1			2~	-97.80				
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders						3-	-96.80				
End of Test Pit (Water infiltration @ 0.8m depth)	^^^					3-	-96.80	20	40 60	60 10	DO
									r Strength	(kPa) moulded	

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive

DATUM

Elevations interpolated based on topographic information supplied by the City of

Ottawa, Ontario

FILE NO. PH1236

REMARKS

HOLE NO.

BORINGS BY Hydraulic Shovel			_		DATE_	3 Dec 09			HOLE	NO. TF	10-0	9
SOIL DESCRIPTION	PLOT		SAI	MPLE	г	DEPTH (m)	ELEV.	!		Blows/0 Dia. Con		eter
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TOPSOIL			-	14	·	0-	99.50	20	40	60 8	0	
Brown SANDY SILT , trace clay	25					1-	-98.50					立
Firm, grey SILTY CLAY with sand	98					2-	-97.50					
3 :	56					3-	-96.50					
GLAICAL TILL: Grey silty clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 0.9m depth)	[^^^^^^											
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patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive

DATUM

Elevations interpolated based on topographic information supplied by the City of

Ottawa, Ontario

REMARKS

FILE NO.

PH1236

BORINGS BY Hydraulic Shovel					ATE :	3 Dec 09			HOL	E NO.	TP	11-0	9
SOIL DESCRIPTION	PLOT	_	SAN	IPLE		DEPTH	ELEV.	Pen. R	esist. 0 mm				fer
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GROUND SURFACE		_	<u> </u>	2	Z -	0-	99.30	20	40	60	80) : :	
TOPSOIL 0.3	0]												
Brown SANDY SILT , trace clay						1-	-98.30						
2.3	4					2-	-97.30						<u> </u>
Grey SILTY CLAY , trace sand						3-	-96.30						
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders 3.8. End of Test Pit (Water infiltration @ 2.0m depth)	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\							20	40	60	80	10	00
								Shea ▲ Undistr	ır Stre urbed	ength	(kPa emould)	

patersongroup Consulting Engineers

28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

DATUM

Elevations interpolated based on topographic information supplied by the City of

FILE NO. PH1236

SOIL DESCRIPTION The state of	BORINGS BY Hydraulic Shovel					DATE	3 Dec 09			HOLE NO.	TP12-0	9
1 99.50 2 40 60 80 80 80 80 80 80 8	SOIL DESCRIPTION	PLOT		SAI	MPLE		DEPTH	ELEV.	1			eter
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GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders 2-98.50 End of Test Pit (Water infiltration @ 2.1m depth)					<u>~</u>	 	0-	100.50	20	40 60	80	<u> </u>
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders 2 – 98.50 End of Test Pit (Water infiltration @ 2.1m depth)	TOPSOIL 	28										
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders 2 – 98.50 End of Test Pit (Water infiltration @ 2.1m depth)							1-	99.50				
End of Test Pit (Water infiltration @ 2.1m depth)	GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders											
End of Test Pit (Water infiltration @ 2.1m depth)	SSES and Soulders						2-	-98.50				
End of Test Pit (Water infiltration @ 2.1m depth)												
End of Test Pit (Water infiltration @ 2.1m depth)	2.9	, , , , , , , , , , , , , , , , , , ,										
	End of Test Pit (Water infiltration @ 2.1m											
Shear Strength (kPa)									20 Shea	40 60	80 10	00

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and day.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

'N' Value	Relative Density %
<4	<15
4 -10	15-35
10-30	35-65
	65-85
>50	>85
	<4 4-10 10-30 30-50

The standard terminology to describe the strength of cohesive solls is the consistency, which is based on the undisturbed undrained shear strength as measured by in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of Individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in-situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75- 9 0	Good, massive, moderately jointed or sound
50-75	Fair, blocky and searny, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

55	-	Split spoon sample (obtained in conjunction with the performing of the
		Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
ΑU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.) Rock core samples are obtained with the use of standard diamond drilling bits

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC% - Natural moisture content or water content of sample, %

Liquid limit, % (water content above which soil behaves as a liquid)
 PL - Plastic limit, % (water content above which soil behaves plastically)

PI - Plasticity index, % (difference between LL and PL)

Dxx - Grain size at which xx% of the soil, by weight, is of finer grain sizes

These grain size descriptions are not used below 0.075 mm grain size

D10 - Grain size at which 10% of the soil is finer (effective grain size)

D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$

Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:

Well-graded gravels have: 1 < Cc < 3 and Cu > 4 Well-graded sands have: 1 < Cc < 3 and Cu > 6

Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded. Cc and Cu are not applicable for the description of soils with more than 10% silt and clay

(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'o - Present effective overburden pressure at sample depth

P'c - Preconsolidation pressure of (maximum past pressure on) sample

Cc - Recompression index (in effect at pressures below p'c)
Cc - Compression index (in effect at pressures above p'c)

OC Ratio Overconsolidation ratio = p'_c / p'_o

Void Ratio Initial sample void ratio = volume of voids / volume of solids

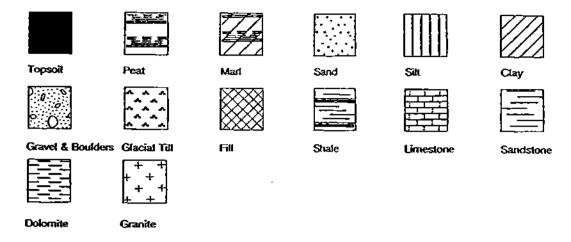
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

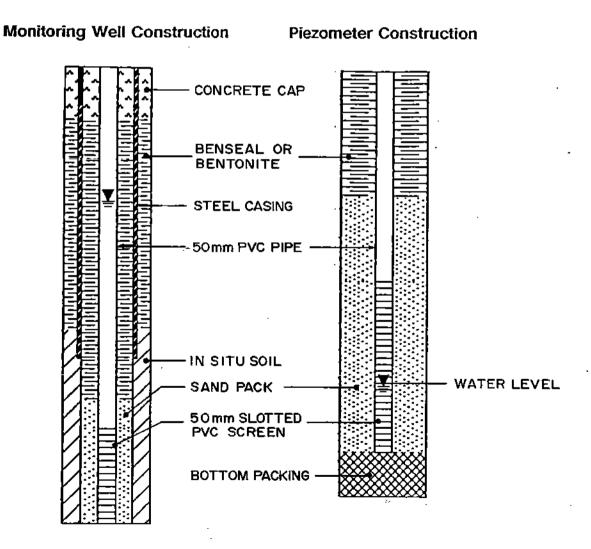
Coefficient of permeability or hydraulic conductivity is a measure of the ability
of water to flow through the sample. The value of k is measured at a
specified unit weight for (remoulded) cohesionless soil samples, because its
value will vary with the unit weight or density of the sample during the test.

SYMBOLS AND TERMS (continued)

STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION



APPENDIX 2

- □ PUBLISHED MOE WELL DATA
- □ WELL RECORDS FOR TEST WELLS
 - TW 1
 - TW2
 - □ TW3
 - □ HW4

3/2009 13:39 6138383277	AIR ROCK F
Ministry of West Tax	366 ·
Ontario the Environment	well Record
Measurements recorded in: Metric Maperial #089	Regulation 903 Ontario Water Resources At Page of
Well Owner's Information	Page of
First Name / Organization	E-mail Address Well Confruence
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County/District/Municipality City/Toyler-Milage	Province Postal Code
	Dec on Outario
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Grouge Black Lines	iture 12/2' son
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- 1624 MC 185 -	
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☐ Rotony (Comventional) ☐ Jehing ☐ SiDomestic ☐ Municipal ☐ Dewelter ☐ Rotary (Revenue) ☐ Driving ☐ Uvestock ☐ Test Hote ☐ Mamiltonir	
	Final water level and of pumping (60) 10 Q4 (9) 10 100 13
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Ministry o	f 14-14-	4 UQ74 I	_		
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Well Owner's Information		<u> </u>	<u> </u>	f	Page of
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Ministry of Environment and Energy

CONTRACTOR'S COPY

The Ontario Water Resources Act
WATER WELL RECORD

House Herr (HW)

0506 (06/02) From Form ?

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 - 	Sarry C Gase	FC Steel			The state of the s	Annutar space		Abando Abando	
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		☐ Pteactic	<u>\</u>		. —			_	
Pumping test i	mestroot Pumping rate 7 GF	M Lines D. Mine				ATION OF W			
c level	Water level water levels during	□ Pumping Unfectivery		in diagra Indicate	m below show north by arrow	v distances of v.	well from r	oad and	lot line.
NO TES	23 77 77		1			NT			
	Table Pump implies set at page	Wider at end of test	[
If now cave	GPM Recommended	Recommended	1	ı					,
Ç:Stelon	Tomp seeing 70	ent branch latte (CS-M	37						
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FINAL STATU	pply (7) Abandoned, insufficier	nt aupphy 🗀 Unitrished	12	`	11.76	Aven	1R	<u> 1 / P</u>	,
☐ Observer ☐ Test hote ☐ Flechers	tion well D Abendoned, poor qual D Abandoned (Other)	ity (1 शिक्कोक्यकारमा सथी।	19		<u> </u>		$\int_{-\infty}^{\infty}$		
WATER USE			13				200	, /	(4)
€ Comesti	TALINICION .	☐ Not use ☐ Cather	3				200	-	
Ti Imigetion	n □ Public supply □ Cooling & air condition	_	12				*		
METHOD OF	CONSTRUCTION		"\						
l i Cable to D Rotary (od Air percussion. (conventional) © Boring	□ Ortving □ Digging							
□ Rotary (□ Populy ((severse) Diamond	□ Ofw ———	$\parallel \perp$					257	362
Name of Well Cop	T/Sketor	Well Contractor's Licence No.							
	ourgeois Well Deil	1414	ONIC	<u>_</u>]
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	2 RAYMONG	1-0264 Suprojecting 2000 1000	MINISTRY						
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Supression State of Inspection

To Date of Inspection

Date of Inspection

Date of Inspection

AUS U 8 2000

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Ministry of the Environment A 000750

Well Record Regulation 903 Ontario Water Resources Act

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Instructions for Completing Form

A 000750

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 tull 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 15011 CON (C) **67** LOT Address of Well Location (County/District/Municipality) Address of Well Location (County/District/Municipality)

SO VI/IG VF1 Dr.

RRW/Street Number/Name

ATT H W H

GPS Reading NAD Zone Easting Northing

8 3 F H 1296 50387057

Log of Overburden and Bedrock Materials (see Instructions) Lot Λ+Ε Officiality City/Town/Village Northing Unit Make Model M 5 0 3 8 0 5 7 Mace / And Instructions Sile/Companiment/Block/Tract etc tion: Undifferentiated Differentiated Specify

Differentiated Specify Mode of Operation: ムナカ General Colour Most common material General Description From. To Brown 1. 8/8 3,030 3.030 30.30

Hole Diameter	Construct	ion Record		Tes	l of Well Yield	
Depth Metres Diameter	Inside	Wall Depth	Metres	Pumping test method	Draw Down	Recovery
From To Centimetres	diam: Matenal the	ckness		ررن اسرا	Time Water Level	Time Water Mad
0 3.63 22.23	centimetres' cen	limetres From	To To	Jubmensible	min Metres	min Mees
2 2	Cas	ing			Static Level ローン	
1	Steel Fibreglass	<u> </u>	:	Pumping rate -	1 / / 9	1 //9
·		es o	3.63	(litres/min) / £	- 1/2 G /	1 447
Water Record	Gafvanized		ا دی،د	Duration of pumping	2 2.00	2 1 / 47
Water found Kind of Water	Steel Fibreglass		·	Lhrs + CO min	2 2, 5	* '.* '
4.29m Fresh Sulphur	Plasic Concrete			Final water level end	3 2.76	3 1.67
Gas Sally Minerals	Gelvanized	1		of pumping metres	******	-~ // ~ /
Other	' <u>-</u>		1	Recommended pump	4 2.33	4 2.76
m Fresh Sulphur	1		·	tγpe. ☐ Shallow [2] Deep	T	1777
Gas Salty Minerals	Plastic Concrete		1	Recommended pump	5 2.44	5 2/4
Other	Galvanized			depth. 28.7 Anetres		
.m _ Fresh — Sulphur	Sc	reen		Recommended pump rate. (htres/min)	10 2.92	10 3.57
Gas Salty _ Minerals	Outside Steel Fibraçiass Si	ol No.		rate ditres/min	15 3 2 P	15 3 57
Other	diam Plastic Concrete		. 1	If flowing give rate -	20 3 5 7	20 3 4 7
After test of well yield, water was	Galvanized	į	.	(litres/mm)	25 3,80	25 4 10
Clear and sediment free	[!	If pumping discontin- ued, give reason	30 Z/, 00	30 400
Other, specify	No Casing	g ar Screen		DEU, give leason	40 4,36	40 4/100
Chlorinated X Yes No	Z Open hole	3.63	30.30	}	50 5. R4	50 4 36
Z 163 _ 10		3.63	30,30	ļ	50 5 PG	60 5.24
Plugging and Sea	ling Record Annular space	e Abandonment	$\overline{}$	Location o	i title it	
Depth set at - Metres Material and No.	e (bankonita slurry, neat cament slurry) etc	Volume Placed	In diagram below	show distances of well fro		nd building
		(cubic metres)	Indicate north by	arrow.	ATTIONED, EXTINES, AN	NA Pulmana
0 3.63 Cem	ent but			71		. 1
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M	ethod of Construction			_\Y		
Cable Tool Z-Rolary (s	ir) Diamond	Digging		7		
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	Water Use			ر ج	241	1
☑Bomestic ☐Industra		C(her		*4		
Stock Commen		———		1		
	☐ Cooling & air cond Final Status of Well	looning	Audit No. Z	UU8∦U ∞∞	Well Completed	MW DO
☑ Water Supply ☐ Recharge well		Abandoned, (Other)		<u>00040</u>	200	4 03 17
Observation well Abandoned, i			Was the well own package delivered			
Test Hote Abandoned p		•	Parago actività	<u> </u>	<u> </u>	410 406
Well Conti	actor/Technician Information			Ministry Use		
Name of Well Contractor	11 70 1 1 1 1 1	tractor's Licence No.	Data Source	Cont	ración 🗘 🐧	
1) KB-WATER-We	d- Weilling 6	006	Í		שטס	6
Business Address (street name, numbe	5. DEV BIC)	Ī	Date Received	TYDE OD Date	of Inspection YY	Y MM DD
Name of Well Technician (last name, fir	st name) Well Yard	migran's Licence No		code		1 1 1
hours 10-5		2 (Remarks	Well CELAS	Record Number	ì
Signature of Technician/Contractor	Dale Subm	mad yyyy MM DO	[C:	55 C %	15340	24
xxous In	~~~~	2004 04 30			15346	41
0506E (09/03)	Contractor's Conv Munistry					

