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## Hydrogeological Assessment and Terrain Analysis

Proposed Residential Subdivision 1730 Wilhaven Drive Ottawa, Ontario



Prepared For 2183144 Ontario Ltd

August 29, 2016

Report: PH1236-REP.02R2



## **Table of Contents**

1.0	INTRODUCTION	. 1
1.1	Terms of Reference	. 1
1.2	Site Description	. 1
1.3	Legal Description	. 2
1.4	Surrounding Land Uses	. 2
1.1	Proposed Subdivision	. 2
2.0	METHOD OF STUDY	. 4
2.1	Topographic Survey	. 4
2.2	Test Pitting	. 4
2.3	Soil Sampling and Grain Size Analysis	. 4
2.4	Water Well Records	. 4
2.5	Permit to Take Water (PTTW) Search	. 6
2.6	Test Well Construction	. 6
2.7	Pumping Tests	. 9
2.8	Groundwater Sampling	13
2.9	Offsite Well Owner Interviews	13
2.10	) Hydraulic Fracturing	14
3.0	GEOLOGY AND HYDROGEOLOGY	15
3.1	Surficial Geology	15
3.2	Bedrock Geology	15
3.3	Hydrogeology	16
3.3.	1 Conceptual Hydrogeological Model	17
3.3.	2 Hydrogeological Sensitivity	17
3.3.	3 Potential Sources of Contamination	18





3.3.4	Large Water Uses and PTTW Review	19
4.0 A	QUIFER ANALYSIS	. 20
4.1 A	quifer Characteristics	. 20
4.2 W	/ater Quality	. 21
4.2.1	Offsite Well Water Quality	30
4.3 W	/ater Quantity	. 31
4.3.1	Peak Demand Water Use	31
4.3.2	Average Daily Residential Water Use	32
4.3.3	Potential Well Interference	33
5.0 D	EVELOPMENT CONSIDERATIONS	. 34
5.1 F	uture Well Construction	. 34
5.2 S	urface Storage for Low Yield Wells	. 35
5.3 P	otable Water Treatment	. 36
5.4 W	/astewater Treatment and Disposal	. 36
5.4.1	Predictive Nitrate Impact Assessment	37
5.4.2	Sewage System Design	37
6.0 C	ONCLUSIONS	. 40
7.0 R	ECOMMENDATIONS	. 41
8.0 S	TATEMENT OF LIMITATIONS	. 44
9.0 R	EFERENCES	. 45





## **Appendices**

Appendix 1 Soil Profile and Test Data Sheets

Symbols and Terms

Soil Grain Size Analysis Results

Appendix 2 MOECC Water Well Records

Appendix 3 Laboratory Certificates of Analysis - Groundwater

Appendix 4 Aquifer Analysis

Well Interference Model

Nitrate Impact Assessment Calculations

LSI-RSI Calculations

Offsite Well Owner Interviews

Appendix 5 Figure 1 - Site Location Plan

Figure 2 - MOECC Water Well Records

Figure 3 – Overburden Geology Figure 4 - Bedrock Geology

Figure 5 - Test Hole Location Plan

Figure 6 – Cross Section

Figure 7 – Draft Plan of Survey Figure 8 - Lot Development Plan

Report: PH1236-REP.02R2

August 2016 Page iv



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

## **Tables**

Table 1- MOECC Water Well Records Summary	5
Table 2 - Test Wells Summary	g
Table 3 - Pumping Tests Summary	. 12
Table 4 - Downhole Camera Survey	. 14
Table 5 - Summary of Aquifer Characteristics	. 20
Table 6 - Groundwater Geochemistry - Deep Wells	. 22
Table 7 - Groundwater Geochemistry – Shallow Wells (A)	. 25
Table 8 - Groundwater Geochemistry – Shallow Wells (B)	. 26
Table 9 - Groundwater Geochemistry – Metals and PHCs	. 28
Table 10 - Groundwater Geochemistry - VOCs	. 29
Table 11- Groundwater Geochemistry - Offsite Wells	. 30
Table 12- Peak Demand Estimate Comparison	32



### 1.0 INTRODUCTION

Paterson Group (Paterson) was retained by **2183144 Ontario Ltd.** to conduct a hydrogeological investigation and terrain analysis for a proposed rural residential subdivision at 1730 Wilhaven Drive, Cumberland Ontario. The property is situated approximately 2.8 km southwest of the Village of Cumberland, as shown on Figure 1 (Site Location) in Appendix 5.

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

#### 1.1 Terms of Reference

This study was conducted in general accordance with Ontario Ministry of the Environment and Climate Change (MOECC) guidance as follows:

- Guideline D-5: Planning for Sewage and Water Services (August 1996).
- Procedure D-5-4: Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment (August 1996).
- Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (August 1996).

## 1.2 Site Description

The subject property is located approx. 2.8 km southwest of the Village of Cumberland, Ontario, on the south side of Wilhaven Drive (see Figure 1). Existing development at the subject property includes a house, and two outbuildings. The house and outbuildings are located near Wilhaven Drive. Most of the subject property is crop land. A treed area occurs to the south of the house area and extends to the southern property boundary. Narrow tree lines run along most of the site boundary and in rows between the crop fields.

The subject property encompasses a total area of approximately 19.91 Ha, and is gently sloping from west to east across the site. There are several shallow drainage ditches which run north to south. The drainage ditches flow towards the southeast corner of the site to roadside ditches that flow to the south, towards Cardinal Creek.

## 1.3 Legal Description

The following legal description of the subject property was obtained from the City of Ottawa's interactive GIS mapping system, GeoOttawa (<a href="http://maps.ottawa.ca/geoottawa/">http://maps.ottawa.ca/geoottawa/</a>):

- PIN 145320196
- Concession 7 North Part Lots D and E Registered Plan; 50R844 Part 2

### 1.4 Surrounding Land Uses

Surrounding land uses within approx. 500 m of the subject site are described below:

- North
  - Wilhaven Drive right-of-way
  - o Rural residential lots
  - o Forest
- East
- O'Toole Road right-of-way
- Agricultural land (pasture and crop land)
- Agricultural buildings (two sheds)
- o Residential lots
- West
  - Agricultural land (pasture and crop land)
  - Residential lots
  - Wilhaven Drive
- South
  - Agricultural land (crop land)
  - Unused partially cleared land
  - o Forest
  - Farm house and buildings
  - Hydro Easement
  - Hydro substation

All existing development in the area utilizes private individual water supply and sewer system services.

## 1.1 Proposed Subdivision

The proposed residential subdivision will include 21 lots as indicated on Figure 8 (Lot Development Plan). The minimum lot size is 8,043 m<sup>2</sup>, or (i.e. slightly more than 0.8 hectares (Ha)). The lots range in size from 8,043 m<sup>2</sup> to 11,100 m<sup>2</sup>. The average lot size is 8,761 m<sup>2</sup>. The lot sizes are consistent with the current City of Ottawa zoning for the property (City of Ottawa, Official Plan, Rural Designations, 2016).



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

The proposed subdivision will be serviced by individual onsite wells and onsite wastewater treatment systems (OWTS). This form of servicing is consistent with the established hierarchy prescribed in the Ontario Provincial Policy Statement and is consistent with the established neighbouring rural estate lot developments, based on both the planning rationale and Servicing Options Report prepared in support of a Plan of Subdivision Application for the subject property.



### 2.0 METHOD OF STUDY

## 2.1 Topographic Survey

A topographic survey of the site was conducted by Annis, O'Sullivan, Vollbekk Ltd. of Ottawa Ontario in 2009. The survey information was used to develop Figure 8 (Lot Development Plan). A copy of the Plan of Survey is included as Figure 7 in Appendix 5.

## 2.2 Test Pitting

Test pitting was conducted as part of the geotechnical investigation of the site by Paterson (Paterson, 2009). The test pitting program aimed to assess the near-surface terrain at the site. Twelve (12) test pits were excavated at locations across the site using a small track mounted excavator in December, 2009.

The test pits were advanced to depths ranging from 2.34 to 3.83 m below ground surface (bgs). The test pit locations are indicated on Figure 5 (Test Hole Location Plan), located in Appendix 5.

## 2.3 Soil Sampling and Grain Size Analysis

The soil profile at each test pit was logged by direct examination of the sides and bottoms of the test pits. Representative soil samples were recovered from the walls and bottoms of the test pit excavations. All soil samples were initially classified on site, placed in sealed plastic bags and transported to Paterson's Ottawa materials testing laboratory. The depths at which the samples were recovered are shown as G on the Soil Profile and Test Data sheets, attached in Appendix 1.

A total of four (4) soil samples were submitted to Paterson's materials testing laboratory in Ottawa Ontario for grain size analysis. The samples that were submitted were representative of the main soil types that were encountered during the investigation. Grain size analysis results are included in Appendix 1.

#### 2.4 Water Well Records

A review of available MOECC Water Well Records in the vicinity of the site was undertaken as part this study. Water well record information was obtained directly from the MOECC water well records interactive GIS system located at: <a href="http://www.ontario.ca/environment-and-energy/map-well-records">http://www.ontario.ca/environment-and-energy/map-well-records</a>

MOECC water well records that were identified are indicated in Figure 2 (Appendix 5). Overburden thickness, depth of casing, aquifer interception points and reported well yields



were reviewed in detail in order to assist in establishing a hydrogeological conceptual model for the site. A summary is provided in Table 1 below.

Table 1- MOECC Water Well Records Summary

Well Record ID	Year drilled	Depth to BR (m)	Casing depth (m)	Depth to water bearing fractures	Total depth (m)	Recommended pumping rate (L/min)
1531266	2000	2.13	6.10	30.5 53.6	61.9	7
1534621	2004	1.83	3.66	4.3	30.5	23
1534787	2004	1.83	6.71	26.5	67.4	18
1534819	2004	3.05	7.01	27.1 96.9	99.4	36
1536079	2004	1.83	6.71	52.7 89.3	100.0	45
1535083	2004	3.05	6.71	91.7	10 1.5	45
1535703	2005	1.21	6.66	77.3	84.8	23
7 113 105	2008	5.18	6.40	93.6 131.7	134.1	34
1513095	1956	1.83	6.40	21.0	21.0	
15 13 10 0	1970	1.52	6.10	45.7	45.7	18
7100598	2008	3.96	10.67	96.9	152.4	23
7045759	2007	2.13	8.84	83.9 99.7	103.6	41
711538	2008	2.74	13.11	85.3	95.1	23
7129154	2009	3.63	12.12	16.7	15 1.5	23
1512686	1969	2.44	6.10	44.5	44.5	27
1513924	1973	0.00	6.71	33.2	33.2	18
15 17 9 0 9	1982	5.18	6.40	57.9 78.6	82.6	9
1517920	1982	3.66	12.19	57.6	61.0	9
13 17 920	1902	3.00	12.19	64.6	0 1.0	9
1534811	2004	0.61	6.70	84.4	91.7	12
1534818	0004	1.00	7.81	89.3 90.9	98.5	45
1534792	2004	1.80	6.70	66.6	70.1	10
1534792	2004	0.76	6.70	64.0	75.3	42
4500450	2002	0.01	40.00	72.8 121.9	400.5	22
1533452	2002	0.61	12.80		129.5	23
1533134	2002	0.00	12.80	106.7 27.4	128.6	5
15 12 033	1972	0.00	6.71	68.6	88.4	23
				87.2		
1E 10 E 4E	10.70	150	6.40	57.9	73.2	20
15 12 5 15	1972	1.52	6.40	64.0	13.2	36
		<b>†</b>	+	73.2 24.4	-	
15 12 5 16	1972	1.22	5.49	29.0	30.5	27
1512685	1966	0.00	3.96	27.4	48.8	9
15 13 0 9 7	1966	1.22	7.62	34.1	34.1	27
7175488	2011	2.59	6.10	13.4	24.4	1
1512688	1967	1.22	5.18	42.7	42.7	27
1512689	1970	0.30	6.71	67.1 85.3	98.5	23
1533753	2003	0.00	6.10	74.7	74.7	9
7040752	2009	11.58	18.29	54.0 73.2	73.2	0
1513931	1973	1.52	6.71	38.1	38.1	41
1534816	2004	3.40	6.70	65.8	73.1	55
7109809	2004	3.40	9.14	15.0	152.4	2
7222505	0011	2.05	6.40	15.2	15.5.4	44
7233585 1536595	2014 2006	3.65 0.60	6.40 12.00	121.0	155.4 128.0	14 20
7144357	2010	0.00	15.86	56.1 131.8	150.2	



## 2.5 Permit to Take Water (PTTW) Search

A review of the MOECC PTTW database was carried out within a 1 km radius of the site. PTTW information was obtained directly from the MOECC interactive GIS system located at: http://www.ontario.ca/environment-and-energy/map-permits-take-water

Results of the search are discussed in Section 3.3.4 below.

#### 2.6 Test Well Construction

Three (3) test wells (TW1, TW2 and TW3) were constructed in 2009 by Air Rock Drilling Company Ltd. of Richmond, Ontario. These wells were drilled to depths of between 110 to 152 m using air-rotary techniques, and were generally found to have relatively low yields and relatively poor water quality (elevated concentrations of TDS, sodium and chloride).

#### TW1 (not used as a representative test well)

A casing hole (9" or 228 mm in diameter) was advanced into competent limestone bedrock to a depth of 6.2 m below ground surface (bgs). A 6.7 m section of new steel casing (6" or 150 mm diameter) was installed and grouted into the hole. The resultant casing stickup is approximately 0.5 m above ground surface. Paterson inspected the casing installation and grouting process and confirmed that grouting of the annular space was conducted in compliance with Ontario Regulation 903.

An open borehole (6" or 152 mm diameter) was advanced to a total depth of 152.40 m, using rotary <u>air percussion</u> methods. Several water bearing fractures were encountered during drilling of the open borehole. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

#### TW2 (not used as a representative test well)

TW2 was constructed in the same way as TW1. Bedrock was encountered at 3.66 m bgs. Steel casing was advanced into the limestone bedrock to a depth of 6.1 m bgs to ensure an effective seal into competent bedrock. The open borehole was advanced using <u>air percussion</u> techniques to a total depth of 109.73 m bgs. Grouting, well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

#### TW3 (not used as a representative test well)

TW3 was constructed in the same way as TW1. Bedrock was encountered at 3.35 m bgs. Steel casing was advanced into the limestone bedrock to a depth of 6.1 m bgs to ensure an



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

effective seal into competent bedrock. The open borehole was advanced using <u>air percussion</u> techniques to a total depth of 134.11 m bgs. Grouting, well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

**NOTE:** Initial water quality results from TW1, TW2, and TW3 included relatively high concentrations of TDS, chloride, and sodium. It was noted that the water quality and quantity at the existing house well (HW) is significantly better than at the first three test wells. A decision was made at that time to focus on the "upper bedrock aquifer zone" (i.e. poor water quality appears to occur below approximately 70 m depth, so the 'upper bedrock aquifer zone' is defined (for the purposes of this report) as the bedrock aquifer above that depth.

#### TW4 (not used as a representative test well)

The casing hole for TW4 was advanced through the overburden and a further 0.9 m into the underlying bedrock at a total depth of 6.1 m bgs. The open borehole was advanced using <u>cable tool</u> techniques to a total depth of 8.53 m bgs. Water bearing fractures were encountered at 7.16 m bgs. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

#### **TW5**

The casing hole for TW5 was advanced through the overburden and seated approximately 1.1 m into the underlying bedrock with a total depth of 10.2 m bgs. The open borehole was advanced using a <u>cable tool</u> rig to a total depth of approximately 24.38 m bgs. Water bearing fracture zones were encountered at 15.70 m and 22.25 m bgs. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Req. 903.

#### **TW6**

The casing hole for TW6 was advanced through the overburden and seated approximately 4.1 m into the bedrock to achieve a casing depth of 6.1 m below ground surface. The open borehole was advanced with the <u>cable tool</u> to a total depth of approximately 69.19 m bgs. Water bearing fractures were encountered at 16.76 m bgs. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

#### TW7 (not used as a representative test well)

The casing hole for TW7 was advanced through the overburden and seated approximately 3.5 m into the bedrock to achieve a casing depth of 6.1 m below ground surface. The open borehole was advanced using <u>air percussion</u> techniques to a total depth of approximately 24.4 m bgs. A water bearing fracture were encountered at 13.4 m bgs. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

NOTE: This well is relatively shallow and the expected yield (based in the driller's one hour pumping test) is extremely low. The well was not used as a test well for the project. An attempt was made to stimulate the well (see Section 3.10) but further testing was abandoned when favourable results were identified at the other onsite test wells.

#### HW

The MOECC Water Well Record for HW shows that the well was constructed 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 used to seal the annular space.

The open borehole was advanced with 'rotary air drilling' techniques (i.e. <u>air percussion</u>). The well contractor reported grey limestone bedrock with shale interbeds. A water bearing fracture was encountered at a depth of 18.3 m bgs and the total well depth was reported to be 26 m bgs. The well depth was independently measured by Paterson.

Four (3) additional wells (TW4, TW5 and TW6, and TW7) were constructed in 2011 by Saunders Well Drilling Ltd. of Braeside, Ontario. These wells were drilled to depths of between 8 and 69 m using cable tool techniques (NOTE: the nature of cable tool drilling (slow pounding of the formation using the weight of the drill string, and removal of cuttings using a bailer) is known to promote advantageous open fracturing, and is often preferable to rapid percussion drilling which can cause blockage and sealing of fractures in some situations).

MOECC water wells records for the test wells are included in Appendix 2.

#### Offsite Well - 1490 O'Toole

A new drilled well was installed at 1490 O'Toole Road (a recently severed residential lot) in June 2015. This well is located approximately 80 m south of the southern property boundary (see Figure 5). This well was observed by Paterson to be artesian in March 2016.

The casing hole for the '1490 O'Toole' well was advanced through the overburden and seated approximately 7.6 m into the bedrock to achieve a casing depth of 12.12 m below ground surface. The open borehole was advanced using 'rotary air' techniques (i.e. <u>air percussion</u>) to a total depth of 103.03 m bgs. A water bearing fracture were encountered at 18.2 m bgs. Well development, chlorination and a one hour constant rate pumping test were all carried out according to the requirements of O.Reg. 903.

The following table provides a summary of the available test wells in the vicinity of the site. For the purpose of this study the <u>four most important test wells are TW5, TW6, HW and 1490 O'Toole.</u>

Table 2 - Test Wells Summary

TEST WELLS S	TEST WELLS SUMMARY											
Well Record ID	Year Drilled	Depth to Bedrock (m)	Casing Depth (m)	Depth to Water Bearing Fractures (m)	Total depth (m)	Recommended Pumping Rate (L/min)						
Non-representative Test Wells												
TW1	2009	3.81	6.10	109.7	152.40	4.5						
TW2	2009	3.66	6.10	105.2 107.0	109.73	54.6						
TW3	2009	3.35	6.10	131.1	134.11	27.3						
TW4	2011	5.18	6.10	7.2	8.53	45.5						
TW7	2012	2.59	6.10	13.4	24.38	1.1						
Representativ	e Test We	lls										
TW5	2011	9.14	10.21	15.7 22.3	24.38	22.7						
TW6	2011	1.98	6.10	16.8	69.19	9.1						
HW	2003	4.27	7.92	18.29	25.30	27.3						
1490 O'Toole	2015	3.63	12.12	18.18	103.03	22.0						

## 2.7 Pumping Tests

Pumping tests were conducted sequentially at each test well using the other test wells as observation wells where deemed appropriate. The pumping tests were carried out following full development of each well, began with a static water level and involved pumping at a fixed rate (+/- 5%) for at least six hours. Water levels were measured at the pumping well and observations wells at one minute intervals, and the pumped water was discharged far enough away from the test wells to ensure that artificial recharge did not occur.

Each of the test wells was pumped at a constant rate and was then allowed to recover. The pumping discharge rates were selected to ensure a demonstrable reduction in potentiometric head (i.e. a lowering of the static water levels) within the water supply aquifer



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

being tested. During the pumping test, the pumping rate was monitored at 60 minute intervals in order to ensure that the rate of discharge remained reasonable constant (i.e. < 5% variation).

Drawdown observations during pumping and recovery were recorded using manual measurements taken with an electronic water level tape. Electronic dataloggers (Schlumberger Micro-Diver<sup>TM</sup>) were installed in each test well (and at some observation wells) prior to the each test. Full recovery was monitored using the dataloggers which were not removed from the wells until at least 24 hours after each pumping test.

Turbidity and free chlorine residual measurements were taken using a Hanna HI93414 Fast Tracker portable meter. Testing was conducted in the field at regular intervals during each pumping test. No residual chlorine was detected at the time that the water samples were collected for analytical analyses.

Field measurements of pH, temperature, conductivity and TDS were carried out during each test using an ExtechTM ExStik II portable multi-meter.

All field instruments were calibrated prior to use, and calibration records are retained within the project file.

#### TW1

A pumping test was carried out at TW1 on December 3, 2009. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 11.3 L/min for six (6) hours. The total drawdown was 77.9 m. Recovery was not fully monitored.

#### **TW2**

A pumping test was carried out at TW2 on December 1, 2009. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 18.9 L/min for six (6) hours. The total drawdown was 5 m. 100% recovery was achieved in less than 12 hours.

#### **TW3**

A pumping test was carried out at TW3 on December 2, 2009. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 15.1 L/min for six (6) hours. The total drawdown was 8.4 m. Recovery was not fully monitored.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

#### TW4

TW4 was pumped for six (6) hours on December 15, 2011. Information about the pumping rate and drawdown are not available for analysis. Water samples were collected at 3 and 6 hours.

A pumping test was carried out at TW4 on June 12, 2015. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 114 L/min for six (6) hours. The total drawdown was 0.94 m. 100% recovery was achieved in 1 minute.

#### **TW5**

TW5 was pumped for six (6) hours on December 19, 2011. Information about the pumping rate and drawdown are not available for analysis. Water samples were collected at 3 and 6 hours.

A pumping test was carried out at TW5 on May 11, 2016. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 19 L/min for six (6) hours. The well was then pumped for a further three (3) hours at a rate of 15 L/min in an effort to reduce turbidity. The total drawdown was 4.6 m. 95% recovery was achieved in 21 minutes. A datalogger was also placed in a nearby observation well (1490 O'Toole), but no response to pumping was identified at the observation well.

#### TW6

TW6 was pumped for 22 hours on December 17, 2011. Information about the pumping rate and drawdown are not available for analysis. Water samples were collected at 6 and 22 hours.

A pumping test was attempted at TW6 on January 13, 2016. The well was pumped with an electric submersible pump from Air Rock Drilling at a rate of 18 L/min for six (6) hours. The water level dropped below the datalogger, so the test was abandoned.

On May 5, 2016 the well was pumped at a rate of 9.6 L/min for 3 hours before the water level dropped below the datalogger. The test was abandoned. A datalogger was also placed in a nearby observation well (HW), but no response to pumping was identified at the observation well.

A successful pumping test was carried out on July 8 and 9, 2016. The well was pumped with Grundfos pump (2" sampling pump) from Pine Environmental Canada, at a rate of 2.8 L/min for twenty four (24) hours. The total drawdown was 15.3 m. 95% recovery was achieved in 13 hours.



#### HW

HW was pumped for six (6) hours on December 8, 2009. Information about the pumping rate and drawdown are not available for analysis. Water samples were collected at 3 and 6 hours.

Another pumping test was carried out on May 24, 2016. The well was pumped using the existing electric submersible pump that is installed in the well. A licensed well technician/plumber/electrician from H.O. Smith Plumbing, disconnected the discharge line from the pump and attached a separate discharge line for the pumping test. The well was pumped at a rate of 20 L/min for six (6) hours. The total drawdown was 4.1 m. 95% recovery was achieved in 1.15 hours.

#### 1490 O'Toole

A pumping test was carried out at the well at 1490 O'Toole Road by Kollard Associated Inc. on March 24, 2016 (Kollard, 2016). The well was pumped at 24 L/min for five (5) hours, then the pumping rate was varied (3 to 24 L/min) in order to develop the well and reduce turbidity. The total drawdown was 11.8 m. 95% recovery was achieved in 27 minutes. Further pumping was required (7 hours on March 22) to reduce the concentration of turbidity to an acceptable level.

A summary of pumping tests is provided in the table below.

Table 3 - Pumping Tests Summary

PUM PING TE	STS SUM N	IARY											
Well Record	Test date	Pumping rate	Duration of test	Static water	Drawdow	Recovery (% and	Transmissivity (m²/day)						
ID	rest date	(L/min)	(hours)	level (mbtoc)	n (m)	time)	Pumping	Recovery					
Non-representaive test wells													
TW1	03-Dec-09	11	6	1.32	77.85	33% in 2 hours	0.1	insufficient data to calculate					
TW2	01-Dec-09	19	6	52.20	5.01	62% in 7 hours and 100% in <12 hours	1.5	insufficient data to calculate					
TW3	02-Dec-09	15	6	54.12	8.41	80% in 8 hours	1.5	2.0					
TW4	12-Jun-15	114	6	0.82	0.94	100% in 1 minute	86.4	1620					
Representaiv	e test wells	•			•	•	•	•					
TW5	11-May-16	19	8	0.37	4.63	99% in 16 minutes	2.6	1.4					
TW6	08-Jul-16	3	24	4.56	15.34	95% in 13 hours	0.02	0.2					
HW	24-May-16	20	6	3.20	4.14	95% in 1.16 hours	14.3	8.2					
1490 O'Toole	16-Mar-16	24	24	0.6	11.8	95% in 27 mins	146.0	13.0					



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

## 2.8 Groundwater Sampling

Groundwater samples were collected at the midpoint and at the end of each pumping test. Prior to collection of the pumping test water samples, the free chlorine residual was verified to be non-detectable using field test equipment.

Two (2) offsite water supply wells were also sampled as part of the investigation. The locations are indicated on Figure 5 (Test Hole Location Plan) in Appendix 5. Well owner interviews were conducted at the time of sampling the offsite wells.

All groundwater samples were submitted for comprehensive testing of bacteriological, chemical and physical water quality parameters consistent with standard 'Subdivision Water Supply' suite of parameters.

The final groundwater sample from TW5 was also submitted for analysis of 'RVCA recommended metals' and phosphate.

The final groundwater sample from HW was also submitted for analysis of 'RVCA recommended metals', phosphate, petroleum hydrocarbons (PHCs), and volatile organic compounds (VOCs).

All samples were collected unfiltered and unchlorinated and were placed directly into clean bottles supplied by the analytical laboratory. Samples were placed immediately into a cooler with ice and were transported directly to the Exova laboratory in Ottawa. All samples were received by the laboratory within 24 hours of collection.

Exova is fully accredited by the Canadian Association for Laboratory Accreditation (CALA) having received a Certificate of Laboratory Proficiency in 1991 (CALA Registration Number 2602). Exova has ISO 17025 accreditation (Standards Council of Canada) and is fully accredited for Ontario Safe Drinking Water Act (OSDWA) testing.

#### Offsite Well Sampling

Offsite water samples were collected at 1753 Wilhaven Drive and at 1865 Wilhaven Drive (see Figure 2 for locations) on July 7, 2016. The sample was submitted to EXOVA Ottawa for analysis of the standard 'subdivision water supply' suite of parameters (see Section 4.2.1 for a discussion of the results).

#### 2.9 Offsite Well Owner Interviews

An attempt was made to interview neighbouring well owners about their well and septic systems. A standard form was used to conduct each brief interview. The form includes

standard questions about the well location, water quality, water quantity and potential environmental concerns. Well owner interview log sheets are included in Appendix 4.

## 2.10 Hydraulic Fracturing

Hydraulic fracturing (also known as hydro-fraccing, or fraccing) is a well stimulation technique in which bedrock is fractured by a pressurized liquid. The process involves the high-pressure injection of 'fracking fluid' (in this case clean water) into a wellbore to open up fractures through which groundwater will flow more freely) was conducted by Outaouais Well Fracturing of Greely, Ontario. Hydraulic fracturing was completed on two wells (TW6 and TW7) on June 14, 2016.

A downhole camera survey of the each well was carried out before and after the well pressurization (fraccing) sequence. The following table provides a summary of the fractures that were identified.

Table 4 - Downhole Camera Survey

DOWNHOLE CA	MERA SURVEY OF FRACTURES
Depth (m btoc)	Description
TW6	
6.86	bottom of casing to bedrock
10.67	large empty void with no water entry
17.98	annulus fracture (1st water production area following hydrofracturing)
23.93	small fracture/void
29.87	small fracture
35.05	small fracture
41.45	small fracture
49.99	borehole rough
69.19	bottom
TW7	
6.89	bottom of casing
8.53	small fracture
14.33	small fracture
19.51	slight fracture (1st water production area following hydrofracturing)

Hydraulic fracturing was carried out using a truck mounted 'fraccing rig' comprised of a 11,000 L water tank, six metric tonne crane, high pressure fraccing pump (heavy duty triplex piston pump and gear transfer box capable of producing 5000+ psi of water pressure, at up to 200 IGPM), and a twin packer downhole assembly.

The hydraulic fracturing sequence at each well involved pressurization of sections of the well where fractures were identified by the downhole camera survey.

## 3.0 GEOLOGY AND HYDROGEOLOGY

## 3.1 Surficial Geology

Surficial geology mapping information from the Ontario Geological Survey (OGS) was obtained from the OGS Earth website at: <a href="http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth">http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth</a>, and is included on Figure 3 (Overburden Geology) in Appendix 5.

The mapping data from OGS indicates that the eastern half of the site has 'fine textured glaciomarine deposits' (silt and clay with minor sand and gravel) at surface, and the western half of the site has 'Paleozoic bedrock' at surface. Till material (stone-poor, sandy silt to silty sand-textured till) occurs to the immediate east of the site. This pattern is generally consistent with the findings of the test pitting program. A detailed description of the upper overburden stratigraphy, based on the test pit findings, is provided below.

The thickness of the overburden unit, based on available water well record information from wells drilled on the subject site, varies from 1.98 m to 9.14 m (average thickness = 4.2 m).

A total of 12 onsite test pits were advanced to depths from 2.34 to 3.83 m bgs (see Figure 5 in Appendix 5, and the test pit logs in Appendix 1), to assess the surficial stratigraphy (Paterson, 2009).

The general stratigraphy that was encountered in the test pits is as follows:

- Topsoil
- Silty Sand / Sandy Silt
- Silty Clay
- Till

Please refer to the geotechnical report by Paterson (Paterson, 2009) for further details. Grain size distribution curves for the main units that were identified are included in Appendix 1.

## 3.2 Bedrock Geology

Geological mapping information from the OGS Earth website (OGS, 2016) shows that the site is located in an area where the Bobcaygeon Formation is the uppermost bedrock unit.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

Figure 4 (Bedrock Geology) in Appendix 5 shows the OGS Earth mapping information in the vicinity of the site.

OGS describes the lithology of the Bobcaygeon Formations as "limestone, with minor shales in upper part". Information from nearby MOECC Water Well Records shows that the dominant rock type is limestone. This information is consistent with the information from OGS mapping.

## 3.3 Hydrogeology

A shallow unconfined 'aquifer' exists within the overburden unit. Observations made during test pitting suggest that the overburden groundwater is typically encountered at depths from 0.8 m to 1.6 m below ground surface. The direction of groundwater flow in the overburden 'aquifer' is interpreted to be to the south.

In the Ottawa area, the most important water supply 'aquifers' occur within the horizontally bedded Palaeozoic carbonate sedimentary bedrock. Permeability within these strata is controlled by fractures. The primary porosity (i.e. the 'primary fracture network') is controlled by large fractures including horizontal bedding plane fractures and large interconnecting vertical/subvertical fractures. A significant secondary porosity is caused by small scale fracturing of the entire mass of rock. These fractures are small and closely spaced.

The direction of groundwater flow in the bedrock aquifer is interpreted to be to the north, towards the Ottawa River.

The locations of MOECC Water Well Records located in the vicinity of the site are included on Figure 2 (Please note: well location accuracy is variable based on the MOECC database).

Water well record information was obtained from the MOECC water well records database. Overburden thickness, depth of casing, aquifer interception points and reported well yields were reviewed in detail.

A total of 40 water well records were identified. The drilled wells typically intercept a water supply 'aquifer zone' within the Bobcaygeon Formation.

### 3.3.1 Conceptual Hydrogeological Model

Please refer to Figure 6 (Cross Section) when reading this section of the report.

#### • Overburden Unit

- Stratigraphy includes thin topsoil over silty sand / sandy silt, over silty clay, over till
- Overburden thickness is typically 4-5 m
- Shallow unconfined 'aquifer'
- Overburden groundwater is typically around 1 m bgs
- Groundwater flows to the south

#### Bedrock Unit

- Bobcaygeon Formation
- Lithology is limestone with some shale in the upper part of the formation
- Confined bedrock 'aquifer'
- Groundwater occurs in fracture controlled porosity
- Groundwater flows to the north

In Paterson's experience, the upper portion of the Bobcaygeon Formation (i.e. the 'upper bedrock aquifer zone' provides relatively good quality groundwater. The lower portion of the Bobcaygeon Formation is typically associated with diminished water quality (elevated TDS, sodium, and chloride).

**NOTE:** The potentiometric groundwater elevations at TW2 and TW3 are much lower than those observed in all of the surrounding wells. This is probably due to the drilling technique that was used (air rotary) which may have caused small water bearing fractures in the 'upper bedrock aquifer zone' to be sealed during the drilling process. This provides evidence that there is some degree of isolation between the 'upper bedrock aquifer zone' and the 'lower bedrock aquifer zone', and shows that the hydrogeological gradient between the two is downwards.

#### 3.3.2 Hydrogeological Sensitivity

The terrain analysis findings (see Section 4.0) show that the overburden thickness varies across the site from 1.98 m to 9.18 m, and appears to be more than 3 m thick across most of the site. A small area near the western end of the site, between the house and the southwest corner of the property has soils that vary from 2-3 m in thickness.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

The overburden soils at the site are not highly permeable. The overburden material includes a significant proportion of clay (see Section 4.1 and the test pit logs, and grain size analyses in Appendix 1). There is a significant proportion of clay in the overburden material at the three locations (TW6, TW7 and TP4) where overburden was identified to be between 1.98 and 3 m thick.

The western half of the site occurs within in area mapped as 'inferred karst' as determined by OGS (OGS, 2015). This means that the area is within a region of carbonate bedrock which is vulnerable or susceptible to karstification, as evidenced by the Cardinal Creek karst (a small cave and associated features) which is located approximately 2.5 km to the west of the site. The eastern half of the site occurs within in area mapped as 'potential karst'. There is no bedrock outcrop at the site, so no karstic features were identified.

The subject site is not considered to be hydrogeologically sensitive. There are no karstic features onsite and the bedrock is protected by overburden (generally greater than 3 m in thickness) that contains a significant proportion of clay.

#### 3.3.3 Potential Sources of Contamination

#### **Onsite**

The site is developed as a farm with cleared fields, an access laneway and a farmyard area with house and outbuildings. Potential sources of onsite contamination include pesticide use, fuel storage & handling, chemical storage & handling, and the existing onsite sewage system attached to the house. Most of these activities are confined to the farmyard area.