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\odot	ntario	the Environment		A (004837	Regulation 903 O.	Well Re
Instruction	is for Compli	eting Form	A0048	37		-,	page_
* For use	in the Provin	se of Optado only The			al document	_	
All Sec Ouseting	ions must be	completed in full to avoi	d delays in process	ng. Furthe	r instructions ar	Please retain for future rand explanations are available.	ererence. ble on the back of thi
' All met	re measurem	ents shall be reported	on can be directed t	of the Wate	er Well Manage	nd explanations are availat ement Coordinator at 410	8-235- 6 203.
Please	print clearly in	plue or black ink only.		<u></u>		Ministry Use O	nly
Well Owne	r's Informati	on and Location of V	(ell information	MUN /	5011	ON COM	07 101
Address of W	en Location (Cou	hty/District/Municipality)		vnship			
	Ottow	a con leto	<u>``</u>		mber 10	and Die	Concession
RR#/Street N		haven		City/Town/	Village	/ Site/Compartm	ent/Block/Tract etc
GPS Reading	NAD	Zoee Easting	Northing	Jnit Make/	n loger lar Model Mod	e of Operation: Undiffere	and Rinning
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	Dlameter		Construction Reco	rd		Test of	Well Yield
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🗸 📙	<u> </u>	[Casing	 			1/32
	 	Slow F			T -	Pumping rate _ 1	5.33 1 2
Wafe	r Record	HI /S & Destroy	onarete .48	٥	6.7	Duration of pumping 2	
Water found at Metres	Kind of Water	Galvanizad		Ι -	0''	hrs + min	6.75 2 2
100	Fresh Sulphu	FII Pleate To	- 1			Final water level and 3 of purrollots matters	7.08 3 2
Gas —	Safty Minera					Recommended pump 4	7.97 4 2
<i> 61-</i> 0□	Fresh 🔲 Sulphu		· 1 i			type. ☐ Shallow ☐ Deep	
☐ Gas ☐ ☐ Other: ☐	SA E Aluera	Gelvanized]			Recommended pump 5 depth metres	8.78 528
	Fresh 📋 Sulphu		Screen			Recommended pump 10	12.34 10 28
☐ Gas ☐ ☐ Other: —	Salty Minera	III diem Usteel UF	- 1			rate. (stres/min)15	1/6·YO 15 20
After test of wel	yleid, water was	Plestic (10	oncreie			(litres/min) 25	20.0720 2
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		Method of Construction		$\vdash \vdash \vdash$		j	
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Rotary (conve	ntional) T Air pa	rcussion Jet	ing 🗀	Other		- 11 V	2.5
	~ Lison	Water Use				1.450	أعبن
Domestic Stock	☐ Indus			Other		1	•
kuldanjou	☐ Comr ☐ Munic		used —— sling & air conditioning		Audit No. Z	↑ ↑ ↑ ↑ ↑ Date Wel	Completed
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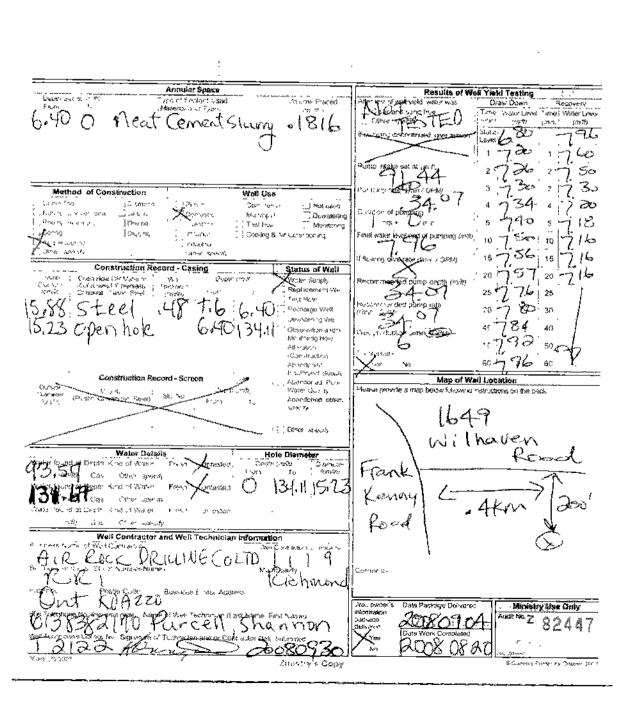
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All Sections	ctions :	must be	completed in full to avoi	id delays in process	ng. Furthe	gan document. F Ir instructions ar	'lease retain for id explanations ar	future reference. e available on the back of this form.
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	er Reco	prd	/5,55 Plastic c	concrete 0148	0	6.00	Ouration of pumpu	9 2 20, 84 2 47.02
Water found at Metres	/ Kin	d of Water		itregiase		┼	hrs +@@	min
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⊔ytner		L		Threniese	 -		Recommended putype.	19 4 24. 84 4 4R 04
		. ☐ Sulphi ☐ Minen	#rki 1822. ∑.	· 1		' '	Shallowiden	mp 5 32,4,473 5 40,09
Other:		i-:	Galvanized ☐		<u> </u>		Recommended our depth (O. G.)	
. ☐ Gas 🔲		Sulphi Miner		Screen Erregiess Skot No.	<u> </u>		Recommended purate. (litres/min)	mp 10 37,70 10 38 82 15 15 78, 49
Other:	ال دفاها ال		diaam				If flowing give rate	20 59, 59 20 75, 82
Clear and			Galvanizad		·	":-	(litree/min) If pumping discontly used, give reason.	25 54.34 25 27.99 30 C4.54 30 37.92
Other, spec	sfy			No Casing or Scre	an) ued, give reason.	40 7/5 7 40 39 12
Chiorinated []	168	□ No	15,5 Dopen hole		6.66	100.00		50 5 7. 5 9 50 27. 171 60 5 7. 5 9 60 27. 172
	Pluge	jing and	Sealing Record 4	Annular space	andonment	 	Locatio	on of Well
Depth seal at - N			type (bantonile alumy, meal cam	cent alternatives Volum	e Placed metres)	In diagram below Indicate north Ky	show distances of w	ell from road, lot lize, and building.
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Water Suppl	, _	Recharge	Final Status of Well well Uni	inished Abando	ned, (Other)	Was the well own	ar's information	Date Delivered YYY Mu DD
Observation Test Hole		Abandon	d, insufficient supply 🔲 Dea	valering placement well	├	package delivered		2004 08 17
			ontractor/Technician Info	ormation		Tala 7	Ministry	Use Only
Name of Well C	ontractor レンジ	TER	well-Drill	Well Configuracy's	No.	Data Source		600 B
Dusiness Addre		name, nu	ntres, city etc.)			Date Received	Ŭ'7 ₁2004 [™]	Date of Inspection YYYY MM DD
Name of Well Y	chniciar	(last name	, lirst name)	. Well Technician's (,	сеповано.	Remarks		Well Record Number
Signature of 16	hridan/	Contractor	-3/10413	Date Submitted YVVV	- W			1535079
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0506E (09/03)	ı	I	Contractor's Copy	Ministry's Copy [⊔ wextown	er's Copy 🔼	Cett	e formule est disponible en français

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		•	ting Form	L		4129		,		1 .	203
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Please	print q	learly in	blue or black	ink only.		IL	5011/1 ×	Ministry w	Use Only	O LOT	
Well Own	er's in	rormati	on and Loca	<u>tion of Well In</u>	ntormation_	I III	7 (711171 ∞	** C L-7*\L		U /101	<u>. ! _ 1 }</u>
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RR#/Street 1		nnh	-Kenn		l	City/Town/V Unit Make/k	her/au	41	5-///	3 4	<u> </u>
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· Ho	e Diam	eter		Co	onstruction Re	cord			Test of We	l Yšeld	 _
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	-				Casing			(metres)	Level 7	1,0%	14/0
			155	[aleties]	0,48	ه ا	6.46	(litres/min) 45	Sα		17,70
Water found at Metres	ter Rec	ord to of Wate	⊣ II !	Galvanized		₩		hrs +	min 7	70 2	
27.00	Fresi	Sulp	hur	Plastic Concre				Final water level of purnotes	and 3 3	73 3	8.06
∐ Gas ∐ Other: -	Salty	Mina	raus	Galventzed Stael Fibregi			-	Recommended pu	mp 4 6	4 4	7,33
iim ⊡Gas	☐ Fresh ☐ Salty	☐ Sulp ☐ Mina		Plestic Concre	Г		-	Recommended pu		, £3 5	6,57
□ Other:	Fresi			Gelvenized	Screen	 		Recommended purette.		P. 7.3 10	417
∬Gas ∬Other: _	Salty	Mine		Steel Fibregi	. 8			(litres/min) If flowing cive rate	19.14	1 13 20	
After test of				☐ Plastic ☐ Concre ☐ Galvanized	ne	Ħ ·	i	(litresmith) (If purpoing discording upon the reason.	9 8	/ / / 25	3.74
Other, sp		at Ireë		 _	o Casing or St	reen	سائم والدور والرس	ued tive reason.	40	3.06 40	
Chlorinated	-	N₀	15:23	Open hole		6.66		∛	50 A	3,6 à 50 4 / 60	
	Plus	ging an	d Sealing Reco		nular space	- Conment	1	Locati	on of Well		
Depth set at	Meires Ta			sluity, neat cament si	urry) etc. Vol. (cu	me Placed sic metres)	in diagram belo Indicate north b	w show distances of w y engow.	ell from road ,	, lot line, and t	xuliding.
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D+L	س ۲	ATE	19. Wall-	Deilling	600	26	Date Received		Date of Imsp	ectibe	0 0
S7:	1	15-	number, city etc.)	~ <u>~</u>	Titles 7-4 4	L	UC1	077 2004 "			<u> </u>
Neme of Well	00			a.s	Well Technicken	ł	Remarks		Well Recon	5350	10179
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⊗ 0	ntario	Ministry of the Environ		A	0140	_	r below)	Regulatio	n 903 Ontari		lecord
Instructions	s or Complet	ting Form		A.	0140	69				page	2 of 3
For useAll SectionQuestion	in the Province ons must be considered	e of Ontario empleted in A empleting this nts shall be	only. This docur full to avoid delay application can reported to 1/16 ink only.	ys in proce be directe	essing. Fur ed to the W	ther instruct	tions:and	l explanations ar tent Coordinate	o aktelieve e	n the back o	f this form.
Well Owner	r's Informatio	n and Loca	tion of Well In	formation	n MUN		CO	W		LOT	
Address of We	Location (Cour	ity/District/Mu	nicipality)		Township	berlo		Sub	7x1	Concession	-
RR#/Street Nu	WII/h	$-\!$	<u> </u>		City/To	vin/Village	1	Charle	ompa <u>r</u> lment/E	Block/Tract el	tc.
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Log of Over	8 3 / rburden and l	Bedrock Ma	চাচারে বি sterials (see ins	co 3/2/ structions	<u>(14) ///</u> s)	ge llan	, ,	4 T/9	Differentialed,	specify	-
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		المستدين الساما			10	6.	.66	(litres/min) 2.2,	75		<u> </u>
Water Schil at Matres	r Record Kind of Water	┨	Galvanized SteelFibregiza					Duration of pump	_min	0.36 2	61.10
2237	Fresh Sulphu		☐ blazne ☐ Couctera	1				Final water level of pumping	end 3 2	1.16 3	57.96
∐Ges ∐ Dominer:—	Salty Minera	s -	Gatwanized	<u>.</u>				Recommended p		2, 24 4	58.56
	Fresh Sulphu Salty Minera		Statel Fibrogles Plastic Concrete					Shallow (se	HITTON - I	2. 26 5	57.75
	 	-	Gelvanized	Paras				depth 45,33	etres		
☐ Gals	Freish Sulphu Salty Minera	ls Outside	Steel Fibroglas	Screen s Skyt No				Recommended prate. (litres/min)		2.0/ 15	53.04
After and of we	il yield, weter was	diam	Plantic [_]Concrete		\dashv			If flowing give rai (litres/min)	25 €	7. 7.£ 25	49.32
Clear and so		1	Galvenizad M -	<u> </u>	<u> </u>			If pumping disconued, give reason.	uin- 30 % .	3 , \$4 30	48.20
Other, speci			Open hole	Casing or	6.c	11 0	4.24	- 12/2/12	50 5	0.79 40 2,04 50	46.56
Chlorinated (#		<u> </u>					7.48	SA COL	60 💪	7,74 60	43.60
Depth set at - M	Plugging and and and and and		Lury, neat cement stur	<u> </u>	Abandonn Volume Place	in diag	gram belgw	phow distances of	tion of Well well from road,	fot line, and bi	ulding.
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							3	4	(K) (F)		-륔개
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			Construction			$\exists \mathbb{I}$	-7	4	Mille	HVEW	Dr. 9
Cable Tool	☐Rota entionel) ☐ Air p	ry (alir) excuesion	☐ Diamgad . ☐ Jetting ,	•	Digging Other		1	3			\
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Stock	□ Com □ Muni		☐ Not used ☐ Coaling &	air condition	ing	Audit	No. Z	1.4011	Date Med C	ompleted	1/M 200
Water Suppl	y Recharge		tus of Well	d DA	bandoned, (O	her) Was (ner's integration	Date Deliver	2005	127 <u>22</u>
Observation	well Abandon	ed, insufficient s ed, poor quelity		vg			ge delivere	07 P Yes □1	*•	2005	
1 1	Well C		hnician informat	tion	tor's Licence (in Data	Source	Minist	Contractor	- *	
DAR +	WATER		Dellia		006	·			6 (006	
Business Address	ss (street name, nu	mber, city etc.	1bent	- on	<u>/</u>	- 11	ÄÜĞ 1	<u>8 2005 i "</u>			мм со
Name of Well 7	ichnician (last nam	6, first numer	415	Well Technici	lan's Licence	Wo. Rema	rks		Well Record	Number	
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0506E (09/03)	va lat	Çon	ractor's Copy			Owner's Co	рру 🔲	· · · · · · · · · · · · · · · · · · ·	ette formule e	st disponible	en français

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Cottawa - Carleton Combined on the reland of plants of the property of the proper Ontario 57 18 Caradal Description Sand Earth Grey Limestone 5.18 [34.1]



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County or Territorial District	ussell	Towns	hip, Village, Town or	City Comberlan	
Con 1 0 5. Lot 22	Street and N	umber (if i	in Village, Town or C	lity)	
Owner.			Address Cumberl	end Ontario	
Date completed22	5	56			
(day)	(month)	(year)		Pumping Test	<u> </u>
Pipe and Casing	icecoru	- ,		1 diubrig 1est	<u></u> .
Casing diameter(s) .4inches	**********************		Static level9.1	eet	P+P++PP++++1
Length(s) 21 Feet			Pumping rate	gpp	***************************************
Type of screen			Pumping level	Feet	
Length of screen	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Duration of test	lhour	*************
			· · · · ·		
Well Log				Water Record	
Overburden and Bedrook Record	From ft.	To ft,	Depth (s) at which water (s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
-Red Sand	0	. Б	69Feet	60 Feet	fresh
lime stone rock	6	69			
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		l			
For what purpose(s) is the water t	o he meed?	•	,		NORTH
		4	i	ocation of Well	
Domestic		l!		v show distances of	,
Is water clear or cloudy?		1 1 1	road and lot lin	e. Indicate north	by arrow.
Is well on upland, in valley, or on h		14	, i		
hilleide			5.		
Drilling firm T. H. Adams		1 7.	5 '	Įį.	
Address .hurdman.sBridge		-	4	VI VI	
		•	77	, % "	
Name of Driller		<u>ا</u> ه	4	Ą	
AddressHurdman!sBridge.			Q	Ť,	
Uttawa, Untario			-1	971	~ Tr * D
Licence Number 42			K- 9 22-	4	or .
I certify that the foregoing statements of fact are true. MONTREAL ADAP - NO					4
statements of fact a	-	一	MONTRE	AL ADAD	- NO17
110 70 2	1/2	_			_

Date July Signature of Licensee

Form 6

The Ontario Water Resources Commission Act

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WATER WELL RECORD

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col	DUTT OR DISTRICT	Z, Circui ZX abitina	TOWNSHIP, BOHOUGH, C				9	OLOCK, TRACT, SURVE	Y, ETC.	/= / l.	OT 25:27
9	Russell	20-47	ADDRESS	-			_let	. from Otta	DATE COMP		2 <u>2</u>
Į		ZONE EASTING	Cumber	land, Ont.	tun	ATION .	erc .	BASIN CODE	_{олу} <u>28</u>	MO_ <u>Il</u>	<u>™_70</u>]
يَا	P)	ZONE EASTING 1/18 1/18 1/18 1/18 1/18 1/18 1/18 1/1		រូ <i>ខេប</i> ៉ី ឝ្រឹ		300	90	<u> </u>	<u> </u>		1.1.1.
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F	10:13	FRESH 3 SULPHUR 14	OC TO-11 DE STEEL	12 100	О	-70°-	25			OF SCREEN	<u>recr</u>
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1	20-25	SALTY 4 MINERAL	17-14 I STEEL 2 GALVANIZE	·• -		20-33	DEFTH	SET AT - FEET	LATERIAL AND	TYPE (CI	MENT GROUT, PACKEN, EYC J
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1	21	SALTY G MINERAL	24-25 ☐ STEEL 2 ☐ GALVAMIZE	24 D		27-30	1	10 21 22-25 1-29 30-33 101			
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		2, Box 194, Orlo	ens, Ont.	LICENCE NUMBER	"				<u> </u>	Fryn ·	
	Z G. Che	rbonneau / ,							n		1
_	SIENATORE OF	CONTRACTION Charter	50 pm 55 pm 52 pm	re	OFFICE PERCE	_		:			<u> </u>
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Ministry of the Environment

Well Tr	A 052474	mber below)
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Well Record Regulation 903 Ontario Water Resources Act

page ___ of _

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 Help Desk (Toll Free) at 1-888-396-9355. All metre measurements shall be reported to 1/10th of a metre. Please print clearly in blue or black ink only. Ministry Use Only Well Owner's Information and Location of Well Information MUN CON LOT 33 My/Town/Village ie/Compartment/Block/T 503890 Undifferentiated 8:3 Log of Overburden and Bedrock (see instructions) General Colour Most common material Other Materials Metres To (1.58 General Description ar Q rouse 7315 Ĭ1.58 Hole Diameter Construction Record Test of Well Yield Depth Draw Down inside Recovery Wall Depth Metres From Τo diam Subfunf centimetres min Metres min Pump intake set et (metres γ.∞ 85 Casing Since Fibregles 15 88 Plestic Concrete 18,29 hrs + 48 \bigcirc Water Record Galvanized ✓ Kind of Water Sieel Fibregias lexel end Plastic Concrete Galvanized Steel | Fibreglass **∖**c6e Plastic Concrete Mineral Galvanized Sulphur
Minerals Fresh Screen 10 15 F1.45 15 9 37 20 51.22 20 7 26 25 50 16 25 6,85 30 33, 10 30 Outside Steel | Fibragias Slot No. ing give rate Plaetic Concrete flitres/min) Galvanized l pumping-discontinued, gara reason. OMPESTED 40 34 13 40 50 6 60 50 No Casing or Screen D,68 Open hote 73.^{is} Chlormated Yes ☐ No CO 60 Plugging and Sealing Record Location of Well Depth set at - Metres | Meterial and type (benionite sturry, next coment sturry) etc. Volume Placed In diagram below show distances of well from road, lot (cubic m Indicate north by arrow. 17,68 Old Marchea [70° Method of Construction Diamond

Jetting Cable Tool Rotary (air) Digging Mar percussion Rotary (conventional) Other Rotary (reverse) □ Driving Water Use Momestic Stock Industrial ☐ Industrial ☐ Commercial Public Supply Other ☐ Not used — Cooling & air conditioning Muracapal Imgation Audit No. z 55562 Final Status of Well Was the well owner's information nackage delivered? Water Supply Abandoned, (Other Abandoned, insufficient supply Abandoned, poor quality Replacement Ministry Use Only Well Contractor/Technician Information Data Source FEB 12 ZGO/ 1 N/SA/C Date of Inspection MONE Well Record Number emarks joj *B*

Ontario Ministry of the Environment	Well Tag A 072326		Well Rec	
Well Owner Sunformation (1)			VALUE OF THE PARTY	ASSESS OF
Address of Well Location (Street Number/Name, RR) County/District/Municipality County/District/Municipality	Township City/fovgn/Village	er land a	Province Postal Cod	
UTM Coordinates Zone Easting Northing	GPS Unit Make Model	Mode of Operation:	Undifferentiated XAverage	Щ.
		Differentiated, specif		
	Other Materials			
The state of the s	Other Makerials	General Description	Depth (Med From	To
			—— <u> Q</u>	<u>, 75</u>
Black Hore	M Imester		<u> </u>	<u>ت</u> وت
				
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- CT 4 CT	<u> 2017 - 1702</u>	+ - (L MO)	AD	
And of the second secon		Participation of the second of		超級特別
Depth Set at (Metres) Type of Seatant Used From To (Material and Type)	Volume Ptaced (Cubic Metres)	Check box if after lest of well yield, water was:	Time Water Level Time Water	ery r Level
10. 0 Nest Com. to	Jucy 4086	Class sourcard free	(Min) (Metres) (Min) (Ma	nous)
	NC	state.	Static 9 70 Static 54	£76
		a puritaing diseason puter, give reason	1 1 3 72 1 53	,95
	- -	Pumping lest method	2 3, 73 2 0	78
MONING AND ADDRESS OF THE PARTY		Subtump	3 7 7 5 6 3 5 5	7
Mednova Construction S S S S S S S S S S S S S S S S S S S		Pump make set at (Metres)	1 22 20 1	3
Rotary (Conventional) Jetting XOomestic	☐ Municipal ☐ Dewatering	Pumping rate (Libes/min),	52,27 5	78
☐ Rotary (Reverse) ☐ Driving ☐ Üyeslock ☐ Rotary (Air) ☐ Digging ☐ Impalion	☐ Test Hole ☐ Monitoring ☐ Cooling & Air Conditioning	Duration of pumping	J	չ.՝−
Mir percussion ☐ Bodog ☐ Industrial		hrs + C min	10 37 33 10 47	3
☐ Other, specify ☐ Other, specify ☐ Status (Marilland		Final water level eng of pumping	1540,70 1545	, 7d
Water Supply	Observation and/or Monitoring Hole	Moires 54- 70	20 4265 20 2	, 4
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Test Hole ☐ Abandoned, Poor Water Quality	Alteration (Construction)	Recommended pump type Shallow Deep	25 15 10 25 13	82
☐ Recharge Well ☐ Abandoned, Propr Water Cluality ☐ Recharge Well ☐ Abandoned, other, specify	Other, specify	Recommended pump pt 304 111	30 1/ 90 30 70	71-
West of the second seco		└── Lai Metres (<5 <2000		3 7 7 5
Please provide a map below showing: - all property boundades, and measurements sufficient to locate the	e well in relation to fixed points.	(Litrus/min)	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	
- an arrow indicating the North direction		If flowing give rate	1 50 527 50 37	3a

Date Well Completed Was the well owner's information Date the Well Record and Package
(psythoddd) package delivered? Delivered to Well Owner (psythoddd)
2001/12/1 4 4 1 0 0 0 7 12-12
Well Contractor and Well Technician Information in Section 20
Business Name of Well Contractor Well Contractor (Contractor's Licence No.
A = 0
TILE FOCK CONTINUE (PITTO) (III)
Busingss Address (Street No./Name, number, RR) Municipality
PRO RICHMAND
Province Postal Code Business E-mail Address
ANT RADIA
OF STREET
Bus Telephone No. (inc. area code) Name of Well Technician (Last Name, First Name)
/11/210/21/20/17/1 Decantage / and
Well Technician's Licence No. Signature of Technician Date Submitted (1999/mm/db)
THE LAWS THAT
and the property of the proper
0505E (11/2006) Ministry's Copy

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Recommended pump de Ru	4117	30 HG 90	30 4276
Recommended pump aire	"" }	4050,49	40,00,07
If flowing give rate		50527	50 37 32
(Litros/milit)	[60 54.70	50 37 71
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X‱eci ⊟sièni,		\Box	<u>55</u> .
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□Plastic □ Plastic	• 1	\bot (\supseteq 2	(

Plastic Plastic	
Concrete Concrete	Wall Trickness (Metres)
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JOHNHO 06-1523	Juniple Diameter of the Cooking (Merres,
plested?	Depth of the Casing (Metros)
AYes ☐ No	10.67
Ministry Us	
z60129	Contractor No.

Ģ	Ontario
U	Ontant
ពែន	tructions for Comp
٠	For use in the Prov
•	All Sections must b
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Ministry of the Environment

Well T	A 054029	uniber bekow)
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Well Record Regulation 903 Ontario Water Resources Act

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page_ ince of Ontario only. This document is a permanent legal document. Please retain for future reference. be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form, g completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-398-9355, ments shall be reported to 1/10th of a metre. Ministry Use Only in blue or black ink only. Well Owner's Information and Location of Well Information MUN LOT Address of Well Location (County/District/Mur 3 GPS Reading Log of Overburden and Bedrock Ma terials (see Instructions) General Colour Other Materials General Description u Clay reenhinestone Hole Diameter Construction Record Test of Well Yield Depth Metres Diameter Metres Pumping test method Oraw Down From Τo, 49 thickness diam Time Water Level Time Water Lev centimetres From ద్రుత్ర Casing 3.84 Steel ___Fibregles Plastic Concrete 48 0 Water Record Galvenized nd Kind of Water Lhrs +__Om Steel Fibregle Prest Supre Salty Oblineral Plastic Concrete Galvanizad Steel Fibregles Fresh Stand Plastic Concrete Galvanized 38 Fresh Sulphur
Salty Mineral 10 26.50 Screen Jm 10 Outside __Steel __Fabregta: Stot No. 20 4. 70 20 25 4. 70 20 25 4. 70 30 30 57 58 30 40 57 58 40 50 60 58 50 Plastic Concrete After test of well-vield, waterwas (litres/min) Galvanized Other; siles No Casing or Screen 50 60 37 50 60 80 63 65 80 37 8,84 103,63 Chlonnated √Z√Z= □No pen hole Annular space Abandonment Plugging and Sealing Record Location of Well Depth set al - Metres | Material and type (bentonite sturry, neat cermant sturry) etc. 1816 Montres 9KW Method of Construction Cable Tool Rotary (air) Diamon Digging ☐ Rotary (conventional) Jelling 🗌 Air percussion Other ☐ Rolary (reverse) _ Boring □ Driving Water Use Domestic Industrial Public Supply Olher Not used — Cooking & air conditioning Stock Commercia: Irrigation Municipal z 65055 Final Status of Welf Water Supply Recharge well Unfinished Abandoned, (Other Was the well owner's interpration package delivered? Observation well
Test Hole Abandoned, insufficient supply ☐ Dewatering
☐ Replacemen Abandoned, poor quality Replacement Well Contractor/Technician Information Ministry Use Only Data Source MM DD Date of Inspection Date Received YYYY ММ 00 JWN 21 8 2007 Well Record Number Remarks

Ministry's Copy

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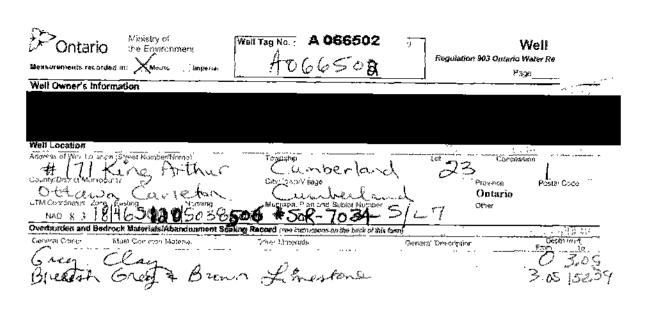


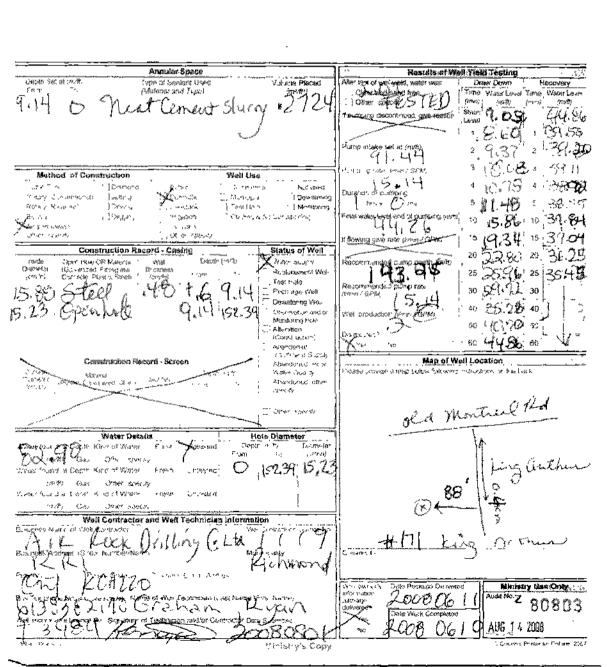
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A 052289 12051254 Well Record

Regulation 903 Ontario Water Resources Act

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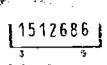
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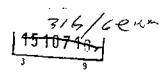
Well Record Regulation 903 Ontario Water Resources Act