The only potential onsite source of contamination that may have affected the entire property is the historical use of pesticides. The overburden thickness at the site is generally between 3-5 m based on the onsite water wells. Surficial geology mapping information from the Ontario Geological Survey indicates the overburden material at the location of the proposed lots is 'till' comprised of sandy silt and silty sand (see Section 4.1 and Figure 3).

Given the fact that there has been no use of pesticides for 16 years or more, and there have been no reports of pesticide contaminated groundwater in the vicinity of the site (including at least one dug well), the potential for any significant impacts to the bedrock aquifer beneath the proposed new lots is considered to be insignificant. No further action is recommended.

#### Offsite

The following potential offsite sources of contamination were identified:

Wilhaven Drive (potential spills, road salt use).





Road salt impacts are expected to be localized and confined to groundwater in the overburden unit.

## 3.3.4 Large Water Uses and PTTW Review

Based on a review of large water taking uses in the vicinity of the site, there are no single large groundwater uses within 750 m of the site. The closest PTTW users of groundwater are as follows:

- Camelot golf club (greater than 850 m to the north of the site)
- Proulx fruit farm (greater than 1.4 km to the south)

Report: PH1236-REP.02R2

## 4.0 AQUIFER ANALYSIS

In order to evaluate the water supply aquifer(s) underlying the site, a total of seven (7) test wells (TW1 to TW7) were constructed across the site from 2009 and 2012. The existing well at the onsite house (HW), and a nearby offsite water supply well (1490 O'Toole) were also used as test wells to evaluate the bedrock aquifer.

The locations of the wells were selected by Paterson to ensure representative lot coverage for aquifer testing. See Figure 5 (Test Hole Location Plan) in Appendix 5.

### 4.1 Aquifer Characteristics

The pumping test data was analyzed using Aquifer Test Pro<sup>™</sup> (V2016) software. Drawdown data was measured using an electronic water level tape. An electronic datalogger unit was also used to monitor drawdown in the test wells.

The drawdown data at the pumping well was analyzed using the Theis (Theis, 1935), and the Cooper & Jacob methods of analysis (Cooper & Jacob, 1946). Recovery data was also analyzed using Theis.

Transmissivity of the 'upper bedrock aquifer zone' is estimated to be approximately 7.5 m<sup>2</sup>/day (average of values from TW5, HW and 1490 O'Toole). Aquifer analysis details are included in Appendix 4.

Aquifer storativity was not calculated. Several attempts to obtain data at nearby observation wells did not provide any data (i.e. no response to pumping was identified at any of the observation wells). Aquifer storativity is estimated to be approximately 1 x  $10^{-6}$  based on Paterson's knowledge of the bedrock aquifer systems in the Ottawa region.

The following table provides a summary of aquifer characteristics.

Table 5 - Summary of Aquifer Characteristics

SUMMARY OF AQUIFER CHARACTERISTICS											
TW5 TW6 HW 1490 O'Toole											
Transmissivity (m²/day)	1.4	0.2	8.2	13							
Pumping Rate (L/min)	19	3	20	24							
Available Drawdown (m)	24	64	22	102							
Maximum Drawdown (m)	4.63	15.34	4.14	11.8							
% Drawdown	19.3%	24.0%	18.8%	11.6%							
Specific Capacity (L/min/m)	4.1	0.2	4.8	2.0							

Report: PH1236-REP.02R2



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

The average transmissivity value (based on TW5, HW and 1490 O'Toole) is considered to be a reasonable approximation of the general transmissivity of the 'upper bedrock aquifer zone', measured in wells that encountered the primary fracture network. Two onsite wells (TW6 and TW7) do not appear to have encountered the primary fracture network and have very low yield. Any future wells that do not encounter the primary fracture network will probably need additional storage at surface to meet peak demand requirements (as discussed in Section 5.2).

## 4.2 Water Quality

Analytical results from the groundwater sampling program are presented in Tables 6, 7 and 8 below. Laboratory certificates of analysis are included in Appendix 3.

#### **Deep Wells**

For the purpose of this report the term 'deep wells' refers to wells that are deeper than 70 m. Analytical results from TW1, TW2 and TW3 are summarized in Table 6 below.

The analytical results from the three deep onsite test wells show that water quality is relatively poor in these wells that extend beyond 70 m in depth. Water quality in the deep wells is characterized by high concentrations of salt (Na and CI), TDS and turbidity.

The well at 1490 O'Toole Road (**1490 O'Toole**) is one of the four selected 'Test Wells' for this project. Although this is a deeper well, the water quality is generally good. The only exceedances of the ODWS limits are for hardness and iron.

Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

Table 6 - Groundwater Geochemistry - Deep Wells

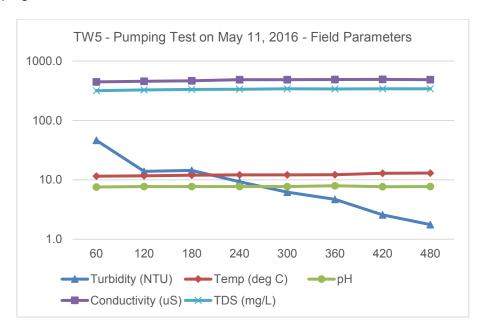
		ODWS							ا	00 OIT	
		02.110		<b>V1</b> ec-09	01-De	v2 ec-09		<b>V3</b> ec-09		90 O'Too ar-16	22-Mar-16
Parameters	Units	Limit	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	7 hour
Microbiological Parame		lth)	0.1.001	01.00.	01.00.	01.00.	01.00.	011001	01.00.	0 1.00.	1
Escherichia Coli	ct/100 mL	0 <sup>MAC</sup>	0	0	0	0	0	0	0	0	-
Faecal Coliforms	ct/100 mL	not specified	0	0	0	0	0	0	0	0	-
Faecal Streptococcus	ct/100 mL	not specified	2	11	0	0	2	0	-	-	-
Heterotrophic Plate Count	ct/1mL	not specified	135	291	>500	>500	181	11	90	153	-
Total Coliforms	ct/100 mL	O <sup>MAC</sup>	0	60	0	0	11	0	0	0	-
Chemical Parameters (H	lealth)				Į	Į.		<u>!</u>	<u>!</u>		
Fluoride	mg/L	1.5 <sup>MAC</sup>	0.12	0.16	1.94	1.96	0.61	0.63	0.25	0.41	-
Ammonia	mg/L	not specified	0.13	0.14	0.20	0.19	0.46	0.46	0.11	0.11	
TKN	mg/L	not specified	0.39	0.23	0.24	0.23	0.58	0.64	0.2	0.2	
Nitrite	mg/L	1 <sup>MAC</sup>	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Nitrate	mg/L	10 <sup>MAC</sup>	0.41	0.42	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Chemical Parameters w	ith Aesth	etic Objectiv	es/ Opera	tional G	idelines			!	<u> </u>		
Alkalinity	mg/L	500 <sup>og</sup>	408	403	212	213	244	244	235	241	-
Chloride	mg/L	250 <sup>AO</sup>	7 18	666	153	153	304	305	16	22	-
Colour	TCU	5 <sup>AO</sup>	<2	<2	<2	<2	10	5	2	<2	-
DOC	mg/L	5 <sup>AO</sup>	1.7	1.5	0.9	0.9	1.7	1.6	1.8	1.5	-
Conductivity	uS/cm	not specified	3200	3040	1500	1480	2730	2780	502	543	
Hydrogen Sulfide	mg/L	0.05 <sup>AO</sup>	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.02	<0.02	-
рН	pH units	6.5-8.5 <sup>AO</sup>	7.81	7.85	8.18	8.18	7.88	7.93	8.06	8.1	-
Sulphate	mg/L	500 <sup>AO</sup>	121	117	295	287	768	784	18	23	-
Hardness	mg/L	100°G	808	662	166	157	687	691	210	212	-
Sodium	mg/L	200 <sup>AO</sup>	382	4 18	272	266	345	340	34	40	-
Calcium	mg/L	not specified	246	199	35	33	173	173	61	62	
Potassium	mg/L	not specified	5	5	5	5	8	8	6	7	
Iron	mg/L	0.3 <sup>AO</sup>	5.51	0.73	<0.03	<0.03	1.55	0.06	0.62	1.47	0.48
Magnesium	mg/L	not specified	47	40	19	18	62	63	14	14	
Manganese	mg/L	0.05 <sup>AO</sup>	0.15	0.06	<0.01	<0.01	0.04	0.03	0.03	0.10	0.03
Total Dissolved Solids	mg/L	500 <sup>AO</sup>	2080	1980	975	962	2180	2220	326	353	-
Tannin & Lignin	mg/L	not specified	0.1	0.3	0.1	<0.1	0.2	0.4	0.2	0.3	
Phenols	mg/L	not specified	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Turbidity (lab)	NTU	<b>1</b> MAC	81.7	15.4	0.7	0.3	19.4	1.3	95	>100	5

#### **Shallow Wells**

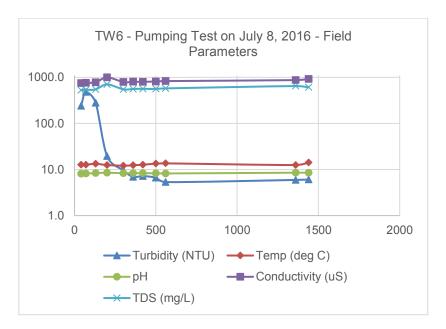
For the purpose of this report the term 'shallow wells' refers to wells that are less than 70 m in depth. All of the shallow wells are completed in the 'upper bedrock aquifer zone'. Analytical results from TW4 and TW5 are summarized in Table 7 below. Analytical results from TW6 and HW are summarized in Table 8.

TW4 is an extremely shallow well (total depth = 8.53 m) that is not considered to be technically suitable as a test well for the site (the well configuration makes it extremely difficult to conduct a meaningful pumping test). The water quality is generally good. Previous sampling of the well in December 2011 demonstrated that there are no bacteria in the aquifer (the well should have been shock chlorinated prior to pumping on December 6, 2015). The only other exceedances of the ODWS limits are for hardness and TDS.

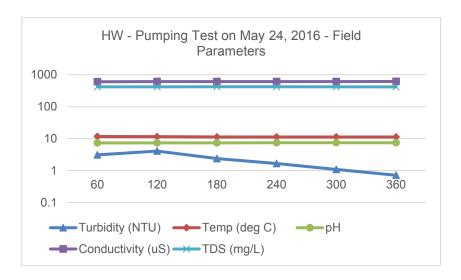
**TW5** is one of the four selected 'Test Wells' for this project. The water quality at TW5 is generally good. The only exceedances of the ODWS limits are for hardness and manganese. Analysis of additional parameters at this location revealed that all results for RVCA metals and for phosphate either had very low concentrations (well below the ODWS limits) or were non-detectable. The following field parameters trends were measured during the pumping test at TW5:



**TW6** is one of the four selected 'Test Wells' for this project. Although the yield is very low, the water quality is generally good. The only exceedances of the ODWS limits is for TDS. The following field parameters trends were measured during the pumping test at TW6:



**HW** is one of the four selected 'Test Wells' for this project. The water quality at HW is generally good. The only exceedances of the ODWS limits is for hardness. Analysis of additional parameters at this location revealed that all results for RVCA metals, phosphate, PHS and VOCs either had very low concentrations (well below the ODWS limits) or were non-detectable. The following field parameters trends were measured during the pumping test at HW:



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

Table 7 - Groundwater Geochemistry - Shallow Wells (A)

	odws		TW4				TW5			
			15-De		11 06-Dec-15		19-Dec-11		11-May-16	
Parameters	Units	Limit	6 hour	12 Hour	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Houi
Microbiological Parame	eters (Heal	th)		•						
Escherichia Coli	ct/100 mL	0 <sup>MAC</sup>	0	0	0	1	0	0	0	0
Faecal Coliforms	ct/100 mL	not specified	0	0	-	-	0	0	0	0
Faecal Streptococcus	ct/100 mL	not specified	1	0	-	-	0	0	0	0
Heterotrophic Plate Count	ct/1mL	not specified	4	3	-	-	5	11	4	2
Total Coliforms	ct/100 mL	0 <sup>MAC</sup>	0	0	50	62	2	0	0	0
Chemical Parameters (I	Health)		•	•					•	
Fluoride	mg/L	1.5 <sup>MAC</sup>	< 0.10	<0.10	< 0.10	< 0.10	0.14	0.14	<0.10	<0.10
Ammonia	mg/L	not specified	<0.02	<0.02	<0.05	<0.05	0.04	0.04	0.05	0.05
TKN	mg/L	not specified	0.20	0.18	0.51	0.14	<0.1	0.13	0.1	0.1
Nitrite	mg/L	1 <sup>MAC</sup>	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10 <sup>MAC</sup>	<0.10	<0.10	0.89	0.91	<0.10	<0.10	<0.10	<0.10
Chemical Parameters w	ith Aesthe	tic Objectives	/ Operati	onal Guid	delines					
Alkalinity	mg/L	500 <sup>og</sup>	193	180	266	278	242	242	258	250
Chloride	mg/L	250 <sup>AO</sup>	43	31	69	72	20	24	21	24
Colour	TCU	5 <sup>AO</sup>	11	10	6	5	5	9	2	<2
DOC	mg/L	5 <sup>AO</sup>	4.2	4.3	3.0	3.3	1.1	1.2	1.4	1.3
Conductivity	uS/cm	not specified	551	481	778.0	791	535	533	527	527
Hydrogen Sulfide	mg/L	0.05 <sup>AO</sup>	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01	<0.02	<0.02
pH	pH units	6.5-8.5 <sup>AO</sup>	8.06	8.02	8.02	7.97	7.9	7.83	8.21	8.16
Sulphate	mg/L	500 <sup>AO</sup>	27	21	34	34	14	16	13	13
Hardness	mg/L	100°G	206	182	338	343	257	267	260	262
Sodium	mg/L	200 <sup>AO</sup>	30	25	42	44	12	13	14	15
Calcium	mg/L	not specified	76	68	124	126	78	82	81	82
Potassium	mg/L	not specified	<1	<1	1	<1	6	6	4	4
Iron	mg/L	0.3 <sup>AO</sup>	0.08	0.03	0.18	0.08	1.31	0.65	0.7	0.18
Magnesium	mg/L	not specified	4	3	7	7	15	15	14	14
Manganese	mg/L	0.05 <sup>AO</sup>	<0.01	<0.01	<0.01	<0.01	0.14	0.14	0.13	0.11
Total Dissolved Solids	mg/L	500 <sup>AO</sup>	358	313	506	514	348	346	343	343
Tannin & Lignin	mg/L	not specified	0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1
Phenols	mg/L	not specified	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.00
Turbidity (lab)	NTU	5 <sup>AO</sup>	3.0	1.2	3.1	1.3	38.5	11.6	6.9	1.6



Table 8 - Groundwater Geochemistry - Shallow Wells (B)

		ODWS		TW6			HW	
			17-Dec-11 09-Jul-16		09-Jul-16	08-D	ec-09	24-May-16
Parameters	Units	Limit	6 Hour	22 Hour	24 Hour	3 Hour	6 Hour	6 Hour
Microbiological Parame	ters (Healt	h)		•				•
Escherichia Coli	ct/100 mL	0 <sup>MAC</sup>	0	0	-	0	0	0
Faecal Coliforms	ct/100 mL	not specified	0	0	-	0	0	0
Faecal Streptococcus	ct/100 mL	not specified	0	0	-	0	2	0
Heterotrophic Plate Count	ct/1mL	not specified	14	14	-	8	5	16
Total Coliforms	ct/100 mL	0 <sup>MAC</sup>	0	0	-	90	2	0
Chemical Parameters (F	lealth)			•				
Fluoride	mg/L	1.5 <sup>MAC</sup>	0.82	1.0	0.68	0.11	0.11	<0.10
Ammonia	mg/L	not specified	n/a	0.21	0.25	<0.02	0.06	0.03
TKN	mg/L	not specified	n/a	0.19	0.30	<0.1	<0.1	0.2
Nitrite	mg/L	1 <sup>MAC</sup>	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10 <sup>MAC</sup>	<0.10	<0.10	0.12	<0.10	< 0.10	<0.10
Chemical Parameters w	ith Aesthet	ic Objectives/	Operation	nal Guideli	nes			•
Alkalinity	mg/L	500 <sup>og</sup>	263	285	296	257	258	283
Chloride	mg/L	250 <sup>AO</sup>	41	106	94	24	25	39
Colour	TCU	5 <sup>AO</sup>	12	11	<2	7	<2	<2
DOC	mg/L	5 <sup>AO</sup>	1.1	0.9	1.0	1.6	1.3	1.2
Conductivity	uS/cm	not specified	n/a	991	1.0	580	587	628
Hydrogen Sulfide	mg/L	0.05 <sup>AO</sup>	<0.01	<0.01	<0.02	0.06	0.01	<0.02
pH	pH units	6.5-8.5 <sup>AO</sup>	8.38	8.42	8.27	7.74	7.76	7.96
Sulphate	mg/L	500 <sup>AO</sup>	42	63	61	19	20	19
Hardness	mg/L	100 <sup>0G</sup>	70	70	98	274	277	341
Sodium	mg/L	200 <sup>AO</sup>	14 1	211	168	4	4	7
Calcium	mg/L	not specified	n/a	15	21	90	91	112
Potassium	mg/L	not specified	n/a	4	5	2	2	2
Iron	mg/L	0.3 <sup>AO</sup>	0.57	0.07	0.10	0.78	0.5	0.19
Magnesium	mg/L	not specified	n/a	8	11.00	12	12	15
Manganese	mg/L	0.05 <sup>AO</sup>	0.01	<0.01	<0.01	0.04	0.04	0.03
Total Dissolved Solids	mg/L	500 <sup>AO</sup>	457	644	597	377	382	408
Tannin & Lignin	mg/L	not specified	n/a	<0.1	<0.1	<0.1	<0.1	<0.1
PhenoIs	mg/L	not specified	n/a	<0.001	<0.001	<0.001	<0.001	<0.001
Turbidity (lab)	NTU	5 <sup>AO</sup>	27.7	5.8	4.6	15.1	6.7	1.6



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

A review of the laboratory groundwater geochemistry results for the wells within the preferred water supply aquifer zone (i.e. TW4, TW5, TW6 and HW) confirms that the raw water within the 'upper water supply aquifer system' is potable and meets the health related parameter requirements specified by the Ontario Drinking Water Standards (ODWS) for the analyzed parameters.

The water quality in the "<u>upper bedrock aquifer zone</u>' generally satisfies the aesthetic objectives/operational guidelines of the ODWS, with the exception of the following parameters:

- Hardness (TW4, TW5 and HW)
- TDS (TW4 and TW6)
- Manganese (TW5)

#### **Hardness**

At the measured concentrations, the water is considered to be moderately hard, which is typical of wells drilled throughout eastern Ontario. Hardness is a measure of the dissolved calcium and magnesium in water and is expressed as the equivalent quantity of calcium carbonate. Hardness can lead to the formation of scale deposits and can form excessive scum (MOE, 2003).

#### **TDS**

Total dissolved solids (TDS) refers to the concentration of inorganic substances dissolved in water. The main constituents are typically chloride, sulphates, calcium, magnesium and bicarbonates. High concentration can cause hardness, bad taste, mineral deposition or corrosion. Water with a TDS concentration above 500 mg/L may not palatable.

#### Manganese

The aesthetic objective for manganese is colour related. Manganese can cause black staining of laundry and fixtures. At excessive concentrations it can cause an undesirable taste.

#### **Additional Parameters**

The final groundwater sample from TW5 was also submitted for analysis of 'RVCA recommended metals' and phosphate. The final groundwater sample from HW was submitted for analysis of 'RVCA recommended metals', phosphate, petroleum hydrocarbons (PHCs), and volatile organic compounds (VOCs). Analytical results are summarized in



Tables 9 and 10 below. All of the results are either non-detectible, or were detected at concentrations well below the ODWS limits.

Table 9 - Groundwater Geochemistry - Metals and PHCs

		ODWS	TW5	HW
Parameters	Units	Limit	11-May-16	24-May-16
RVCA Metals				
Silver	mg/L	not specified	<0.0001	<0.0001
Aluminum	mg/L	0.1 <sup>OG</sup>	0.01	<0.01
Arsenic	mg/L	0.025 <sup>IMAC</sup>	<0.001	<0.001
Boron	mg/L	5 <sup>IMAC</sup>	0.05	0.02
Barium	mg/L	1 <sup>MAC</sup>	0.14	0.18
Beryllium	mg/L	not specified	<0.0005	<0.0005
Cadmium	mg/L	0.005 <sup>MAC</sup>	<0.0001	<0.0001
Chromium	mg/L	0.05 <sup>MAC</sup>	<0.001	<0.001
Copper	mg/L	1.0 <sup>AO</sup>	<0.001	0.002
Molybdenum	mg/L	not specified	<0.005	<0.005
Nickel	mg/L	not specified	<0.005	<0.005
Lead	mg/L	0.010 <sup>MAC</sup>	<0.001	<0.001
Antimony	mg/L	0.006 <sup>MAC</sup>	<0.0005	<0.0005
Sellenium	mg/L	0.01 <sup>MAC</sup>	<0.001	<0.001
Strontium	mg/L	not specified	1.02	1.01
Thallium	mg/L	not specified	<0.0001	<0.0001
Uranium	mg/L	0.02 <sup>MAC</sup>	<0.001	<0.001
Zinc	mg/L	5 <sup>AO</sup>	<0.01	<0.01
Mercury	mg/L	0.001 <sup>MAC</sup>	<0.0001	<0.0001
Petroleum Hydrocarbo	ons			
F1 (C6-C10)	ug/L	not specified	-	<20
F2 (C10-C16)	ug/L	not specified	-	<20
F3 (C16-C34)	ug/L	not specified	-	<50
F4 (C34-C50)	ug/L	not specified	-	<50
Chemical Parameters				
Phosphate (as P)	mg/L		<0.6	<0.2

Table 10 - Groundwater Geochemistry - VOCs

DADAMETED	LINUTO	HW	004/04/44	
PARAMETER	UNITS	24-May-16	ODWS LIMIT	
Volatile Organic Compounds				
1,1,1,2-tetrachloroethane	ug/L	<0.5	-	
1,1,1-trichloroethane	ug/L	<0.4	-	
1,1,2,2-tetrachloroethane	ug/L	<0.5	-	
1,1,2-trichloroethane	ug/L	<0.4	-	
1,1-dichloroethane	ug/L	<0.4	_	
1,1-dichloroethylene	ug/L	<0.5	14 <sup>MAC</sup>	
1,2-dichlorobenzene	ug/L	<0.4	200 <sup>MAC</sup> / 3 <sup>AO</sup>	
1,2-dichloroethane	ug/L	<0.2	5 <sup>IMAC</sup>	
1,2-dichloropropane	ug/L	<0.5	-	
1,3-dichlorobenzene	ug/L	<0.4	-	
1,3,5-trimethylbenzene	ug/L	<0.2	-	
1,4-dichlorobenzene	ug/L	<0.4	5 <sup>MAC</sup> / 1 <sup>AO</sup>	
Benzene	ug/L	<0.5	<b>5</b> <sup>MAC</sup>	
Bromodichloromethane	ug/L	<0.3	-	
Bromoform	ug/L	<0.4	-	
Bromomethane	ug/L	<0.5	-	
c-1,2-Dichloroethylene	ug/L	<0.4	_	
c-1,3-Dichloropropylene	ug/L	<0.2	_	
Carbon Tetrachloride	ug/L	<0.2	5 <sup>MAC</sup>	
Chloroform	ug/L	<0.5	-	
Dibromochloromethane	ug/L	<0.3	_	
Dichlorodifluoromethane	ug/L	<0.5	_	
Dichloromethane	ug/L	<4.0	<i>50</i> <sup>MAC</sup>	
Ethylbenzene	ug/L	<0.5	2.4 <sup>AO</sup>	
Ethylene Dibromide	ug/L	<0.2	-	
Hexane	ug/L	<5	-	
m/p-xylene	ug/L	<0.4	-	
Methyl Ethyl Ketone (MEK)	ug/L	<10	_	
Methyl Isobutyl Ketone (MIBK)	ug/L	<10	_	
Methyl Tert Butyl Ether (MTBE)	ug/L	<2	_	
Monochlorobenzene	ug/L	<0.2	80 <sup>MAC</sup> / 30 <sup>AO</sup>	
o-xylene	ug/L	<0.4	-	
Styrene	ug/L	<0.5	_	
t-1,2-Dichloroethylene	ug/L	<0.4	_	
t-1,3-Dichloropropylene	_	<0.4	_	
Tetrachloroethylene	ug/L	<0.2 <0.3	30 <sup>MAC</sup>	
Tetrachioroethylene Toluene	ug/L ug/L	<0.5	24 <sup>AO</sup>	
Trichloroethylene	ug/L ug/L	<0.3	5 <sup>MAC</sup>	
Trichlorofluoromethane	ug/L	<0.5	_	
Vinyl Chloride	ug/L	<0.2	2 <sup>MAC</sup>	
Xylene; total	ug/L	<0.5	300 <sup>40</sup>	

## 4.2.1 Offsite Well Water Quality

Water samples were collected at 1753 Wilhaven Drive and at 1865 Wilhaven Drive on July 7, 2016. The analytical results are summarized in Table 9 (below).

Table 11- Groundwater Geochemistry - Offsite Wells

		ODWS		1865 Wilhaven
			1753 Wilhaven	1000 Williavell
Parameters	Units	Limit	07-Jul-16	07-Jul-16
Microbiological Paramete	rs (Health)	•	•	-
Escherichia Coli	ct/100 mL	0 <sup>MAC</sup>	0	0
Faecal Coliforms	ct/100 mL	not specified	0	0
Faecal Streptococcus	ct/100 mL	not specified	0	0
Heterotrophic Plate Count	ct/1 mL	not specified	39	196
Total Coliforms	ct/100 mL	0 <sup>MAC</sup>	5	11
Chemical Parameters (He	ealth)	•		•
Fluoride	mg/L	1.5 <sup>MAC</sup>	<0.10	0.11
Ammonia	mg/L	not specified	0.03	0.11
TKN	mg/L	not specified	<0.1	0.3
Nitrite	mg/L	1 <sup>MAC</sup>	<0.10	<0.10
Nitrate	mg/L	10 <sup>MAC</sup>	0.6	2.23
Chemical Parameters wi	th Aesthetic Ol	jectives/ Opera	tional Guidelines	
Alkalinity	mg/L	500 <sup>OG</sup>	273	347
Chloride	mg/L	250 <sup>AO</sup>	16	153
Colour	TCU	5 <sup>AO</sup>	3	3
DOC	mg/L	5 <sup>AO</sup>	2.0	2.8
Conductivity	uS/cm	not specified	529	1220
Hydrogen Sulfide	mg/L	0.05 <sup>AO</sup>	<0.02	<0.02
pH	pH units	6.5-8.5 <sup>AO</sup>	7.86	7.83
Sulphate	mg/L	500 <sup>AO</sup>	16	85
Hardness	mg/L	100 <sup>OG</sup>	288	452
Sodium	mg/L	200 <sup>AO</sup>	9	84
Calcium	mg/L	not specified	107	135
Potassium	mg/L	not specified	<1	5
Iron	mg/L	0.3 <sup>AO</sup>	0.06	0.03
Magnesium	mg/L	not specified	5	28
Manganese	mg/L	0.05 <sup>AO</sup>	<0.01	<0.01
Total Dissolved Solids	mg/L	500 <sup>AO</sup>	344	793
Tannin & Lignin	mg/L	not specified	<0.1	<0.1
Phenols	mg/L	not specified	<0.001	<0.001
Turbidity (lab)  MAC = Maximum Acceptable Conce	NTU	5 <sup>AO</sup>	0.5	0.3

The analytical results from 1753 Wilhaven Drive show that one parameter (Total Coliforms) exceeded the ODWS Maximum Acceptable Concentration. The well owner was immediately



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

notified in writing of this health related exceedance and instructions for disinfecting the well (shock chlorination) were provided. The only other exceedance is for the operational guideline limit for hardness.

The analytical results from 1865 Wilhaven Drive also show that Total Coliforms exceeded the ODWS Maximum Acceptable Concentration. The well owner was immediately notified in writing of this health related exceedance and instructions for disinfecting the well were provided. The only other exceedances were for hardness and TDS which are elevated above the ODWS operational/aesthetic limits.

## 4.3 Water Quantity

#### 4.3.1 Peak Demand Water Use

The suitability of the aquifer to supply the proposed development was assessed using the methodology provided in MOECC Procedure D-5-5 (MOEE, 1996), which indicates the number of people per house is the number of bedrooms plus one. New houses in the proposed development will be four bedroom single family homes, so the number of persons per house will be five (5).

Procedure D-5-5 indicates the minimum 'per-person water requirement' is 450 L/day, which is 2,250 L/day per house (or per well).

Procedure D-5-5 indicates that 'peak demand' occurs over a 120 minute period and is to be based on a per person usage rate of 3.75 L/min during that period. Using this information, the 'peak demand rate' per house is  $3.75 \times 5 = 18.75 \text{ L/min}$ .

Table 3 in Section 2.6 shows that the pumping rates chosen for most of the shallow well pumping test, were above the estimated 'peak demand rate'. Only one pumping test was conducted at a lower rate (TW6 was pumped at approximately 3 L/min for 24 hours).

All of the shallow test wells used less than 25% of the available drawdown during the pumping tests (see Table 5 in Section 4.1).

This shows that the calculated yield at most of the well locations is representative of the yields which residents of the proposed development are likely to obtain from future wells installed at the site. It is likely that a small percentage of the new wells do not intersect the primary fracture network (like TW6), and these locations will require some additional water storage at surface to meet peak demand requirements.

Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 4.3.2 Average Daily Residential Water Use

Information from the City of Ottawa website indicates the Canadian average daily residential water use per capita is 326 L/day. The Canadian Mortgage and Housing Corporation's Household Guide to Water Efficiency (CMHC, 2000, revised 2014) indicates that the average daily residential water use per capita in Ontario is 225 L/day.

Current Ontario Building Code requirements (OBC, 2012) for water conservation specify that toilet and shower consumption must now comply with lower use requirements (OBC Table 7.6.4.2.A & B and Table 7.6.4.1). Based on the new requirements, toilet water demand is reduced from approximately 13 L/flush to 4.8 L/flush. Shower consumption is reduced from 18 L/min. to 7.6 L/min.

Toilet use accounts for approximately 25% of total domestic water use, and shower use accounts for approximately 20% (CMHC, 2014). The OBC efficiencies will result in an average per person domestic water usage of 163 L/day.

A summary of daily usage estimates and associated peak demand usage rates is provided below in Table 12.

Table 12- Peak Demand Estimate Comparison

PEAK DEMAND ESTIMATE COMPA				
Daily Usage Estimate Source	L/day/ person	L/min/person (during peak demand period)	L/min/house (during peak demand period)	Daily Household Water Demand (L/day)
Procedure D-5-5	450	3.75	18.8	2,250
City of Ottaw a	326	2.72	13.6	1,630
СМНС	225	1.88	9.4	1,125
CMHC (w new efficiency changes)	163	1.36	6.8	815

This suggests that the daily household water demand could often be less than 1,000 L/day.

As stated above, it is likely that a small percentage of the new wells do not intersect the primary fracture network (like TW6), and these locations will require some additional water storage at surface to meet peak demand requirements.

In order to be conservative, the additional storage volume should be calculated based on Procedure D-5-5 'average daily residential water use' values.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

#### 4.3.3 Potential Well Interference

It is anticipated that a total of 21 individual water supply wells (including some of the existing wells if suitably configured) will be used at the proposed subdivision. All of the wells will be completed in the 'upper bedrock aquifer zone'. The well spacing will vary according to lot size and the locations of wells on each lot. There will be no clustering of wells as there will be one well on each lot.

No drawdown was identified at any nearby wells during the pumping test. Dataloggers were placed in the closest well during several tests and no drawdown was observed at the observation well during the pumping test.

A potential well interference model was used to reflect a hypothetical worst case scenario for drawdown at the site. The model assumes a series of wells arranged in a concentric circular array, with each well pumping continuously over a period of 20 years. Mathematical model calculations are presented in Appendix 4. The calculations were based on an average of the transmissivity results from TW5, HW and 1490 O'Toole (as presented in Section 5.1).

The well interference model developed by Paterson assumes a series of approximately evenly spaced wells, located along concentric circular spacings extending outward from one central well, (i.e. a regular concentric circular array) each pumping continuously at a rate of 2,250 L/day over a period of 25 years. The model assumes 29 wells at a spacing of 50 m, in order to simulate the 21 onsite wells plus an additional 8 offsite wells located in close proximity to the site). The model creates an array of wells with a well spacing that is close to the minimum well spacing in the proposed subdivision. It is a worst case scenario because the actual well spacings are mostly greater than the minimum well spacing.

The well interference model predicts that there will be an 11.6 m decline in the potentiometric head of the water supply aquifer. This represents a reduction of approximately 18% of the available drawdown (based on TW6 which has an available drawdown 63 m). The findings of this analysis suggest the proposed use of well water in the subdivision will not result in unacceptable water quantity interference conflicts between onsite and offsite wells.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 5.0 DEVELOPMENT CONSIDERATIONS

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

Based on the results of this study, the subject site is considered to be suitable for the development of 21 lots as supported in the analysis advanced in the body of this report.

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.

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.

### 5.1 Future Well Construction

New lots in the proposed subdivision will be serviced by individual drilled wells water supply wells completed in the 'upper bedrock aquifer zone'. The wells must be installed by a licensed well contractor in accordance with Ontario Regulation 903.

New wells should be configured as follows:

- Minimum depth of 15 m.
- Total depth from 60-70 m bgs.
- Steel casing to be installed at least 0.3 m into competent bedrock.

The minimum depth is specified in order to ensure new wells that encounter water bearing fractures at shallow depths are drilled deep enough to accommodate long term potentiometric fluctuations in the 'shallow bedrock aquifer zone'.

The creation of the casing hole, the installation of the casing and the grouting of the annular space should be inspected by a licensed Professional Engineer or Professional Geoscientist of Ontario.

New wells 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.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

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 licensed 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.

Consideration should be given to changing the configuration of some of the existing onsite wells to make them consistent with the configuration that is provided above. TW1, TW2 and TW3 are too deep (water quality is poor due to salty, high TDS water from fractures below 70 m). The bottoms of these wells can be filled with grout below 70 m. The remained well section may have a low yield (possibly die to the drilling technique used). Well stimulation by hydraulic fracturing may cause an increase in yield. Alternatively, the deep wells should be abandoned.

TW7 should be drilled deeper (to 70 m total depth) if it is in a suitable location.

### 5.2 Surface Storage for Low Yield Wells

As discussed above in Section 5.1, two onsite wells (TW6 and TW7) do not appear to have encountered the primary fracture network and have very low yields. Any future wells that do not encounter the primary fracture network will probably need additional storage at surface to meet daily usage and peak demand requirements.

The daily water usage according to Procedure D-5-5 is 2,250 L/day. The peak demand water usage is (18.75 L x 120 mins) 2,250 L in 120 minutes.