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Well Caner's information			
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Welltocation			W NASSE SANTASSAS VASAR BENGER STONE SANTAN AND SANTAN S
Address of Well Location (Street Number/Name)	Township	// ¿Lot	Concession
County/Destrict/Municipality	St Curs har	land 11	Province Postal Code
OTTAWA. PIFY	- Per is b	erland.	Ontario 1900A2
NAD 8 3 / P 4 6 5 4 0 5 5 0 3	Municipal Plan and Suble	ol Number	Olher
Overburden and Bedrock Ralenas/Abandonine		1362 Taxon (m)	
General Colour Most Common Material	Other Materials	General Description	Depth (m/n) From To
Brown Clay	Boulders	LOOSE	0 3.63
Grey himastone	*	Hand	3.63.151.51
			<u>:</u>
		<u> </u>	<u> </u>
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Annülar Spac	<u>. </u>	Results of We	Miglid Testing
Depth Set at (m/tt) Type of Seatant U From To (Material and Type		After test of well yield, water was: Clear and send free	Draw Down Recovery Time Water Level Time Water Level
1 1212 Penent	but 120kg	Other, specify	(min) (min) (min) (min)
	7	If pumping discontinued, give reason	Level 6.01 42.0P
		Pump intake set at (m/h)	15.77 1 5/0.85
		5454	$ \frac{2}{6},25 ^{2}$ 40.73
Method of Construction (No Welluse V. Sur	Pumping rate (Vmin / GPM)	3 6.90 3 40.60
☐ Cable Tool ☐ Diamond ☐ Public ☐ Rotary (Conventional), n☐ Jetting ☑ Domestic	☐ Commercial ☐ Not used ☐ Municipal ☐ Dewatering	Duration of pumping	* 7.44 * 40.50
■Rotary (Reverse) # M □ Oriving □ Livestock □ Boring □ Iringation	☐ Test Hale ☐ Manitoring ☐ Cooling & Air Conditioning	min (m/ti) hrs + min Final water level end of pumping (m/ti)	5 F.O. 5 40.4/
☐ Air percussion • ☐ Industrial		t was rote: letter and its pumping (new	10 11.29 10 39.65
Toner, specify WATER- PETC434 Februar, sp Construction Record & Casing	物数を変換。 対象を変換。 対象を表現をの「Well 引	If flowing give rate (Irmin / GP&I)	15 14.30 15 39-5 (
	Depth (m/fi) [[]-Water Supply	Recommended pump depth (m/h)	20 17.79 20 39.16
(Galvanicad, Fibregless, (Galvan) Fig. (Galvan) Fig.	Test Hole	Recommended pump rate	25 21,12 25 36 ² 75
586 Steel 0,48 76	Recharge Well Dewatering Well	Umia / GPM) 22.50	30 3423 30 34 34
	Observation and/or Monitoring Hole	Well production (Vinin / GPM)	40 30 35 40 37.60
	Alteration (Construction)	Disinfected?	50 36,22 50 31-126
	Abandoned.	Z/Yes □ No	60 42 Coff 50 36,15
Construction Record Screen Outside Material Statute	Depth (m/t) Abandoned, Poor Water Quality	Please provide a map below tollowing in	
	m To Abandonad, other, specify	l :	i 1
	Done conte		*
	Other, specify	21 2	<u> </u>
Water Details		to Songai	// \$ ^t
Water found at Depth Kind of Water. ☐ Fresh ☐ Unit ☐ Gas: ☐ Other, specify	From To (cm/n)	1	C WAYE
Water found at Depth Kind of Water:Fresh 'Unt	95ted 0 12/2 15/5G	76	Æ
(m/ft)	sted 12.12 151.5 15.54	Kenny	2
(m/ft) 🖺 Gas 🖳 Other, specify		1 3	72 SX 0
Well Contractor and Well Tech Business Name of Well Contractor	nijoran Information Well Contractor's Licence No		·
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Business Address (Street Number/Name)	est NAtion	Comments:	1 tre
Province Postal Code Business E-ma		Well owner's (Date Resident Date	53 me
Bus Telaphone No. (Inc. area code) (Native of Well Technia	ian (Lest Name, First Name)	Well owner's Date Package Delivered information package	Audit No.
413947-3594 Dest	oyers hours	delivered Date Work Completed	∠ ≠ ° z 099704
Tib 215 TELL M	or Contractor Date Submitted	[No 2009 107)	€ 6.5EB € 3.2000

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The Ontario Water Resources Commission Act

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WATER WELL RECORD

County or District	Carleton		l'ownshi	p, Village, T	Fown or City!	Cumberland	***************************************
Copp 79	Lot D		Date con	npleted	21 April 19	69	
Owner .							
Casin	ig and Screen Reco	ord			Pumping	Test	
Inside diameter of casing			Statio	c levei	10'		
Total length of casing	20	THE STATE OF STATE	ı				
Type of screen							
Length of screen			Dura	tion of test	pumping.,	2 hrs.	
Depth to top of screen .		7-11/1 3 4 4 4 4	Wate	er clear or cl	oudy at end of	testclear	
Diameter of finished hole	61	Plantition in	Reco	mmended j	pumping rate	. 6	G.P.M.
			with	pump settir	ng of60	feet belo	w ground surface
	Well Log					Water	Record
Ove	rburden and Bedrock	Record		From ft	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
		_loam		0	3	146	fresh
		loose rock & cla grey limestons	y	3	146	 	
For what purpose(s) is th				In diagra	Location of the below show		1 from
				_	m below show	of Well distances of well cate north by	
	ey, or on hillside?	upland		_	m below show	distances of wel	
Is well on upland, in valle	ey, or on hillside?	upland Drilling,	25	_	n below show lot line. Indi	distances of wel	
Is well on upland, in valle Drilling or Boring Firm G. Charbonneau	ey, or on hillside? Dia ndn d & Cable ox 194, Orleans	Upland Drilling, Ont.	25	_	m below show lot line. Indi	distances of well icate north by	
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MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act VATER WELL RECORD 1513924 ONTARIO 2. CHECK & CORRECT BOX WHERE APPLICABLE COUNTY OR DISTRICT Carleston Cumberland R. R. 1, Cumberland, Ont. (ZI) 1466220 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) FEET * OTHER NATERIALS GENERAL DESCRIPTION GENERAL COLDUR limestone grey 109 31 <u>┡┸┸╫╬┸</u>┸┸╀┩╏┰┸┸<u>╀┸</u>┸┸┼╸╏┰┸╂┸╂┸┼┦╏╃┸┸╂┸╃┸┦╸╏┰┸╂┼┸╂┰┩ 32 CASING & OPEN HOLE RECORD 41 WATER RECORD 51) SCREEN KIND OF WATCH OCPT 1 T FRESH 3 SULPHUR 2 SALEY 4 MINERAL STEEL
GALVAMIZED
CONCRETE 0022 0 **0109** 250 1 | TRESH 2 | SULPHOR
2 | SAITY 4 | MINERAL 61 PLUGGING & SEALING RECORD 4 - OPER HOLE [] STEEL MATERIAL AND TYPE LEAD PACKER STO I ☐ FRESH I ☐ SULPHUR
L ☐ SALTY I ☐ MINERAL C GALVANIZED CONCRETE 1 ☐ FRESH > [] SULPHUR 2 ☐ SALTY • [] MINCRAL STEEL STEEL S GALVANIZED S CONCRETE 1 D CHESH 3 D SOLPHUR
2 D SAUTY 4 D MINERAL D OPEN HOLE LOCATION OF WELL 71 0004 02 15-16 DO 2 FAILER O PUNP IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AN LOT LINE. INDICATE NORTH BY ARROW WATER LEVEL END OF PROPINE 23-7 WATER LEVELS DURING 24-26 30 MINUTES 50 1111 PUMPING 100 1 ETCLEAR SECONMENDED AFCOMMENDED FUMFING DO Q. L GPM./FT SPECIFIC CAPACITY SETTING 7EL MATE 0004 I A WATER SUPPLY 3 AMANDONED, INSUFFICIENT SUPPLY FINAL 2 G OBSERVATION WILL
3 G TEST HOLE
4 G RECHARGE WELL C AMENDONED POOR QUALITY STATUS OF WELL . . DOMESTIC S CORMENCIAL 2 🔲 STOCK 1 | IMPORTION WATER 7 THE PUBLIC SUPPLY USE () COOLING OF AIR CONDITIONING 0.65 OTHER 1 G CABLE TOOL
2 ROTARY (CONVERTIONAL)
3 ROTARY (REVERSE)
4 ROTARY (ARE)
5 AIR PERSONNEL PORING
DIAMOND
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DIAMOND Lot D VII METHOD OF DRILLING 1304 ONLY 1504 Charbonness, Massond & Cable In-111ing DATE OF INSPECTIO E. R. 2, Box 194, Orleans, Ont. USE CONTR LICENCE NUMBER REWARK4 R OFFICE wt.

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MINISTRY OF THE ENVIRONMENT COPY

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Ministry of the Environment

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The Ontario Water Resources Act WATER WELL RECORD

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The Ontario Water Resources Act WATER WELL RECORD

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Well Tag No. Place Stone: Jewor Prut Below)

Well Record

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Well Owner's Information Well Location Connection Address of Well Location (Street Number-Name) Ťokesski. Lot 15 Camelot ContyDatestMunopubly 23 . Province 10) Postal Code Cumberland Ottawa Carleton
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Well Record

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Ministry of the Environment

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Well Record

Measurements reported in: "X Metric " Imperial A 0

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Well Owner's information Well Location Conversión *** Actives of Wolf Unitality (Sires, Naminer/Name). "Foundatio 1353 Jules Leger Dr. Cumberland BF Posta Gode Province Ottawa Carleton
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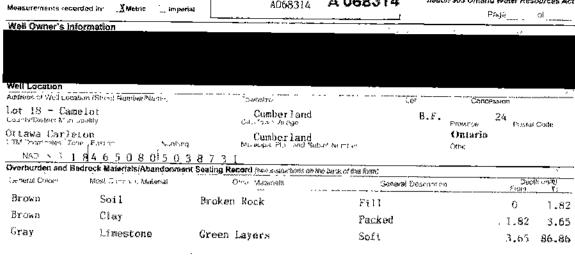
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Well Record

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Well Record Regulation 903 Ontario Water Resources Act

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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.

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Well Owner's Inform	ation and Loca	tion of Well Info	rmation	MUN	CC	N N	$\top \top \top$	LOT	
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Well	ched, poor quality Replacement well Contractor/Technician Information		Ministry Use Only
Name of Well Contractor	Ville Could 1119		Corriesactor 1119
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Name of Well Technicalin (last of	ane, instiname) Well Technicer		Well Record Number
Signature of Technician/Contract X		4124189 F	1534811
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• All me	nte me	garding (Pasurem	completing this application is shall be reported	ion can be directed to I to 1/10th of a metre	the Water	Well Manager	nent Coordinator at	416-235-6203.	
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The Ontario Water Resources Act WATER WELL RECORD

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The Ontario Water Resources Act WATER WELL RECORD

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County or District	WA- CARLET	Township/Borough/City/To	oup√illage		Çon, block tract	survey, etc. Lot 🙃
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		FOVERBURDEN AND BEDRO	CK MATE		 -	Depth - lest
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—————	Sally 6 Ges 77.11	5 Pientin	<u> </u>	2023 E	PLUGGING & SEA Attrider apaco	LING RECORD Abandonment
* -	Salay 4 Minerale	2 Galventred 3 Comprete 4 Open hole 5 Plantic	4	Depth sal at From 619-13 Ff	To Material and t	pe (Carrent grout, benkonile, etc.
7.0	Salty : Gas	1 Stee) 25 2 Geleunkard		27-30 0 77	2" com	F Bun
1' '	Fresh Basinerals Gas	7 □ Concrete •*2 Open hale 5 □ Plastic	12 4	/22 **	30:33 40	
71 Pumping test m	pethod 10 Pumping rate 11			LOC	ATION OF WELL	
Stational V	Vator level 25 Water levels during	Dumping 2 Recovery	tr Jr	diagram below show dicate north by arrow	distances of well f	from road and lot line.
F 1 - 0 - 1	22 24 15 minutes 30 minutes 24 25				,	
	7 20 teet 375 1841 360 t 1860 SM-11 Pump intelior metal	Water at error of layer		_	ν	non
Recommended p	ump type Recommended 43	eef Ciew Choudy Ciew Choudy Choudy 45-ee		<u>ا</u> () ا		D
Shellow 50.55	Comp seeing 410	GPM GPM	1			/
FINAL STATUS	S OF WELL, se ply 5 (1) Abtundoned, presufficien	Legady *□ Unitedad		0180	` (/
? ☐ Obsarvation 3 ☐ Test hole 4 ☐ Recharge	on well	ty '□ Replecement well	`			
WATER USE	06-06				<i>≯</i>	
2 Domestic 2 Domestic 3 Dimpation	o □ Commercial 6 □ Municipal 7 □ Public supply	9 ☐ Nol use 19 ☐ Other	1	500		
4 (nclustrial	Cooling & air condition	ing		(i		
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3 Rotary (as	ve-se) ¹□ Diamond	10 Digging 11 Dither ————	ι	VIII	· · · · · · · · · · · · · · · · · · ·	240320
Name of Well Contr	Bouk Levis	Well Contractor's Licenson No.	Data Source Date of	14	14	SEP 1 3 2002 ""
Address A	16 000				nspector	
Name of Well Toom	ain Bourges	Submission date	NINIE Remarks		ĊS	SS.ES2
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WATER RECORD SI CASING & OPEN HOLE RECORD SUBJECT	Blue	limestone						90	290
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PART PART	CA 3 (0 ₇₅₋₂₈	□ FRESH 3 □ SULPHUR 29	3 COMCRETE	.E	02	90 L].		
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ADJAN UNITE SURVEY TO SOURCE 1		4 🖺 ROTARY (AIR)							
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7/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1/1	-	LER ON WORER		l		· .			P K.
	SIGNATORE OF	L Kallen	7/	_	2 6		<u>. —</u> — —	V 1, 1	WI



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RUSSE		TOWNSHIP, BOROUGH, CITT, TOWN, VILLA COMBESS ADDRESS	•		TO F LOT 123
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GREY	LIMESTONE				5 240
					+ + +
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MANA OF D	RILLER OK BONEN FIEURY OF CONTRACTOR	SUBMISSION DATE	 2	(**	P WI
OWR	C COPY	DAYY	<u> </u>		



The Ontario Water Resources Commission Act WATER WELL RECORD

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Water incomprised to Orderin 1. PRINT ONLY IN SPACES PROVIDED 2. CHECK CORRECT BOX WHERE APPLICABLE 11 15 15 15 15 15 16 16 16 16	1/1 25-1 19/
COUNTY OR DISTRICT CARLESO J TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE COM, BLOCK, TRACE CUMBERLAND 1057	KOM OTT-RIL
ADDRESS	DATE COMPLETED 44-53 DATE OF THE PROPERTY OF T
21) 1/18 465400 5038820 4 Q3251 6 251 CODE	, , , , , , , , , , , , , , , , , , ,
LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTION)	DEPTH - FEET
GENERAL COLOUR COMMON MATERIAL OTHER MATERIALS GENERAL DESCRIPTION OF A MATERIAL OF A MATERIALS	ON FROM TO
3/3/10	
GREY LIMESTONE	4 /00
	