The volume of water that can be stored in each new well (based on 6" diameter well that is 70 m deep) is approximately 1,270 L. However, the pumping rate in the well will be relatively low (to ensure the water level does not draw down past the pump), so the water stored in the well will not be delivered at a fast enough rate for use during peak demand periods. For example, if the maximum sustainable flow rate from a well is 3 L/min, it can only deliver 360 L during the 120 minute long peak demand period, so an additional 1,890 L of surface storage would be required.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

In cases where surface storage is deemed to be necessary, the amount of surface storage should be determined based on the actual sustainable yield of the well.

### 5.3 Potable Water Treatment

The water within the bedrock aguifer has elevated hardness, TDS and manganese.

#### **Hardness**

A standard residential grade water softener can be installed to remove hardness in the raw water. Conventional water softeners will introduce sodium into the water supply, and it may be appropriate to bypass the water softener with a separate tap for drinking water.

#### **TDS**

The Langelier Saturation Index (LSI) and Ryznar Stability Index (RSI) were calculated for the three test wells (Appendix 4). The LSI result indicate the water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive). The RSI result indicates the water is aggressively corrosive.

TDS is primarily comprised of the inorganic substances dissolved in water including chloride, sulphates, calcium, magnesium and bicarbonates. The palatability of drinking water with TDS above 500 mg/L may be unacceptable. Reverse osmosis treatment can be used to remove TDS if raw water is considered to be unpalatable. Point of use systems (at kitchen sink) are recommended due to the relatively high cost of reverse osmosis treatment.

### Manganese

Manganese can cause staining of plumbing fixtures and laundry. The concentration of manganese in TW5 is well below the treatable limit according to Procedure D-5-5. A standard residential grade water softener should be sufficient to significantly reduce the concentration of manganese to an acceptable level. Alternatively, a green sand filter can also be used to effectively reduce the concentration of manganese.

### 5.4 Wastewater Treatment and Disposal

MOECC Procedure D-5-4 (Technical Guidelines for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment, MOEE, 1996) provides a methodology for assessing the risks associated with individual onsite sewage systems. Procedure D-5-4 indicates that developments consisting of lots which average 1 Ha (with no lot being smaller than 0.8 Ha) may not require a detailed hydrogeological assessment if it can be demonstrated that the area is not hydrogeologically sensitive. Since the average lot size in



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

the proposed subdivision is 0.87 Ha, the following nitrate impact assessment has been provided.

### 5.4.1 Predictive Nitrate Impact Assessment

Groundwater within the bedrock aquifer will be protected from sewage system effluent by the available overburden and the massive nature of the upper bedrock units.

In conducting an assessment of the impact of the proposed development, the estimate of groundwater recharge, by infiltration from precipitation, is the primary site-specific input parameter. In this regard, assumptions are required to be made with respect to evaporation and evapotranspiration, as well as infiltration and runoff rates. The rate of infiltration will be dependent upon surficial soil types, vegetative ground covers and their distribution, and site topography.

In conducting our assessment, a mean annual precipitation value (net of evaporation and evapotranspiration processes) of 943 mm/year was used (Environment Canada, 2015). An estimation of infiltration was calculated based on site specific information and the infiltration factors provided in the document MOEE Hydrogeological Technical Information Requirements for Land Development Applications (MOEE, 1995). A calculation is provided in Appendix 4.

The cumulative nitrate impact for this subdivision has been calculated to be **4.4 mg/L**. Nitrate concentrations in onsite and offsite wells are typically non-detectible or below 1 mg/L, so the additional loading will be well below the provincially mandated limit of 10 mg/L. As such, it is Paterson's opinion that the proposed development will have acceptable impacts on the drinking water aguifer.

### 5.4.2 **Sewage System Design**

The fieldwork program carried out on the site shows that the surficial soils are of low permeability and have significant vertical thickness overlying the limestone bedrock of the Bobcaygeon Formation. As such, the site is not considered to be hydrogeologically sensitive to surficial sources of contaminants in the long term.

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.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

OBC requirements state that the 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. Some lots are located in areas with permeable cover which may permit either in-ground or partially raised leaching beds. Where lots are located in areas with moderately low permeable silty 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 is also required.

Based on OBC design sewage flow tables, a four bedroom house may produce up to 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 will be required.

The Lot Development Plan (Figure 8 in Appendix 5) shows the size of the leaching beds. The leaching beds have been placed in the front of each lot, between the house and the roadside ditch in order to maximize subsurface effluent movement and facilitate maintenance.

The sewage system layouts detailed on Figure 8 are fully raised leaching beds with a 15 m imported sand mantle. The Lot Development Plan shows the size of the leaching beds on each lot.. The end of each mantle will be unobstructed and free draining.

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 sewage systems located on neighbouring lots.

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 Figure 8 (Lot Development Plan) 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.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### **Alternative Sewage System Design Considerations**

As an alternative to the use of a traditional fill based absorption trench style leaching bed, advanced treatment of sanitary sewage may be utilized. While not shown on the Lot Development Plan, the sewage system envelopes associated with effluent meeting Column 3 of Table 8.6.2.2.A of the OBC will be upwards of 40% smaller than the conventional absorption trench leaching beds.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 6.0 CONCLUSIONS

The following statements and conclusions are based on the investigation and analysis contained within this report:

- The test wells (TW5, HW, and 1490 O'Toole) and all future domestic wells in the proposed subdivision will provide water that is safe and suitable for human consumption.
- Each future domestic well in the proposed subdivision will provide a sufficient quantity
  of water for normal domestic purposes. In some cases additional above ground storage
  will be required in order to satisfy peak demand requirements.
- Adverse effects on well water in the proposed subdivision from potential onsite and offsite sources are considered to be minimal/insignificant.
- In Paterson's professional opinion the probable well yields determined on the basis of this investigation are representative of the yields which residents of the proposed subdivision are likely to obtain from their wells in the long term.
- Potential well interference between neighbouring wells within the subdivision and nearby offsite wells is considered to be minimal.
- The subject property is suitable for development as a residential subdivision at the proposed density. Impacts to the neighbouring well users are expected to be minimal.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 7.0 RECOMMENDATIONS

### **Water Supply**

- All new wells should be constructed such that the casing hole extends into sound bedrock at least 0.3 m as per O.Reg. 903, with a minimum casing length of 6.7 metres below grade.
- All new wells in the subdivision should be drilled using 'cable tool' drilling techniques
  to maximize potential yield. There are at least two companies in the Ottawa region that
  offer this service. Costs are approximately 100% higher compared to regular air rotary
  drilling techniques.
- All new wells should have a minimum depth of 15 m and a maximum depth between 60 m and 70 m below ground surface (NOTE: wells should not be drilled deeper in order to improve yield, as the 'deep bedrock aquifer zone' has diminished water quality).
- Existing wells at the site which are not to be utilized for water supply wells, should be decommissioned according to the requirements of O.Reg. 903. Consideration should be given to the reconfiguration and stimulation of some of the existing deep wells if they are suitably located. Reconfiguration would typically involve grouting the hole below 70 m depth, then hydraulic fracturing of the remainder of the well to stimulate flow (the original drilling method may have led to some fractures in the upper bedrock aquifer zone being sealed).
- At the time of new well installation, the drilling of the casing hole, installation of casing, and grouting of the annular space should be inspected by a licensed Professional Engineer or Professional Geoscientist of Ontario. All well construction must be carried out by a licensed well technician.
- 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. It is likely that future wells at this
  site will require additional well development.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

- All future water wells to be completed such that the top of well casing is a minimum of 450 mm above the finished grade within a 3 m radius of the wellhead. The grade should slope away from the wellhead in all directions for a distance of at least 3 m.
- Well owners should ensure that the wellhead and surrounding area are maintained in accordance with the requirements of O.Reg. 903. Future well owners should refer to the MOECC Water Supply Wells Requirements and Best Management Practices, (Revised April 2015) website at: https://dr6j45jk9xcmk.cloudfront.net/documents/4410/a-wwbmp-titlemaster-table-of-contents-chapter-1.pdf
- The raw water found in the water supply aquifer system is considered to be hard.
  Residential grade water softeners are recommended where water hardness is deemed
  unsuitable. A warning clause addressed to people on low sodium diets should be
  registered on title regarding the elevated concentration of sodium (> 20 mg/L)
  associated with water softeners.
- Additional treatment to address TDS, and manganese may be required. Additional treatments methods may include reverse osmosis, coagulation/flocculation processes, biological filtration, and/or granulated activated charcoal filtration.
- Although artesian conditions are not anticipated, such conditions have been
  encountered historically in some nearby wells. Drilling and instrumentation should be
  carried out by a suitably experienced and licensed well technician taking precautions
  as provided in the document Water Supply Wells Requirements and Best Management
  Practices, (Revised April 2015). <a href="https://dr6j45jk9xcmk.cloudfront.net/documents/4410/a-wwbmp-title-master-table-of-contents-chapter-1.pdf">https://dr6j45jk9xcmk.cloudfront.net/documents/4410/a-wwbmp-title-master-table-of-contents-chapter-1.pdf</a>

### **Wastewater Treatment**

- A site specific investigation should be carried out for the detailed sewage system design at each lot, as part of the building permit application process.
- The septic systems should be constructed with all appropriate setbacks as per Ontario Building Code requirements.
- The native soils should be assessed at the proposed septic location and imported fill should be used, if the native soils are unsuitable.
- Proposed well, septic, and building locations are noted on Figure 8 (Lot Development Plan) in Appendix 5.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

 Future owners of individual onsite wastewater treatment systems should familiarize themselves with basic safety and maintenance information which is available at: <a href="http://www.omafra.gov.on.ca/english/environment/facts/sep\_smart.htm">http://www.omafra.gov.on.ca/english/environment/facts/sep\_smart.htm</a>

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.

### patersongroup

Russell L. Chown, P.Geo. Senior Hydrogeologist

Report: PH1236-REP.02R2



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 8.0 STATEMENT OF LIMITATIONS

This Hydrogeology and Terrain Analysis report has been prepared in general accordance with the agreed scope-of-work and the requirements of MOECC/MOE Guideline D-5: Planning for Sewage and Water Services (August 1996), Procedure D-5-4: Technical Guideline for Individual Onsite Sewage Systems: Water Quality Impact Risk Assessment (August 1996), and Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (August 1996).

The conclusions presented herein are based on information gathered from a limited historical review along with a field inspection and testing program. The findings of this investigation are based on a review of readily available geological, historical, and regulatory information and a cursory review made at the time of the field assessment. The historical research relies on information supplied by provincial agencies and was limited within the scope-of-work, time, and budget of the project herein.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those described by the test holes themselves.

This report was prepared for the sole use of **2183144 Ontario Ltd.** Permission from the above noted party and our firm will be required to release this report to any other party.



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### 9.0 REFERENCES

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Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### Appendix 1

- Soil Profile and Test Data Sheets
- Symbols and Terms
- Soil Grain Size Analytical Results

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 BORINGS BY Hydraulic Shovel				D	ATE (	3 Dec 09			HOL	E NC	<b>T</b> I	P 1-	09
SOIL DESCRIPTION	PLOT		SAN	/IPLE		DEPTH		Pen. R ● 5			ows/		eter
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TOPSOIL	0.23						100.00						
Brown <b>SILTY SAND</b> with clay	0.81	G	1			·							
	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	G	2			1-	-99.50						
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders						2	-98.50						
End of Test Pit Refusal on inferred bedrock @ 3.02m depth	3.02	```````````				3	97.50						
(Water infiltration @ 2.6m depth)													
								20 She ▲ Undis		trenç	50 jth (k	80 (Pa) oulded	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

BORINGS BY Hydraulic Shovel					ATE (	3 Dec 09			HOLE N	IO. TP 2-0	9
SOIL DESCRIPTION	PLOT		SAN	/IPLE		DEPTH		l		Blows/0.3m ia. Cone	eter
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GROUND SURFACE	ັ້		된	RE	ZÖ	0-	99.25	20	40	60 80	
TOPSOIL	25	G	1				00.20				
Brown SILTY CLAY						1-	-98.25				Ā
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders	22						00.20				
	65 \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	G	2	,	7	2.	97.25				
End of Test Pit  (Water infiltration @ 0.9m depth)	44 \( \hat{\hat{\hat{\hat{\hat{\hat{\hat{	^^^									
								20 She ▲ Undi		60 80 1 ngth (kPa) △ Remoulded	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

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REMARKS

PH1236

HOLE NO. TP 3-09

	E		SAI	/IPLE				Pen. R	esist.	Blov	vs/0.3	m	
SOIL DESCRIPTION	PLOT			1	F-I	DEPTH (m)	ELEV. (m)	1	0 mm				neter
	STRATA	TYPE	NUMBER	RECOVERY	N VALUE or RQD			0 V	Vater (	Conte	nt %	ì	Piezometer
GROUND SURFACE	0,			2	Z	0-	99.10	20	40	60	80		
TOPSOIL 0	25						00.10						
Brown <b>SILTY CLAY,</b> some sand	60	G	1										
GLACIAL TILL: Grey-brown	86 (2222	G	2										
	- \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	G	3			1-	98.10						
	\^^^^												
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders													Ž
		G	4			2-	97.10						
2	.72 \^^^												
End of Test Pit													
Water infiltration @ 1.6m depth)													
								20 Sho	40 ar Stre	60 anath	80 (kPa		00

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

### SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

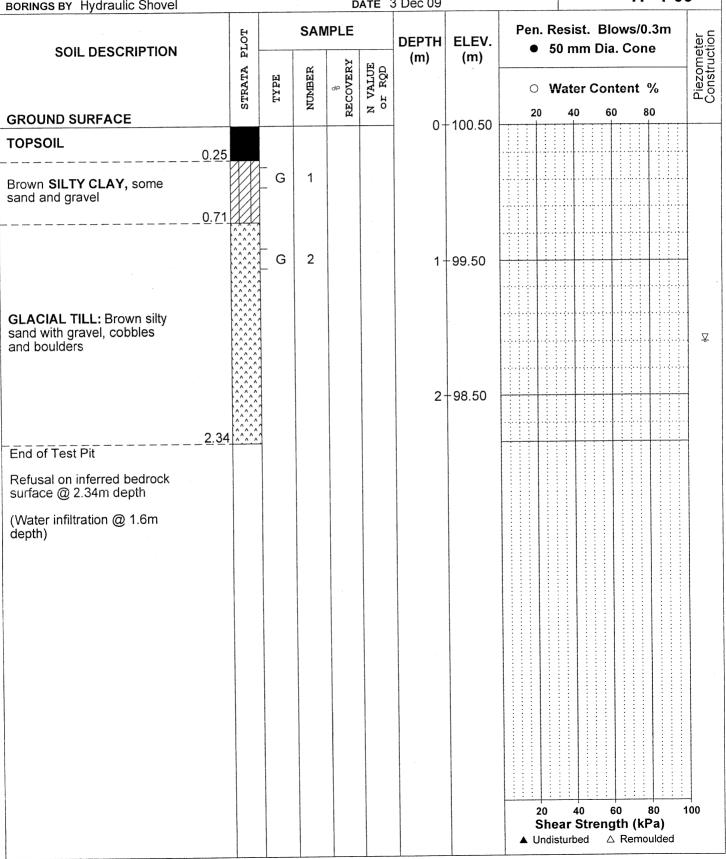
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Elevations interpolated based on topographic information supplied by the City of Ottawa.

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PH1236

REMARKS HOLE NO. TP 4-09 DATE 3 Dec 09 BORINGS BY Hydraulic Shovel Pen. Resist. Blows/0.3m SAMPLE **DEPTH** ELEV.



SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

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

Elevations interpolated based on topographic information supplied by the City of Ottawa.

FILE NO.

PH1236

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REMARKS BORINGS BY Hydraulic Shovel				D	ATE (	B Dec 09			HOLE N	O. TP 5-0	9
SOIL DESCRIPTION	PLOT		SAN	1PLE		DEPTH	ELEV.	1		Blows/0.3m ia. Cone	eter
SOIL DESCRIPTION	STRATA P	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	(m)	(m)			ontent %	Piezometer
GROUND SURFACE	SI	H	Z	REC	Z O		00.00	20	40	60 80	
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Brown SILTY SAND with	.25	G	1								-
lay 	.60	_									
ed-brown SILTY CLAY	.94	G	2								
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	\^^^^										
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copples and boulders											
						2	97.80				
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Water infitlration @ 1.0m											
depth)											
										60 80 ngth (kPa)	100
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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.

40

▲ Undisturbed

60

△ Remoulded

Shear Strength (kPa)

100

PH1236 Ottawa. REMARKS HOLE NO. **TP 6-09** DATE 3 Dec 09 BORINGS BY Hydraulic Shovel SAMPLE Pen. Resist. Blows/0.3m Piezometer Construction PLOT DEPTH ELEV. 50 mm Dia, Cone SOIL DESCRIPTION (m) (m) RECOVERY N VALUE or RQD STRATA NUMBER TYPE Water Content % 60 20 **GROUND SURFACE** 0+99.60 **TOPSOIL** 0.30 G 1 Brown SILTY CLAY, some sand 1 + 98.60 $\nabla$ Interlayered SAND and SILTY CLAY 2 1.68 Stiff, brown SILTY CLAY 2 + 97.60- grey by 2.3m depth 2.59 **GLACIAL TILL:** Grey silty G 3 2.74 clay with sand, gravel, cobbles and boulders End of Test Pit (Water infiltration @ 1.5m depth)

**SOIL PROFILE AND TEST DATA** 

40

▲ Undisturbed

60

Shear Strength (kPa)

80

△ Remoulded

100

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

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

Elevations interpolated based on topographic information supplied by the City of FILE NO. DATUM PH1236 Ottawa. REMARKS HOLE NO. TP 7-09 DATE 3 Dec 09 BORINGS BY Hydraulic Shovel SAMPLE Pen. Resist. Blows/0.3m Piezometer Construction PLOT **DEPTH** ELEV. • 50 mm Dia. Cone **SOIL DESCRIPTION** (m) (m) N VALUE or RQD RECOVERY STRATA NUMBER Water Content % 20 40 60 80 **GROUND SURFACE** 0 + 99.20**TOPSOIL** 0.23 Brown SANDY SILT, trace clay 1 + 98.201.07 Ţ G 1 GLACIAL TILL: Brown fine to coase sand with gravel, 2 + 97.20cobbles and boulders - grey by 2.1m depth 2.90 End of Test Pit (Water infiltration @ 1.1m depth)

**SOIL PROFILE AND TEST DATA** 

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

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

Elevations interpolated based on topographic information supplied by the City of Ottawa.

FILE NO. PH1236

REMARKS

BORINGS BY Hydraulic Shovel				D	ATE :	3 Dec 09			HOLE	NO. TP 8-0	9
SOIL DESCRIPTION	PLOT		SAN	/IPLE		DEPTH				Blows/0.3m Dia. Cone	eter
	STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	(m)	(m)	0 V	Vater C	ontent %	Piezometer
GROUND SURFACE	ß		Z	RE	z °	0-	99.00	20	40	60 80	
TOPSOIL 0.	<u>25</u>										
Brown <b>SANDY SILT,</b> trace clay						1-	-98.00				
	.41					2-	97.00				
Firm, grev SILTY CLAY	.84	G	1			3	96.00				
								20 She ▲ Undis		60 80 ngth (kPa) △ Remoulded	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 Ottawa.

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PH1236

REMARKS BORINGS BY Hydraulic Shovel				D	ATE :	3 Dec 09		HOLE NO. TP 9-0	09
SOIL DESCRIPTION	PLOT		SAN	/IPLE		DEPTH		Pen. Resist. Blows/0.3m • 50 mm Dia. Cone	ețer
	STRATA	TYPE	NUMBER	RECOVERY	N VALUE or RQD	(m)	(m)	○ Water Content %	Piezomețer
GROUND SURFACE						0-	99.80		
Brown <b>SANDY SILT,</b> trace clay	28					1-	-98.80		
irm, brown SILTY CLAY	.83	G	1			2-	-97.80		
	.05					3	96.80		
								20 40 60 80 Shear Strength (kPa)  ▲ Undisturbed △ Remoulded	100

SOIL PROFILE AND TEST DATA

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

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Elevations interpolated based on topographic information supplied by the City of Ottawa.

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REMARKS

BORINGS BY Hydraulic Shovel					D	ATE (	3 Dec 09			HOLE	NO. TF	P10-0	9
SOIL DESCRIPTION		E SAMPLI					DEPTH (m)	ELEV. (m)	l .		Blows/0 Dia. Con		eter
		STRATA	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	(111)	(111)		Vater C	ontent		Piezometer
GROUND SURFACE					2	2	0-	-99.50	20	40	60 8	30 <del>  : : : :</del>	
TOPSOIL	0.25												
Brown <b>SANDY SILT</b> , trace clay	0.20						1-	-98.50					▼
Firm, grey <b>SILTY CLAY</b> with sand	_ 1.98						2-	-97.50	<b>.</b>				to the state of th
GLAICAL TILL: Grey silty clay with sand, gravel, cobbles and boulders End of Test Pit  (Water infiltration @ 0.9m depth)	3.56 3.81						3	96.50					, and the same and
									20 She		60 ngth (kF △ Remo	Pa)	00

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

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study 1730 Wilhaven Drive Ottawa, Ontario

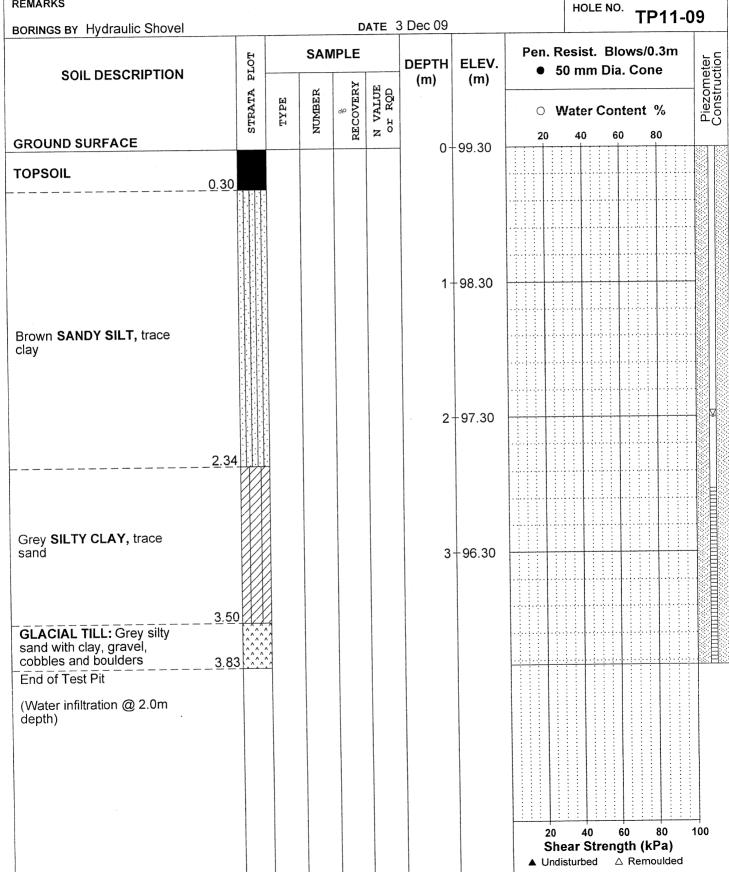
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Ottawa. REMARKS



Terrain Analysis & Hydrogeological Study

SOIL PROFILE AND TEST DATA

lacktriangle Undisturbed  $\triangle$  Remoulded

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

1730 Wilhaven Drive Ottawa, Ontario

DATUM Elevations interpolated bas Ottawa.	ed or	topo	graph	ic info	rmatio	on supplie	ed by the	City of	FILE NO.	PH1236	
REMARKS				_	'	2 Dag 00			HOLE NO.	TP12-0	9
BORINGS BY Hydraulic Shovel	DATE 3 Dec 09  SAMPLE							Pen. R	esist. Blov		
SOIL DESCRIPTION	A PLOT		~	37	担っ	DEPTH (m)	ELEV. (m)	• 5	0 mm Dia.	Cone	mete
	STRATA	TYPE	NUMBER	% RECOVERY	n value or RQD			0 W	ater Conte	ent %	Piezometer Construction
GROUND SURFACE	Ŋ		Z	RE	z o	0-	100.50	20	40 60	80	
TOPSOIL 0.28											
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders							-99.50 -98.50				₹
End of Test Pit											
(Water infiltration @ 2.1m depth)								20	40 60	80 1	000
								20 She	40 60 ar Strength	80 1 ( <b>kPa</b> )	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 clay.
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.

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

The standard terminology to describe the strength of cohesive soils 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
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

### **SAMPLE TYPES**

SS	-	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
AU	-	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

Cu > 4

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

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'\_ - Preconsolidation pressure of (maximum past pressure on) sample

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

Compression mass (in shoot at prossures above p

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

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

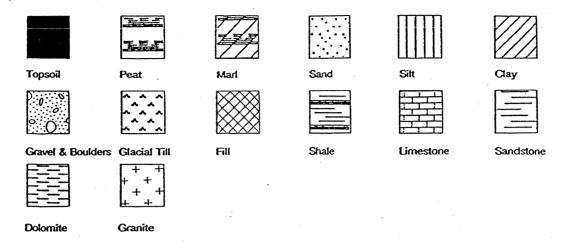
Wo - Initial water content (at start of consolidation test)

#### **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.

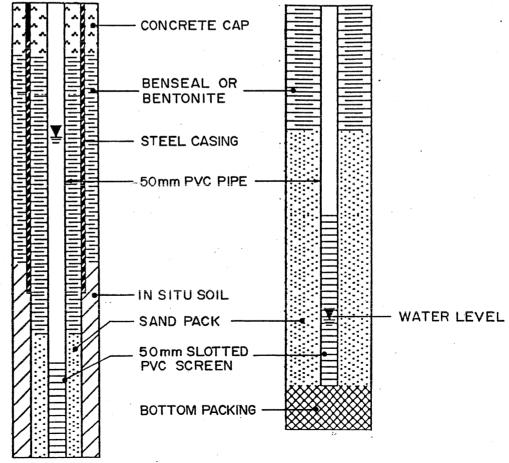
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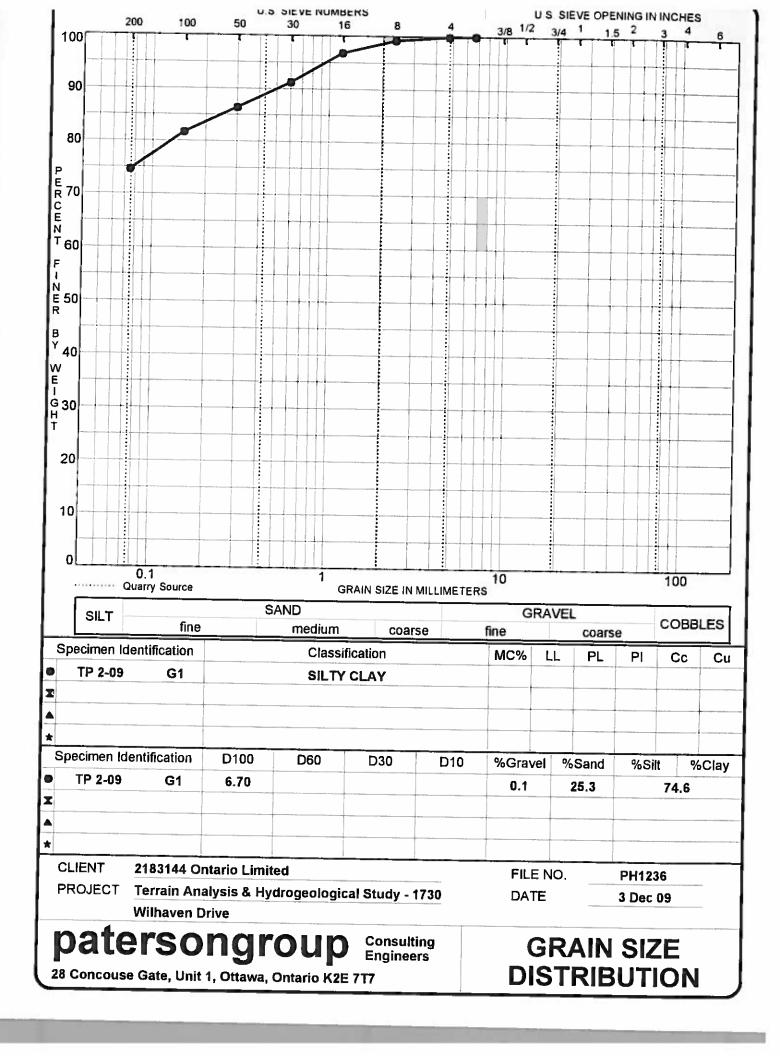
### STRATA PLOT

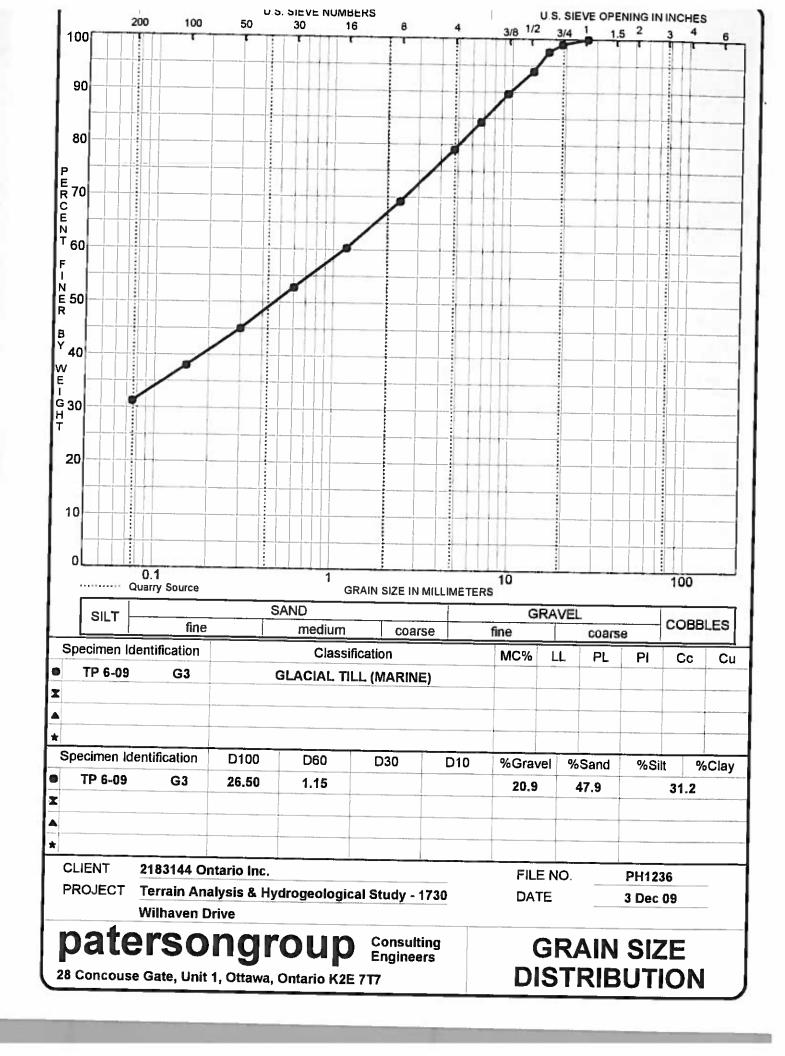


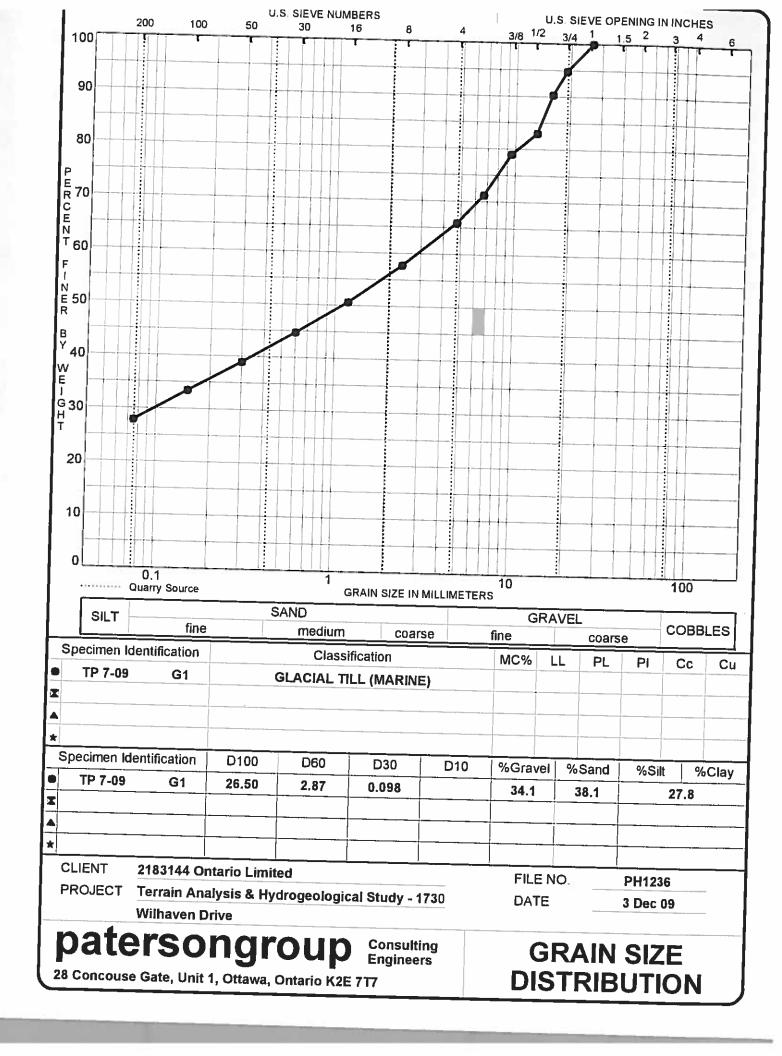
### MONITORING WELL AND PIEZOMETER CONSTRUCTION