	
31) aggatastan largolarstan []	
	5)-55 [Olamates Sa-36] LENGTH 38-42]
41 WATER RECORD 51 CASING & OPEN HOLE RECORD WATER AGIND WATER AGIND WATER AGIND WATER AND OF WATER WALL THACOCAS THACOCAS THACOCAS WATERIAL AND TIPE	PERIS FEET
10-13 AFRESH 5 SUPHUR TO 10-13 HERESH 10-13 SUPHUR TO 10-13 HERESH 12 COTTS 5	DEPTH TO TOP #1-44 ED OF SCHEIN
095-1-1 1 FRESH 3 SULPHUR 1 67 3 CONCRETE 100 0 10 5 61 PLUGGI	IG & SEALING RECORD
1 FRESH 9 SULPHUR 2 GALYARIZED FROM TO	MATERIAL AND TIVE LEAD PACKER, CTC;
FRESH 3	ii l
1 POUPING TEST METROD 10 POUPING SALE 214 CORRANGE OF POUPING	3 60
TO PUMP STAILER OOFD CPE OZ 15-16 OF 17-16 IN DIAGRAM BELOW SHOW DIS	N OF WELL
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ACCOMMENDED FOR THE RECOMMENDED 13-75 PREZONMENDED 4-41	<i>f</i>
SD-S) OO / OCPH JET SPECIFIC CAPACITY	/
FINAL WATER SUPPLY S ABANDONED, INSUFFICIENT SUPPLY CONSERVATION WELL CONSERVATION WE	9
OF WELL 4□ RECHARGE WELL 7□ UNTINISHED	205"
WATER 10 IMPRICIPAL 10 IMPRICI	150'
USE O/ 4 TINDUSTRIAL 8 COOLING ON AIR CONDITIONING	. 4m & 5
METHOD CONVESTIONAL CONVESTIONA	
OF 3 REVENUE 1 DETING 1 DETIN	1
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WATER WELL	RECORD
7	[⊻] WATER WELL

Besinty of District Russell (2005)	Township, Village	. Town or	City Cumb	erlan	đ
Con Lot					966 7947)
	Address R.R.				• '
Casing and Screen Record		P	umping Test		
Inside diameter of casing 6 3/16	Static level		70		
Total length of casing	Test-pumping	rate I	.25 GPH		
Type of screen	Pumping leve	a	90	.,,	
Length of screen	Duration of te	st pumpin	g. 1 hr.		
Depth to top of screen	Water clear or	r cloudy at	end of test	clear	
Diameter of finished hole			-		w ground surface
Well Log					r Record
Overburden and Bedrock Record	From ft.	T ft	which	h(s) at water(s) und	Kind of water (fresh, salty, sulphur)
Limestone	0	1.6	50 9	90	fresh
For what purpose(s) is the water to be used? Lara	In diag	gram below	ection of We	es of we	
Is well on upland, in valley, or on hillside? . velley	road a		e. Indicate n Ma Rive		arrow.
Drilling or Boring Firm				_	/
J.B. DUFRESNE & CO. LIMITED	HWY(17)				/
Address 1014 Maitland Ave.	1 1 1				-
Ottawa 5, Ont.	5)			
Licence Number 2030		<u> </u>	<u> </u>	٠	D HWY IT
Name of Driller or Borer R. Laniel		7.405	T	<u> </u>	 `
Address 6 Bellevue - Lucerne, Que.	-	·			
Oate July 28th 1966 (Signature of Licensed Drilling on Boring Contractor) for J.B. Dufresne & Co. Limited Form 7 15M-60-4138	Con. 8	1/2 M			
O W R C COPY			CSS	\$.58	

UTM 1/18 Z 4 6 121/10 E		<u> </u>	097	56 N	327
Elev. 6 10 3 10 0 WATER WEI	orc	REC	م ماری م		
County or District Luss OF Con That 22	XIII	اران لال Ship, Village, T	own or City	Cumberland	
					year)
Owner A				- 1	
Casing and Screen Record			Pumping	Test	
Inside diameter of casing	St	atic level	35'		
Total length of casing251	T	est-pumping ra	ite ., 6	·· · · · · · · · · · · · · · · · · · ·	
Type of screen	Pι	umping level	50!		
Length of screen	\mathbf{D}	uration of test p	oumping	3 hrs	
Depth to top of screen	W	ater clear or cle	oudy at end of	test clea	r
Diameter of finished hole	R	ecommended p	oumping rate	6	G.P.M.
	w	ith pump settin	ıg of 75		w 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	30	 	-
loose rock Yark & limestone		10	112	112	fresh
For what purpose(s) is the water to be used?domestic			Location (
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.			lot line. Ind	distances of wellicate north by	
Licence Number 2/56			6		
Name of Driller or Borer G. Charbonneau		95	3	28ME	0,0
Address R.R. # 1, Orleans, Ont.		, i. 7	3 - 73	14117	-X-
Date 20 January 1966.		∤ °	284		o
(Signature of Licensed Drilling or Boring Contractor)					
Form 7 15M-60-4138	٠			C 58333	
OWRC COPY					

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APPENDIX 3

- □ SOIL LABORATORY TEST RESULTS
- □ WATER LABORATORY TEST RESULTS
 - □ Water Samples from Test Wells

EXOVA WAS

REPORT OF ANALYSIS

EXOVA ACCUTEST

CFU/100mL CFU/100mL UNITS 2929721 2009-12-07 2009-12-04 GUIDELINE ODWSOG PH1236 0 0 Water MAC MAC Report Number: Date: Date Submitted: P.O. Number: Project: Metrix: 764881 2009-12-03 TW1 WS2 39°0 €2 1°0 €2 1°0 €2 2009-12-03 TW1 WS1 764880 ၁၀ဦးဝ၀ Sample Date: Sample ID; 9 8 똪 CFU/100mL CFU/100mL CFU/100mL CFU/100mL PARAMETER 28 Concourse Gate, Unit 1 Chain of Custody Number: 11723 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Escherichla Coli Heterotrophic Plate Count Client: Paterson Group Nepean, ON Faecal Coliforms Faecal Streptococcus KZE 777 **Cotal Coliforms**

MRL - Method Reporting Limit INC * incomplete AO * Aesthetic Citylective OG * Operational Guidelina MAC = Maximum Allowable Concentration IMAC = Inferim Maximum Allowable Concentration Comment:

1 0/1

Results relate only to the peremeter's tested on the samples submitted.

Oragana Dzelelović Microbiology Analita



REPORT OF ANALYSIS

EAUVA ACCUIES!

2929698 2009-12-08 2009-12-04 PH1236 7873 Water Report Number: Date: Date Submitted: Project: 28 Concourse Gale, Unit 1 Attention: Mr. Robert Pagemore INVOICE: Paterson Group Inc. Client: Paterson Group Nepean, ON K2E 7.17

P.O. Number: Matrix:

INVOICE: Paterson Group Inc. Chain of Custody Number: 11723						P.O. Number: Matrix:	Ľ	7873 Water	
		LAB ID:	764828	764829				GUIDELINE	
	San	Sample Date:	2009-12-03	2009-12-03					
	w	Sample ID:	TW1 WS1	TW1 WS2				ODWSOG	
PARAMETER	CNITS	MRL					TYPE	LIMIT	UNITS
Aikatinity us CeCO3	mg/L	æ	408	403			90	200	ω ₀ /γ
Chioride	мgЛ	-	718	999		-	Ą	250	mg/L
Colour	J.	2	7	8			Q	တ	TCI
Conductivity	п2/сш	цэ	3200	3040					-
Dissolved Organic Carbon	mg/L	0.5	1.7	ا. ئ			Q	ĸ	mg/L
Fluoride	шg/L	1:0	0.12	91.0			MAC	1.5	МgИ
Hydrogen Sulphide	mg/L	0.1	¥0.1	-6.1			ð	0.05	щgЛ
N-NH3 (Ammonia)	mg/L	0.02	0.13	0.14					
N-NO2 (NItrite)	mg/L	0.1	<0.10	<0.10			MAC	1.0	mg/L
N-NO3 (Nitrate)	щg/L	1.0	0.41	0.42			MAC	10.0	mg/L
표.			7.81	7.85				6.5-8.5	
Phenois	mg/L	0.001	<0.001	- - - - - - -					
Sulphate	mg/L	-	121	117			Ş	200	mg/L
Tignnin & Lignin	mg/L	5	0.1	0,3				_	
Total Dissotved Solids (COND - CALC)	щgЛ	מו	2080	1980	_		Q	200	ω g /L
Total Kjeldahi Nitrogen	⊒/6ш	5.	0.39	0.23					
Turbidity) DTN	2	81.7	15.4			₩¥c	0,	Ē
Hardness as CaCO3	mg/L	-	808	662			8	6	щg/L
Ion Betance		10.0	1.06	1.08					
Calclum	mg/L	-	246	199					
Magnesium	mg∕L	-	47	4					
Polassium	π9/L	-	ĸ	LO.	_				
Sodium	mg/L	2	382	418			φ	500	₩
Iron	⊒/6ш	0.03	5.51	0.73			Q	6.0	TQT
Manganese	mg/L	0.01	0.15	90'0			Ą	0.05	mg/L
						_			
		_				_		_	

MRL = Method Roporting Limit INC = Incomplete AO = Assthetic Objective OG = Operational Guideline MAC = Maximum Attoweble Concentration IMAC = interim Maximum Attoweble Concentration

H2S MRL elevated due to sample turbidity.

APPROVÆL:

Results relate only to the perameters rested on the samples submitted.

REPORT OF ANALYSIS

EXUVA ACCUTEST



Claric Payment Group Claric Payment Group										
Project: PH1235 P.O. Number: 7873 P.O. N	llent: Paterson Group 28 Concourse Gale, Unit 1 Nepean, ON						Report Numbe Oate: Date Submitte		2929469 2009-12-03 2009-12-01	
P.O. Number: 7873 P.O. Number: 7873 P.O. Number: 7873 P.O. Number: 7873 P.O. Number: 9. Water	K2E 717 ttention: Mr. Robert Passmore						Project:		PH1236	
Sample Date: 2009-12-01 Sample Date: 2009-12-01 Sample Date: 2009-12-01 Sample Date: 2009-12-01 Sample Date: 2009-12-01 TWZ WST TWZ	WOICE: Paterson Group Inc.						P.O. Number: Matrix:		7873 Water	
Sample Dies 2009-12-01 20	nain of Coatody Number: 1004/3	: Yes ID:	L	764212					GUIDELINE	
Sample ID: TWZ WS1 TW2 WS2 TW2 W		Sample Date:	_	2009-12-01		:				
PARAMETER UNITS MRL 0 0 0 MAC 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Sample ID:		TW2 WS2		ı			ODWSOG	
WAG 0 0 0 WAG 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	PARAMETER	-						TYPE	LIMIT	UNITB
OFU/100mL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Ļ,	0	٥				MAC	O 1	CFL//100ml
Sunt CFW/mL >500 >500 CFW/100mL 0 0 0 CFW/100mL 0 0 0 O O O O O O O O O O O O O O O O	scherichie Coll	CFU/100mt.	0	٥				WAG	•	CFU/100m
CFU/100mL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	eterofrophic Plate Count	CFU/1mL	>200	00s*		-				
O O O	secal Coliforns	CFU/100mL	0	0		•				
	secal Streptococcus	CFU/100mL	•	0						
								_		
		-								
					_					
		-				-				
										_
		_								
		-								

MPL = Method Reporting Limit INC = Incomplete AO = Assignate Objective OG = Operational Guideline MAC = Maximum Allowable Concernation IMAC = Infertin Maximum Allowable Concernation Comment:

APPROVAL: Krista Quantifil Krista Quantifil Drinking Water Coordinator

Results relate only to the parameters tested on the samples submitted.

1 of 1

REPORT OF ANALTOIS

Client: Paterson Group						Repor	Report Number:	20.5	2929470	
ZB Concourse Gate, Unit 1 ZB Concourse Gate, Unit 1						Date:	Date Submitted:	¥ %	2009-12-01	
KZE / I / Attention: Mr. Robert Passmore						Project:	÷	₫	PH1236	
INVOICE: Paterson Group Inc.						P.O. Nu	P.O. Number:	22.3	7873 Water	
Chain of Custody Number: Tubs/4		200	704040	110172		YINDW	 -	: c	ALIDEI ME	
	ď	Carrie Date:	2000-12-01	2000 12.01			<u> </u> 	1	UIDELING	
	E or	Sample ID:	TWS WS!	TW2 WS2				J	ODWSOG	
PARAMETER	STINO	MRL					F 	TYPE	LIMIT	UNITS
Alkalinity as CaCO3	J/Gш	20	212	213				g	200	πg/L
Chlande	J/gE	-	153	53			_	 9	260	Tage/L
Colour	TCE	N	4	7	_		_	- Q	цэ	<u>당</u>
Conductivity	uS/cm	un	1500	1480	_					
Dissolved Organic Carbon	mg/L	0.5	6.0	0.9			_	Q :	uc.	
Fluoride	mg/L	0	1.94	1.96			≥ `	<u>ي</u> چ ج	رن دن ز	16 T
Hydrogen Sulphide	щgЛ	90	4 0,0 1	60.0 10.0			_	 0	0.02	
N-NH3 (Ammonia)	Tig/L	0.02	0.20	0.19				٠.	•	1
N-NO2 (Nitrite)	ш <u>а</u> ,	<u> </u>	0.00	40.10 40.10			ē 2		3 5	J 6
N-NG3 (Nitrate)	7/BE	5	2.5 2.8	8.18 8.18	_			_	6.5-8.5	J
Phenois	mg/L	0.001	<0.001	40.00	•					
Sulphate	mg/L	-	295	287	_		_	Q A	280	mg/L
Tannin & Lignin	mg/L		0.1	£.05						
Total Dissolved Solids (COND - CALC)	mg/L	ıo	975	962				<u>۔</u> و	200	76E
Total Kjeldahi Nitrogen	Hg/L	. .	0.24	0.23					•	Ē
Turbidity	אור אור		/:0	£ 6				٠ ا	5. 5) = 2
Hardness as CaCO3	E E	- 60	69	197		_		 }	3	
Calcium	mg/L	-	33	33	_					-
Magnesium	mg/L	-	19	18		_				
Polassiva	mg/L	-	ıç.	ĸ		_				
Sodium	mg/L	2	272	286			•	40	200	mg/L
Iron	ng/L	0.03	<0.03	<0.03			_	9	0.3	mg/L
Manganese	mg/L	0.01	-0.01	<0.04			۹. 	<u> </u>	0.05	—————————————————————————————————————
					•				-	
	-						_		_	
	4			0 111	C 144		The Contraction	3		

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Altowable Concentration IMAC = Interim Maximum Alfowable Concentration Continent:

Results relate only to the parameters tested on the samples submitted.

EXUVA ACCUTEST

REPORT OF ANALYSIS

=	
EXOVQ Accutest	

UNITS CFU/100mL CFU/100mL 2929599 2009-12-07 2009-12-03 GUIDELINE ODWSOG LIMIT PH1236 00 Water 7873 MAC MAC MRL = Method Reporting Linit INC * Incomplete AO = Aesthelic Objective GG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Intertin Maximum Allowable Concentration Report Number: Date Submitted: P.O. Number: Project: Matrix: 2009-12-02 TW3 WS2 764595 00200 2009-12-02 TW3 WS1 784594 Sample Date: Sample ID: LAB ID: 뚪 CFU/100mL CFU/100mL CFU/1mL CFU/100mL UNITS PARAMETER Chain of Custody Number: 108474 28 Concourse Gate, Unit 1 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Heterotrophic Plate Count Client: Paterson Group Nepean, ON Faecal Sinaplococcus K2E 7T7 Faecal Coliforms Escherichia Coli **Fotal Coliforms**

Comment:

Results relate only to the parameters tested on the samples submitted **Gragana** Dzeletovic Microbiology Analyst APPROVAL:

FXCVC | | Accutest

Ollant: Detector Group						Report Number:	umber:	2929600	
28 Concourse Gate, Unit 1						Date:	j	2009-12-07	
Nepean, ON						Data Submitted	mitted:	50-21-6007	
K2E 717 Attention: Mr. Robert Passmore						Project:		PH1236	
INVOICE: Paterson Group Inc.						P.O. Number:	iber:	3	
Chair of Custody Number: 108474						Matrix:		water	
		ig ay	764596	764597			-	GUIDELINE	
	San	Sample Date:	2009-12-02	2009-12-02			Ţ		_
-	.₩	Sample ID:	TW3 WS1	TW3 WS2		-	-	ODWSOG	<u>.</u>
	Í						 		SEINI
PARAMETER	UNITS	Z L							2120
Alveliaity as CaCO3	mg/L	ις.	244	244	-		8	200	mg/l.
Chloride Carolina and Carolina	7 E	Ψ-	304	305		_	Q Q	7220	ш9/Г
Colour	<u></u> ₹.	2	9	ιΩ			Q —	ďς	200
Conductivity	E3/Sn	10	2730	2780		_			, i
Dissolved Organic Carbon	mg/L	0.5	1.7	1,6			₹ 2	o ;	1 E
Fluoride	Т9Л-	0,1	0.61	0.63			MAC	d. 6	1/6# #2%
Hydrogen Sulphide	щg/L	0.0	. 0.1	€0.04	_		₹	3	- - - -
N-NH3 (Ammonia)	g Z	0.02	0.46	0.46				5	ţ.
N-NO2 (Nitrie)	πg/L	0.7	6 .46	<0.10 <0.10				2 5	֝֞֝֝֝֞֝֝֞֝֝֓֓֞֝֞֝֓֓֓֞֝֞֝֓֓֓֞֝֞֝֓֓֞֝֓֓֞֝
N-NO3 (Nihata)	mg/L	1.0	<0.10	°,5		_	Ž	8 7 8 5) 2
Ha			7.68	7.93				200	
Phenols	mg/₹	0.001	<0.001	€ 0.001			4	, L	line.
Sulphate	πgγ	- ;	768	784			-	3	j 1
Tannin & Lignln	Д И	<u>-</u>	0.2	0.4			- V	580	mod
Total Dissolved Solids (COND - CALC)	₩ 1/6 1/6	ıo j	2180	0777		_	-	}	ļ ģ
Total Kjeldahl Nitrogen	e i	- 0.7	0.0 0.0	0.64			MAC	1,0	N DI
Turbídity) Y	Ξ,	19.4	. PO			ပို	100	μα/L
Hardness as CaCO3	Jô E	- 5	980	180			-	1	,
Ion Balance	ľoe	3 -	173	173.	_				_
Calcum	Vol.		95	63		_			
	, c	•	. es	00	-				
Polassium	, E	. 2	345	340			V	200	J/Bw
Souland	mg/L	0.03	1.55	90:0	-		Q —	0.3	J⁄gш
Management	, <u>6</u>	0.0	0.04	0.03	_		Q —	0.05	mg/L
Desiration of the second of th	,								
					_				
		•							
-									
						-	=]	

MRL = Metbod Reporting Linit INC = Incomplete AD = Assilveto Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment: 764596; H2S MRL elevated due to sample turbidity.

Results relate only to the parameters tested on the samples submitted,

EXOVA ACCUTEST

REPORT OF ANALYSIS

EXOVQ Acculesi

2930081 2009-12-09 2009-12-08 PH1236 7875 Date: Date Submitted: Report Number: P.O. Number: Project: Client: Paterson Group 28 Concourse Gate, Unit 1 Napsean, ON K2E 7T7 Chain of Custody Number: 105473 Attention: Mr. Robert Pasamore INVOICE: Paterson Group Inc.

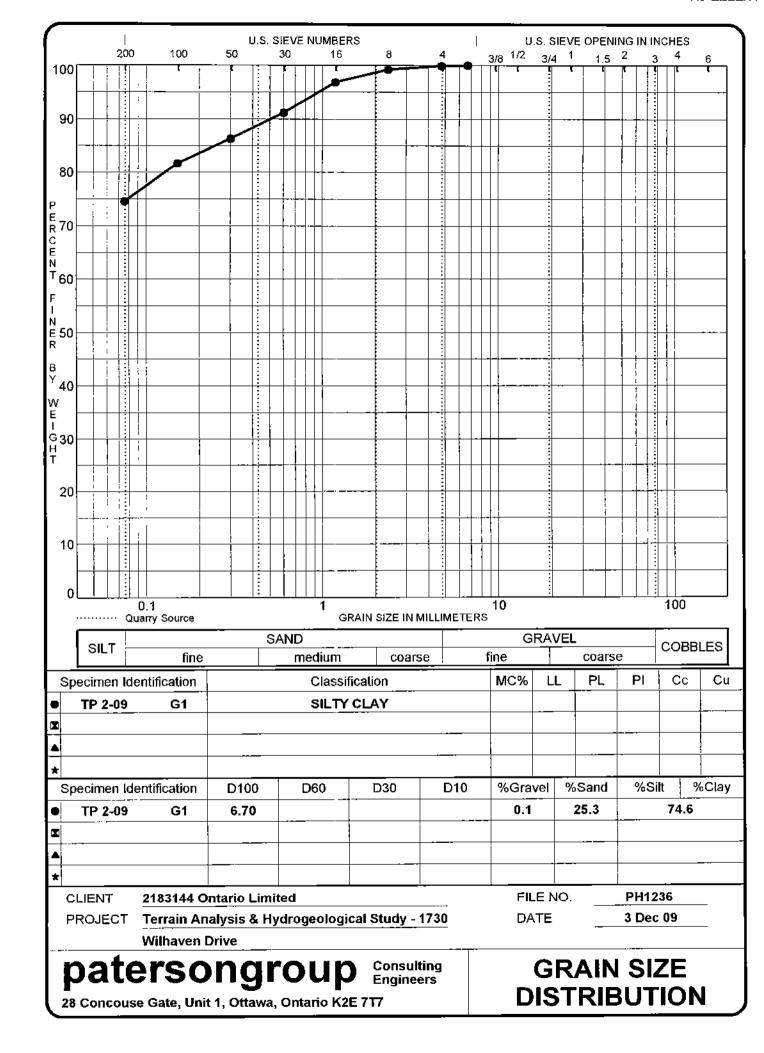
Citain of Custody Number: 105473						Matrix:		Water	
		<u>:</u>	765939	765940				GUIDELINE	
	ERS	Sample Date:	2009-12-08	2009-12-08					
	<i>.</i>	Sample ID:	HW WS1	HW WS2				ODWSOG	
PARAMETER	SLINO	MRL					TYPE	LIMIT	LINITS
Alkalinity as CaCO3	mg/l.	ĸ	257	258			8	200	Pow
Chloride	mg/L	_	24	22			QV CV	250	n E
Colour	D)	7	7	8			Q Q	<i>ي</i> {) - - -
Conductivity	uS/cm	ď.	580	587			?	·	3
Dissolved Organic Carbon	mg/L	0.5	1.6	1,3			Q¥	ĸ	Đợc Đ
Fluoride	mg/L	1.0	0.11	0.11	_		MAC	<u>پ</u>	100
Hydrogen Sulphide	mg/L	0.01	90.0	0.01			OV .	900	
N-NH3 (Ammonia)	79V	0.02	<0.02	90'0			!		j D
N-NO2 (Nilrite)	щgуľ	0.1	0.10	0.10			MAC	1.0	ma/L
N-NO3 (Nilrate)	76E	0.1	~0.10	0.10			MAC	10.0	Volume.
			7.74	7.76			!	8.5-8.5	b
Phenois	√gш	0.001	<0.001	<0.001					
Sulphate	mg/L	-	19	20			Q	500	ψυw
Tannin & Lignin	1/6	0.1	¥0.1	¢0.1				}	i D
Total Dissolved Solids (COND - CALC)	mg/L	מ	377	382			9	200	ma/i
Total Kjeldahi Nitrogen	1/0E	0.1	<0.10	<0.10				}) h
Turblaity	JĘ.	6.1	15.1	6.7		_	MAC	-	Ė
Hardhess as CaCO3	J/gr	-	274	277			8		TO THE
lon Balance		0.01	0.92	0.82			- -	}	,
Caldum	mg/L	-	8	91					
Magnesium	щgЛ	-	12	12	_				
Potassium	mg/L	-	2	24					
Sodium		7	4	4			Q¥	200	900
lion lion	mg/L	0.03	0.78	0.50			2	200	, e
Manganese	mg/L	0.01	0.04	0.04			¥Q.	0.06	
	_	_							
	_	_							
				,			_		
		_							_

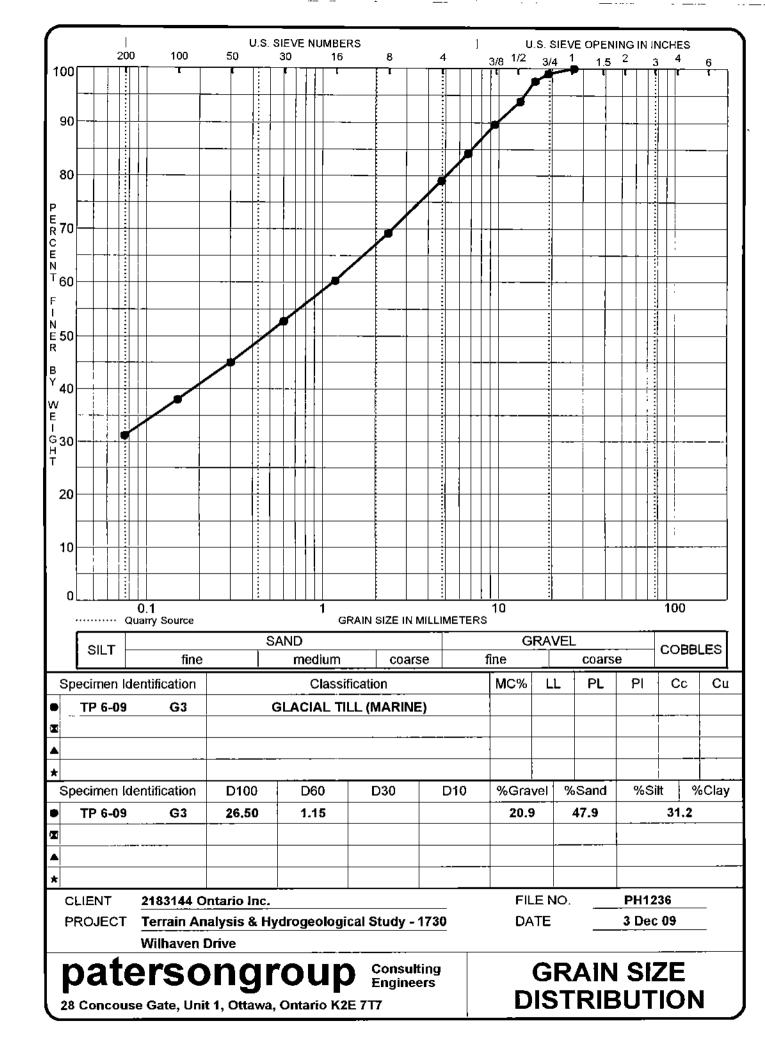
MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Meximum Allowable Concentration IMAC = Interfin Maximum Allowable Concentration Comment:

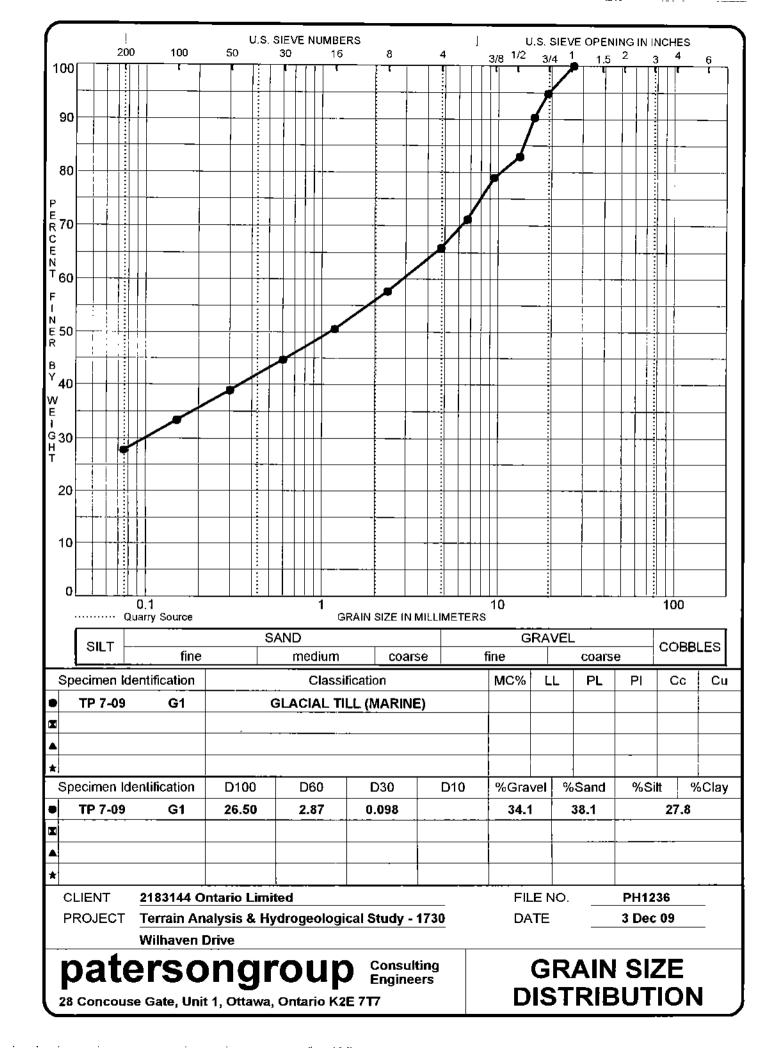
nistae Supervisor APPROVAL

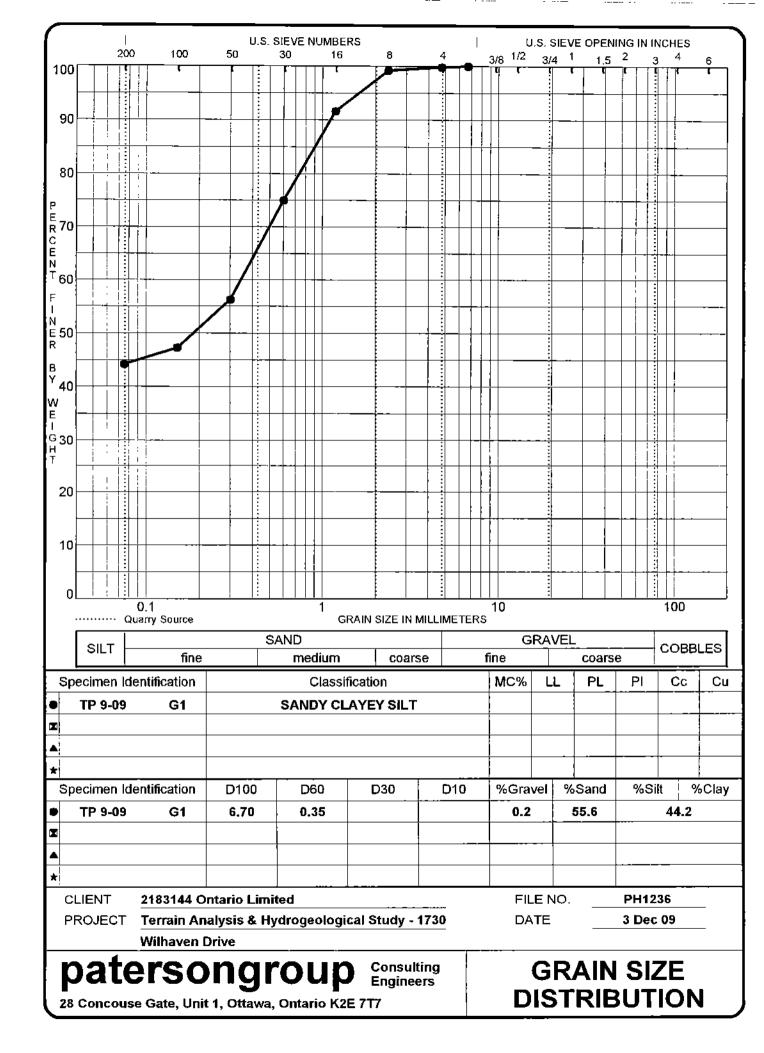
Results relate only to the parameters tested on the samples submitted.