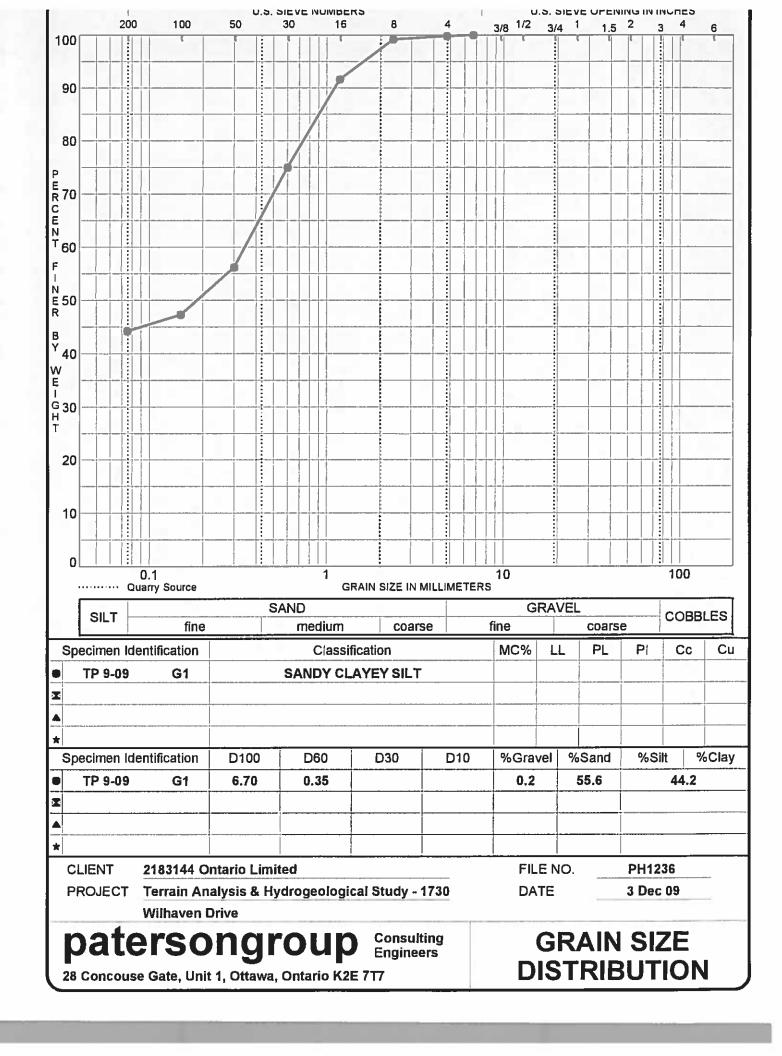
# Monitoring Well Construction Piezometer Construction CONCRETE CAP















Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### Appendix 2

MOECC Water Well Records

Report: PH1236-REP.02R2

X5√Ye∉ \_\_; No

Ministry's Copy

03/10

TW1

102654

C Queen's Printer for Omario, 2007

Well Record t Below) Ministry of Well Regulation 903 Ontario Water Resources Act Ontario the Environment Page\_ Measurements recorded in: Metric Hymperiat Well Owner's Information Will Constructed A Care Name / Organization 92183 E-mail Address FRED Mailing Address (Street lectac Well Location Address of Wall Location (Street Number/Name) St. 1750 M County/District/Municipality Postal Code Ontario ANTRPSOR arto 503812 ment Sealing Record (see instructions on the back of this form) Overburden and B General Description Other Materials Most Common Material General Colour 0' 19 10' inestone Results of Well Yield Testing Annular Space Draw Down Type of Sealant Used (Material and Type) Volume Placed (m)(ft) Depth Set St (1997) Time Water Level Time Water Level (ITATE) 4,68 10, 2057 created give reason: 1909 ump intake set at (((n)) 2 1855 21804 300 3 1123 rate (Minh (GFM) Well Use Duration of pumping Method of Construction 1 182'5 Not used
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Other, specify Cooling & Air Constituting 93'2 Borng Diagra Describe (Amin COPM) 15 1747 Air percussion 15 1971 Status of Well 13'5" Construction Record - Casing Recommended pump depth (m/li) 20 Wyoter Supply
Reptacement Well
Teel Hole
Rectarge Well
Dewatering Wen Recommended pump rate
(Vmin GPM) Depth (mm) Open Hole OR Material (Galvanized, Foreglass, Controle, Plastic, Steel) Insuring Digmelier (cm/in) Wolf. 25 To 30 归山 188 40 170 Observation and/or Monitoring Hole
Alteration (Construction)
Abandoned, insufficient Supply Well production (White (SPA) 50 169'5" 0 Districted? 69205'7" BO Ores I No Map of Well Location Abandoned, Poor Water Quality Construction Record - Screen provide a map below following instructions on the back Depth (m/h) Outsking ! Moterial Sicely 282 Sto: No Azandoned, othe 130 Wilhauen specify DINE TWEE THE TOOK Hole Diameter Water Details Water found at Depth Kind of Water Fresh Ontested
Water found at Depth Kind of Water Fresh Ontested

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Water found at Depth Kind of Water Fresh Untested MXG. 360 (m/h) \_Gas; \_Other, specify\_ Well-Contractor and Well Technician Information nitross Name of Well Contractor

12 Lock D2 LL

africas Address (Street Number/Name) Colap Postal Codo Bueiness E-mail Address
No. (rig crca code) Name of Well Testmician (Les Name Tirs) Name

20 1 0
Les No. Signature of restriction and/or Contractor Data Submitted Ministry Use Only Aude No. 2 102633 2009 No. Cuoun's Printer for Omena, 2007 Ministry's Copy 0505E /12/200/1

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TW2

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W. A UDJUUJ Well Record rint Below) Ontario Regulation 903 Ontario Water Resources Act the Environment Measurements recorded in: (1) Metric Amperial Well Owner's Information Municipality Well Location haven Di Postal Code Ontario AN# 5038 General Description General Colour 337 405 231 440 Results of Well Yield Testing Annular Space Drew Down After test of prediction in a Type of Sealant Used Depin Set at (4/11) Water Level Time Water Level (m/h) (m/h) (Famorial and Type) 468 Stetic 184 pumping decontinued, give reason; 1854 201 1879" 2 196 umparative set at (AVA) 1 3 194 Well Use Duration of pumping min Method of Construction Pa'1' Public
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Monitoring Diamond Commercia: Cable Tool 93'7" 5 191 Digging Municipal
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Sair percussion
Other, spearly Industrial Da 9" 15 18L Rowing give rate (Ison GPM) Other, specify A'9" 20 178:4" Status of Well Construction Record - Casing Water Supply
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Test Hole ommended pump depth (1978) Open Hoto OR Meterial (Gehreniced, Fibreglass, Concrete, Presig, Steel) Wall Thickness (cm/in) Inside Diamete (cm/h) 25 206 2 25 3506 9 30 Recommended pump ra 188 Recharge Well u Dewstering Well Observation and/or Monitoring Hole Map of Well Location

Map provide a map below following instructions on the back

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TW3

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

A106363

TW4

YWI Well Record

Regulation 903 Ontario Water Resources Act

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wa TW5 Well Tag No. (Place Sticker and/or Print Below) Well Record Ministry of Regulation 903 Ontario Water Resources Act the Environment A115887 Page 7175491 Well Owner's Information Last Name / Organization E-mail Address First Name FARSI by Well Owner Postal Code Telephone No. (inc. area code) Mailing Address (Street Number/Name) Municipality Province OR OVAWA CARELTON 1730 WILHAVEN ON 164471 Well Location Lot A Township Concession Address of Well Location (Street Number/Name) FORMERLY 20 WILHAVEN CUMRERIANO City/Town/Village Province Postal Code County/District/Municipality OTTAWA Ontario MANTE VTM Coordinates Zone Easting
NAD 8 3 Municipal Plan and Sublot Number Other Northing LOTS WORTH PARTS OF Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) Depth (m/ft) Most Common Material Other Materials **General Description** From BROWN SOFT CLAY GRAVEL RDUN UMESTONE LIMESTONE Results of Well Yield Testing **Annular Space** Depth Set at (m/ft) Type of Sealant Used Volume Placed After test of well yield, water was: Draw Down Recovery (m³/ft³) (Material and Type) Clear and sand free Time Water Level Other, specify UEARING (min) (m/ll)(m/ft) ENTONITESLURR Static If pumping discontinued, give reason: Leve 1 1 Pump intake set at (m/ft) 2 2 Pumping rate (I/min / GPM) Method of Construction Well Use 4 4 Cable Tool ☐ Diamond Public ☐ Commercial ☐ Not used Duration of pumping Rotary (Conventional) ☐ Jetting ☐ Domestic Municipal □ Dewatering 5 5 hrs + ( ) min Rotary (Reverse) Driving ☐ Livestock ☐ Monitoring Final water level end of pumping (m/ft) ☐ Boring ☐ Irrigation ☐ Digging Air percussion
Other, specify ☐ Industrial Other, specify 15 15 If flowing give rate (Vmin / GPM) Construction Record - Casing Status of Well 20 20 Water Supply
Replacement Open Hole OR Material (Galvanized, Fibreglass, Wall Thicknes Depth (m/ft) Recommended pump depth (m/ft) Diameter (cm/in) Replacement Well 25 Concrete, Plastic, Steel) (cm/in) Test Hole
Recharge Well Recommended pump rate 30 30 STEEL (I/min / GPM) ☐ Dewatering Well 40 40 0 OPENHOUR ☐ Observation and/or Well production (Umin / GPM) Monitoring Hole 50 50 ☐ Alteration (Construction) 5-85 60 Yes No 60 Abandoned, Insufficient Supply Map of Well Location Construction Record - Screen Abandoned, Poor Please provide a map below following instructions on the back. Outside Depth (m/ft) Water Quality **Material** Slot No (Plastic, Galvanized, Steel) Abandoned, other, From specify FRANK KENNYRO Other, specify Water Details Hole Diameter Water found at Depth Kind of Water: Fresh Duntested Depth (m/ft) Diamete: (cm/m) (m/ft) Gas Other, specify Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify Well Contractor and Well Technician Information Business Name of Well Contractor Well Contractor's Licence No. TI SAUNDERS ORILLING. Business Address (Street Number/Name) Municipality Comments: Province Postal Code Business E-mail Address Well owner's Date Package Delivered Ministry Use Only DIUT. K10191/60 informatio package delivered Bus. Telephone No. (inc. area code) Name of Well Technician (Last Name, First Name) DIDIY14 MIRIONS Well Technician's Licence No. Signature of Technician and/or Contractor Date Submitted z131189 Date Work Completed ☑ Yes ☐ No MENDINE Well Owner's Copy

Measurements recorded in: Metric Imperial

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

Tag#: A124333

TW6

Twb **Well Record** 

Regulation 903 Ontario Water Resources Act Page\_

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ous, reiepnone No	J. (ITIC. ATEA CODE)	E allenation	ien (Last Name,	T (ISC INDINE)	package delivered	MIN N & CO YE	00	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	24	104
0/1902	THOCK	SHUNUDER	-) //	0/		Date Work Completed	1	ZI	<b>5 L</b>	191
Well Technician's L	icence No. Signati	ire of Technician and	or Contractor Da	te Submitted	✓ Yes	O Muller I	316			
151	/ ()	roy lack	- X	A N X W W B B	□ No	X K Y Y MEN	OD	Received	66	
0506E (2007/12)	Queen's Printer for	Ontario 2007		Well Owner's Cop	py					
		1/								



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

Tag#: A124334

TW7
Well Record
Regulation 903 Ontario Water Resources Act

Well Location Address of Well Location (Street Number/Name) LOTU PTOFE 1730 WILHAVEN

County/District/Municipality FORMERLY CUMBERLAND DR. City/Town/Village Postal Code OTTAWA CARELTON Ontario KUETITI UTM Coordinates | Zone | Easting | Northing | NAD | 8 | 3 | 1 | 8 | 465 | 7 | 1 | 9 | 50 | 3 | 8 | 2 | 7 | 4 Municipal Plan and Sublot Number Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form General Colour Most Common Material Other Materials General Description BROWN LOAM BROWN CLAY DENSE BROWN GRAVEL STONES BROWN UMESTONE Annular Space Results of Well Yield Testing Depth Set at (m/ft) Type of Sealant Used Volume Placed After test of well yield, water was Draw Down Recovery (m³/ft³) From (Material and Type) Clear and sand free Water Level Time Water Level 224 ☐ Other, specify CLEARING (min) (m/ft) 20 BENTONITE SLUBRY f pumping discontinued, give reason 408 eve 10.0 Pump intake set at (m/ft) 75 3 Pumping rate (I/min / GPM) Method of Construction Well Use '2.0 Cable Tool Diamond Public ☐ Commercia ☐ Not used 30. Duration of pumping Rotary (Conventional) Jetting ☐ Domestic ☐ Dewatering Municipal hrs + 💍 min 6 Rotary (Reverse) ☐ Driving Livestock ☐ Monitoring X Test Hole Boring
Air percussion
Other, specify Final water level end of pumping (m/ft) ☐ Digging ☐ Irrigation Cooling & Air Conditioning Industrial Other, specify 7.8 If flowing give rate (I/min / GPM) Construction Record - Casing Status of Well 20.5 Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) Inside Well Depth (m/ft) ☐ Water Supply Recommended pump depth (m/ft) Diameter (cm/in) Thicknes Replacement Well 25 25 From (cm/in) Test Hole Recommended pump rate . 188 24.4 Recharge Well 30 20 STEEL (I/min / GPM) Dewatering Well OPEN HOLE 20 80 Observation and/or Well production (I/min / GPM) Monitoring Hole 22.6 50 50 ☐ Alteration Disinfected? (Construction) Abandoned Insufficient Supply 60 Yes 🗌 No Construction Record - Screen Map of Well Location Abandoned, Poor Outside Depth (m/ft) Water Quality Please provide a map below following instructions on the back. Slot No. Abandoned, other From specify Other, specify Water Details Hole Diameter Water found at Depth Kind of Water: Fresh Wintested Depth (m/ft) Diamete (cm/in) From (m/ft) Gas Other, specify 20  $\circ$ Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify 6 20 80 Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify Well Contractor and Well Technician Information Business Name of Well Contractor 41817 7. SAUNDERS Comments RR#I BRAESIDE Business E-mail Address KIDIAI GO Well owner's information Date Package Delivered Ministry Use Only Name of Well Technician (Last Name, First Name)

SAUNOERS TROY 2011/1206 package delivered z131192 Date Work Completed X Yes JAN 2 4 2012 20/201/06 ☐ No

Ministry of Environment and Energy

WATER WELL RECORD
House Well (HW)

Print only in spaces provided.

Mark correct box with a checkmark, where applicable.

	with a checkmark, where appro-		Township/Borough/City	Town/Villan	4	. 10	con block tract sur	vey, etc. Lot	
cernity or District	in Carelton	_	Cum	, /	and .		7		
wuecz anwawe	First Name	1	Address of Well Location	9/	1.64	moort	Date complete	d 50/0	Anto year
FITZPI	Atrick Farle	and the same	1730 W.	DITUR	es par	2 /381 . / )2	257.92		
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	ŁOG C	F OVE	RBURDEN AND BED	ROCK MA	TERIALS (se			Depth	- tesf
ieneral colcur	Most common material		Other materials			General de	scription	From	To
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							mening De	ometer   Lo	ngth
AW	TER RECORD	C C	ASING & OPEN HO	1 0	R17 Septh - feet			inches	1941
Water found	Kind of w≥ler dis		Material thickness	Profi	n To	SCHEEN HEEN	and type	Depth at t	op of screen
-85	Gresh G Suprur  Sary G Gas		Steel J Galvanized	1 /	1 24	<u> </u>			feet.
60	= C	<i>U</i> "	Concrete Copen hale	10	26		PLUGGING & SE	ALING RECO	RD
	□ Fresh □ Suprer □ O		C Plate F. Steel		1		Annular space	Ξ <b>V</b> Pπiq	onment
	G Fresh L Minerals	4.1	☐ Gaherrized   / S	P/+:	1 26	Depth set	trainertal and	Abe (Cement 3.5c	t, benzenc. dt.)
	Salry Gast G	71	Open hole	_ _		0	26 Cen	eat gR	out
	☐ Fresh ☐ Minerals ☐ Sally ☐ Gaz	Ži T	C Cahanised	2	6 83		36367		
	C Fresh C Minerals C Sarry C Gas	5"	Concrete  Copen hold  Plastic	12	07				
	□ Sarry □ Gas						CATION OF WELL		
Pumping t	est method Pumping rate	GPM	Duration of pumping Hours N	fms	In diag	LA gram below she	ow distances of we	ll from road an	d lot line.
A STATE OF THE STA	Water levels Water levels during	, =	Pumping Union	24007	Indical	e north by arr	DAN.		
TEST	end of pumping   15 minutes   20 m	sicules	45 minuses 50 minus		£		NT		
5 3	83 22 2		22 14 2	2	]				
3 3 3	Over tate Pump intake pet al	73 <sub>m</sub>	Vizier at end of test	uzy	V				
D. Recommen	Recommended		Recommended		372				
Q Stell	Julia Maria A	O test	6	GPM	-3			t	
1				==1	3/	. 19	1	1211	P :
	ATUS OF WELL  Cer supply   Abandened, in	sufficient 9	upply 🖸 Untrilated	_	Ž	WH	haven		
200	Servation well D Abendoned, Dr	OL GITTIEN	7 Replacement v		13			N/	
	custics and the property of th				7.7			200 / *	9
WATER	JSE T. Commercial		☐ Not use ☐ Caher	11	3			31/	
1 S4	OCA Sunicipal Thursday	10		***	1.3			<i>ች</i>	
Ulin	dustrial Cooling & air	conditionin	• *:		M				
METHOL	OF CONSTRUCTION	¥	n						
Title	able tool 🔲 Air percussio	n	□ Driving □ Deging □ Other		}			ಿ ೨೯	7362
5 R	Lottery (conventional)		Odier		1				1302
			Well Contractor's Li	cence No					
flame of V	reli Contractor	Koil.	Well Contractors U	WIND IN	ONE				
1. 3	s Bonageois Wells	<i></i>	7-1	X.Y.	18				
61	Thort Du		Well Technician's U	cance No	A USE				
	Proload P	/	West Tourson's	1.41	E				
	2000000 Just	<u> </u>	Sprigeron alle	103	MINISTRY				
_			day mo	<b>y</b>				0	506 (06/02) Front
	CONTRAC	TOR'S	COPY						

Ministry of We	Tag#:A17	Zaca Juli	1490	O'Toole	
Ontario Ministry of the Environment We		*	Regulation		Well Record Water Resources Aci
Measurements recorded in: Metric Imperial	173263	<u></u>			3 of $3$
Well Owner's Information  First Name   Last Name / Organization		e la setta e seve		4.6 to 0.555	िल्लाकुर्या राज्य (दी विष्
Jean Couthing		E-mail Address	_	-	☐ Well Constructed
Mailing Address (Street Number/Name)	Municipality	Province	Postal Code		by Well Owner ne No. (inc. area code)
1529 Frank-Keeny Rd Well Location	Cumberlan	10 OM	K 14 K 11 1	N9613	9097297
Address of Well Location (Street Number/Name)	Township 70 0	Tool-Rd -	Lot	Conces	sion
County/District/Municipality Lof DRF Co	City/jown/Village	elippini di	DRP		7
OTTHWA CITY		1000		Province Ontario	Postal Code
UTM Coordinates Zone Easting Northing	Municipal Plan and Sul	blot Number		Other	K141C11 1/119
NAD   8   3 / 4   466   3   3   5   5   6   3   4   4   6   6   6   7   8   6   7   7   7   7   7   7   7   7   7	2 4R-20	736			
General Colour Most Common Material	Other Materials		eral Description		Denth (m/ft)
Brown Clay			Confingence (	2+	From To 3.63
GURY SHALE		<u> </u>	Loose	07~/	3.63 4.54
Grey Limestone			Hard	·	4,54 103.03
	<del></del>		777700		7.59 105.05
		-	·-·		
		<u> </u>	<del></del>		
	<del></del>				
		<u> </u>	<del> </del>	<del></del>	
Annular Space			Results of We	I Vield Testin	 g
Depth Set at (m/ft) From To (Material and Type)	Volume Placed (m³/ft³)	After test of well yield.	water was:	Draw Down	Recovery
12.12 0 Coment Count	240/	☐ Clear and sand f☐ Other, specify	ree	Time Water Le	vel Time Water Level
Petus	- 70h 5.	If pumping discontinue	d, give reason:	Static 0.90	<del> </del>
		11.		1 1,57	
		Pump intake set at (n	√ft)	2 2.60	2 24 91
Mothed of Court of		Pumping rate (Vmin /	0014	3 2.77	3 24 17
Method of Construction Well  Cable Tool Diamond Dublic Com	The state of the s	11 22'00			3711
Retary (Conventional)	cipal Dewatering	Duration of pumping		1 2 4	<del>                                      </del>
☐ Boring ☐ Digging ☐ Irrigation ☐ Cooling	Hole	hrs + 10 m	pumping (m/#)	5 4, 74	100.10
Air percussion Industrial Other, specify Other, specify	-	37.5	5/	10 7.24	
Construction Record - Casing	Status of Well	If flowing give rate (I/m	in / GPM)	15 /3 . P	6 15 25,01
Inside Open Hole OR Material Wall Depth (m/ft) Diameter (Galvanized, Fibreglass, Thickness	☐ Water Supply	Recommended pump	depth (m/ft)	20 17, 20	20 22.57
(crivin) Concrete, Plastic, Steel) (cm/in) From To	Replacement Well Test Hole	102:0		25 20.0	[ . ] e.e.
15.40 Open Hole 0 12.12	Recharge Well	Recommended pump (Vmin / GPM)	· · · · · · · · · · · · · · · · · · ·	30 22. 56	30 /5,92
	Dewatering Well Observation and/or	22! Well production (l/min.		40 27, 50	40/0 //
5,55 Steel 0.48 1,21 12.12	Monitoring Hole 2. ☐ Alteration	13.50	No section .	50 22.40	50 6 65
9,0.1	(Construction)  Abandoned,	Disinfected?  Yes No	* SORREIT	60 37.5%	60 3 5/2
Construction Record - Screen	Insufficient Supply		Map of Well		التفيع في وقيل
Outside Diameter (cm/in) (Plastic, Galvanized, Steel) Slot No. From To	Water Quality  Abandoned, other,	Please provide a map b	elow following ins	structions on the	back.
17011 18	specify		1:11	. n	
	Other, specify	1 J	ilhave	WILL	C. S. Immercani
		2	_		
Water found at Depth Kind of Water: Person I Interest Do	Hole Diameter pth (m/ft) Diameter	1 %	1746	R.	
(m/ft) Gas Other, specify From	pth ( <i>m/ft</i> ) Diameter To ( <i>cm/in</i> )	3	e Res	e	
Water found at Depth Kind of Water: Fresh Untested	103.03 15,55		10 E-30	Ö	
(m/ft) ☐ Gas ☐ Other, specify Water found at Depth Kind of Water: ☐ Fresh ☐ Untested	1. 1		•	2	
(m/ft) Gas Other, specify		True .		7	
Well Contractor and Well Technician Informa Business Name of Well Contractor Iw		13		7	
DAR-WATER-Well-Duilling  Business Address (Street Number/Name)  W	ell Contractor's Licence No.	ITWA	es Bo	1	Printer Marchall transfers, \$4.6 reprove programmer programmer and printer than \$15° 1-9° 1.7°
Business Address (Street Number/Name)	unicipality	Comments:			
Frovince   Postal Code   Business E-mail Address	lastions			**	
on KOPIBCO		Well owner's Date Pac	kage Delivered	1 34.2 26 - 20.2	<del></del>
Bus. Telephone No. (inc. area code) Name of Well Technician (Last Name,	First Name)	information			try Use Only
Vell Technician's Licence No. Signature of Technician and/or Contractor Da	II	delivered Little	ダー(を) を) k Completed	웨	T3//5/
1 +3 1 /3 / Taves of 2	te Submitted	∐ Yes	IS AKA BA		
506E (2007/12) @ Queen's Printer for Ontario, 2007	Well Owner's Copy	- 184 km	ta Im kan Dla	Received	

THE OWN PROCESSION TO SECURITY WHEN SPICES AND ADDRESS OF THE WAY A STATE OF THE WHOLE AND ADDRESS OF THE WAY A STATE OF THE WA	Ontario Ministry     of the     Environment		110. A • • • • • • •	The Ontario Wate WATER W	r Resource ELL REC	es Act
County to black of the control market of the	Print only in spaces provided. Mark correct box with a checkmark, where applicable	. 11	153126	6 นุ๊ริดัน ผู้	ייי אם:	107
Committed colors   Mont common mistrial   Color malarida   Color malarid	OTTAWA - Carleton	Pumbe	MVIIIage	Date complete	7 05/0	
Control   Cont		VERBURDEN AND BEDRO	CK MATERIALS (see		Depth	feet
SECULAR SELECTION OF SELECTION	General colour Most common material	Other materials		£ .	From	70
Section   Sect	Buous Clay	Bould	ev.	h005=	10	7,-
Cash	Cary himestone			Dava _	1	7-2-
Total   Control   Contro	Brewn SHALE			10 vous	3	203
WATER RECORD	Cary himestone			- / · orci		2.05
WATER RECORD	-'-					
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T   WATER RECORD   Water Found   Cash of value   Cash of val	31		البلبل المالية	بالبلباباليسال	والماليين	
Water Parce   Subject	N 19 19 19	ليلياباليييال	PARA I	Street of noming 31-13   Diam	eter >> Lengt	ايا لواصلت
Section   Supplementation	Water found Inside	Wall	Depth - teet	(Clast 1)a )	Inches	
Safety   Galler   Safety   G	at - 1991 suches 1 Sulphur 4 suches	D-Steel	rrum /b	Li Meterial and type	Depth at top o	
First   Gallery   Galler	Sally b Gas	1 Cl Coornele   / //	بالسحسايين			led
	Cas City	□ Steel	27.73	☐ Annular space		eni
	Fresh Suppor	2 Congreta	20 203	From To Material and typ	e (Cament grout, be	ntorule, etc.)
Fresh	25-19     Fresh 2     Sutphur   19	Plants	200		neut	rout
Continued   Cont	Fresh 1 Sulphur 34 00	1 Concrete	1 11	19 78 33-77 dr	_/	0
Static level   Water level of purposition   Water level of only   Purposition   Purp	□ Salty □ Gas	Plastic				
State level   West rever   We	71 Pumping left method 10 Pumping rate GPM	Duration of pumping	to diagram l	PROMITOR OF THE	om road and lo	A.A.
Pactor mended pump type   Recommended   Clude	Static level Water level 2" Water levels during 1		Indicate nor	th by arrow.	10	<del>*                                    </del>
Pactor mended pump type   Recommended   Clude	10 200 160 135	120 100	00		I par.	-
Station   Sertices   purp sating   Seet   purp rate   GPM		Water at end gladet			64	- 11
WATER USE    Stock		Recommended 46.48			C	
WATER USE    Stock	I SALIOW EPTONE 75 No	и ритолав / с дрм	1 1	4.4	~	<b>、</b>
WATER USE    Stock	FINAL STATISTOF WELL			Wilhner	-n 1	
WATER USE    Stock	Description will     Description will     Description will	supply 1   Unfinished 10   Replacement well	Ŭ			R
Signature of Destroction   Signature of Destro			1			
Stude   Municipal   Driving   Driv	Decreesic   Commercial	» □ Not use	74			- šP
Cable tool   Construction   Constr	☐ Stock ☐ Municipal ☐ Impartion ☐ Public supply	F340E 15 COVERNOUS CO.	[4]			3
Cable tool   All percussion   Debung		-	\			7
Marrierol Well Contractor   Marrierol Well Contractor   Libertol Mode   Marrierol Well Contractor   Libertol Mode   Marrierol Well Technician's Libertol   Marrierol Well Te	Cable tool Air percussion	* 🖸 Driving ** 🖸 Digging				4
Harmord Well Continuous  Actignes  Hame pi Well Technician  Well Technician Lownce No.  Signature of DestroyControtors  Signat	Darriord  Darriord  Darriord  Jetting	11 🗇 Other	1		206	<u>825 </u>
Adagona - A B = w f. O M f  Name pi Well Technician's Licence No.  Signature of DestroyCodiffician	Marmad Well Contractor	//jet Contractor's License No.	>: Data sa	Contractor O C WHZ Dat		2000
Name of Well Technician's Licence No.    Name of Well Technician's Licence No.   No.	1.1.1/	Willing 600	Date of Inspection		טט טטג ע	UUU
Name pl Well Technician's Libertes No. 1	15+-17/bont 01	n t	S			
0506 (11/86) Front Fairn	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Well Technician's Licence No.	Hemarks		CSS	.ESO
0506 (11/86) Front Fairn		09/07/00	Ž			
	2 MAINTEN OF THE FAILUR		(180 m) (170 m)		0506 (11/9	6) Front Farm

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Well Tag Number (Place sticker and mint number below) A 000750 A 000750

Well Record
Regulation 903 Ontario Water Resources Act

page  $\angle$  of 3

### 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 1/10° of a metre.

Please print clearly in blue or black ink only. 07 LOT MUN 15011 CON (CN Well Owner's Information and Location of Well Information

Address of Well I	NAD Zone Easting	Northing	ownship  The wait  Cityrown Village  Combar Land  Unit Make/Model Mode of Operat  Mace // An UTA	Site/Compartment/Block/Tract etc.  Ref 3 S 1 II Plum 4E/7 732  On Unafferentiated Specify  Differentiated Specify
Log of Overb	urden and Bedrock Materials		TINGE TIATU CLITT	Differenced, aprily
Brown Grey Grey	Mast common material  Clay  SKNKE  Limes Fance	Crnvc/	General Description  Soft  Loose  Hard	Depth Motres From. To 0 1, 4/4 1, 4/4 3, 030 3, 030 30,30
/		1000	30.55	

Hole Diameter		Cons	truction Rec	ord		Test of Well Yield				
Depth Metres Diameter	Inside		Wali	Depth	Metres	Pumping test method	Draw Dow	n F	ecovery	
From To Centimetres	diam	Material	Inicknoss		1101.00	1	Time Water Lo			
0 3.63 22.23	continetres		centimetres	From	To	JUDIN FAS 16/c	min Metre	s min	/Actas	
0 5,63 22,29			Casing			Pump intake set at (metres) 2 6.7 6	Static O.	5	4	
		Steo Fibreglass	Casuili			Pumping rate -	1 / /	91 1	116	
		1 44	1:88	0	3.63	(litres/min) / S	11.6	7	1.6.7.	
Water Record	15.55	Plastic Concrete	7.00	O	3,63	Duration of pumping	2 20	2 2	179	
Water found Kind of Water		Galvanuzed			Consult on the	1 hrs +CR1 min	2 2, 6		1,51	
		Steel Foreglass				Final water level end	3 7.7	6 3	169	
4.27m Fresh Sulphur Gas Salty Minerals	1	Plastic Concrete		į.		of pumping metres		Ye	7.47	
Gas Salty Minerals "Other:		Galvanized				Recommended pump	4 2 3	3 4	277	
m Fresh Sulphur		Steel Fibreglass				Shallow Pateup			ESTE Y	
Gas Salty Minerals		Plastic Concrete				Recommended pump	5 2.4	4 5	17/6	
Other: -	1	Galvanized			3)	depth. 28 7 Rnetres			1	
m Fresh Sulphur			Screen			Recommended pump	10 2.9	시 10	7.5	
Gas _ Sally _ Minerals	Outside	Steel Fibraglass	Slot No		2i	Recommended pump rate. (litres/min)	15 3	£ 15	3.57	
Other:	diam 1	Plastic Concrete	arul NO		4	If flowing give rate -	20 7.5	7 20	3 4	
After test of well yield, water was					10	(litres/min)	25 3,8	0 25	4.00	
X Clear and sediment free	i.	Galvanued		1	4	If pumping discontin- ued, give reason	30 4,00		400	
Other, specify		No C	asing or Scr	.eeu		uou, give reason.	40 4.3	6 40	41.00	
Chierran de la	r,	Open hole		3.63	30,30	1	50 5.8	50	4.30	
Chlonnated X Yes No		- opon no-e		13.63	30,30		60 5 AP	60	1 9H	
						·	00 3 6		10414.7	
Plugging and Se.  Depth set at Metrics Material and typ  From To Material and typ  0 3.43	aling Recor o (bentonite six	d Annuta ury, neal coment sturry	Volum	bandonment ne Placed c metres)	In diagram below Indicate north by	Location of well from a way arrow	f Well		ilding pJ	
Depth set at - Metres   Material and typ	aling Recor o (bentonite sil	d @Annuta ury, neat coment sturry	Volum	bandonment ne Placed	In diagram belov Indicate north by	w show distances of well from	f Well	ne, and bu	,,	
Depth set at - Metres Material and typ	c (bentonite siz	urry, neat coment sturry	Volum	bandonment ne Placed	In diagram belov Indicate north by	w show distances of well from	of Well om road, lot lin	ne, and bu	,-,	
Depth set at - Metres Material and typ	e (bentonite sil	d Parinuta  Iny, neal coment stury  Court  Court  Construction	) etc Volum (cub	bandonment ne Placed c metres)	In diagram belon indicate north by	w show distances of well from	of Well om road, lot lin	ne, and bu	,-,	
Depth set at - Metres Material and typ From To  3.63 Fe an  Material and typ	o (bentonite sit	rry, neat coment thurry	) etc. Volume (cub	bandonment ne Placed	In diagram below	w show distances of well from	of Well om road, lot lin	ne, and bu	,-,	
Depth set at - Metres Material and typ From To Material and typ  0 3, 43	o (bentonite sit	onstruction	) etc. Volume (cub	bandonment ne Placed c metres)	In diagram below indicate north by	w show distances of well from	of Well om road, lot lin	e, and bu	,,	
Depth set at - Metres   Material and typer   To   To   To   To   To   To   To   T	o (bentonite sil.	onstruction  Diamond  Dirting	) etc. Volume (cub	bandonment ne Placed c metres)	In diagram below indicate north by	w show distances of well from	of Well om road, lot lin	ne, and bu	,,	
Depth set at "Meter's Moterial and typ From To  3. 43  Cable Tool  Rotary (conventional)  Rotary (reverse)  Performatic  Industria	o (bentonite sil.	onstruction Diamond Disting Use Public Supp	) etc. Volume (cub	bandonment ne Placed c metres)	In diagram below indicate north by	w show distances of well from	of Well om road, lot lin	e, and bu	,-,	
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Well Tag Number (Plice sticker and print number below)
A 0 1 4 0 79 Ministry of Well Record প) Ontario the Environment Regulation 903 Ontario Water Resources Act A 014099 Instructions for Completing Form For use in the Province of Ontario only. This document is a permanent legas cocument. Please retain for future reference.

All Sedions must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form. Questions reparting completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.

All motire measurements shall be reported to 1/10th of a metre.

Ministry Use Only

Please print clearly in blue or black ink only. MUN 15011 CON CON O LOT D Well Owner's Information and Location of Well Information O Chncossion
D F Conc. 7

npartment/Block/Tract etc. Address of Well Location (County/District/Municipality) D-E romenhole WII
NAD Zone Easting
1813 / P 4651/44 WilhnuEN Northing Log of Overburden and Bedrock Materials (see instructions) Motres To General Description Other Materials Most common material 3.03 Boulder 0 005 Brown 3,03 96,96 ownol 96.96 Test of Well Yield Construction Redord Recovery Diamo Depth Maires Inside Material Timo Water Leve thickness From To diam Motres From То ntimotr rump intake set at -(metres) O. CO Pumping rate 6,06 1222 6,20 32,10 Casing Cated []Fibreglas 31,40 (litres/min) **G** 5,55 Pleastic Concrete 0,48 0 7,27 Water Record
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Not used TT Other Stock j Imgalio Cooling & air conditioning Final Status of Well Unfleisher Abanconed, (Other) Was the well owner's inf package delivered? Yes LAND Abandon Abandon Dewatering Replacement ed, poor quality Test Hole Ministry Use Only Well Contractor/Technician Information R-WATER-WC DO JUL 1 3 2004 1 Well Record Number houis Contractor's Copy Ministry's Copy Well Owner's Copy 1534819 Cette formule est disponible en français

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For use in the Province of Ontario only. This document is a permanental legal occurrent. Please within for future reference.  All Sections have be completed in all for world delays in presenting in the permanent of the formation of the formatio		Ontario Ministry of the Environment A 0140  Instructions for Completing Form						Regulation 90:	3 Ontai	rio Water R	Record
Well Dameter    Control	• For use • All Section • Question • All metri	in hie Provi ions houst bi ns regarding a measurer	nce of Ontarion completed in completing the ments shall be	/ull to avoid delay is application can a reported to 1/10	nent is a pern s in processi be directed to	nanent leg ng. Further o the Wate	al document. P	d explanations are ava ment Coordinator at	ailable 416-2	rence.	
Address of Well Location (County/Djate/Anuncipality)  The Management of the County of						MUN		<del></del>	Only	<del></del>	<del></del>
Statisfier of Hammon Program (Company Visign Statisfor Statistics)    Company Visign   Statisfor Statistics	Well. CWIII	B IIIIOIIII	uon and Loc	arion of AASH INK	ormation	ALC: N				1 1 1 2	n[[.]
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Mote Diameter	91 1	8:3	V4 146	55567 50	7 3/2//2	Mno	- lan				Vereged
Section   Construction Record   Constructi		¥				-					
Construction Record	General Cologr							Description			
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Depth Material   Dept	Hale C	Diameter		Cons	struction Reco	ord	· · · · · · · · · · · · · · · · · · ·	Tes	t of We	ell Yield	
Casing   C			. II INNGO i		Wall	Depth	Metres	Pumping test method			Recovery
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Cobin Tool   Subject   Concrete							0,00	Duration of pumping	2 2	0.36	2 61.10
Color   Sulty   Morenal   Control   Colore   C		-		Stant Floreglass				Figal uples lount and			
Cobin Tool								of pumping 64.79	.3	14.16	3 5 7, 76
Gas   Sulty   Merinals   Galvanicad   Galv	Other:			7-7-1			-	Recommended pump	4 2	2.24	4 58.56
General   Sulphus   General   Sulphus   General   Gene	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							Shallow Procesp		3 32	c 499 4-
Playid, water was   Play		301y						depth J.J. metres	3 4	3. 40	3 37.75
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After first of whall yield, water was   Galvenaced   Galv		Sally [_] Mine			Skot No.			(filres/min)		2.011	5 53.04
Chlorinated   Tyes   No   Residence   No Casing or Screen   Well Contractor   No Casing or Screen   No	After left of well	yield, water w	ıs	Plastic Concrete					25	7.72	5 49. 32
Chlorinated (								If pumping discontin- ued, give reason.		3 34 3	10 48.20
Plugging and Sealing Record	Usher, specify	y			asing or Scre	en	<del></del>	1-x	40 5		
Plugging and Sealing Record	Chlorinated [#1	Yes No	- 11	Open hole		6.66	84.84	A CONTRACTOR OF THE PARTY OF TH	60 K		
Septiment   Sept		Plugging an	d Sealing Reco	rel Z Annula	rabaca [] Ab	endonment		I neation o	( Well	27 17 1 0	~ 170,020
Mothod of Construction   Diampad   Diagrag   Diagrag   Other   Rotary (corpvantional)   Air percussion   Jetting   Other   Rotary (reviews)   Boring   Diampad   Diagrag   Other   Diagrag   Other   Diagrag   Diagrag   Other   Diagrag	Deput set at - Me	Tes [Material or	nd type (bentonite s	turry, neet cement sturry	Volum	e Placed	In diagram below	show distances of well fro		lol line, and	building.
Method of Construction							Indicate north by	утом			9
Rotary (conventional)				Jus	/ 2	5-		100	17		\$
Rotary (conventional)				<del></del>	_		1 :				:11
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Rotary (conventional)	10 10			······				4 -			- 3
Rotary (conventional)			Method of C	Construction			-7		:: 14	AVEN	0,
Rolary (revises)   Borring   Driving	Cable Tool						1 3	g ~	-		
Industrial						Other	ق ا	<b>}</b>	<b>b</b>		$-\lambda$ II
Stock Commercial Cooling & air conditioning   Infristion   Municipal Cooling & air conditioning								$\neg$			
Impation   Municipal   Cooling & air conditioning							1	1	<b>R</b> -		וי
Well Contractor   Date Of Inspection   Well Contractor	Impation Municipal Cooling & air conditioning						Audit No. 😙	1 / 94 N   Date	Malt c	ompleted	
Observation well Abandoned, insufficient supply Dewatering Replacement well Replacement wel								14610	<u> </u>	2005	
Test Hole Abandoned, poor quality Replacement well  Well Contractor/Technician Information  Name of Well Contractor  Name of Well Contractor  Data Source  Data Received  Data Record Number  Well Record Number  Well Record Number	Observation well Abandoned, insufficient supply Dewatering								- CONVES	,	
Name of Well Contractor  Data Source  Data Source  Contractor  Suspense Address (street frame, number, city etc.)  Data Contractor  Suspense Address (street frame, number, city etc.)  Data Received 1 872805  Data Received 1 872805  Data Record Number  Well Record Number  Signalure of Technician (test name)  Data Source  Contractor  BO 0 6  Data Received 1 872805  Well Record Number	Test Hole Abandoned, poor quality Replacement well							Onh			
Date of Inspection vivy MA DD DATE o											
Name of Well   Schnicken (lest name, first name)   Well Tochnicken's Licence No.   Remarks   Well Record Number	DAR+WATER-Well-Dulling 6006								6_(	106	
Node of Well   Schnician (last name)   Well Technician's Licince No.   Remarks   Well Record Number   Signalure of Technician's Licince No.	DUST COLUMN	(street harne, r	S # . A	Iben 7-	ani		Date Received	1 2Rd5 DO Date	of Inspi	action YYYY	MM DD
Stringly Technipsin/Contracted  Data Submitted  TO THE SUBMITTER OF THE PROPERTY OF THE PROPER			ne, first name)	- We	I Technician's L		Remarks		Record	Number	1-1
xot aus bleums. 2005 1828			7-00	44.7.3 Date	C. dummer and	<del>2</del>		495			
0506E (09/03) Contractor's Copy C Ministry's Copy (71/4Vell Owner's Copy C Catte formula ast disposible on Impresis	0500E (09/02)	is la	em		2003	0300	<u></u>				

Well Record

A076053

A076053 Measurements recorded in: Metric Imperial

Regulation 903 Ontario Water Resources Act

Well Owner's Information	
REPORT OF STREET	
Addison of Well Counting (Strong Number/Name)  Comply/District/Municipality  Office of the County Object of the Co	Not Number Other PARTI
Annular Space  Deput Set at (πνπ) Type of Septem Used Volume Placed	Results of Well Yield Testing 21, 21, After the of American Management of American Management (American Management of American Management of Management of American Management of
Method of Construction   Well Use	Pumping resident (apple)  A 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Construction Record - Casing   Status of Well	Recommended pump depth (m/h) 20 5 20 7 16  Recommended pump tate 25 7 4 25  Recommended pump tate 30 7 30 30  Well production immer 50 50 7 30 50  Disanfyrited 5 No 60 7 60  Map of Well Location 11 2 1
Water Details   Hole Diameter	Frank Land Resol Kenny Lakon Jool Road Lakon Jool
Well Contractor and Well Technician Information  Business Name of Well Contractor  H. R. C. D. C. D. R. L. L. D. C. L. D. Man Contractor at Lence 4.  H. R. C. D. C. D. R. L. L. D. C. L. D. D. Man Contractor at Lence 4.  H. R. C. D. C. D. R. L. L. D. C. L. D. Man Contractor at Lence 4.  H. R. C. D. C. D. R. L. L. L. D. M. M. C. L.	Constraints  Well owner's Data Plackage Defected allocated and Data Work Completed No 2 82 4 4 7 Harden No 2 82 4 4 7 Harden No 2 82 4 4 7 Harden No 2 8 2

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GEOLOGICAL BRANCH DEPARTMENT OF MINES	1

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O.F. Con I Rot >2	A arei.	· AA G		3(4 (114	u Ļ	3
County or Territorial District	Russell	Tow	aship. Village	Town or	City Comberlan	
Con L. Lot 64	Street and N	umber (if	' in Village, '	Fown or C	ity)	***************************************
Owner .	******************************		Address	Cumterl	end Ontario	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Date completed22(day)	(month)	(Asst)	<del> </del>			
Pipe and Casing	Record				Pumping Test	
Casing diameter(s) .4inches	<b>461744744356674710714017116</b>		Static level	9_£	ect	***************************************
Length(s) 21 Feet					-GPB	
Type of screen	-0-14-0114400-4	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Pumping le	vel <u>1</u> /	Feet	
Length of screen		***************************************	Duration of	' test	l hour	
Well Log					Water Record	•
Overburden and Hedrock Record	From ft.	To ft.	at WA	pth(s) which ter(s) ound	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
Red Sand	0	6	<u>9</u>	Feet	60 Feet	fresh
Lime stone rock	6	69				
		-	E-1		<del> </del>	
				0		
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		<del></del>	—			
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	·					
For what purpose(s) is the water t	*************************	11	In diag		cation of Well	NURTH well from
Is water clear or cloudy?			road an	d lot line	. Indicate north b	y arrow.
			ָנ <sup>י</sup>			
Drilling firm T. H. Adams		······· } <	2			
Address Hurdman!s Bridge		12	2		Ψ w	A.
Uttowa, Untario		I			8	ν̈́
Name of Driller TA H. As			0			J.
AddressHurdman.LsBridge			1		7	4
Uttawa, Untario			1		971:	<b>^</b>
Licence Number 42		<b>I</b> _	XK-	9 22 -	4,	<i>o</i>
I certify that the fo	oregoing			2000	7	4
statements of fact a	re true.		MON	+RE	AL ADAD	. NO17

Date July 2 This I belans

Form 5

9

## WATER WELL RECORD

Water managament in Or	HOW I PAINT ONLY IN SPACES P	ROVIDED 11	5601301- 56003 GE C. C.
COUNTY OR DISTRICT		NASHIP, BOROUGH, CITY, TOWN, VILLACE Crimberland	Lot. From Ottawa H. (14-1 022
1	10-47	Cumberland, Out.	DATE COMPLETED 40-51 DAY 28 SIG. 11 YR. 70
21	्रिष्ठ सिद्धे इ	NORTHING NC	ELEVATION RC BASIN CODE () 12 LY
		17 18 24 25	DCK MATERIALS (SEE INSTRUCTIONS)
SENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION DEPTH - FELT FROM TO
blue	olay & bolders		0 5
grey	limestone		5 150
			454040
			1513100
			3 3
	105/13 1 10/15/04		╿┸╍┸╂┸┦┸╂╍┦┸╍┯╃┹┞┸╂┦╏┷╍╄╂╌╏┸╂╸╏
(32)		نابليلينيا ليليل	Learning on Companies 11.31 Impainting 36-16 (thectal 33-40)
	KIND OF WATER	MATERIAL THICHHELD	OFFTH - FEET III INCHES FIET
0150			ROM TO DE MALERIAL AND ITES OF SCHEIN CELT.
1 pr. 2 pr.	RESH 7 3 SULPHUR	3 CONCRETE	0020 61 PLUGGING & SEALING RECORD
25-33 1   F	RESH 3 SULPHUR	17-18 1 STEEL  2 GALVANIZED  3 CONCRETE	78-23 DEPTH SET AT - FEET MATERIAL AND TYPE LEAD PACKER. CTC 1  10-11 14-17
75-78 107	HERH 3 C SOLPHON 19	24-23 1 D STEEL 24	0/50 27-30 10 21-38
10:31	RESH 3 SULPHUM 34 HE	2 GALVANIZED 1 CONCRETE 4 GOPEN HOLE	25-29 36 10 90
71 PUMPING TEST HETHO		11-14 DURATION OF PUMPING	LOCATION OF WELL
T	WATER LEVEL ZB WATER LEVEL	S DURING DECOYERY	IN DIAGRAM SELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE WORTH ST ARROW.
TEAET FLAT	PUMPING	######################################	[] 11 ii 1/h [
O 10 FEET	140 <sub>FET</sub> 055 FEET 08	10 FEET 110 FEET 140 FEET	li li vintita l
Z GIVE RATE  Z RECOMMENDED PUMP	CPG 140	FEET CLEAR 20 CLOUDY	1 1
SHALLOW	E DEEP SETTING 140	PUMPING RATE OO 4 GPM.	11 11 010 17
	Al .	5 ABANDONED, INSUFFICIENT SUPPLY	
FINAL STATUS OF WELL	WATER BUPPLY OBSERVATION WELL TEST HOLE	5 ABANDONED, POOR QUALITY 7 D UNFINISHED	-7
OF WELL	DOMESTIC 3 L	COMMERCIAL MUNICIPAL	1
WATER USE 0/	3 D IRRIGATION 70	] MUNICIPAL ] PUBLIC SUPPLY ] COOLING OR AIR CONDITIONING	
01	☐ giwen	• □ NOT LISED	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
METHOD	CABLE TOOL  CONVENTIONAL  ROTARY (CONVENTIONAL)  ROTARY (REVERSE)	DINDER () 5 DINDER () 1 DINTEL () 6	[] [] []
DRILLING	4 D ROTARY (AIR)	9 [] DRIVING	DHILLERS REMARKS:
MAME DF WELL CO	NYRACTOR eau. Diamond & Cal	ble Drilling, 1504	DATA SOURCE   1504 230271
U a a a	Box 194, Orleans		O DATE OF INSPECTION INSPECTION
MAME OF DRILLER	OR BOREF	FICENCE NUMBER	S PEMARES
Z G. Charb		EUR MISSION DATE	L L
OWEC CO	1 farton	DAY 28 NO 11 YH 70	/μ ,

Well Record

O Quesn's Printer for Ontario. 2006

Regulation 903	Ontario			rA				-	
	Pa	Dε	>		c	af			

	A0723	26 Regulation	Page of
Well Owners information			TELEVISION OF SECTION
RanyArConstruction and or Anteration of a two			
Address of Well Location (Street Number/Name, RR)	Township	ar lainti	Concession
County/District/Municipality	City/Towp/Village	1 4	Province Postal Code
UTM Coordinates   Zone   Egating   Northing	GPS Unit Make   Model	Mode of Operation:	Ontario
	23 Magella	Ditterentiated, specify	77
Overburger; and Bedrock Materials (see histocetals in he he General Colour   Most Common Meterial   Other	or Malerials	General Description	Depth (Metros) From To
Can + Sand			0 896
Black +Gren	Inesta	<u></u>	396 523
		· · · · · · · · · · · · · · · · · · ·	
VA DI	0 7 0	. Cl . kv	7/2
an ran a	DK-403	4 7 6	B
2011/2017 WYARMINIAN Space/Abandonment Spaling		Programme Results of W	(e)((Y)e)d)Testing \$47,495.375.55
Depth Sol at (Metres) Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)	Check box if after test of well yield, water was:  Cleft sand card free	Time Water Level Time Water Level
10, 0 Nest Cenats	urry . 4086	Christ-develop to sentifice	(Min) (Matros) (Min) (Metrus) Static O O Static C 70
	!	state	1 2 72 1 = 3 0
		Pumping last repthod	28,73 25218
		Subfund	3 2256 3 527
	ater. Use Make West West West West West West West Wes	Pump stake set at (Metres)	4 22 26 4 = 1 50
	Municipal Dewatering Test Hole Menitoring	Pumping rate (Litres/min)	5 34 27 5 50 98
	Cooling & Air Conditioning	Duration of pumping	10 3733 10 47 3
Other, specify Other, specify		hrs + min. Final water level end of pumping	15 40,70 15 45 92
Water Supply Dewatering Well 🔲	Observation and/or Monitoring Hole		20 42 65 20 45 4
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐	Altoration (Construction) Other, <i>specify</i>	Shallow Deep	25 45,10 25 43.82
Recharge Woll Abandoned, other, specify  The Property Location of Well Careau		Recommended pump dentil 4 H	30 4690 30 4276
Please provide a map below showing:  - all property boundaries, and measurements sufficient to locate the way		Recommended pump (ale	4050,49 40 40,01
an arrow indicating the North direction     detailed drawings can be provided as attachments no larger than legi		Il flowing give rate	50 527 50 3732
vidigital pictures of Inside of well can also be provided	NE		60 54.70 60 37 7
old Montreal &	Cod		r Details paths access an analysis of
1		Metros @Gas []Fo	esh Solty Sulphur Minerals
SKM - 1	i ca	Metres Gas GFn	esh Solty Sulpher Minerals
1.54m # 2014 Arth		H ' 12'	of Water Sulphur Minerals
Acti	\u	Casing Used Scroon Use	
130' 6		Galvanized Salvanized	Diameter of the Hole (Cenametres)
Day Mall Combined I May be not a complete to the complete to t	W. 45.	Fitneglase Fitneglase	Dopth of the Hoto (Metros)
Date Well Completed Was the woll owner's information Date the package delivered?	e Well Record and Package ed to Well Owner (yyyuhunytki)	Plastic Plastic Concrete	Wall Thickness (Mores)
DUN Wall Contractor and Well Technician in		No Casing and Screen Used	Inside Diameter of the Casing (Metres)
Business Name of Well Contractor  AD PROCE APILL LAKE C. 17	Well Contractor's Licence No.	NO Open Holy 06 -155	Dopth of the Casing (Mejros)
Business Address (Street No./Name, number, RR)	unicipality	L Yes No	Ospun ocine Casing (Mestos)
Province Postal Code Business E-mail Address	AMOND	Audil No.	y,Use Only  Well Contractor No.
ONT KOAJZO	Total St.	z60129	Trues:
Bus. Telephone No. (inc. area code) Name of Well Technician (Light No. ) DeSawn	ame, First Name	Date Received construction	Date of Inspection (yyywmrate)
Well Technician's Licence No. Signature of Technician	Date Submitted (yyyymmidd)	Remarks	
0506E (11/2006)	Ministry's Conv	AND THE RESERVE OF THE PARTY OF	O Queen's Protes for Ordano 2006

Ministry's Copy

A 054029

Weli Record
Regulation 903 Ontario Water Resources Act

Cette formule est disponible en français

### Instructions for Completing Form

<ul> <li>Questions regarding of</li> </ul>	ce of Ontario only. This docur completed in full to avoid delay completing this application car ants shall be reported to 1/1	ya in processing, Fi	it legal document arther instructions Water Well Help	and explanations are available Desk (Toll Free) at 1-888	on the back of this form. -396-9355.
Well Owner's Informatic	on and Location of Well In	formation MU	NT T T T T	Ministry Use Only	·
- Indinate	THE POCATION OF AABILIUM	rormation   Inc	<u>"  </u>	CON	LOT
Addrose of Well Location (Courter of Well Lo	King Arth	rihing Unit N	unter k	de of Operation: Undifferents	
Log of Overburden and i	Bedrock Materials (see Ins	itructions)	Thocone	Differentiate	d, specify /
General Colour Most commo	on material Other M	aterials	Gone	aral Description	Depth Metres
Koc	12-4i				5 001
S2X	dyclay				091 273
Gra	44 Green	inestor	Q		513 1036
					المردوات المح
Hole Diameter	1			JA .	
Depth Motres Diameter	Cons	truction Record		Test of We	
From To Continuates	diam Material	Wall Del			V Down Recovery  Vater Lovel Time Water Lovel
0 103,60 14.91	Contimetres	contimetres Fro	m To	Day Ull I min	Metres min Motres
	Steel   Fibregiuss	Casing		Pump intako setya - Statio (matres) , Level	57 225
	Plastic Concrete	48 0	3.84	Pumping rate 95 18	3,40 158,40
Water Record	SS Plastic Concrete	.480	13.	The second secon	0,30 2 57.40
Am Leftesh (Isulpher	Steel Fibregiass			Final water level and	247 257 95
Gas Salty Utralinerals	Plastic Concrete			of pumping 05 3 11	3 56 45
99.66 From 18 18 P	Steel Fibreglass				4.61 4 5600
Gas Salty Minerals	Plastic Concrete	i		Shallow (XDeep	0 5.55 15
Other	Galvanized			depthnetres	a /0 5.55 15
Gas Salty Minerals	Outside Care Care	Screen		Recommended Comp 10	650 10 51.55
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est Hole Abandoned, p	oor quality Replacement v	weil	package delivered	7 TYYOU NO	>070516
Well Contractor,	actor/Technician Information	Contractors   In the contractors	Date Dec	Ministry Use Only	
12 XOCL DR	1( いんも) (かばが	Contractor's Licence No.	Data Source	Contractor	7113
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MWell Technician (lest name, tire	(Dame)   Well	Technician's Licence No.	Remarks	JUN 21 8 2007 Well Record No	unhac
tions of Technicion/Contractor	Date 8	LO (O)	ا ا	Front Liebrald M	with/01
(Carried)		200°70618	41		

Ministry's Copy



Well Tag No. (Place Sticker andler Print Below). A 052289

A052289

7111538

Well Record

Regulation 903 Ontario Water Resources Act

Page\_\_\_

Address of Well Location (Stre	et number/name, RR)	a /	msnip	1.0	- /	Lot		Concession		
County/District/Municipality	the cumb	City	/Town/Village	Cur	and	7	Provin		Postal	Code
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Overburden and Bedrock N	Materials (see instructions	on the back of this fo	em)		4 2 2 2 2 2 2 2			3 10 15 1	Denth	(Metres)
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Appelle	ar Space/Abandonment	-	e und	A	rodere 4	Results of W	ell Viel	d Testing		
Depth Set at (Metres)	Type of Sealant Us	sed	Volume Pla		Check box if after to water was:	the second secon	Dra	w Down	-	ecovery
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Rotary (Conventional)	etting Domestic	☐ Municipal	☐ Dew	vatering	Pumping rate (Litre		5	29.90	5	111160
Rotary (Reverse) Dr	riving Livestock	☐ Test Hole ☐ Cooling & A	☐ Mon Air Conditioning		Duration of pumping		10	00	10	1100
☐ Air percussion ☐ Bo	oring   Industrial   Other, spe	ncify			/ hrs +	min	15	28.60	15	4410
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	ewatering Well bandoned, Insufficient Supp	and the second s	and/or Monitorin	ing Hole	Recommended pu	imp type		28.05		41.20
☐ Test Hole ☐ Al	bandoned, Poor Water Qua	and the same of th			Shallow Recommended pu	Deep mp death	25	29.30	25	40.00
Recharge Well At	Location of We	all			295 Meta	4.5	30	35.90	30	38.80
Please provide a map below sho	owing:		n to fived points		Recommended pu (Litres/min)		40	41.60	40	3270
<ul> <li>all property boundaries, and me</li> <li>an arrow indicating the North dir</li> </ul>	irection			5,	If flowing give rate	mune Je	50	45,10	50	37.00
<ul> <li>detailed drawings can be provided - vidigital pictures of inside of well</li> </ul>		er triam legal size (6.5	Dy 14 )		(Litres/min)		60	50.00	60	36.00
TN					Water found at D		r Detail	_		
					180 Metres				lphur	Minerals
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0 . 6 11 1200		- Appendix			Galvanized	Galvanized		_		
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Date Well Completed Was the (yyyy/mm/dd) package	e well owner's information e delivered?  Yes No	Date the Well Rec Delivered to Well	Owner (yyyy/m/	m/dd)	Plastic Concrete	Plastic Concrete	Wa	I Thickness (	Metres)	A CORNER OF T
Vell Cor	ntractor and Well Tech	nician Informatio	n	75.0	No Casing a	nd Screen Used	Insi	de Diameter	of the Ca	sing (Metres)
Business Name of Well Contract			ontractor's Licens	oe No.	Open Hole			Genel	2	
Business Address (Street No./N	Lt.	Municipality	517		Disinfected?		Det	oth of the Cas	-	es)
Dusiness Address (Street Me.in	value, number, Avry	nate			10 5 7 A 2 0 1 1 4 4	Ministry	/ Use O			
Province Postal Co		I Address			Audit No.	184	Well Co	ontractor No.		
Bus. Telephone No. (inc. area cod	le Name of Well Technicia	an (Last Name, First	Name)		Date Received (yyy)		Date of	Inspection (y	yyyimmi	olal)
6 /3 + 76 4-1/3 ± Well Technician's Licence No. Sig		O. e. an		(	SEP 1-8	2008				
			Submitted (yyyy)	mmvdd)	Remarks					
0506E (11/2006)	Mariner Cary		Contractor	's Cop	у			© Queen's	Printer for	r Ontario, 2006

Well A 086962 Balow)

Well Record of 3

Ministry of Regulation 903 Ontario Water Resources Act the Environment 086962 Distric | Imperial ments recorded in: Well Owner's Information Well Location Marks Postal Code K4COA2 Ontario Other Northing 05 5034452 Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form Depin (m²t) From To General Description Other Materials General Colour 0 3.63 105E 3.63/51.51 Brown Etomo Results of Well Yield Testing After test of well yield, water was Arinular Space Draw Down Volume Placed Time Water Level Time Water Level Type of Sealant Used Clear and sand free Depth Set at (m/h) (m'/ft1) (Material and Type) mili Other specify Kuits 42.0P 120 KC 6.01 If pumping discontinued, give reason Level 4085 2 40.73 Pump intake set at (m/h) 6.25 5 1/5 1/ 3 40.60 6.20 7,44 4 40.50 Duration of pumping Well Use SECTION of Construction Not used
Dewatening Public
Domestic
Livestock Diamond | 8.03 5 40 41 Cable Tool \_ hrs + 273 min Municipal Rotary (Convention ☐ Monitoring 11.29 10 39.PF Test Hole Final water level end of pumping (mil PRotary (Reverse) # JR Driving Cooling & Air Conditioning Imgation Boring □ Degging 1430 15 39.57 Industrial I flowing give rate (vmin / GPLI) Air percuss When specify WATER PETC455 Politier, specify 17.79 20 39,16 Status of Well Construction Record - Casing Recommended pump depth (m/ti) 1)-Water Supply Depth (m/ft) 25 347. 78 Open Hole OR Material (Galvanozad, Fibroglass, Concrete, Plastic, Steel) Wall 21.12 Replacement Well Inside Diameter (em/n) 24,23 00 38.38 (cm/in) Tesi Hole Recharge Well umin / GPAI) 0,48 70.45 12.1 10 37 100 Dewatering Well 1586 Observation and/or 3622 50 36586 Monitoring Hole 19.00 Alteration 36,15 /3£ 60 GO (Construction) Yes No Abandoned, Insufficient Supply Map of Well Location Construction Record - Screen Abandoned, Poor Please provide a map below following instructions on the back 14.00 Water Quality Depth (m/tl) Abundaned, other specify FUEWIT Other, specify Longaille way Water found at Depth Kind of Water Wresh Cuntested Hole Diameter Water found at Depth Kind of Water. Fresh \_ Untested 15,46 12/2 (mvit) Gas Chher, specify
Water found at Depth Kind of Water Fresh Unitested (m/ft) Gas Other, specify Well Contractor and Well Technician Information 600 153 mes Ministry Use Only Date Package Delivered Well owner information package delivered "2 099704 20070817 Well Technician (Last Name, First Name) WYes SEP 03 2009

20090414

M 118 = 465450 41 5:013181117:01 Ontario Water Resources Commission Act 518 0 3 2 5 RECORD Township, Village, Town or City. Cumberland Carleton 21 April 1969 month County or District Lot \_\_\_\_ Date completed Cumberland, Ont. (print in block letters) Owner **Pumping Test** Casing and Screen Record Static level \_\_\_\_\_10 6n..... Test-pumping rate 8 ...... G.P.M. Inside diameter of casing Pumping level 604 Total length of casing Duration of test pumping 2 hrs. Type of screen Water clear or cloudy at end of test .....clear Length of screen 6 G.P.M. Depth to top of screen Recommended pumping rate feet below ground surface Diameter of finished hole with pump setting of 60 Water Record Kind of water Well Log Depth(s) at (fresh, salty, sulphur) which water(s) found To From ft. Overburden and Bedrock Record fresh 146 3 0 Loam 8 3 loose rock & clay 146 8 grey limestone Location of Well For what purpose(s) is the water to be used clomestic In diagram below show distances of well from road and lot line. Indicate north by arrow. Is well on upland, in valley, or on hillside? ..... upland...... Drilling or Boring Firm .....G. Charbonneau, Diamend & Cable Drilling, .... 94 Address R. R. 1, Box 194, Orleans, Ont. ...... Licence Number 3395 Name of Driller or Borer G. Charbonneau, Address R. R. 1, Orleans, Ont. Date Lexand Charles or Boring Contractor)

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Form 7

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Carle ton

MINISTRY OF THE ENVIRONMENT

The Ontario Water-Resources Act	
WATER WELL RECORD	

1513924 DAY 31 #05 R. R. 1, Cumberland, Ont. LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) GENERAL DESCRIPTION

		GENERAL DESCRIPTION	Lud M	
COMMON MATERIAL	OTHER MATERIALS		0	109
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TOWNSHIP, BORDUGH CITY, TO

Cumberland

FINAL STATUS OF WELL	* WATER SUPPLY  E [] ORSERVATION WELL  D TEST HOLE  BECHARGE WELL	
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C. Cherbonness, Diagond & Cable Brill	ing 7364
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LOCATION OF WELL	
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## The Ontario Water Resources Act

# WATER WELL RECORD

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MINISTRY OF THE ENVIRONMENT COPY

- SHALLOW

FINAL STATUS OF WELL

WATER USE OL

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FORM NO 05

OFFICE USE

KOA-IMO INCENCE HUMBIR

2351

Mi	HSUY,OI I	Number (Ples sicker and	print number below)	Regulation 903 Onta	Well Re	ecord
	Environment A C	14599			page	_ ol
structions for Completing For use in the Province of	Ontorio only This docume	nt is a permanent le	gal document. Plea	ase retain for future refe	erence. on the back of	this form.
All Sections must be comp	the this employed on he	directed to the We	er instructions and ( ter Well Manageme	ent Coordinator at 416-	235-6203.	
Questibns regarding compl All metre measurements Please print clearly in blue		100.0		(1),,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Y   LOT	धर-
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idress of Viell Location (County/	1600	Chy/Tov	my beal lo	Site/Compartme	nVBlock/Tract et	С.
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	Steel Fibregia			(litres/min)(2		2 41.22
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Gas Sally Mineral		161		Recommended pump type. Shallow Comp		5 42.05
Gas Salty Minor	Plastic [   Concre			Recommended pump depth 5 * 2 metres Recommended pump		10 42.10
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After test of well yield water was	Galvenized	O alex or Screen		If pumping discontin- ued, give reason.	40 1/3,48	40 141.79
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Name of Well Contractor	number city etc.	d 1119	Data Recu	2 1 2004		TYYY MM
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Dimina Ct atan a gennerada, June	shannon	1973			15:	34011
Signature of Techniciary Contre	clor	2007	Well Owner's Copy		o formule est disp	onible on Iron

Well Record
Regulation 903 Ontario Water Resources Act A 014100 Ministry of Ontario the Environment page  $\mathcal{L}$  of  $\mathbf{3}$ Instructions for Completing Form

• For use in the Province of Ontario only. This document is a permanent legal document. Please ratein 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 1/10% of a metre.

• Please print clearly in blue or black ink only.

• Please print clearly in blue or black ink only. Well Owner's Information and Location of Well Information MUN | 50 | CON OF | O/ LOT 20 Address of Well Location (County/District/Municipality)

OTT (1) 19 - 410 ( C ) 200

RR#/Street Number/Name

GPS Reading NAD Zong Easting Site/Compartment/Block/Tract etc. L'Averaged GPS Reading NAD Zong Easting A Northing SO 396 0 6

Log of Overburden and Bedrock Materials (see Instructions) CITIM Differentiated, sp General Description Other Materials General Cok 0 60030 SMALE 1.00 imes tone Test of Well Yield Construction Record noing test method Draw Down Hole Diameter Motres Depth Subsection Time

Subsection Time

Pump Intake age at continuous

(meline)

Pumping rate

(itres/min) / 5 - 50 Time Water Love Maires inside Depth Metres Material thickness dlam To To From centimotro 57.52 8.46 entimetre 7.87. 22.2 Casing 10.01 55,10 Fibregian 7,81 0 0.48 Duration of pumping 53.02 2 Plastic Concrete 5,55 hrs + OC mir Galvenized Water Record Final water level end 3 /5/10 of pumping 57 hetres 540 Kind of Water Steel Fibreglas Plastic Concrete Sulpi Safty Galventzed Steel Fibreglass 19,59 5 47.0 Plestic Concrete depth. 92 construs j m Fresh Salty 10 37. (7) 10 36. 36 15 37.36 15 26. (6) 20 42. 56 20 24. 66 25 47. 50 25 27. 54 30 49. 15 30 48. 40 40 52.30 40 72.40 50 57. 57 80 47. 40 60 57. 57 80 47. 46 Gas Other. Gulvanized oded pump (tiros/min) Screen Fresh Sulp Salty Mine Outside Steel Fibregians Slot No. (litros/min) Plastic Cond If pumping disconti-ued, give reason. After test of well yield, water [ ]Galvenized Clear and No Casing or Sceen Other, spe 15,55 LAMPEN hole 7.87 98 48 Informated No Location of Well Trinular space Adandonment diagram below show distances of well from road, tol line, and building advantage and building advantage and building and b Plugging and Sealing Record Depth and of Justines (Masterial and type (borntonite sturry, next coment sturry) ord. metres. 160 Kg Grathica Cenent Method of Construction Digging difficiery (air) Diamond Othe Air percussion antional) Rotary (cor Driving Rolary (reverse) Water Use Othe Public Supply ind intrial Not used
Cooling & air conditioning udit No. 7 Stock Imigation Final Status of Well orad, (Othe Yes A

Unfinished

intractor's Copy Ministry's Copy

20040000

Rocha e well

Observation Test Hole

insufficient supply

Well Contractor/Technician Information

peckage delivered?