1 of 1





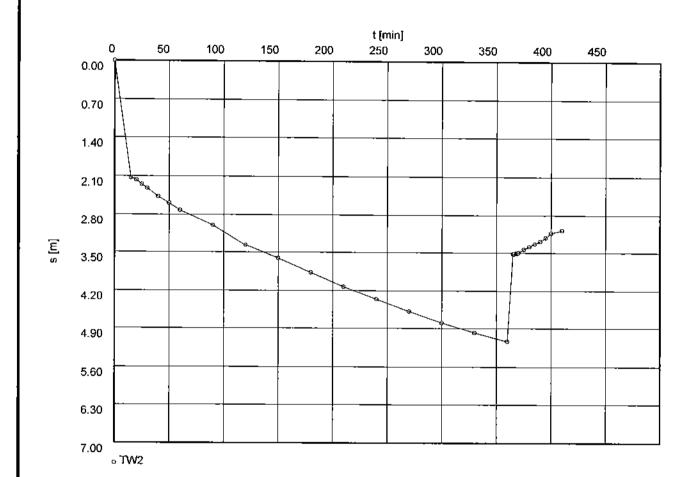




APPENDIX 4

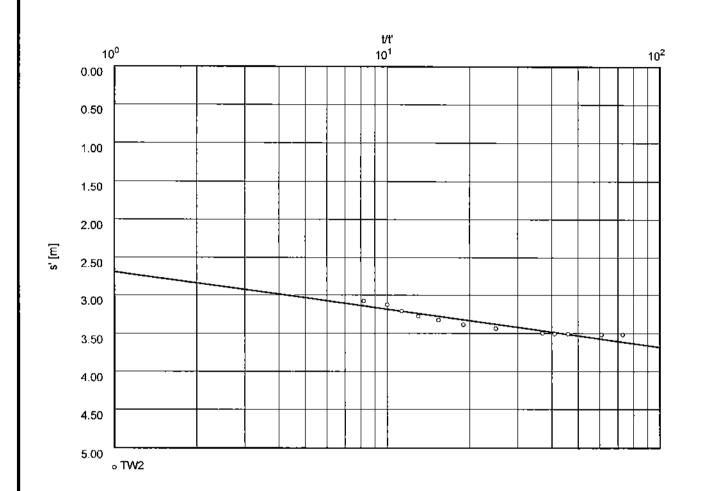
☐ AQUIFER ANALYSIS DATA FOR TEST WELLS

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo, Ontario, Canada ph. (519)746-1798	Pumping test analysis Time-Drawdown plot	Date: 07.12.2009 None, Page 1 Project: PH1236 Evaluated by: RAP
Pumping Test No. 1	Test conducte	ed on: Dec.3, 2009
TW2		
Discharge 0.32 l/s		



Wate	rloo Hydrogeologic	Pumping test analysis		Date: 07.12.2009	None, Page 2
	olumbia St. W.	Time-Drawdown plot		Project: PH1236	<u> </u>
	9)746-1798			Evaluated by: RAP	<u> </u>
Pump	ing Test No. 1	<u> </u>	Test conducted on: D		
TW2					
	arge 0.32 l/s				
	-				
Static	water level: 52.070 m below datum				
	Pumping test duration	Water level	Drawdov	vn	
i	[min]	[m]	[m]		
1	0.00	52.070		0.000	
2	15.00	54.200		2.130	
3	20.00	54.240		2.170	
4	25.00	54.320		2.250	
5	30.00	54.390		2.320	
6	40.00	54.540		2.470	
7	50.00	54.660		2.590	
8	60.00	54.790		2.720	
	90.00	55.070		3.000	-
10 i	120.00 150.00	55.440 55.680	 	3.370 3.610	
12	180.00	55.940	-	3.870	 .
13	210.00	56.200	-	4.130	
14	240.00	56.430		4.360	 -
15	270.00	56,660		4.590	
16	300.00	56.870		4.800	
17	330.00	57.050	 	4.980	
18	360.00	57.210	1	5.140	
19	365.00	55.590		3.520	
20	366.00	55.590		3.520	
21	368.00	55,580		3.510	
22	369.00	55.580		3.510	
23	370.00	55.570		3.500	
24	375.00	55.510		3.440	
25	380.00	55.460		3.390	
26	385.00	55.400		3.330	
27	390.00	55.350	-	3.280	
28 29	395.00 400.00	55.280 55.200		3.210	
30	410.00	55.150		3.130 3.080	· - · · · · · · · · · · · · · · · · · · ·
30	410.00	55.150	+	3.000	
			 		· · · · · · · · · · · · · · · · · · ·
				 -	<u>.</u>
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Waterloo Hydrogeologic 180 Columbia St. W.	Pumping test analy Recovery method a		Date: 07.12.2009 None, Page 1
Walerloo,Ontario,Canada	THEIS & JACOB		Project: PH1236
ph.(519)746-1798	Confined aquifer		Evaluated by: RAP
Pumping Test No. 1	·	Test conducte	ed on: Dec.3, 2009
TW2			
Discharge 0.32 l/s		_	
		Pumping test	duration: 360.00 min



Transmissivity [m²/min]: 7.09×10^3

Wate	erloo Hydrogeologic olumbia St. W.	Pumping test analysi	s	Date: 07.12.2009	None, Page 2	
	Olumbia St. VV. po,Ontario,Canada	Recovery method aft THEIS & JACOB	ter Project: PH		-	
))746-1798	Confined aquifer		<u>, </u>		
Pump	ing Test No. 1		Test conducted on: Dec.3, 2009			
TW2	TW2		TW2		-	
Disch	arge 0.32 l/s	-				
Static	water level: 52.070 m below datum	·	Pumping test duration	n: 360.00 min		
-	Time from	Water level	Residu	al		
	end of pumping		drawdov	wn		
_	[min]	[m]	[m]			
1	5.00	55.590		3.520		
3	6.00	55.590		3.520		
4	8.00 9.00	55.580 55.580		3.510 3.510		
5	10.00	55.570		3.500	-	
6	15.00	55.510		3.440		
7	20.00	55.460		3.390		
8	25.00	55.400		3.330		
9	30.00	55.350		3.280		
10	35.00	55.280		3.210		
11 12	40.00 50.00	55.200 55.150		3.130 3.080		
12	30.00	33.130		3.000		
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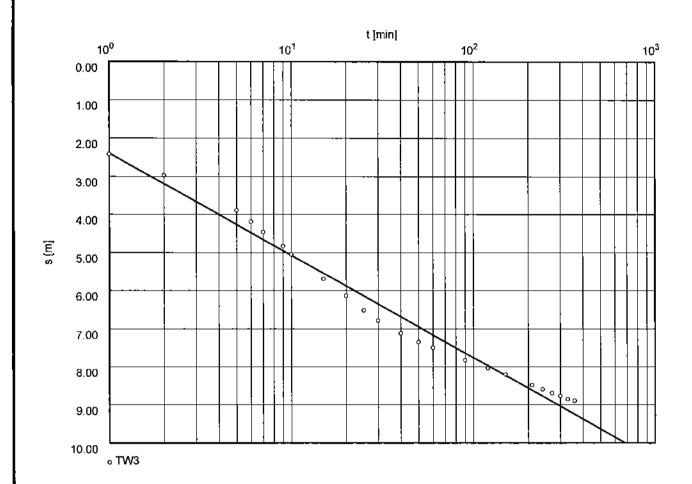
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Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer		Project: PH1236 Evaluated by: RAP	
Pumping Test No. 1		Test conducted on: Dec. 2, 2009		
TW3				
Discharge 0.25 l/s				



Transmissivity [m²/min]: 1.02 x 10⁻³

Storativity: 2.97 x 10⁻⁴

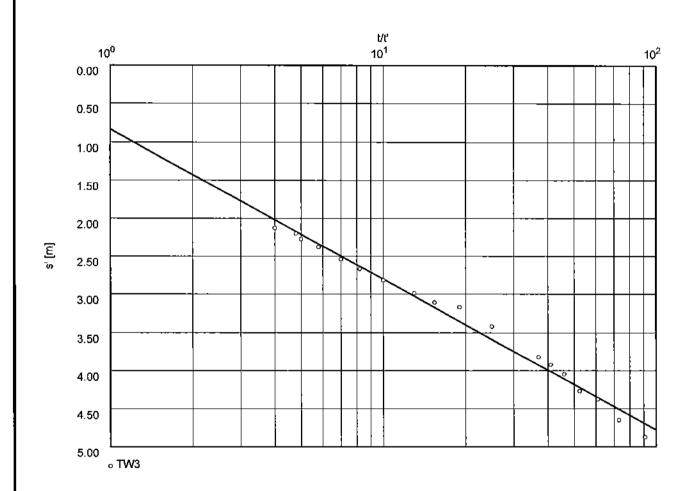
Waterloo Hydrogeologic Pumping test analys 180 Columbia St. W. Time-Drawdown-me		is	Date: 08.12.2009	none, Page 2	
	Columbia St. W. Do,Ontario,Canada	Time-Drawdown-met			
	9)746-1798	Confined aquifer		Evaluated by: RAF	,
Pump	ing Test No. 1		Test conducted ол:	Dec. 2, 2009	
TW3			TW3		
Disch	arge 0.25 l/s		Distance from the po	umping well 1.000 m	
Static	water level: 53.630 m below datum			-	
	Pumping test duration	Water level	Drawdo	wn	
	[min]	[m]	[m]		
		1-4			
2	1.00	56.050		2.420	-
3	2.00	56.600		2.970	
4	5.00	57.530		3.900	
5	6.00	57.820		4.190	
6	7.00	58.090		4.460	
7	9.00	58.460		4.830	
8	10.00	58.680		5.050	
9	15.00	59.330		5.700	
10	20.00	59.770		6.140	
11	25.00	60.150		6.520	
12	30.00	60.420			
13	40.00	60.750			
14 15	50.00 60.00	60.970 61.120	· · · · · · · · · · · · · · · · · · ·		
16	90.00	61.460	1		
17	120.00	61.670			
18	150.00	61.840			
19	210.00	62.120	. 1	8.490	
20	240.00	62.230		8.600	
21	270.00	62.330		8.700	
22	300.00	62.400		8.770	
23	330.00	62.490		8.860	
24	360.00	62.530		8.900	
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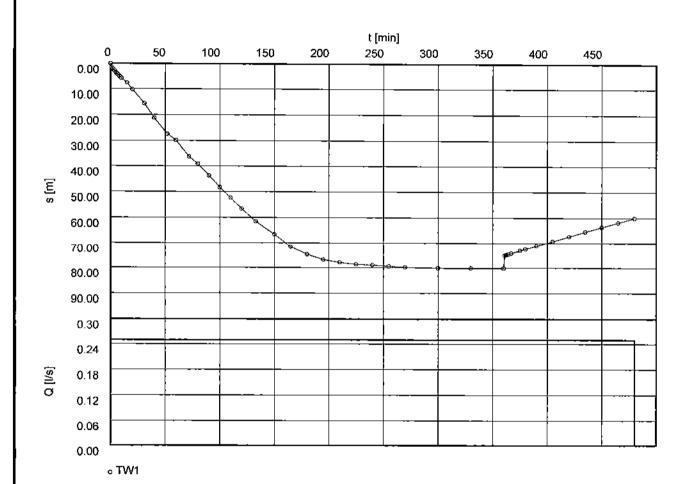
Vaterloo Hydrogeologic Pumping test analys 80 Columbia St. W. Recovery method at THEIS & JACOB vaterloo,Onlario,Canada THEIS & JACOB Confined aquifer			Date: 08.12.2009 none, Page 1 Project: PH1236 Evaluated by: RAP		
Pumping Test No. 1	Test conducted on: Dec. 2, 2009				
TW3					
Discharge 0.25 l/s					
<u> </u>		Pumping test duration	 on: 360.00 min	-	



Transmissivity [m²/min]: 1.39×10^{-3}

Moto	erloo Hydrogeologic	Bumping test analysis		Date: 08.12.2009	none, Page 2	
180 Columbia St. W. Recovery meth		Pumping test analysis Recovery method after			none, Fage 2	
	oo,Ontario,Canada	THEIS & JACOB		Project: PH1236	oject: PH1236	
)/746-1798 	Confined aquifer	<u></u>	Evaluated by: RAP) 	
Pump	ing Test No. 1		Test conducted on: I	Dec. 2, 2009		
TW3			TW3			
Disch	arge 0.25 l/s		Distance from the pu	mping well 1.000 m	<u> </u>	
Static	water level: 53.630 m below datum		Pumping test duration	n: 360.00 min		
	Time from	Water level	Residu	al .		
	end of pumping		drawdov	wn.		
	[min]	[m]	[m]			
1	4.00	58.500		4.870		
2	5.00	58.280		4.650	<u>-</u>	
3	6.00	58.010		4.380		
4	7.00	57.900		4.270		
5	8.00	57.680	<u> </u>	4.050		
6	9.00	57.550		3.920		
7	10.00 15.00	57.450 57.050		3.820 3.420		
9	20.00	56.800		3.420		
10	25.00	56.740		3.110		
11	30.00	56.620		2.990		
12	40.00	56.450		2.820		
13	50.00	56.300				
14	60.00	56.170		2.540		
15	75.00	56.010				
16	90.00	55.900	2.270			
17	95.00	55.830				
18	120.00	55.760	760 2.130			
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Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada	Pumping test analysis Time-Drawdown plot with discharge	Date: 08.12.2009 none, Page 1 Project: PH1236		
ph.(519)746-1798		Evaluated by: RAP		
Pumping Test No. 1	Test conduct	Test conducted on: 03.12.2009		
TW1				
Discharge 0.25 l/s				