JUL 1 3 2004

Ministry Use Only

DO

6006

1534818

Cette formule est disponible en français

Date of Inspection

Well Record Number

) Onta	ario Mi	niatry of Environment	Well Tag Number	r( A	0047	06	Regulation 903 O	Well Re Interio Water Resou	irces Act
			AO	27/70	9				_ of
For use in the	Province of	Ontario only. Ti	his document is a	pennaneni	legal doc	ument. Ples ctions and e	ise retain for future i explanations are availa nt Coordinator at 41	eierence. ble on the back of t 6-235-6203	his form.
Questions re	garding comp	ehali he reporti	ed to 1/10" of a r		Vater Well	Manageme	nt Coordinator at 41		
Please print	clearly i <b>n</b> iblue	or black ink only	Well Information		1150	// CON	CONTI	O I LOT	23
Owner s n	HOI Marchin a								
							Lab	Concession	
OW	DVVC	trict/Municipality	UI.	C		berio	200	ment/Block/Tract etc	
	r/Name	old Ma	nveal &	41	Make/Model	Mode		rentiated - Tivers	ged
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reen .	Si ch								
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Hole Dia	mater		Construct	on Record					ta Kec
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	51 650	I Land	renized el []Fibreglass		-	- 131	Recommended pump type. Shallow & Deep Recommended pump		
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							) <u></u>	7 010	Rc
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frigation	Mut	Final Status		[] Abando	ed, (Other)	Was the well	owner's information	NA Delivered AAA	
☐ Water Suppl ☐ Observation ☐ rest Hole	Well Abando	ned, insufficient suppl	y Dewalaring Replacement v			package deliv	Ministry	Jae Only	
Name of Meli	Well	Contractor/Techn	ician Information	Contractors	Sence No.	Data Source	: 3 - 2 V/(V)63:	Contractor 11	19
	(atrees page)	Tules, city etc.	ad Dut	-		Dais Receive	2 2004	Date of Inspection YY	YY 1411 DE
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estructions for Complet	ing Form	4004			ee retain for future refer	nce
For use in the Province	of Ontario only. Thi	s document is a peri id delays in processi	ng. Further instru	ctions and e	ise retain for future refere explanations ere available o int Coordinator at 416-23	n the back of this form. 5-6203.
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Name of Well Contractor	Il Contractor/Technic	Man Count	TOT & CHESTOR INC.		Dote of	
Tast Hole Abar Well Name of Well Contractor Business Volumes (street name	Trumbor, city stc.)	old Dat	<b>)</b>	Date Received	2 1 2004 1	DO MM YYYY NOLOUGH
Name of Well Cintractor	Trumbor, city stc.)	oud Veil Techne	cian's Libenco No.		2_1_2004_1	Inspection YYYY MM DO
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41 WA	SIND OF WATER  SIND OF WATER  FIRSH 3 SULPHUR  SALTY 4 MINERAL  FIRSH 3 SULPHUR  SALTY 4 MINERAL  FIRSH 3 SULPHUR  SUSALTY 4 MINERAL  STRESH 3 SULPHUR  LI SALTY 4 MINERAL	SI CA SING & OPEN  BANESHAL THE TO TH	NESS FROM	0027 24	MATERIAL AND TYPE  NATERIAL AND TYPE  DEPTH SET AT - FEET  FROM 10  10-13 14  10-21 27	NG & SE  MATERIAL A	DEPTH 10 10P OF SCREEN	ECOR
41 WA	TER RECORD  KIND OF WATER  WIRESH 3 SULPHUR  SALTY 4 MINERAL  MINE	INSIDE MATERIAL INC.  INSIDE MATERIAL INC.  INC. HIS INC. STEEL INC.  INC. STEEL INC. STEEL  INC. STEEL I	NESS FROM	10 27	MATERIAL AND TYPE  II PLUGGI  DEPTH SET AT - FEET  FROM 10  10-12 14  10-21 27  40-19 50	NG & SE  MATERIAL A  177  28  80	BAPTER TO TOP OF SCHER	ECOR
10 41 0 10 0 11 0 11 0 10 1 10	TER RECORD  KIND OF WATER  STEPS 1 SULPHUR  STEPS 2 SULPHUR  STEPS 3 SULPHUR  STEPS 3 SULPHUR  STEPS 3 SULPHUR  STEPS 4 MINERAL  STEPS 3 SULPHUR  STEPS 3 SULPH	ST CASING & OPEN  WATERIAL TRICE  OCCURS STEEL SO CONCRETE  A COPEN HOLE  2 CALVANIZED  3 CONCRETE  2 CALVANIZED  3 CONCRETE  2 CALVANIZED  3 CONCRETE  4 COPEN HOLE  2 CALVANIZED  3 CONCRETE  4 COPEN HOLE  5 CALVANIZED  5 CALVANIZED  6 CALVANIZED  6 CALVANIZED  7 CALVANIZED  6 COPEN HOLE  7 CALVANIZED  7 CALVANIZED  8 CONCRETE  6 COPEN HOLE  7 CALVANIZED  8 CONCRETE  6 COPEN HOLE  7 CALVANIZED  7 CALVANIZ	S O -	10 2 4 0 2 4 0 2 17 10 10 10 10 10 10 10 10 10 10 10 10 10	DEPTN SET AT - FEET FROM 10 10-13 14 10-21 28-19 50 LOCATIO	MG & SE  WATERIAL A  25  DO N OF W	BATTA TO TOP OF SCHER	ECOR
71 Pulpme 1	TER RECORD  KIND OF WATER    SALTY   A   MINERAL   MINER	ST ASING & OPEN  WENDE MATERIAL TRUCK INCRES INC.  IN	8 0 -	10 2 4 0 2 4 0 2 17 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  II PLUGGI  DEPTH SET AT - FEET  FROM 10  10-12 14  10-21 27  40-19 50	MG & SE  WATERIAL A  25  DO N OF W	BATTA TO TOP OF SCHER	ECOR
71 robring 1	TER RECORD  KIND OF WATER  KIND OF W	STATEL 12  SCHOOL TIPLE   S O - 17-10 SINS SURVEY SO WHITE STATE STATE SO WHITE STATE	10 2 4 0 2 4 0 2 17 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  TO THE THE TYPE  TO THE T	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	BATTA TO TOP OF SCHER	ECOR	
71 Fasherine 1 71 Fas	TER RECORD  SIND OF WATER  SIND OF W	SI CASING & OPEN  WATER LEVELS DURING  11-140 DURANTED  24-25 1 STEEL  2 CALVANIZED  3 CONCRETE  3 CONCRETE  4 COPEN HOLE  24-25 1 STEEL  2 CALVANIZED  3 CONCRETE  4 COPEN HOLE  24-25 1 STEEL  2 CALVANIZED  3 CONCRETE  4 COPEN HOLE  24-25 1 STEEL  2 CALVANIZED  3 CONCRETE  4 COPEN HOLE  34 CONCRETE  4 COPEN HOLE  11-140 DURANTON OF PUMPHE  ANTE 11-140 DURANTON OF PUMPHE  ANTE 12-32  4 CONCRETE  4 COPEN HOLE  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-16  15-	12-16  12-16  12-16  12-16  12-16  12-16  13-17  35-27  35-27  35-27  35-27  35-27  35-27  35-27  35-27  35-27  35-27	10 2 4 0 2 4 0 2 17 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  MATERIAL AND TYPE  DIPTH SET AT - FEET  FROM 10  10-13 14  10-21 28  AA-19 10  LO C AT14  CRAM BELOW SHOW D  NE IMUICATE NORTH	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	BATTA TO TOP OF SCHER	ECOR
TO TO THE PROPERTY OF THE PROP	SIND OF WATER  SIND OF WATER  SIND OF WATER  STESSH 2 SULPHUR  SALTY 4 SILPHUR  SALTY 4 SILPHUR  SI SALTY	STATE STATE  10 STEEL  10	1955   FROM   FROM   17-16   FROM	10 2 4 0 2 4 0 2 17 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  IN PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-21 28  An-19 19  LOCATIS  CRAM BELOW SHOW D  NE INDICATE NDRIM	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	BATTA TO TOP OF SCHER	ECOR
10 TO	ATER RECORD  SIND OF WATER  SIRSH 3 SULPHUR  SINSH 4 MINERAL  MALTY 4 MINERAL  SINSH 3 SULPHUR  SINSH 4 MINERAL  SINSH 4 MINERAL  SINSH 4 MINERAL  SINSH 5 SULPHUR  SINSH 5 SULPHUR  SINSH 5 SULPHUR  SINSH 6 MINERAL  SINSH 6 MINE	STATE STATE SALE SALE SALE SALE SALE SALE SALE SAL	19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19:16  19	20 27 10 20 27 10 20 27 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  IN PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-21 28  An-19 19  LOCATIS  CRAM BELOW SHOW D  NE INDICATE NDRIM	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	BATTA TO TOP OF SCHER	ECOR
71	TER RECORD  SIND OF WATER  SIND OF W	STATE STEEL SO GRAVANIZED SO CONCRETE AND GRAVANIZED SO CONCRETE S	S O	10 02 f 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MATERIAL AND TYPE  II PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-23 22  Ab-29 30  LOCATII  CHAM BELOW SMOW D  NE IMUICATE NORTH	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	DATTH TO THE OF SCHOOL STATE OF SCHOOL SCH	ECOR
TI TO	SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SALTY 4   MINERAL  STRESH 3   SULPHUR  SALTY 4   MINERAL  STRESH 3   SULPHUR  STRESH 3   SULPHUR  STRESH 3   SULPHUR  STRESH 4   MINERAL  STRESH 4   MINERAL  STRESH 5   SULPHUR  STRESH 6   MINERAL  STRESH 7 0   MINERAL  STRESH	ST CASING & OPEN   ST   ST   ST   ST   ST   ST   ST   S	S O	20 27 10 20 27 10 20 27 10 10 10 10 10 10 10 10 10 10 10 10 10	MATERIAL AND TYPE  II PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-23 22  Ab-29 30  LOCATII  CHAM BELOW SMOW D  NE IMUICATE NORTH	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	DATTH TO THE OF SCHOOL STATE OF SCHOOL SCH	ECOR Tumar cardo D PACALA. C
71 Pulprine 1 71	SIND OF WATER  SIND OF WATER  SIND OF WATER  SIND OF WATER  SALTY 4 MINERAL  STRESH 3 SULPHUR  SI SALTY 4 MINERAL  SI SALTY 5	STATE	S O - 12-10 O -	10 02 f 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MATERIAL AND TYPE  II PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-23 22  Ab-29 30  LOCATII  CHAM BELOW SMOW D  NE IMUICATE NORTH	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	DATTH TO THE OF SCHOOL STATE OF SCHOOL SCH	ECOR Tumar cardo D PACALA. C
TO T	SIND OF WATER  SIND O	SI CASING & OPEN  WATER LEVELS DURING  2-2-24 DURING  2-2-25 DURIN	S O - 12-10 O -	10 02 f 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MATERIAL AND TYPE  II PLUGGII  DEPTH SET AT - FEET  FROM 10  10-13 14  10-23 22  Ab-29 30  LOCATII  CHAM BELOW SMOW D  NE IMUICATE NORTH	MG & SE  WATERIAL A  173  DON OF W  ISTANCES OF WELL  BY ARROW	DATTH TO THE OF SCHOOL STATE OF SCHOOL SCH	ECOR Tumar cardo D PACALA. C
TO T	SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SALTY 4   MINERAL  SALTY 5   MINERAL  SALTY 5   MINERAL  SALTY 6	SI CASING & OPEN  WATER ALL  17-120   STEEL  2   GALVANIZED  3   CONCRETE  4   OPEN HOLE  2   STEEL  2   CALVANIZED  3   CONCRETE  4   OPEN HOLE  2   STEEL  2   CALVANIZED  3   CONCRETE  4   OPEN HOLE  5   STEEL  2   CALVANIZED  3   CONCRETE  4   OPEN HOLE  5   STEEL  6   OWNERT   S O - 12-10 O -	10 02 f 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	MATERIAL AND TYPE  MATERIAL AND TYPE  III PLUGGII  DEPTH SET AT + FEET  FROM 10  10-13 14  10-21 28  LOCATIO  GRAM BELOW SNOW O  NE IMUICATE NORTH  7 - 37	NG & SE  WATERIAL A  220  ON OF W  ISTANCES OF WELL  BY ARROW	DEPTH TO TOP OF SCHEEN  ALING R  IND TYPE LIAM  FROM ROAD AN	ECOR	
TO T	SIND OF WATER  SIND OF WATER  SIND OF WATER  SIND OF WATER  SALTY 4   MINERAL  STRESH 3   SULPHUR  SALTY 4   MINERAL  STRESH 3   SULPHUR  STRESH 3	SI CASING & OPEN  WATER ALL  INCRES  I	S O - 12-10 O -	DRILLERS REMAN	MATERIAL AND TYPE  MATERIAL AND TYPE  TO THE TENT TO THE TENT THE TENT TO THE	NG & SE  WATERIAL A  177  28  ON OF W  ISTANCES OF WELL  BY ARROW  1.3 3 3 3	DATTH TO THE OF SCHOOL STATE OF SCHOOL SCH	ECOR
TO T	SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SIRD OF WATER  SALTY 4   MINERAL  STRESH 3   SULPHUR  SALTY 4   MINERAL  STRESH 3   SULPHUR  SI SALTY 4   MINERAL  SI SALTY 4   MINERAL  SI SALTY 4   MINERAL  SI SALTY 4   MINERAL  SI SALTY 5   MINERAL  SI SALTY 6   MIN	SI CASING & OPEN  WATER ALL  INCRES  I	12-16  12-16  12-16  12-16  12-16  12-16  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13-31  13	DRILLERS REMAN	MATERIAL AND TYPE  MATERIAL AND TYPE  TO THE TENT TO THE TENT THE TENT TO THE	NG & SE  WATERIAL A  173 258  ON OF W ISTANCES OF WELL BY ARROW	DEPTH TO TOP OF SCHEEN  ALING R  IND TYPE LIAM  FROM ROAD AN	ECOR

	Ownerio I. PRINT ONLY IN 2. CHECK COR	TOWNSHIP MORDUGH, CITY, TOWN, VILLAGE	1512516 NUNCE, TRACT, SPATEY, EC	1470 OF 1001
RUSS	FLL	CUMBERLAND	D   FROM	OMPLETED 48-43
		MORTHMAG AND	ELEVATION OC BASIN COOL D	[N E
Ú) _	ः ्रिष्ठा सिक	THOO STUBBLE AND BEDRO	25 30 21	
	MOST	LOG OF OVERBURDEN AND BEDRO	GENERAL DESCRIPTION	DEPTH - FEET FROM TO
ENERAL COLOUR	COMMON MATERIAL	E. II		0 4
RED	SAND	J- 1 Inch.		4 100
SREY	LIMESTON	VE		4 700
			7	
MATE   ONE	MP 2 CALLER  PROTECT LEVEL PRO	INCLUSE  INC	PROM TO STATE AND THE STATE AN	WELL
RECOMMENS  SH  SO-53	OOL OGPM.	FT. SPECIFIC CAPACITY  SUPPLY ATION WELL  SPECIFIC CAPACITY  ABANDONED, INSUFFICIENT SUPPLY ATION WELL  SUPPLY AND ABANDONED, POOR QUALITY	15 15 15 15 15 15 15 15 15 15 15 15 15 1	Ø æs
STAT OF W	FEL TRECHAR  10 DOMES  2 STOCK  3 DIRRIGAT	GE WELL  100 5 COMMERCIAL  6 MUNICIPAL  7 PUBLIC SUPPLY  RIAL 4 COOLING OR AIR CONDITIONING  HER 9 NOT USED	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Y
METH O DRILL	F 3C ROTAN	Y (CONVENTIONAL)  Y (MEYERSE)  S DRIVING  RCUSSION	DRILLERS REMARKS:	<u>1"61172</u>
MAME O	10 FISH	GHNEY  ER AUE OTTAWA  LUCINICE BURBER	DATE OF INSPECTION INSPECTION  S REMARKS	K
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	FIR	15 10 15 110	THE Ontario	Males Kaspaices	-	
	IS.		MATER	MELL	RECORD	
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Jate com	pieteu		month	Jent)				
Address	R.R. 1	- Cumber						
		Pumping	Test					
Test-	Test-pumping rate 125 GPH XXXX							
14/	- close or clo	udv at end of	test clear					
Dans	mmended p	umping rate	125 GPH	O.RM				
Reco	numn settin	g of 120	feet below	w ground surfac				
With	pump accen	6	Water	rest  Clear  125 GPH  Supply S				
T	From ft.	To ft.	which water(s)	Kind of water (fresh, salty, sulphur)				
	0	160	90	fresh				
	In diagra	am below show	w distances of w	ell from				
	road an	d lot line. It	RIVER	atiow.				
HW	YOU	$\sim$						
	3	1						
		T. NO.		LP HWY				
	. 6	MILD	£					
	Static Test-Pum Dura Wate Reco with	Static level Test-pumping ra Pumping level Duration of test p Water clear or cle Recommended p with pump settin  From ft.  O  In diagraroad and In wy (17)	Pumping Static levei 70 Test-pumping rate 125 G Pumping level 90 Duration of test pumping 1 Water clear or cloudy at end of Recommended pumping rate with pump setting of 120  From ft. ft. 0 160  Location road and lot line. In OTTAWA  LWY (17)  CON. 8  MILL  CON. 8	Pumping level 90  Duration of test pumping 1 hr.  Water clear or cloudy at end of test clear Recommended pumping rate 125 GPH with pump setting of 120 feet below  Water  From To Depth(s) at which water(s) found  0 160 90  Location of Well  In diagram below show distances of we road and lot line. Indicate north by OTTAWA RIVER  HWY(IT)  CON. 8				

M 1/18 7 141618121101E	115130		56 Ng	327
5 10 18 19 16 19 No Ontario Water Resource	Commission	Act	1	
" ISTRIBIZION WATER WELL	RECO	)RD		
: 1215 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	iship, Village, To	own or City Ci	mberland	
unty or District	completed	20 January	1965	year)
n. 1st. Con. from OrrawaRI ot	ess.4102. Lakew	ood Detroi	11. Michig	an, U.S.A
vner print in block letters)	632.4TOZTigue.			
		Pumping		
Si diameter of casing	Static level	35'		CPM
251	Test-pumping ra	te 6		
11 000000000000000000000000000000000000	Pumping level	501		
214 C C C C C C C C C C C C C C C C C C C	Duration of test p			
	Water clear or cl	oudy at end of t	est clear	
epth to top of screen	Recommended ]	pumping rate	6	G.P.M.
iameter of finished note	with pump setting	ng of	feet belo	w ground surface
Well Log				Record  Kind of water
Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	(fresh, salty, sulphur)
clay & loose rock		4		
loose rock rack & limestans	4	112	112	fresh
grey limestone	10			
			<u> </u>	
		<u> </u>		<u> </u>
For what purpose(s) is the water to be used? domestic.		Location		ell from
For what purpose(s) is a second secon	In diagr	am below show	dicate north by	arrow.
Is well on upland, in valley, or on hillside? hillside	1000	المحالا		2/4
Drilling or Boring Firm		10125		Nuc 7 12
G. Charbonneau, Cable & Diamond Drilling				N. C.
Address R.R. # 1, Box 194, Orleans, Ont.		77		
Address . R-A+ # . A+ BOX . ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ		15	OLD 17.	
Licence Number 2156		<del></del>	1000	
Name of Driller or Borer G. Charbonneau	9		528ML	9 0
Name of Driller or Borer G. Ont.  Address R.R. # 1, Orleans, Ont.	ラ <sup>*</sup>	12 7	X LILLAS W	
Date 20 January 1966.	lo'	77		4
Date 20 January 1966.	·			Q
(Signature of Licensed Drilling or Boring Contractor)				
Form 7 15M-60-4138		1 (	CSF	ì
•		, ,		

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

Tag#: A124334

Well Record
Regulation 903 Ontario Water Resources Act

	ocation (Street Num		1 30	ownship		Lot N P	Concess	lon
County/District/M				DRMERLY CUI		01-104	Province	Postal Code
UTM Coordinates		Northing		Unicipal Plan and Suble			Ontario Other	KRETITI
NAD 8 3	118 4657	119503	38274	·			Other	
Overburden and General Colour	d Bedrock Materia  Most Commo			rd (see instructions on the er Materials	T	al Description		Depth (m/ft)
BROWN	4090			er materials .	Cenen	ar Description		From To
BROWN	CLAY	ν,			DE	NSE		13 3
BROWN	GRAVE	<i></i>	STON	RS				3 85
BROWN	LIMEST	ONE						8280
-								
		***************************************						
	<u>I</u>	Annular Spac	e		R	esults of We	Il Yield Testin	<u> </u>
Depth Set at (m		Type of Sealant U Material and Typ		Volume Placed (m³/ft³)	After test of well yield, w		Draw Down Time Water Le	Recovery
0 20		TONITE		. 224	Other, specify		(min) (m/ft)	(min) (m/ft)
			201001	8-3-6	If pumping discontinued	, give reason:	Static Level 40	
							1 10.0	2 1 32.6
					Pump intake set at (m. 7.5	( <del>11</del> )	2 /0-9	7 2 32.3
Method o	f Construction		Well Us	e	Pumping rate (I/min / G	РМ)	3 //, 5	3 31.7
☐ Cable Tool ☐ Rotary (Conven	☐ Diamond itional) ☐ Jetting	☐ Public☐ Domestic	☐ Commer	<del>-</del>	Duration of pumping		4/2.0	7 4 30.6
Rotary (Reverse	e) 🔲 Driving	Livestock	👿 Test Hol	e	hrs + m		5/2.6	<u> </u>
Boring Air percussion	☐ Dìgging	☐ Irrigation ☐ Industrial		& Air Conditioning	Final water level end of	pumping (m/ft)		3 10 27.8
Other, specify_		Other, sp	ecify	30000	If flowing give rate (I/m	n / GPM)		8 15 27,0
Inside Ope	Construction Red In Hole OR Material	Wall	Depth ( <i>m/ft</i> )	Status of Well	Recommended pump	depth (m/ft)	20 20.5	5 20 263
Diameter (Gal (cm/in) Con	crete, Plastic, Steel)	Thickness Fro	от То	Replacement Well	75		25 22.2	$\frac{2}{1}$ 25 $\frac{25.7}{1}$
64 5	TEEL .	.188 ō	20	Recharge Well Dewatering Well	Recommended pump (I/min / GPM)	rate	30 24.	9 30 2 5.1
6 01	EN HOLE	2	0 80	Observation and/or Monitoring Hole	Well production (I/min /	GPM)	40 2 7.	7 40 23.1
				Atteration (Construction)	Disinfected?		50 3/./	50 22.6
				Abandoned,	Yes No		60 34.	0 60 21-2
Outside	Construction Rec		Donth (m/8)	Abandoned, Poor Water Quality	Please provide a man h		ell Location	e back
Diameter	Material ic, Galvanized, Steel)	Siot No. I	Depth ( <i>m/ft)</i> om To	Abandoned, other,	Please provide a map b	FRANI	L KENINY	DOOK,
								A
				Other specify				7N   N
	Water Deta			ole Diameter				2
Water found at D	epth Kind of Water: Gas Other, <i>speci</i>		ested Depti From	h ( <i>m/ft</i> ) Diameter To ( <i>cm/in</i> )				2
	epth Kind of Water:		ested O	20 93				450
	Gas Other, speci epth Kind of Water:		20	80 6			-	
	Gas Other, speci						Ť	4500
Business Name of	Well Contractor	and Well Tech		ion I Contractor's Licence No.			1	350
		ORILLIA		11 R 17 19				'
	(Street Number/Nam		Mui	nicipality RAESIDE	Comments:		······	
Province	Postal Code	Business E-ma		ANTESINE				***************************************
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Bus.Telephone No.	315614B1 S	AUNDER	ian (Last Name, I	·	package delivered	rk Completed		131192
Well Technician's Lic	cence No. Signature o	f Technician and	or Contractor Date	e Submitted	∕A-Yes	r K L DC	1a    م	N 2 4 2012
0506E (2007/12) ®	Queen's Printer for Ontari		<u> </u>	Ministry's Conv		IN MACE	Received	

319/6e  $|O|O_{\mathsf{The}}^{\mathsf{N}}$  Ontario Water Resources Commission Ac OMTARIO WATER FS COMMISSION .....Township, Village, Town or City Lot E E Date completed **Pumping Test** Casing and Screen Record Static level Inside diameter of casing Test-pumping rate 18 Total length of casing 17 Pumping level 50 Type of screen Length of screen Water clear or cloudy at end of test. Depth to top of screen Recommended pumping rate G.P.M. Diameter of finished hole with pump setting of \_\_\_\_\_\_ feet below ground surface **Water Record** Well Log Depth(s) at Kind of water From (fresh, salty, sulphur) which water(s) found Overburden and Bedrock Record 140 140 For what purpose(s) is the water to be used? Domestic Location of Well In diagram below show distances of well from road and lot line. Indicate north by arrow. ab Is well on upland, in valley, or on hillside? G. CHARBO NNEAU Drilling or Boring Firm Licence Number 2593 Name of Driller or Borer... RD N 1. 194 Signature of Licensed Drilling or Boring Contractor) Form 7 15M-60-4138

OWRC COPY

**CRS.38** 

### The Ontario Water Resources Commission Act WATER WELL RECORD 1512689

316/6W

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c	OUNTY OR DISTRICT	D 2. CHECK & CORRECT	TOWNSHIP, BOROUGH, CIT			· / -	CON. BLOCK, TRACT, SUR	VEY, ETC.	- 2	Q 1 = 1
9	WNER (SURNAME FIRST)	J 100 47	ADDRESS	TEIL S		li C	1 011	DATE COMP	LETED 4	- 70
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~ ∟ . F	21 7	10 12	G OF OVERBURDEN	AND REDRO	OCK /		30 31			47
+	GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MAT			TO THE REAL PROPERTY OF THE PERTY OF THE PER	GENERAL DESCRIPTION		DEPTH FROM	- FEET
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4	32 1			4.3 & ( / )	لليا		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			75 80
		RECORD	51 CASING & C				SIZE(S) OF OPENING	31-33   DIAME	ì	ENGTH 39-40
	10-13	IND OF WATER  ESH 3  SULPHUR   14	INSIDE DIAM MATERIAL	THICKNESS INCHES FA	OEPTH -	0022	MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN	41-44 80
4	220 2 SAI	LTY 4 MINERAL	STEEL 2 GALVANIZED 3 CONCRETE	188 0		225	[6] DUICCING	9 CFA	LING DE	CORD
9	A SO ZOSA	LTY 4 MINERAL	4 1 □ STEEL	, 2		20-23	DEPTH SET AT - FEET FROM TO	& SEA	CEP (CEP	MENT GROUT, PACKER, ETC.)
	2 0 82	LTY 4 MINERAL	2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ COPEN HOLE	29		0290	10-13 14-17			
	2 ☐ SAI	LŤY 4 MINERAL	24-25 1 STEEL 2 GALVANIZED	26		27-30	18-21 22-25 26-29 30-33 80			
***	1	LTY 4 MINERAL	4 OPEN HOLE			0323				
1	71 PUMPING TEST METHOD	BAILER OCO 8	107 15	17-18 0 17-18		IN P	LOCATION			
4	LEVEL	ATER LEVEL 25 END OF WATER	R LEVELS DURING	PUMPING RECOVERY S 60 MINUTES			LINE. INDICATE NORTH BY ARE			-
	19-21 2 0 FEET 2	200 FEET 070 FEE	1200	2-34 20 <b>Q</b> FEET			[ي		``	
	IF FLOWING, GIVE RATE  RECOMMENDED PUMP TO	38-41 PUMP INTAKE	SET AT WATER AT END	OF TEST 42			(5)			
	RECOMMENDED PUMP TO	PUMP 🗩	43-45 RECOMMENDED	46-49 5 GPM.			2			
L	50-53 OC						[8	,56	bys	180
ſ	FINAL	1 WATER SUPPLY 2 OBSERVATION WEI						ى .	6	
	STATUS OF WELL	3 ☐ TEST HOLE 4 ☐ RECHARGE WELL	.7 UNFINISHED						_/	
	WATER	DOMESTIC  2  STOCK  3  IRRIGATION	5 COMMERCIAL 6 MUNICIPAL 7 PUBLIC SUPPLY				3			
	USE OI	4   INDUSTRIAL	8 COOLING OR AIR CON				Ta a			
}	METHOD 57	1 CABLE TOOL CONVENT	100 323   BORING				B			
	OF DRILLING	3 TROTARY (REVERSE					<b>1</b> .			
L	MAME OF WELL CON	5 AIR PERCUSSION		ICENCE NUMBER		DATA	58 CONTRACTOR 59-	2 DATE RECEIVE		63-68 80
	5 aprile	al Hal	in Supply	1358		SOURCE DATE OF INSPE	/ 1558	02	1270	
	ADDRESS ADDRESS NAME OF DRILLER OF	hord	Da	ICENCE NUMBER	25	REMARKS:				- 1
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{	Signature of cont	N War	DAYMO	YR	P.		r'	tan jiya	, \	VI Vm
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Ministry of the Environment

### The Ontario Water Resources Act WATER WELL RECORD

Print only in spa Mark correct bo	<b>Enviro</b> aces provided. x with a checkmark, w		э.	11	15	3375	3	Municipality	Con.	L <b>0</b> 7
County or District	A. Paula	ton	Townshi	p/Borough/City/To	/ -	1 OF		Con block trac	7 ate 20	/A.Th
21		Ť	1/55	Northing	<i>[[h]</i>	9000 RC Elevan	tion RC	Basin Code	mpleted day	month year
1 2		LOG OF	OVERBURDE	N AND BEDRO	OCK MATE	FRIALS (se	e instruction	31		47
General colour	Most common n			her materials		LITIALO (SC	General de			Depth - feet
adribiai doldai	moor common n			- Indicates			General Ge	SSCription	Fro	
									0	245
		5								
			· · · · · · · · · · · · · · · · · · ·							
31	<u> </u>									<del></del>
32	14 15 21	<u></u>			43		54		65	75 80
41 WATI Water found	ER RECORD	51 Inside		PEN HOLE RI Wall	Depth - 1	leet	Sizes of ope (Slot No.)	ening 31-33	Diameter 34-38	Length 39-40
at - feet	Kind of water	diam inches	Material 12	thickness inches	From	To 13-16	Material and	d type	inches Depth a	t top of screen 30
2 [	☐ Salty 6 ☐ Gas	コーノリ	1 Steel 12 2 Galvanized 3 Concrete	188	0	20	8			41-44 feet
	Fresh 4 Minerals	19 2	4  Open hole 5  Plastic	144			61 <b>P</b> I	LUGGING & SI	FALING RECO	)RD
	□ Fresh 3 □ Sulphur :	17-18	1 Steel 19 2 Galvanized			20-23	A	nnular space	Aban	
2 [	☐ Salty 6 ☐ Gas	J 19 1	3 ☐ Concrete 4 ☐ Open hole		20			To Material an	d type (Cement gro	ut, bentonite, etc.)
	□ Fresh <sup>3</sup> □ Sulphur : □ Salty <sup>4</sup> □ Minerals □ Salty <sub>6</sub> □ Gas		5 Plastic  1 Steel  26			27-30	0°13 2		1 - B/4	5
20.22	o LJ GES	34 60	2 Galvanized 3 Concrete				18-21 26-29	30-33 80 CM	touite	·
2 [	☐ Salty 6 ☐ Gas		4 ☐ Open hole 5 ☐ Plastic				20-29	30-33	4/_	B15.
71 Pumping test r		rate 11-14 GPM	Duration of pump				LOCA	TION OF WEL	.L	m
Static level	Water level 25 Water I		•	2 🗆 Recovery			below show o	listances of we	ll from road an	d lot line. 🌱
Salic level   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21   19-21	end of pumping 22-24 15 minutes 26-	_	45 minutes 32-34	60 minutes 35-37	'	indicate no	illi by allow.			·
5 feet		eet feet	feet	feet		20				
If flowing give	rate <sup>38-41</sup> Pump intal	ke set at	Water at end of te	est <sup>42</sup>		4				
Recommended		nded 43-45	☐ Clear Recommended	☐ Cloudy 46-49		7				
☐ Shallow	☐ Deep pump setting	ng feet	pump rate	GPM		24				
FINAL STATU	IS OF WELL 54					J	141	lhave		2
1	pply 5 ☐ Abandi ion well 6 ☐ Aband 7 ☐ Abandi	loned, insufficient su loned, poor quality loned (Other) ering	ipply <sup>9</sup> ☐ Unfinis <sup>10</sup> ☐ Replac	shed cement well	,	4-4	0011	VIVI VE	N- P	
WATER USE  1 Domestic 2  Stock 3  Irrigation	6 ☐ Munici 7 ☐ Public	ercial pal supp <del>l</del> y	9 🔲 Not us		),	当公	į			
4 ☐ Industrial	8 Cooling	g & air conditioning				10				
¹ ☐ Cable too	ol 5 🗆 Air per		9 ☐ Driving 10 ☐ Diggin	·		1				
3 ☐ Rotary (re 4 D Rotary (a	everse) ∕ ⊔ Diarno	nd	11 🗆 Other			<u> </u>			25	1137
Name of Well Control	ractor WATEB-WE	1/Port	Well Contract	or's Licence No.	Data source		<b>600</b>	0.6	APR 0 4	2003 e3-68 80
Address /	A11500	4-0"	1		Date of	finspection	Ins	pector		
Name of Well Tech	nician O-	*	Well Technici	an's Licence No.	Remark	ks	1 .		~~	~ _ ~ :
Signature of Techn	ician/Contractor	DYOUS	Submission d	ate 0.2	Remark			,	CS	S.ES3
2 - MINIS	TRY OF THE EN	IVIRONME		,, <u>,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, </u>	27.57				0506 (	07/00) Front Form 9



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### MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

### VATER WELL RECORD

FORM 7 MOE 07-091

Ontario	1. PRINT ONLY IN 2. CHECK 🗵 CORE				SHEET				011 (	CON	0
COUNTY OR DISTRICT			, BOROUGH, CIT				• •	CON., BLOCK, TRACT, SURVE	Y. ETC.		LOT
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			R.	1. Cun	berla	nd,	Ont		DAY_8	мо10	×9 vr. 76
	Lo	OG OF OV	ERBURDE	N AND BE	DROCK N	IATER	RIALS	(SEE INSTRUCTIONS)		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
GENERAL COLOUR	MOST COMMON MATERIAL		OTHER MA	TERIALS				GENERAL DESCRIPTION		DEPTH FROM	- FEET
•										0	12
brown	hardpan									12	
brown	slate		·							130	130
grey	sand stone									150	245
brown	slate									150	243
					-			vertical section of the section of t			
	***										
WATER FOUND AT - FEET	TER RECORD	INSIDE	CASING &		LE RECO			SIZE(S) OF OPENING (SLOT NO.)	DIAMET	INCHES	LENGTH FEET
	KIND OF WATER	DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	FROM	то	SCREEN	MATERIAL AND TYPE		DEPTH TO TOP OF SCREEN	
245	SALTY   MINERAL   SULPHUR	64	GALVANIZED CONCRETE	188	0	21	IE				FEET
C	SALTY   MINERAL		OPEN HOLE				41-	DEPTH SET AT - FEET	G & SEAL	ING RECO	ORD
	FRESH SULPHUR SALTY MINERAL		☐ GALVANIZED ☐ CONCRETE					FROM TO		LEAD PA	ACKER, ETC.)
	FRESH SULPHUR MINERAL		OPEN HOLE	-			$\dashv \vdash$				
	FRESH SULPHUR SALTY MINERAL	] (	GALVANIZED CONCRETE OPEN HOLE								
PUMPING TEST ME			DURATION OF P	PUMPING				LOCATION			
☐ PUMP	BAILER 2	GPM			MINS	LN	DIAGRA	M BELOW SHOW DISTANCE			
STATIC	END OF WATER L PUMPING 15 MINUTES	EVELS DURING		PUMPING RECOVERY				INDICATE NORTH BY AF		FROM ROAD A	ND
15 FEE	04-				. 11						
IF FLOWING,	PUMP INTAKE	SET AT	WATER AT END	OF TEST							
15 FEE	JMP TYPE RECOMMENDED	3.5 FEE	RECOMMENDED PUMPING		IDY						
SHALLOV		235 💬		2	<b>GPM</b> .						
	WATER SUPPLY	ПАВ	ANDONED, INSU	FFICIENT SUPP	<u> </u>						
FINAL STATUS	OBSERVATION WEL	LL 🗀 AB	ANDONED, POOF								
OF WELL	RECHARGE WELL	☐ COMME	RCIAL								
WATER	STOCK IRRIGATION	☐ MUNIC	IPAL								
USE	USE   INDUSTRIAL   OTHER		IG OR AIR COND	T USED							
METHOD			BORING								
OF	ROTARY (CONVENT		DIAMOND DETTING								
DRILLING	ROTARY (AIR) AIR PERCUSSION		DRIVING		DRILL	ERS REM	MARKS:	# m** 1. \			
NAME OF WELL			ſ	ICENCE NUMBER	>.				ADE	R 0 4 20	)U3
Char	<del>bonneau +</del> Sor	n Drill	Ling Li	ta 150					ALL	1 0 4 20	100
MAR DRZ	RAMES F DR PLER OF BOXE 194. Or		Ont the	KIC WIMBER	<b>1</b>   ss						
	L. Bourge		BMISSION DATE		FFICE					CSS.	ES3
		, 150.								_ ~~•	~