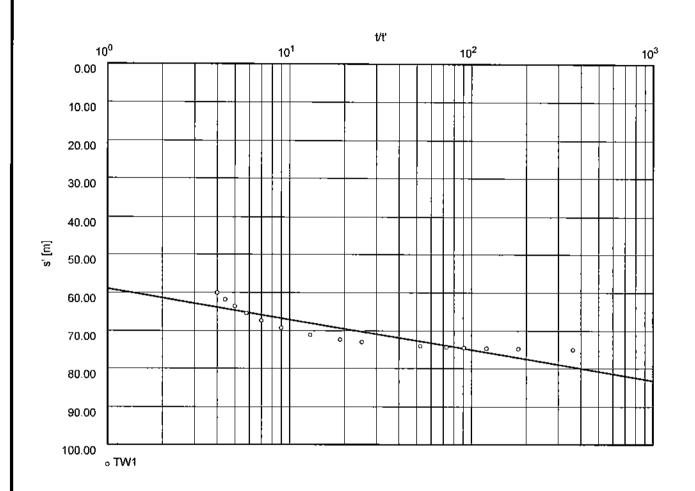
Waterloo Hydrogeologic 180 Columbia St. W.		Pumping test analysis Time-Drawdown plot with discharge		none, Page 2		
Waterloo,Ontario,Canada						
ph.(519)7 46- 1798			Evaluated by: RAI	Evaluated by: RAP		
Pumping Test No. 1		Test conducted on: 03.12.2009				
TW1		TW1				
Discharge 0.25 l/s		Distance from the pumping well 1.000 m				
Static water level: 1.320 m below datum	n	·				
Pumping test duration	Water level	Ι	Traudoum			

	Pumping test duration	Water level	Drawdown	
	[min]	[m]	[m]	
1	0.00	1.320	0.000	
2	1.00	2.910	1.590	
3	2.00	3.410	2.090	
4	3.00	3.990	2.670	
5	4.00	4.380	3.060	
6	5.00	4.990	3.670	
7	6.00	5.480	4.160	
8	7.00	5.920	4.600	
9	8.00	6.440	5.120	
10	9.00	6.850	5.530	
11	10.00	7.280	5.960	
12	15.00	9.080	7.760	
13	20.00	11.640	10.320	
14	31.00	16.990	15.670	
15	40.00	22.600	21.280	
16	52.00	28.730	27.410	
17	60.00	31.220	29.900	
18	72.00	37.610	36.290	
19	80.00	40.430	39.110	
20	90.00	45.060	43.740	
21	100.00	49.640	48.320	
22	110.00	53.690	52.370	
23	120.00	57.960	56.640	
24	133.00	62.870	61.550	
25	150.00	67.900	66.580	
26	165.00	72.970	71.650	
27	180.00	76.030	74.710	
28	195.00	78.160	76.840	
29	210.00	79.270	77.950	
30	225.00	80.100	78.780	
31	240.00	80.330	79.010	
32	255.00	80.810	79.490	
33	270.00	81.110	79.790	
34	300.00	81.510	80.190	
35	330.00	81.510	80.190	
36	360.00	81.510	80.190	
37	361.00	76.440	75.120	
38	362.00	76.210	74.890	
39	363.00	76.050	74.730	
40	364.00	75.910	74.590	
41	365.00	75.800	74.480	
42	367.00	75.500	74.180	
43	375.00	74.400	73.080	
44	380.00	73,740	72.420	
45	390.00	72.470	71.150	
46	405.00	70.550	69.230	
47	420.00	68.620	67.300	
48	435.00	66.710	65.390	
49	450.00	64.910	63.590	

Waterloo Hydrogeologic 180 Columbia St. W.		Pumping test analysis Time-Drawdown plot with discharge		Date: 08.12	.2009	none, Page 3		
180 Columbia St. W. Waterloo,Ontario,Canada					Project: PH1236			
ph.(51	9)746-1798			Evaluated by: RAP				
Pump	oing Test No. 1			Test conducted	on: (3.12.2009		
TW1				TW1				
Disch	arge 0.25 l/s			Distance from the	те ри	mping well 1	.000 m	
Statio	water level: 1.320 m below datu	ım						
	Pumping test duration	-	Water level	Dra	wdov	vn]	
	[min]		[m]		[m]			
51	480.00		61.400		<u>[[]]</u>	60.080	_	 -
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Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Onlario,Canada	Pumping test analysi Recovery method aft THEIS & JACOB		Date: 08.12.2009 none, Page 1 Project: PH1236		
ph (519)746-1798	Confined aquifer		Evaluated by: RAP		
Pumping Test No. 1		Test conducted on: 03.12.2009			
TW1					
Discharge 0.25 l/s					
		Pumping test dura	tion: 360.00 min		



Transmissivity [m²/min]: 3.39 x 10⁻⁴

-		 -					
Wate	erloo Hydrogeologic Columbia St. W.	Pumping test analysis		Date: 08.12.2009	лопе, Page 2		
			er	Project: PH1236			
	9)746-1798	THEIS & JACOB Confined aquifer			Evaluated by: RAP		
Pump	ping Test No. 1		Test conducted on:	<u> </u>			
TW1			TW1				
	narge 0.25 l/s						
			Distance from the pu		<u> </u>		
Statio	water level; 1.320 m below datu		Pumping test duration				
i	Time from	Water level	Residu				
	end of pumping	,	drawdov	wn			
1	[min] 1.00	[m] 76.440	[m]	75.120			
2	2.00	76.210		74.890			
3	3.00	76.050		74.730			
4	4.00	75.910		74.590			
5	5.00	75.800	-	74.480			
6	7.00	75.500		74.180			
7	15.00	74,400		73.080	<u> </u>		
8	20.00	73.740		72.420	_		
10	30.00 45.00	72.470 70.550		71.150 69.230			
11	60.00	68.620	_	67.300			
12	75.00	66.710		65.390			
13	90.00	64.910		63.590	<u> </u>		
14	105.00	63.140		61.820			
15	120.00	61.400		60.080	<u> </u>		
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APPENDIX 5

PH1236-3

	FIGURE 1 -	SITE LOCATION PLAN
	FIGURE 2-	TERRAIN UNIT DELINEATION
	FIGURE 3-	BEDROCK MAPPING
u	FIGURE 4-	GRAPHICAL SUMMARY OF WELL HEAD
	TO 7	WATER QUALITY ANALYSIS OF
		TEST WELLS DURING PUMPING TEST
a	TEST HOLE	LOCATION PLAN - Drawing No. PH1236-1
	LOT DEVEL	OPMENT PLAN - Drawing No. PH1236-2
	HYDROGEO	LOGICAL CROSS SECTION - Drawing No.



SITE LOCATION PLAN

ONTARIO TERRAIN ANALYSIS & HYDROGEOLOGICAL STUDY 1730 WILHAVEN DRIVE 2183144 ONTARIO LTD.

Scale: 1:15,000

₽ BA

paterson group

DWD. Des.:

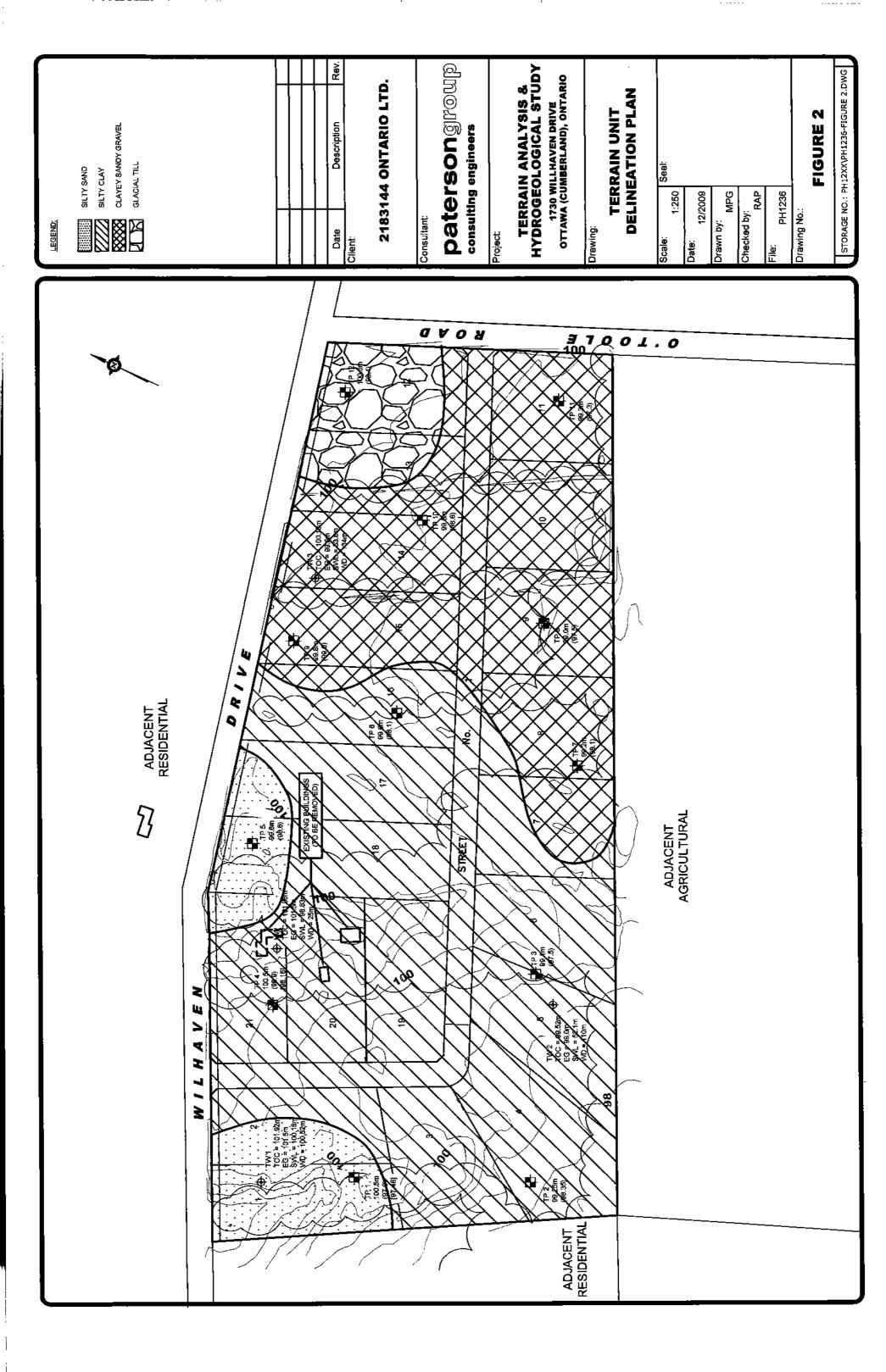
OTTAWA (CUMBERLAND),

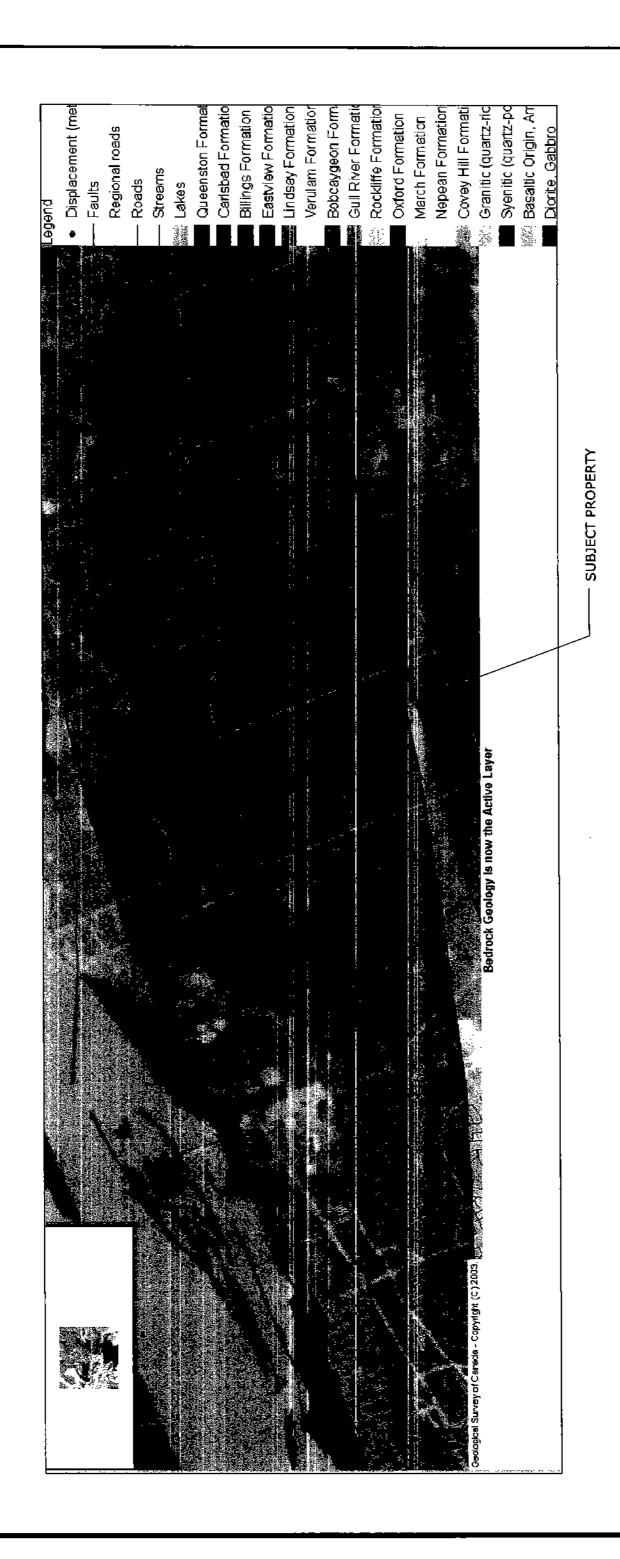
DW9. No. PH1236-FIG1 Report No.; PH1236-REP.02 Date

> Chkd: 28 Concourse Gate, Unit 1, Ottawa, Ontario K2E 717

consulting engineers

PH12XX\PH1736-4.DWG





INFORMATION FURNISHED BY NATURAL RESOURCES CANADA (GEOLOGIC SURVEY OF CANADA 2003 INFORMATION)

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	Des.:	RAP	TERRAIN ANALYSIS & HYDROGEOLOGICAL STUDY	REDUCK
onsulting engineers	Dwn:	BA	1730 WILHAVEN DRIVE	בההאסכור
8 Concourse Gate, Unit 1, Ottawa, Ontario K2E 7T7	Chkd:	RAP	OTTAWA (CUMBERLAND), ONTARIO	

MAPPING

PH1236-FIG3 Report No. PH1236-REP.02

Dwg. No.

PH12XX\PH1236~FIGURE 3.DWG