Ministry of the Environment

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Well Record
Regulation 903 Ontario Water Resources Act

Cette formule est disponible en français

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 link only. **Ministry Use Only** MUN CON LOT Well Owner's Information and Location of Well Information Address of Wall Accation (County/District/Municipality) Ownship Concession 2 imper Ojty/Town(Villago Site/Compartment/Black/Tractete Unit Make/Model Northing 890 Undiferentiated C GPS Reading NAD Zonel Easting Nathling 818 AGS11 D DOS 8700 Log of Overburden and Bedrock Materials (see instructions) General Colour Most common material Other Materials General Description Š8 POLICE Hole Diameter Construction Record Test of Well Yield Recovery Dooth Metros Diameter Drnw Down Metres Depth From To Centimetre Time Water Levol Time Water Lev 1491 To mln min centimetres 73. ಔಕ 46 2.00 Casing .eve Steel Fibreglass 588 Plastic Concrete 18,29 .48 Water Record Galvanized \_hrs -/ Kind of Water Steel Fibreglass Gas Other Gus Sulphui Plastic Concrete Fresh Stulphur Galvanized 16.01 Slee | Fibreglass Plastic Concrete recommended pump deption netre Mineral Galvenized Other Recommended punt 1769 10 10.48 Screen Fresh Sulphui 10 \_ m Outside Steel Floreglas Skal No. Plastic Concrete (litres/min) Galvanized Il pumping disconin ued, pho reason. OMPENTED No Casing or Screen 73.15 Open hole 17,68 Chlorinated 22 es Plugging and Scaling Record Annular space Abandonment Location of Well Dooth set at - Motres Volumo Places In diagram below show distances of well from road, lot line, and buildings indicate north by arrow. Material and type (benionite slurry, neat cement slurry) etc 17,68 (cubic matres) 4086 Old Marties Method of Construction Diamond Cable Tool Rolary (air) Digging Rotary (conventional) Jetting Br percussion Other Rotary (reverse) Boring Driving Water Use Domestic Public Supply Industrial
Commercial Other Stock Irrigation Municipal Cooling & air conditioning 55562 Z Final Status of Well Unfinished Water Supply Recharge well Abandoned, (Other Was the well owner's infor package delivered? Abandoned, insufficient supply Dewatering Abandoned, poor quality Replacement wel Ministry Use Only Well Contractor/Technician Information Data Source FEB 1 2 ZGU/ DO Date of inspection ICHMONE OA 270 ell Technician's Licence No Well Record Number (2122 TOB

Ministry's Copy

MINISTRY OF THE ENVIRONMENT Cty 56 Thursa
The Ontario Water Resources Act WELL 1513931 1. PRINT ONLY IN SPACES PROVIDED

2. CHECK 
CORRECT BOX WHERE APPLICABLE COUNTY OR DISTRICT TOWNSHIP, BOROUGH, CITY, TOWN, VIL (AGE Carleton Cumberland 16 1<u>2</u>16 LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS) MOST OTHER MATERIALS GENERAL COLOUR GENERAL DESCRIPTION COMMON MATERIAL clay & bolders 5 0 grey prown shale 15 15 125 limestone grey 32 SIZE(S) OF OPENING 41 WATER RECORD **(51) CASING & OPEN HOLE RECORD** DEPTH - FEET WATER FOUND AT - FEET KIND OF WATER WALL THICKNESS INCHES MATERIAL DEPTH TO TO OF SCREEN FROM FRESH 3 SULPHUR 2 SALTY 4 MINERAL I STEEL 188 6022 () 125 3 CONCRETE 1 FRESH 3 SULPHUR
2 SALTY 4 MINERAL 61 **PLUGGING & SEALING RECORD** 4 | OPEN HOLE DEPTH SET AT - FEET 1 | STEEL 3 SULPHUR 2 SALTY 06 CONCRETE
OPEN HOLE 0125 1 | FRESH 3 | SULPHUR
2 | SALTY 4 | MINERAL 1 STEEL 2 GALVANIZED 1 | FRESH 3 | SULPHUR
2 | SALTY 4 | MINERAL 30-33 CONCRETE 4 T OPEN HOLE LOCATION OF WELL Z | BAILER IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW. PUMPING
PECOVERY STATIC LEVEL WATER LEVELS DURING 1 30 MINUTES 2 CLOUDY RECOMMENDED PUMP TYPE SHALLOW DEEP FEET GPM **60** O50 50-53 001.8 WATER SUPPLY S ABANDONED, INSUFFICIENT SUPPLY FINAL OBSERVATION WELL ABANDONED, POOR QUALITY **STATUS** 7 UNFINISHED OF WELL ▲ □ RECHARGE WELL 1 DOMESTIC 2 STOCK 5 COMMERCIAL WATER O ☐ IRRIGATION 7 T PUBLIC SUPPLY INDUSTRIAL 8 | COOLING OR AIR CONDITIONING ☐ OTHER 9 D NOT USED 6 D BORING
7 DIAMOND
B DIETTING ☐ CABLE TOOL METHOD , 2 ROTARY (CONVENTIONAL)
3 ROTARY (REVERSE) OF 4 ROTARY (AIR)
5 AIR PERCUSSION DRILLING 9 | DRIVING DRILLERS REMARKS 80374 Charbonneau, Diamond & Cable Drill DATE OF OFFICE USE R. R. 2, Box 194, Orleans, Ontario LICENCE NUMBER REMARKS Leo Bourgeois MINISTRY OF THE ENVIRONMENT COPY

	Ministry of Well Ta	ag Number (I		4811	T 1534816	Well R	ecord
	the Environment	10048		The second second	Regulation 903 Ontari		ources Act
	of Ontario only. This docum	nent is a perma	anent lega			ence.	
<ul> <li>Questions regarding com</li> </ul>	mpleted in full to avoid delay apleting this application can ts shall be reported to 1/10	be directed to					this form.
Please print clearly in blu Well Owner's Information	ie or black ink only.		MUN / K	50// 0	Ministry Use Only	LOT	23-3
Ottawa (	a letoñ		iim	ber la	nel 23	. /	
RR#/Street Number/Name	contreal R	cl	Cun	ber 10	Site/Compartment/I	- <u></u>	
GPS Reading NAD Zor 8 3 Log of Overburden and Be		x038871	Init Make/M		e of Operation: Undifferentiated,		aged
General Colour Most common				Genera	al Description	Depth From	Metres To
Clay	1100 (5-			- '		3,4	3,4
9127+512011	limestone			nixed		3/9	194
					· · · · · · · · · · · · · · · · · · ·		
							1 - 7 - 30
Hole Diameter  Depth Metres Diameter	Inside	struction Reco	Depth	Metres	Pumping test method Draw		Recovery 3
From To Centimetres  0 73.1 14.91	diam Material centimetres	thickness centimetres	From	То		Metres min	
	Steel Fibreglass	Casing			(metres) 5 Level 7 Pumping rate - 1 3 (litres/min) 4 5	016 1	39.33
Water Record	15.88 Plastic Concrete	.48	0	6.7		3.41 2	38.93
Water found at Metres Kind of Water	Steel Fibreglass Plastic Concrete	1 11				4.06 3	38.68
m Fresh Sulphur Salty Minerals Other:	Galvanized Steel Fibreglass	s	-		Recommended pump 4 3	4.90 4	38.51
Gas Salty Mherals Other:	Plastic Concrete				Recommended pump 5 3 depth. Deep	5.02 5	38.30
Gas Salty Minerals	O. Alda	Screen			Recommended pump 10 3	6,54 10 7 60 15	38.05
Other:  After test of well yield, water was	diam Plastic Concrete	) 11			If flowing give rate - 20. 3	8.47 20	37.68
Clear and sediment free	Galvanized	Casing or Scree	en		If pumping discontinued, give reason.	3 <b>5</b> ,44 30	37.50
Chlorinated Yes No	<b>≥</b> pen hole		6-1	73.1	50 <b>4</b>	0.87 50 1.87 60	37.19
Plugging and Se	ealing Record Annul	v) etc. Volume	andonment Placed	In diagram belov	Location of Well w show distances of well from road,	lot line, and bu	uilding.
From 10	rest sturry	0.13		Indicate north by		reld	2
	tonite sulvi	4 0.2	27		N Car		17-
	***				J. IKM	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	
n n	Method of Construction					00'	Nonth
☐ Cable Tool ☐ Rotary ☐ Rotary ☐ Rotary ☐ Rotary ☐ Rotary ☐ Air percentage ☐ Rotary	cussion Jetting		Digging Other		· · · · · · · · · · · · · · · · · · ·	OD.	~a.
Rotary (reverse) Boring	Water Use						
□ Domestic     □ Industri       □ Stock     □ Comme       □ Irrigation     □ Municip	ercial Not used	air conditioning	Other	Test Audit No. 7	Well#1	ompleted	
☐ Water Supply ☐ Recharge w	Final Status of Well		ned, (Other)	L	vner's information Date Deliver		MM DD
Observation well Abandoned, Test Hole Abandoned,	, insufficient supply Dewatering Door quality Replacement	ent well		package delivere			
Name of Well Comractor		ion Vell Contractor's Lie	cence No.	Data Source	Ministry Use Only Contractor	111	g
Business Address (street game, number	per, city etc.)	<del></del>		Date Received	2 1 2004 DD Date of Inspe	ection YYYY	MM DD
Name of Well Technician (last name,	first name)	Well Technician's Li	icence No.	Remarks	Well Record	Number 5 3 4 8	16
Signature of echnician/Contractor		Pate Submitted		l con C			
0506E (09/03)	Contractor's Copy   N	Ministry's Copy	<b>3</b> ⊓ weii Owr	iers copy	Cette formule e	ac uisponible	on nançais

Well accretion  Order of the property of the control of the property of	Ontario  Ministry of the Environment  Monstrements recorded in: Metric   Imperial   ATO	A 066502   Well .    Regulation 903 Onturio Water Re   Page	· management date *
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Ministry of the Environment

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

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Tag#: A123491

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Regulation 9	03 On	tario	И	la	te	r	R	25	ou	rc	es	А	ct

Measurements recorded in: Metric [ Imperial Page of Well Owner's Information Last Name / Organization E-mail Address by Well Owner Metric Homes (1979) Inc. Mailing Address (Street Number/Name) Municipality Telephone No. (inc. area code) Province Postal Code K O A 1 LO 61 3 8 3 6 8 0 7 Arbourbrook Blvd Carp Ontario Well Location Address of Well Location (Street Number/Name) Township Lot Concession Cumber1and City/Town/Village 161 King Arthur Street County/District/Municipality Postal Code Ontario Ottawa Carleton UTM Coordinates | Zone , Easting Cumberland
Municipal Plan and Sublot Number Other NAD 8 3 1 8 4 65 1 0 503856 Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) Depth (m/ft) Most Common Material General Description From Packed 3.65 Brown Clay 3.65 151.78 Cloured Layers Medium Gray Limestone Coloured Layers Medium 151.78 155.44 Grav Limestone Annular Space Results of Well Yield Testing After test of well yield, water was: Depth Set at (m/ft) Type of Sealant Used Volume Placed Draw Down Recovery (Material and Type) (m³/ft³) Clear and sand free Water Level Time Water Level Other, specify (min) (m/ft) (min) (m/ft) Grouted - Cement 21m3 6.40 Static If pumping discontinued, give reason: 16.75 Level 1 18.80 76.20 Pump intake set at (m/ft) 2 19.27 75.09 91.43 3 Pumping rate (I/min / GPM) 74.38 19.80 Method of Construction Well Use Cable Tool
Rotary (Conventional) Diamond Public ☐ Commercial ☐ Not used 13.65 Duration of pumping 20.50 73.88 Domestic Dewatering Jetting Municipal 5 1 hrs + 20 min 73.28 ☐ Monitoring 20.94 Rotary (Reverse) Driving Livestock ☐ Test Hole Cooling & Air Conditioning Final water level end of pumping (m/ft) ☐ Irrigation ☐ Industrial Boring Digging 10 23.90 71.53 Air percussion Other, specify ☐ Other, specify If flowing give rate (I/min / GPM) 26.75 69.37 Construction Record - Casing Status of Well 20 20 29.40 66.70 Water Supply Recommended pump depth (m/ft) Inside Open Hole OR Material Wall (Galvanized, Fibreglass, Concrete, Plastic, Steel) Thickness Replacement Well 25 65.35 (cm/in) (cm/in) To 32.95 91.43 Recommended pump rate Test Hole Recharge Well (l/min / GPM) 35. 15.86 Stee1 .48 + .45 6.40 Dewatering Well 13.65 Well production (I/min / GPM) 40 40 Observation and/or 39. 59.85 Monitoring Hole 50 57.09 Alteration Disinfected? (Construction) 🔀 Yes 🗌 No 60 Abandoned, Insufficient Supply Map of Well Location Construction Record - Screen Abandoned, Poor Water Quality Please provide a map below following instructions on the back Outside Depth (m/ft) Material Diameter (cm/in) Slot No Abandoned, other, (Plastic, Galvanized, Steel) From specify Other, specify Water Details Hole Diameter Depth (m/ft) Water found at Depth Kind of Water: Fresh Xuntested Diameter (m/ft) Gas Other, specify Water found at Depth Kind of Water: Fresh Untested 6.40 15.89 (m/ft) Gas Other, specify 0 6.40 151.78 15.23 Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify 151.78 155.44 Well Contractor and Well Technician Information Business Name of Well Contractor Well Contractor's Licence No Capital Water Supply Ltd. Business Address (Street Number/Name) 1 5 Municipality Comments: P.O. Box 490 Province Postal Code Stittsville Business E-mail Address Well owner's Date Package Delivered Ministry Use Only Ontario K 2 S 1 A 6 office@capitalwater.ca information Audit No. 2 1 8 8 5 5 7 package delivered 0 1 4 0 9 12 Miller; Stephen f Technician and/or Contractor Date Submitted 6 1 3 8 3 6 1 7 6 6 Date Work Completed YYes DEC 1 2 2014 ☐ No 2 0 1 4 0 9 0 9 2 0 1 4 0 91 Ministry's Copy

Well Record
Regulation 903 Ontario Water Resources Act

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ructions for Completing F For use in the Province of C	teriorio only Thi	s document	is a perma	ment legal do	cument. Plea	se retain for future	reference	te. he back of	this form.
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Gas Sally Minerals		ASUrseq				Recommended pu	res [	792-	10 223
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m Fresh Sulphur	Outside [")Ste	el [] Fibreglass	Slot No.			If flowing give rate	· 20	15.40	20 20, 2
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Clear and sediment lies  Other, specify		No	Casing or 1		1 40		50		50 /4.0
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☐ Irrigation ☐ Mus		Cooling	& air condition	-4	71 💻 _	z <u>51952</u>	Date De	S de la constant	
Weler Supply Recharg		Unfinish	ed 🛄	Abandoned, (Other	) Was the w	ell owner's information	1		γγγ 8α - Σν
Weller Supply Recharge Observation well Abando	e wen ned, insufficient suppl	y Downton	ring		package de				
ILI Owen service III		Replace	ment well			i di sala (	w Lisa O	niv	

	0 90M 41092
Method of Construction	
☐ Cable Tool     ☑ Rotary (air)     ☐ Diamond     ☐ Digging       ☐ Rotary (conventional)     ☐ Air percussion     ☐ Jetting     ☐ Other       ☐ Reference     ☐ Boring     ☐ Driving	nul
Water Use	
Domestic   Industrial   Not used   Stock   Commercial   Cooling & sir conditioning   Industrial   Cooling & sir conditioning   Place   Place   Cooling & sir conditioning   Place   Place   Place   Place   Place   Place   Place   Pla	Audit No. Z 51952   Date Well Completed   Detail Co
Abandoned poor funity Replacement well	Ministry Use Only
Name of Well Contractor/Technician Information Well Contractor Licence No. Name of Well Contractor Doug 9 806  Or 1 1 2 5 Polyte of visits  Or 1	Data Source Contractor 1 4 1 4  Data Received YYYY MM DD Date of Inspection YYYY MM DD  AUG 2 3 2086
News or Veli Technician (last name, first name)  Well Technician's Licence No.  State Bubmitted yvyy  State Bu	Remarks YVEN RECORD FEMALES
OSOBE (09/03)   Well On	Cette formule est disponible en français

Ministry of the Environment Metric

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Well Record

Regulation 903 Ontario Water Resources Act
Page \_\_\_\_\_\_ of \_\_\_\_\_ 3

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		on (Street Num		20 D	To	ownship / /	0	Lot 12	84	Concession	1	
	I - 60 strict/Municip A W U4 - inates   Zone	Pality C5	Y Nort	er- Dr		ity/Town/Village	law of	. /3	Ont:			C   E
NAD				03887		4M-						
Overburde General Co		Most Comm		ment Sealing	2000	r <b>d</b> (see instructions on to er Materials	e back of this for	m) General Description			De	oth (m/ft)
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ore/	yh	imes	Fon								0	750,75
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Depth Se From	et at (m/ft)		Type of Seala (Material and	ant Used		Volume Placed (m³/ft³)		well yield, water was: nd sand free	Dr Time	aw Down Water Lev	-	Recovery Water Level
10.60	1.51	Cem	1	brut	,	2mks.	Other,	specify	(min) Static	(m/ft)	(min)	(m/ft)
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									1	13,52	1	47,04
							-	o set at (m/ft)	2	16,05	2	46.12
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Cable To	ool	☐ Diamond	☐ Publ	ic 🗆 C	Comme	rcial Not used	Duration of	3.50 pumping	4	19,27	4	44,15
Rotary (f	Conventional) Reverse) 14	R Driving	Lives		Municipa Test Hol		1 1 640	+ 00 min	5	21,47	2 5	43,18
Boring		Digging	☐ Irriga	ition 🗌 C	Cooling	& Air Conditioning	Final water I	evel end of pumping (m/lt)	10	23.09	10	41,09
☐ Air percu ☐ Other, st				er, specify			If flowing gir	ve rate (Vmin / GPM)	15	29.61	) 15	39.23
	1	struction Re			111111	Status of Well			20	328	/ 20	37.40
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(cm/in)		Plastic, Steel)	(cm/in)	+		Test Hole Recharge Well	Recommen	ded pump rate	30	279	2 30	34.00
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0 . 0	Name of Well	Contractor		11-		ell Contractor's Licence N	1					
Business A	ddress (Stre	TER- W get Number/Na	me)	1//1100	S Mu	o 0 0 0	Comments:					
176	3-1	oute	900	Wes7	+ /	VATION						
Province	1	Ostal Code		E-mail Address			Well owner	s Date Package Deliver	ed	Min	istry U	se Only
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Ontario Ministry of the Environment Measurements recorded in; XI Metric [] Imperial

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Owner's Information						
						Contrassion
Location as of Well Location (Steep) Nur	nhec Name)	Market .	Townst	pil.	Lot	10
14 Camalor Estat		_	CutyTe	mberland.	23	Province Postal Code Ontario
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Business Name of Well Cont Capital Water St Business Address (Street N	innly Ltd.			Municipality	6 Comments	13.0
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Ontario K2S Bus temphone No line men	LA6 of sxey Name of Well	fice® ttechnos	CADita n (Lan Nam	lwater.ca nu First Name)	pactorpo 2 0 0 0	9 0 3 2 0 AMAR Z 09533
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Measurements recorded in: Metric

0506E (12/2007)

Ministry of the Environment

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Well Tag No. ( A 066502

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Regulation 903 Ontario Water Re

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Address of Well Loca	tion (Street Numbe	Arthu C	10	Camber	-land	23	Concess	ion ]	
County/District/Munic		1000	Ci	ty/Town/Village	. 0 . 1		Province Ontario	Postal	Code
UTM Coordinates Zor	ne Easting	Northing	-	unicipal Plan and Suble	ot Number	7	Other		
NAD 8 3 L Overburden and Be	edrock Materials/	Abandonment Sea	ling Recor	d (see instructions on the	back of this form)				
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Cable Tool Rotary (Conventions	Diamond	Public Domestic	Commerci		Duration of pumping	4	4 10.7	9 4	38.98
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	onstruction Reco		THE STATE OF THE S	Status of Well			20 52.9	20	36.25
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	Sanaturation Book	rd Career		Abandoned, Insufficient Supply	Yes No	Man of W	60 448	60	
Outside	Material States	Slot No.	, ,	Abandoned, Poor Water Quality Abandoned, other,	Please provide a map			e back.	
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				Other, specify		ea M	Contreal	2740	
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Water found at Depti	h Kind of Water:	Fresh Untested				88	3: 1/2		
(m/ft) Ga:		nd Well Technicia	n Informati	on		(6)	- \ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\		
Business Name of We	Contractor 1	Lilling Co	Lta Well	Contractor's Licence No.	#1	11 22	, 1 A	thu	~
Business Address (St	reet Number/Name)		Mufr	cipality	Comments:		3		
Province	Postal Gode	Business E-mail Add	Iress	- CI WOT OF	L			1-4 1	0-1
Bus. Telephone No. (inc	area cade) Name	of Well Technician (I	_ast Name_V	First Name)	information package	ackage Delivere	Audit No	Z or	1541710102
Well Technician's Licence	e No. Signature of	Yeshain Teshnician and/or Co	ontractor Date	Submitted	delivered	Vork Completed			1803
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Ministry's Copy

Well Record
Regulation 903 Ontario Water Resources Act

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Instructions for Completing Form

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Instructions for Complexing Form

• For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.

• For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.

Questions regarding comple	eted in full to avoid delays if ting this application can be half be reported to 1/10th (		Water Well	Manageme	nt Coordinator at 416- Ministry Use On	
Diagga print clearly in Diug Q	r black ink only.		UN	CON		LOT
ess of Well Cocation (County/Di		Towns	hip  MDe  TownVillage	rlar verb	d Sije/Comparim	3 Concession asVBlock/Tract etc 70.34
Roading NAD Zone   813   S   Of Overburden and Bed	Figure 1	uctions)	Make/Model	Mode	f Operation: Undifferent Different	Depth Metros From 10
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					Test o	y Well Yield
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Water Record	Steel   Fibregless   Steel   Fibregless   Steel   Gulvanized   Steel   Fibregless   Steel   Fibregless   Steel   Fibregless	.48	0	7,31	(litres/mlp)	2 4, 50 2 4,40 3 50 3 1350
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Ges Selly Minerals Other:  The Selly Minerals Other:  The Selly Sulphur Ges Selly Minerals	Plastic Concrete [Galvanized]  Outside Steel Fibregian	Screen			Recommonded pump rate (Infestmin)	10 235 10 8 3 15 7 80 15 7,90 20 11,20 20 20 00
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hiorinated See No	Open hole			103.63	Location 0	60 [7], 80 60
Plugging and S Depth set at - Metros From To Meterial and by		rry) etc. Volum (cubic	sandonment le Paced ; merral	In diagram besindicate north	ow show distances of well fro	om road, folline, and building.
Cable Tool Rotary (conventional)	rcussion Jetting		Digging Other	AKM	2 160	+ 181 King Arthur
Rotary (reverse) Boring   Boring   Boring   Boring   Boring   Grown Grow	Water Use  Inst Public S percial Not use  spai Cooling		Other	Audit No. Z	48602	To Completed Oct of Top
	Final Status of Well well Unfinish id, insufficient supply Dewate id, poor qualify Raptect entractor/Technician Inform	ring	ioned, (Other)	Was the well package delk	owner's information Daniered? Yes []No Ministry U	the Deliverant Carlo
Name of Well Contractor  Bushdas Audines (strept)mame, nur  Name of Well Tybrinicien (last name	THINK COLTD  TO THE COLTD  TO THE COMPE	Ko A 9	7	Date Receiv	r 1 mr 2006,	els of Inspection YYYY MM
Signature of Technicia-Vicentiesion	Contractor's Copy C	Dein Submitted  006  Ministry's Copp	2927 Wellow	ner's Copy [	Cette	formule est disponible en fra

09UED (12V2003)

Ministry of the Environment

Well Tag No. (Piace Sticker and/or Print Selow)

Well Record

\*stion 903 Ontario Water Resources Act

A076803 A076803 Measurements recorded in: [XMetric | [] Imperial Well Owner's Information Well Location Township Province 10 Postal Code Address of Weil Location (Street Number/Name) Cumberland. Lot 15 Camelot Ontario County/District/Municipality Cumber land Municipal Plan and Sublot Number Other Ottawa Carleton
UTM Conducted 2 Per Easting
Northing
NAC 8.31 8 4 6 5 1 17 9 5 0 3 8 6 0 8 Overburden and Bedrock Materials/Abandonment Sealing Record (see Instructions on the back of this form) Decemberry General Description Other Materials Most Common Material 3.65 German Colour Packed. 3.65 79.24 Clay \_\_\_ Medium Brown Light Colours 79.24, 93.26 Limestone Gray Medium Dark Layer Limestone Gray Results of Well Yield Testing Recovery Draw Down After less of well yield, writer was Timo Water Level Time Witter Level Volume Placed Type of Sestam Used (Material and Type) Clear and sand free WWT. Directly Set at (1117) (m\n2) lu/h) privat! STATIC .21m3 18.29 it pumping discontinued, give revisor). O Grouted Cement 48.57 18.39 Pump intain set at (mill) 2 47.96 18.80 83.81 19.21 47,37 Pumping rate (thmin / GPM) Well Use 18.2 19.66. Method of Construction [] Not used ] Commercial Duration of numbing Public C) Diamont 46.19. Dewalering 19.98 2 hrs \* רווריי T Domestic Municipal Ratin's (Consuntional) Monitoring Test Hole Monit
Cooling & Air Conditioning Final writer level end of pumping (m/ll) 10 43.45 Livestock 10 C Driving 23.49 X Reduy (Rove 5t1 D tragation Digging 50.69 □ Boring 15 40.57 []] Industrial 15 27.03 Il flowing give rate (brain / GPM) [] Ar perpussion Other, spendy Other, specify 38.64 20 29,68 Status of Well: Construction Record - Casing 1973 Recommended pump depth (multi) (X Water Surply Depth (m/t) 25 32,15 36.84 Open Hale OR Material (Galvanized, Fibroglass, Curcretts, Plastic, Steet) Risplacoment Well 68.57 Enickness From Darnolo Test tysle Recommended bump rate 30 35.03 (cinera) 30 34.79 (cm/n) Techninga Well (Smart / GPM) 6.4 +.45 38.12 40 32.26 .48 Dewatering Wall -18.2040 Steel 15.86 Wes production (time) GPM) Observation and te 50 41.19 50 30.07 Montening Hour Alteration Disinfikkled? 43.59 60 28.89 (Construction) 60 XI Yes ... No [7] Abundamed. Map of Well Location inpurficient Supply Please provide a map below following instructions on the buch Abandoned Poor Construction Record - Screen Water Ouolity Depth Intiti Custom Ab indoned, other, From (Plastic, Galvanunid, Steril) ερεαίγ Char, specify Holo Diameter Water Details Dianater Water toesed at #epth Kind of Water: | ] Fresh X Uninsted Depth (m/fl) (c/mien) Water found in survey of Water Fresh 6.4 15.86 0 Water found at Depth Kind of Water (natt) Gas Joiner, spendy Water bound at Doubth Kind of Water Fresh Unitested 83.81 15.23 6.4 83.81 93.26 14.75 (m/tt) Gas Diher, specify Well Contractor and Well Technician Information VANI Contractor a Licanos No Business Name of Wolf Contractor 1 5 5 8 Capital Water Supply Ltd. Commissions Municipality Business Address (Street Number/Mane) Stittsville Box 490 Ministry Use Only Business E-mail Address Poster Code Date Philings Delivered Province Well owns I > K2S 1 A6 office@capitalwater.ca z 095334 eformation Bus Triesprone No. (etc., wee code) Name of Wes Technique (Last Manie, First Name) 20090320 Ontario package delivered Date Work Completed Successed APR 0 6 2009

XYes No

20090314

Well Tag No. (Place Sticker under Port Below)

A068294 A 068294

Well Record tion 903 Ontario Water Resources Act

Measurements recorded in: 1½ Metric | Imperial

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	les Leger Dr.		City/T	umberland ewoVillage	prox fat-in	Ontario	Postal C	Depa
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		Annular Space	1	Volume Placed	After test of well yield, water was:	Onw Dow	n i n	ecovery Water Leve
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				Abandoned Insufficient Supply	Map	I Well Location	1	
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Business	Name of Well Contractor			1 _5 5	8	physical of the second subsequence of the se	and of a summary of the summary of t	amenda-femaness this
Cupi I	tal Water Sur Address (Street Number)	laus) = S.F.W.		Municipality	Commusts.			
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Well Tag No. (Place Sticker und/or Print Below)

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Well Record

Hation 903 Ontario Water Resources Act Page\_\_\_\_ ol \_\_\_\_

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				Ì		Pumping rate (Vinor	(GPA)	3	11.1	) 3	16,42
Mothe	d of Construction			Well Use		13.65		4	11.1	5 4	15.88
Cattle Too		Pub Di Dor	pere.biG	Commerci	Dewatering	Duration of pumpin	min	5	11.8	7 5	15,35
Robins (Co	Drawing [ ] Arrestor	Our	#DCIAH	Test Hole	: [1] Montoning Air Crasidioming	Final water level ene	of pumping (m-	10	13.4	7 10	13.05
□ Boring IX Air bürcüs	Dyspec	☐ Ind	(1911ith	Carry Street, of		18.67	man I conti	15	14.3	7 15	
Other, stv	-cat/		nee, spacely		Status of Well	I I it downed dwa tore	Autora en soa	20	15.3	20	1
	Construction Re	cord - Car	Deptr	£178/11	X Water Scoply	Recommended pu	ny depth (mm)			26	
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correin)		48	1+.45	6.40	Recharge Well	Ginla / GPM)		30	16,5	20	7.0
15.86	Steel	. 40			Dewalteing Viell  Observation anator	Well production (V	inan / GPMb	40	17.5	, U	
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				,	(Construction)	X1es No		60		6 60	1
		and Ger	noderb	-	mauticent Supply Abandoned, Prior	Please provide a r	Map of	Well L	erens or l	ne track	
Cubyde	Construction R		Depl	ds <i>Onditl</i>	Water Quality [7] Abardones, offen	11 \					
Dustricks' (confe)	(Plasac, Guivanized Stock	Stat No.	Fzom	To	specify	6	Lot A	8	,		
				]	El Other, specify	18	1 1		1	}	f.
-11	0 600						10,		,	_	-
	Water Do	talls			Hole Diameter						
Water fou	nd at Depth' Kind of Wati	er "Firesh	,X:rinteste	rom Erom	P95 (76-10) Diamet To (677)			- 1			
79.24	nati Gas Other, sp led at Depth Find of Wat		untosk	st 0	6.40 15.8	36		1			
1	men) Sun Other, sp	arcity		6.40	86.86 15.3	23   🔻	17 /	11/24			
Water fou	and at Depth. Kind of Wat		h Untesti	M		1 3	THE RESIDENCE OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUMN	11.62	-61	Winds and Street	
	(mrit) G-is Other St Well Contrac	tor and Wi	oli Technic	ian Inform	ation		LE POT			E	= 1
Ausness	Name of Well Contractor				Mall Principles a service	No / CA	MELOT.			1	M
Const	at Water Suppl	y Ltd.			1 5 5 5	Opportunits.	Marin Congression		4-16-		
Business	Address (Street Numbern	AUTHA)			Stittsville_						
p., /.	Postat Code		ess E-mail /	Address			Oale Peckage Di	permed		Ministr No.7	y Use Onl
Box 4									LT AUGI	4512 7	A 4 8
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Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### **Appendix 3**

• Laboratory Certificates of Analysis – Groundwater

Report: PH1236-REP.02R2

### **REPORT OF ANALYSIS**

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 717

Attention: Mr. Robert Passmore

Report Number:

Date:

2929721

2009-12-07 TW1 2009-12-04

Date Submitted:

Project:

PH1236

P.O. Number:

IVOICE: Paterson Group inc.						P.O. Number: Matrix:		Water	
hain of Custody Number: 11723		1 4 10 10	704000	764881				GUIDELINE	
		LAB ID:	764880	2009-12-03					
	Sam	ole Date:	2009-12-03	TW1 WS2			1	ODWSOG	
	Sa	mple ID:	TW1 WS1	14414425				ODWAGO	
		1451					TYPE	LIMIT	UNITS
PARAMETER	UNITS	MRL		60			MAC	0	CFU/100m
otal Coliforms	CFU/100mL		0				MAC	0	CFU/100n
scherichia Coli	CFU/100mL		0	0					1
leterotrophic Plate Count	CFU/1mL		135	291			<u> </u>		
aecal Coliforms	CFU/100mL		0	0					
	CFU/100mL		2	11			<u> </u>		
aecal Streptococcus									
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

Microbiology Anal 15

Exova |

Client: Paterson Group					Z.	Report Number:	5 5	2929698		
28 Cancaurse Gale, Unit 1 Nepean, ON						Date Submitted:	2 2	2009-12-04		
K2E 7T7 Attention: Mr. Robert Passmore					P	Project:	Δ.	PH1236		
INVOICE: Palerent Green Inc.					P.C	P.O. Number:	7	7873		
Chain of Castody Number: 11723				I	Ma	Matrix:	5	Water		
		148.0	764828	764829				GUIDELINE		
	Sam	Sample Date:	2009-12-03	2009-12-03		T				
	ű	Sample ID:	TW1 WS1	TW1 WS2				ODWSOG	ľ	
		1					TYPE	LIMIT	UNITS	
PAKAMETEK	DINI'S	J u	400	LUV			90	200	mg/L	
Alkalinity as CaCO3	16 E	n -	1 1	999			Q	250	mg/L	
Chloride	12	- 1	? ?	8			ð	co	귤	
Conductivity	uS/cm	נחינ	3200	3040			(2)	,	115	
Dissolved Organic Carbon	mg/L	0.5	1.7	<del>7.</del>		- 1	Q Y	n ¦	7gr	
Fluoride	щgу	-:-	0.12	0.16			S S	ر د ا	100	
Hydrogen Sulphide	шgЛ	0.1	40.1	<b>-0.1</b>			Ş	CO.	Jen Jen	
N-NH3 (Ammonia)	шgЛ.	0.02	0.13	0.14			945	5	Pour	
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10			385	2 5	1 200	
N-NO3 (Nitrate)	mg/L	1.0	0.41	0.42			2		- A	
Hd			7.81	7.85				6.0-0.0		
Phenois	шgЛ	0.001	<0.001	40.001			Ş	60	J'ou	
Sulphale	mg/L	٠- '	†21 (*)	117			}	3	h	
Tannin & Ugaln	mg/L	£; '	ם מ	6.0			QV	200	mo/L	
Total Dissolved Solids (COND - CALC)	ا ع	n ;	2080	1960			2	}		
Total Kjeldahi Nitrogen		3 6	0.38	15.4			MAC	1.0	UTN	
Turbidity		- -	808	862			8	8	mg/L	
Tardinass as Caccos	i b	0.0	1.06	1.08						
Calcius	mg/L	-	246	199						
Magnesica	mg/L	-	47	4						
Polassium	mg/L	-	ល	2				000		
Sodium	mg/L	7	382	418			ą į	3 3	man in	
Iron	mg/L	0.03	5.51	0.73			Ş Ş	2 6		
Manganase	mg/L	0.0	0.15	90.0			2	6	<b>a</b>	
										_
						=	•			

MRL - Method Roporting Limit INC = Incomplete AO = Asstratic Objective OG = Operational Guideline MAC - Musinum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:
H2S MRL elevated due to sample turbidity.

Resurts relate oxly to the parameters fested on the samples submitted.

# Certificate of Analysis

Kollaard Associates Inc. Client:

210 Prescott St., Box 189

Kemptville, ON K0G 130

Ms, Colleen Vermeersch Attention:

160128

Kollaard Associates Inc. Invoice to:

2016-03-17 1603877 Report Number: Date Submitted: Date Reported: Project: COC #:

2016-03-23 160128 167385

Page 1 of 5

## Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Shyla Monette 2016.03.23 16:01:56-04'00'

Shyla Monette

APPROVAL:

Team Leader, Inorganics

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa Is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at <a href="http://www.caja.ca/scopes/2602.pdf">http://www.caja.ca/scopes/2602.pdf</a>.

Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water.

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

Certificate of Analysis

Kollaard Associates Inc. Client:

210 Prescott St., Box 189

Kemptville, ON KOG 130

Ms. Colleen Vermeersch Attention.

160128 PO#: Kollaard Associates Inc. Invoice to:

2016-03-23 2016-03-17 160128 167385 1603877 Date Reported: Project: COC #: Report Number: Date Submitted:

																		,					_
1231377 Water	2016-03-16 TW1-6hr Sample		212*	1.04	353	241	22	<2	543	1,5	0.41	<0.10	<0.10	8.10	23	>100	62	1,47*	7	14	0.10*	40	
1231376 Water	2016-03-16 TW1-3hr Sample		210*	1,05	326	235	16	2	502	1.8	0,25	<0,10	<0.10	8.06	18	95.0*	61	0.62*	9	14	0.03	34	
Lab I.D. Sample Matrix	Sample Type Sampling Date Sample I.D.	Guideline	00100		AO-500	002-90	AO-250	AO-5	. Andreas and grant of the contract of the con	AO-5	MAC-1.5	MAC-1.0	MAC-10.0	6,5-8.5	AO-500	AO-5.0		AO-0.3			AO-0.05	AO-200	
		Units	mg/L		mg/L	mg/L	mg/L	LCO	uS/cm	mg/L	mg/L	mg/L	mg/L		mg/L	NTO	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	Second in constitution of the last of the

0.10 0.10

> N-NO2 N-NO3

0.5

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Conductivity

200

Colour

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General Chemistry

AR

0.0

Hardness as CaCO3

Calculations

Group

Analyte

TDS (COND - CALC) Alkalinity as CaCO3

Ion Balance

5

8

0.03

0.1

Turbidity

Ca

Metals

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ODWSOG	All markets and all and a land
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uidel	1
3	2

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise Indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted.

146 Colonnade Rd. Unit 8, Ottawa, ON KZE 7Y1

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

<0.001

<0.001 0.11

mg/L

0.001

mg/L

0.1

Total Kjeldahl Nitrogen

Phenols

N-N-T3

Subcontract

Nutrients Phenols

N

0.0

₽ Ę

<0.02 0.11

**20.0**2

AO-0.05

mg/L

0.02

mg/L

0.7

Tannin & Lignin

mg/L

0.0

0.2

Certificate of Analysis

Kollaard Associates Inc. Client:

210 Prescott St., Box 189

Kemptville, ON K0G 1J0

Ms. Colleen Vermeersch Attention: PO#;

160128

Kollaard Associates Inc. Invoice to:

Report Number: Date Submitted:

160128

2016-03-17 2016-03-23 167385 Date Reported: Project: COC #:

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No F304805 F Analysis/Extraction Date: 2018-03-172	16-03-17 Anaivsi AET		
Method CSM2130B			
Turbidity	<0.1 NTU	101	73-127
Run No 304836 Analysis/Extraction Date 2016-03-21	Analyst	ABT POST REPORTED	
Method C SM2120C	是"是"为解析。 第二章 为解析。	The state of the s	
Colour	STOUT STOUT	1	80-120
Run No. 304866. Analysis/Extraction Date 2016-03-18. Analysi	16-03-18 Analysi SKH	<b>用:原产的</b>	<b>第三条件机制制</b>
Method M SM3/20B-3500C			
Calcium	<1 mg/L	101	90-110
Polassum	<b>3/3mg/c</b>	103	87-113 (FE
Magnesium	<1 mg/L	101	76-124
unipos.	S2.mg/L	lop S	82-118
Run No 3048901. Analysis/Extraction Date 2018-03-18. Analyst NP	18-03-18 Analyst N	P. SEPTIME	
Method CSM4500-NO3-E			Asset Transfer of the State of
N-NO2	<0.10 mg/L	26	80-120
	10 mg/L	86	80-120
* Run No 304895. *** Analysis/Extraction Date 2016/03-19!/ Analyst : K.A.	it6-03-19-i Analyst K	ANDRES	<b>的机械制度</b>
Wolflod' EPA/2008			

Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise Indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC Information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

and the state of the state of Certificate of Analysis

Kollaard Associates Inc.

Client:

210 Prescott St., Box 189 Kemptville, ON

K0G 1J0

Ms. Colleen Vermeersch Attention: PO#:

160128

Kollaard Associates Inc. Invoice to:

2016-03-17 1603877 Report Number: Date Submitted:

2016-03-23 160128 167385 Date Reported: Project: COC#:

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
lron	<0.03 mg/L	86 86	92-107
Figuria 2018-00 Analysis (Extraction Date 2018-05-18 Analysis A RET	ili ostalija IB-03-18 met Analysie PA		
Method C SM4500-H-B		A Company and a company of the compa	
Alkalinity (CaCO3)	<5 mg/L	66	90-110
Conductivity	<b>46.US/cm</b>	66.317	90-110
of the control of the community of the control of t	<0.10 mg/L	66	90-110
は、一般の対象を表現している。	808	50	90-110
Run.No. 304919 Analysis/Extraction Date 2016-03-18	16-03-18 Analyst N	P. S. S. W. S. S. S.	ではない。
Method SM 41,19C		Three Livers Sheeman	The state of the s
Chloride	<1 mg/L	101	90-112
	41mg/L		90-110
Rum No. 304929 Analysis/Extraction Date. 2016:03-21 Analysis AET	16-03-21 Analyst Al		
Method C SM5310C			
cod	<0.5 mg/L	104	84-116
Rum No. 3050553 - Analysis/Extraction Date 12016-09-23 Analysis	16-08-23 Analysi Si	SDC: The page	<b>新型化等等等等</b>
Method SUBCONTRACT P	<b>建学学业教会协会会教</b>	AT TO SHARE OF THE SHARE S	
SEN'S	· · · · <0.01 mg/L	96	
Phenois	<0.001 mg/L	88	-

Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise Indicated by " which indicates analysis was completed in MissIssauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit. AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Cermicate of Analysis

ロメロメロ

Kollaard Associates Inc. Client:

210 Prescott St., Box 189 Kemptville, ON

K0G 130

Ms. Colleen Vermeersch 160128 Attention:

Kollaard Associates Inc. Invoice to: P0#;

2016-03-17 1603877 Report Number: Date Submitted: Date Reported:

2016-03-23 160128 167385 Project: COC #:

## QC Summary

Analyte	Blank	QC % Rec	QC Limits
SS2 Thirties and the second se	<0.02 mg/L <0.1 mg/L	100	
Total 'Keldahi Nitrogen	-0.1 mg/L	102	
Method Clon Balance	を記れている。		(大) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )
ion Balance Method CiSM2340B			
Hardness as CaCO3 Method C SM2540			
TDS (COND - CALC)			

Guideline = ODWSOG \* = Guideline Exceedence All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).

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

Methods references analyor additional QA/QC Information available on request.

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IIMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Page 5 of 5

# Certificate of Analysis

EXOVQ

Kollaard Associates Inc. Client:

210 Prescott St., Box 189 Kemptville, ON

K0G 1J0

Ms. Colleen Vermeersch 160128 Attention:

Kollaard Associates Inc. Invoice to:

Report Number: Date Submitted: Date Reported: Project: COC #:

1603879 2016-03-17 2016-03-19 160128 167385

Page 1 of 2

## Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

12:13:08 -04'00' Krista Quantrill 2016.03.19 A Change

APPROVAL:

Laboratory Supervisor, Microbiology

Krista Quantrill

All analysis is completed in Ottawa, Ontarlo (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf. Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water.

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

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Certificate of Analysis

EXOVA

電子の方とは、一切があるとなる。

Client: Kollaard Associates Inc.

210 Prescott St., Box 189

Kemptville, ON

K0G 1J0 Attention; Ms. Colleen Vermeersch

PO#: 160128

Invoice to: Kollaard Associates Inc.

Report Number:. 1603879 Date Submitted: 2016-03-17 Date Reported: 2016-03-19

Date Reported: 2016-03-Project: 160128 COC #: 167385

1231388 Water 2016-03-16 TW1-6Hr Sample		153	0	0	0
1231387 Water 2016-03-16 TW1-3Hr Sample		06	0	0	0
Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	Guideline		MAC-0		MAC-0
	Units	ct/1mL	ct/100mL	ct/100mL	ct/100mL
	MRL	0	0	0	0
	Analyte	Heterotrophic Plate Count	Escherichia Coli	Faecal Coliforms	Total Coliforms
	Group	Microbiology	Others	<b>.</b>	-

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Guideline = obwSoG
All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

# Certificate of Analysis

Kollaard Associates Inc. Client:

210 Prescott St., Box 189

Kemptville, ON K0G 1J0

Ms. Colleen Vermeersch Attention:

PO#:

Kollaard Associates Inc.

Invoice to:

Report Number: Date Submitted: Date Reported: Project: COC #:

2016-03-23 2016-03-24 160128 175693 1604190

Page 1 of 3

## Dear Colleen Vermeersch:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to cail (613-727-5692),

Report Comments:

2016.03.24 15:14:23 -04'00' **Pinsonneault** Nadine

Team Leader, Inorganics Nadine Pinsonneault

APPROVAL:

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf.

Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm solis). Licensed by Ontario MOE for specific tests in drinking water.

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Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

The section of

EXOVA ENVIRONMENTAL ONTARIO

1.5

Kollaard Associates Inc. Client:

210 Prescott St., Box 189

Kemptville, ON

1604190 2016-03-23 2016-03-24

Report Number: Date Submitted: Date Reported: Project: COC #:

160128 175693

K0G 1J0 Ms. Colleen Vermeersch

Attention: PO#:

Kollaard Associates Inc. Invoice to:

1232101	Water	2016-03-22	TW1
Lab I.D.	Sample Matrix	Sampling Date	Sample I.D.

_	<del></del>						
101202	Water	2016-03-22	TW1		5.0	0.48*	0.03
Lab I.D.	Sample Matrix Sample Type	Sampling Date	Sample I.D.	Guideline	AO-5.0	AO-0.3	AO-0.05
				Units	NATU	mg/L	mg/L
				MRL	0.1	0.03	0.01
				Analyte	Turbidity	Fe	Mn
				Group	neral Chemistry	Metals	•

General Ch

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Page 2 of 3

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All analysis completed in Ottawa, Ontario (unless otherwise Indicated by \*\* which indicates

analysis was completed in Mississauga, Ontario).

Guideline = ODWSOG

\* = Guideline Exceedence

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

### REPORT OF ANALYSIS

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number: Date Submitted:

Date:

2929469

2009-12-03 TW2 2009-12-01

Project:

PH1236

7873

INVOICE: Paterson Group Inc.					P.O. Number: Matrix:		7873 Water GUIDELINE	
Chain of Custody Number: 108473	LAB ID:	764211	764212				GUIDELINE	<del>-</del>
	Sample Date:	2009-12-01	2009-12-01					
	Sample ID:	TW2 WS1	TW2 W\$2				ODWSOG	
						TYPE	LIMIT	UNITS
PARAMETER	UNITS MRL		0			MAC	0	CFU/100ml
Total Coliforms	CFU/100mL	0	ŏ			MAG	0	CFU/100ml
Escherichta Coli	CFU/100mL		>500					
Heterotrophic Plate Count	CFU/1mL	>500	0					1.0
Faecal Coliforms	CFU/100mL	0	0	1 1				
Faecal Streptococcus	CFU/100mL	0	, ,			4		
	1 1				-	K		_
	1 1							
						1		
		N I					1	
					Allowable Co			

MRL = Method Reporting Limit INC = Incomplete AO = Assthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

Drinking Water Coordinator

EXOVA |

2929470 2009-12-08 2009-12-01

PH1236

Report Number: Date: Date Submitted: Project: Client: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON KZE 7T7 Attention: Mr. Robert Passmore

	108473
	Chain of Custody Number: 168473
i	Chain of Cus

Type	Chain of Custody Number: 108473		!! !!	20,02	1010101		Maurix	-	GUIDELINE	
Sample Date: 2009-12-01   TWZ WS1   TWX WS2   TYZ WS2				764213	764214					
Sample ID:         TWS WS I         TWZ WS WS I         TWZ WS WS I         TWZ WS I         TWZ WS WS I         TWZ WS WS WS I         TWZ WS		Sami	ple Date:	2009-12-01	2009-12-01			T		
PATAMETER   UINITS   MRL		Š	imple ID:	TWS WS1	TW2 WS2				ODWSOG	
PARAMETER   UNITS   MRL   153   213   213   250								TVDE	TIMIT	UNITS
10	PARAMETER	UNITS	Z Z						1	
1		mo/L	5	212	213			8	8	The s
150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150   150	a più	ШоД	-	153	153	G		Q V	250	E i
1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480   1480		TCO	7	8	8			Q Q	io.	
A		mS/cm	LC	1500	1480					
Sulphide   MAC   1.5   1.94   1.96   MAC   1.5   MAC		gow we	, C	6.0	6.0			φ	ĸ	mg/
Sulphide   mg/L   0.01   c.0.01   c.0.01   c.0.01   mg/L   0.01   c.0.10   c.0.10   mg/L   0.01   c.0.10   c.0.10   mg/L   0.1   c.0.10   c.0.10   mg/L   0.1   c.0.10   c.0.10   mg/L   0.1   c.0.10   c.0.10   c.0.01			-	1.94	1.96			MAC	1.5	mg/L
High   Harder   High   Harder   High   Harder		208	5	<b>CD.01</b>	<0.01			Q	0.05	Agm Agm
MAC 1.0 MAC 1.	rogen Sulphide		5 6	0.50	0.19					
Higher   H	H3 (Ammonta)	100	1	<0.10	<0.10			MAC	10	mg/L
Higher Birth	OZ (MITTE)	2 C C C	-	01.0>	×0.10			MAC	10.0	mg/
Lignin mg/L 0.001 <0.001 <0.001	OS (MITATE)		;	8.18	8.18				6.5-8.5	
Lignin mg/L 1 295 287 AO 500 AO 500 Gentle Mg/L 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	<u> </u>	mg/L	0.001	<0.001	<0.001				100	
Lignin Lignin mg/L 0.1 0.1 40.1 40.1 60.1 60.0 600 600 600 600 600 600 600 600 60	e)teti	mg/L	-	295	287			Q P	200	Ē
Marcolour   Marc	pp & Lionia	mg/L	0.1	1.0	-0°					
delt Nitrogen         mg/L         0.1         0.24         0.23         MAC         1.0           n ss CaCO3         mg/L         1         166         157         0.3         0.0         1.0           ice         mg/L         1         35         33         0.0         1.0           im         mg/L         1         19         18         AO         200           mg/L         2         272         266         AO         0.3         AO         0.3           isa         mg/L         0.03         <0.03	al Dissolved Solids (COND - CALC)	mg/L	10	975	362			8	3	
NTU 0.1 0.7 0.3 MAC 1.0 mac 1.	Meldah Nitrogen	mg/L	0.1	0.24	0.23				,	Ē
mg/L 1 166 157 006 100 100 100 100 100 100 100 100 100	pldiiv	DEN.	0.1	0.7	0.3			MAC	1.0	
mg/L 1 35 33 1.01 mg/L 1 35 33 mg/L 1 19 18 mg/L 2 272 266 mg/L 0.03 <0.03 <0.03 mg/L 0.01 <0.01 <0.01	dness as CaCO3	mg/L	-	166	157			9 	3	
mg/L 1 35 33 AO 200 mg/L 1 19 18 mg/L 2 272 286 AO 0.3 · mg/L 0.01 <0.01 <0.01 <0.01	Balance	•	0.01	1.03	<u>1</u> .0					
mg/L 1 19 18 AO 200 mg/L 1 5 5 5 mg/L 2 272 266 AO 0.3 · mg/L 0.01 <0.01 <0.01 <0.01 <0.01		_10µ	-	32	83					
mg/L 2 272 266 AO 200 mg/L 0.03 <0.03 <0.03 <0.03 AO 0.3 · AO 0.05 angalasa	Bijogo	mor	-	19	18					
mg/L 2 272 266 AO 200 CD 3 cD 200 mg/L 0.03 <0.03 <0.03 <0.03 <0.03 <0.03 <0.03 <0.05 Mg/L 0.01 <0.01 <0.01 <0.01		mg/L	-	52	6					-
ganssa		may	2	272	266			Q Q	200	Ē
ganssa mg/L 0.01 <0.01 <0.01 AO 0.05		- Pag	0,03	<0.03	<0.03			V V	0.3	1,6E
		mg/L	0.01	<0.01	<0.01			ov V	0.03	Ê
				1				_		

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

forgante Lab Supervisor

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

### REPORT OF ANALYSIS

Exova

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 7T7

Attention: Mr. Robert Passmore

Report Number: Date: Date Submitted:

2009-12-07

2929599 TW3

Project:

PH1236

2009-12-03

P.Q. Number:

7873

INVOICE: Paterson Group Inc.							P.Q. Numbe	ır.	Water	
Chain of Custody Number: 108474				70.450.4	764595		161861 201		GUIDELINE	
			LAB ID:	764594	2009-12-02					
		Samp	ole Date:	2009-12-02	2009-12-02				ODWEGG	
		Sa	mple ID:	TW3 WS1	1W3 WS2				ODM200	
							Matrix: Water GUIDELINE ODWSOG  TYPE LIMIT MAC 0 MAC 0	UNITS		
PARAMETER		UNITS	MRL					MAC		CFU/100ml
Total Coliforms		CFU/100mL		11	G					CFU/100ml
Escherichia Coli		CFU/100mL		0	0			l made		
Heterotrophic Plate Count		CFU/1mL		181	11					
Faecal Coliforms		CFU/100mL		0	0		i	4		
Faecal Streptococcus		CFU/100mL		2	0					
Faeca displaceces	PARAMETER	1								
		1		1						
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MRL = Method Reporting Limit iNC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

1 of 1

Comment:

APPROVAL:

**Gragana** Dzeletovic

Microbiology Analyst

	ı					œ.	Report Number:	29	2929600	
Chent: Paterson Group						66	Date:	2 20	2009-12-07	
Noosan, ON										
K2E 7T7						4	Project:	<u>.</u>	PH1236	
Attention: Mr. Robert Passmore										
INVOICE: Palarson Group Inc.						D. Z	P.O. Number:	3	Water	
Chain of Custody Number: 108474		Ī						9	GUIDELINE	
		<u>:</u>	764596	764597						_
	Sam	Sample Date:	20-21-6002	2003-12-02	†				0	
	S.	Sample ID:	TW3 WS1	TW3 WS2					ODWSOG	
									\   	
		!						TYPE	LIMIT	SLIND
PARAMETER	UNITS	MRL						98	200	шgЛ
Alkalinity as CaCO3	mg/L	ഹ	244	747				Q	250	mg/L
	mg/L	-	304	e e				AO.	ın	칻
	5	7	9	ĸ				2		
Cotour	uS/cm	ي.	2730	2780				V	1¢,	may
Conductivity	mad.	0.5	1.7	9.1				2	, <u>«</u>	ψow
Dissayed Organic Carbon		-	0.61	0.63				3 6	2 5	l Contract
Fluoride	i e	00	<0.1	<0.01				?	2	h
Hydrogan Sulphide		002	0.46	0.46						Form
N-NH3 (Ammonia)	1 2	6	<0.10	<0.10 <				NAC.	2 6	000
N-NO2 (Mirte)	, FO	6	<0.10	<0.10				MAC	20.00	j h
N-NO3 (Nitrate)	h H		7.88	7.93					0.0	
Ha	ma/L	1000	<0.001	<0.001				ç	000	mail
Phenois	Mo/L	Ţ	768	784				?	3	h
	₩ W	0.1	0.2	6.4				Ş	COR	maß
	mg/L	Ŋ	2180	2220				?	2	0
	ma/L	0.1	0.58	0.64				0111	-	E L
Total Kjeldahi Milogen	Z	0.1	19.4	1.3				2 0	2 5	Vous
Turbidity	900	-	687	169				3	3	i b
Hardness as CaCO3	<b>D</b>	5	96:0	0.97						
Ion Balance	Ē	; -	173	173.						
Calcium			62	63						
Magnesium			¦ co	80				5	S	li nom
Potassium	# W	2	345	340				<b>Q Q</b>	200	
Sodium	wow.	0.03	1.55	90.0				5 5	50	200
Iron	Vol.	0.01	0.04	0.03				Q	20.0	j j
Manganese	1			1						
_										

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Alfowable Concentration IMAC = Interim Maximum Allowable Concentration 764596; H2S MRL elevated due to sample turbidity.

Inorganic Lab Supervisor APPROVA

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

#### **EXOVA** ACCUTEST

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Report Number:

1129193

Date: Date Submitted: 2011-12-21

TW4 2011-12-16

Nepsan, ON **K2E 7T7** 

Attention: Mr. Robert Passmore

Project:

PH1238

INVOICE: Paterson Group Inc.

P.O. Number:

11041 Water

Chain of Custody Number: 99228

Matrix:

Chain of Custody Number: 99228						Matrix:	Water	
		LAB ID:	932535	932536			GUIDELIN	E
	Sam	ple Date:	2011-12-15	2011-12-15				
	S	ample ID:	TW4-WS1	TW4-WS2			ODWSOG	
PARAMETER	UNITS	MRL	TREATED	TREATED		n	PE LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	193	180			OG 500	mg/L
Chloride	mg/L	1	43	31		1 4	AO 250	mg/L
Colour	TCU	2	11	10			NO 5	TCU
Conductivity	uS/cm	5	551	481				
Dissolved Organic Carbon	mg/L	0.5	4.2	4.3		4	AO 5	mg/L
Fluoride	mg/L	0.1	<0.10	<0.10		М	IAC 1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01	<0.01			AO 0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	<0.02	<0.02				
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10		M	IAC 1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	0.55	D.43		M	IAC 10.0	mg/L
pH	25		8.06	8.02			6.5-8.5	
Phenois	mg/L	0.001	<0.001	<0.001				
Sulphate	mg/L	1	27	21			AO 500	mg/L
Tannin & Lignin	mg/L	0.1	0.1	<0.1				
Total Dissolved Solids (COND - CALC)	mg/L	1	358	313			AO 500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.20	0.18				
Turbidity	NTU	0.1	3.0	1.2	7		IAC 1.0	NTU
Hardness as CaCO3	mg/L	1	206	182	1 12		OG   100	mg/L
ion Balance	1	0.01	0.98	0.96				
Calcium	mg/L	1	76	68				
Magnesium	rng/L.	1	4	3				
Potassium	mg/L	1	<1	<1				
Sodium	mg/L	2	30	25			AO 200	mg/L
Iron	mg/L	0.03	0.08	0.03			AO 0.3	mg/L
Manganese	mg/L	0.01	<0.01	<0.01		/	AO 0.05	mg/L
					•			
MOL - Make of Records - Mark 1990 - Incomplete ACC - April				Allewalds Co-		Mayley at Alleyshia Connector		

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

APPROVAL:

Inorganic Lab Supervisor

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Jamie Blakely Attention:

Invoice to:

Paterson Group

1510551

2015-06-25 PH1236 2015-06-12 Report Number: Date Submitted: Date Reported:

52212

Project: COC #:

Page 1 of 5

#### Dear Jamie Blakely:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

Nadine Pinsonneault 2015.06.25 16:26:55 -04'00'

APPROVAL:

Team Leader, Inorganics Nadine Pinsonneault

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

## Certificate of Analysis

Exova

Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Jamie Blakely Attention:

Paterson Group Invoice to:

PO#:

1510551 Report Number:

71770 CCC #:

52212	.#: 
PH1236	Project:
2015-06-25	Date Reported:
2015-06-12	Date Submitted:

1180970 Water	2015-06-12 TW4 WS2		343*	1.05	514*	278	72	2	791	3.3	<0.10	<0.10	0.91	7.97	34	0.2	1.3	126	0.08	₹	7	<0.01	44	<0.05	0.14	<0.002	<0.002
1180969 Water	2015-06-12 TW4 WS1		338*	1.07	*905	266	69	*9	778	3.0	<0.10	<0.10	0.89	8.02	34	0.2	3.1	124	0.18	_	7	<0.01	42	<0.05	0.51	<0.002	<0.002
Lab I.D. Sample Matrix	Sample Type Sampling Date Sample I.D.	Guideline	OG-100		AO-500	OG-200	AO-250	AO-5		AO-5	MAC-1.5	MAC-1.0	MAC-10.0	6.5-8.5	AO-500		AO-5.0		AO-0.3			AO-0.05	AO-200				AO-0.05
		Units	mg/L		mg/L	mg/L	mg/L	TCU	nS/cm	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	NTO	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		MRL	_	0.01	_	2	_	2	2	0.5	0.10	0.10	0.10	1.00	_	0.1	0.1	_	0.03	_	_	0.01	2	0.05	0.07	0.002	0.002
		Analyte	Hardness as CaCO3	lon Balance	TDS (COND - CALC)	Alkalinity as CaCO3	ō	Colour	Conductivity	DOC	L	N-NO2	N-NO3	Hd	SO4	Tannin & Lignin	Turbidity	Ca	Fe	$\prec$	Mg	Mn	Na	N-NH3	Total Kjeldahl Nitrogen	Phenois	S2 <b>-</b>
		Group	Calculations			General Chemistry												Metals						Nutrients		Phenols-4AAP	Sulphide

### Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates

Methods references and/or additional QA/QC information available on request. analysis was completed in Mississauga, Ontario). Results relate only to the parameters tested on the samples submitted.

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr Jamie Blakely Attention:

Paterson Group Invoice to:

PO#:

1510551 Report Number: Date Submitted: Date Reported:

2015-06-12 2015-06-25

PH1236 52212

Project: COC #:

#### QC Summary

Ar	Analyte	Blank	QC % Rec	QC Limits
Run No 288745	Analysis/Extraction Date 2015-06-13	Analyst	CF	
Method C SM2130B				
Turbidity		<0.1 NTU	101	73-127
Run No 288799	Analysis/Extraction Date 2015-06-15	Analyst	K A	
Method EPA 200.8				
Iron		<0.03 mg/L	26	92-107
Manganese		<0.01 mg/L	66	94-106
Run No 288805	Analysis/Extraction Date 2015-06-15	Analyst	NΡ	
Method C SM4500-NO3-F	03-F			
N-NO2		<0.10 mg/L	107	80-120
N-NO3		<0.10 mg/L	92	80-120
Run No 288808	Analysis/Extraction Date 2015-06-15	115-06-15 Analyst	AET	
Method C SM4500-H+B	+B			
Alkalinity (CaCO3)	3)	<5 mg/L	86	90-110
Conductivity		<5 uS/cm	101	90-110
ш		<0.10 mg/L	66	90-110
Hd		6.21	100	90-110
Run No 288815	Analysis/Extraction Date 2015-06-16	Analyst	SKH	

Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted. analysis was completed in Mississauga, Ontario).

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr Jamie Blakely Attention:

PO#:

Paterson Group Invoice to:

1510551 Report Number: Date Submitted: Date Reported:

2015-06-12 2015-06-25 PH1236

52212

Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Method M SM3120B-3500C			
Calcium	<1 mg/L	100	90-110
Potassium	<1 mg/L	66	87-113
Magnesium	<1 mg/L	100	76-124
Sodium	<2 mg/L	91	82-118
Run No 288817 Analysis/Extraction Date 2015-06-16	Analyst	AET	
Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 288942 Analysis/Extraction Date 2015-06-16	15-06-16 Analyst NP	Ь	
Method SM 4110			
Chloride	<1 mg/L	66	90-110
804	<1 mg/L	102	90-110
Run No 289289 Analysis/Extraction Date 2015-06-22	Analyst	AET	
Method Exova Edmonton-SM5530D			
Phenols	<0.002 mg/L	100	
Run No 289293 Analysis/Extraction Date 2015-06-22	Analyst	AET	
Method Exova Edmonton-SM4500-NH3-G			
N-NH3	7/6w 90'0>	99	
Run No 289322 Analysis/Extraction Date 2015-06-17	Analyst	AET	

#### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates \* = Guideline Exceedence

Methods references and/or additional QA/QC information available on request. analysis was completed in Mississauga, Ontario). Results relate only to the parameters tested on the samples submitted.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr Jamie Blakely Attention:

PO#:

Paterson Group Invoice to:

1510551 Report Number: Date Submitted: Date Reported:

2015-06-12 2015-06-25

PH1236 52212 Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Method SUBCONTRACT-E-INORG			
Total Kjeldahl Nitrogen	<0.07 mg/L	100	
Run No 289342 Analysis/Extraction Date 2015-06-18 Analyst AET	15-06-18 Analyst A	ET	
Method Exova Edmonton-SM5200-S2 E			
S2-	<0.002 mg/L	103	
Run No 289344 Analysis/Extraction Date 2015-06-18	15-06-18 Analyst AET	ΈΤ	
Method Exova Edmonton-SM5310B			
000	<0.5 mg/L	105	
Run No 289353 Analysis/Extraction Date 2015-06-23 Analyst AET	15-06-23 Analyst A	ΈΤ	
Method Exova Surrey-SM5550B			
Tannin & Lignin	<0.1 mg/L	103	

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Jamie Blakely Attention:

Invoice to:

Paterson Group

Page 1 of 2

Project: COC #:

2015-06-12 2015-06-15 PH1236

1510547

Report Number: Date Submitted: Date Reported:

### Dear Jamie Blakely:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

This is an amendment and supercedes all previous copies of this report. The project and analytes have been corrected.

09:21:58 -04'00' Krista Quantrill 2015.06.19

Krista Quantrill

APPROVAL:

Laboratory Supervisor, Microbiology

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests

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## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr Jamie Blakely Attention:

PO#:

Paterson Group Invoice to:

2015-06-12 2015-06-15 1510547 Report Number: Date Submitted: Date Reported:

PH1236 Project: COC #:

52212

1180965 Water	2015-06-12 TW4 WS2		*	62*
1180964 Water	2015-06-12 TW4 WS1		0	<sub>20</sub> *
Lab I.D. Sample Matrix	Sample Type Sampling Date Sample I.D.	Guideline	MAC-0	MAC-0
		MRL Units	ct/100mL	ct/100mL
		MRL	0	0
		Analyte	Escherichia Coli	Total Coliforms
		Group	Microbiology	

Methods references and/or additional QA/QC information available on request.

#### **EXOVA** ACCUTEST

#### **REPORT OF ANALYSIS**



TW5

Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON K2E 717

INVOICE: Paterson Group Inc.

Attention: Mr. Robert Passmore

Report Number:

1129300

Date: Date Submitted: 2011-12-22 2011-12-20

Project:

PH1236

11636

P.O. Number:

Chain of Custody Number: 150779						Matrix:		Water	
	LAB ID:	932884	( a = 0					GUIDELIN	
	Sample Date:	2011-12-19				4	1 2		
	Sample ID:	TW 5 - WS1 -						ODWSOG	
		19/12/11						ODWOOG	
PARAMETER	UNITS MRL						TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL	2					MAC	0	CFU/100n
Escherichia Coli	CFU/100mL	0					MAC	0	CFU/100n
feterotrophic Plate Count	CFU/1mL	5							1
Faecal Coliforms	CFU/100mL	0							
Faecal Streptococcus	CFU/100mL	0							
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

Microbiology Lab Supervisor



Client: Paterson Group	2	Report Number:	1129312
28 Concourse Cate, Unit	ra caracteria de la car	Date: Date Submitted:	2011-12-20
Nepean, ON K2E 7T7	ä	Project:	PH1236
Attention: Mr. Robert Passmore			14838
NVOICE: Paterion Group Inc.		P.O. Number:	Water
Chain of Custody Number: 150779			GUIDELINE
Class of customs transfer	LAB ID: 932906		
	Sample Date: 2011-12-19		
	-twe-Ws1		ODWSOG

Chain of Chatody Number: 150779								GUIDELINE	
Chamital Command in the Command in t		- in Res	932906						
	Semo	۲.	2011-12-19						
	Sar	_	TW5-WS1- 19/12/11					ODWSOG	
							TYPE	LIMIT	UNITS
DADAMETER	SLIND	MRL					50	500	mg/L
	mg/L	2	242				3 8	250	mg/L
Alkalimity as Caco	ma/L	-	8				2	LC:	10.
Chloride	<u>5</u>	7	ιρ				2	,	
Colour	uS/cm	LD.	535				4	ın	mg/L
Conductivity	TION.	0.5	7				2	4	mo/L
Dissolved Organic Carbon	L Com	5	0.14				3 6	2 2	, de
Fluoride	may	0.0	<0.01				ş	3	b
Hydrogen Sulphide	ma/L	0.02	0.04		_		200		mod
N-NH3 (Ammonia)	l cu	10	0.10				2 0	2 9	non.
N-NO2 (Nitrite)		2	010				MAC	10.0	JAN I
N-NO3 (Nitrate)			06.7					0.5-0.0	
H	Com	0.001	100.05				,	002	li cu
Phenois	and the same	-	4				Ş	3	Į,
Sulphate			5					-	
Tannin & Lignin	100	5 -	348				Q	8	Hg/L
Total Dissolved Solids (COND - CALC)	Tight.	- ;	0.00						į
Total Keldahi Ningen	age i	5 6	2 4				MAC	0,1	
Turbidity	OTU	5,	26.0				8	5	mg/L
Hardness as CaCO3	mg/L	- 0	3 :						
lon Balanca			2 2						
Calcium	mgir.	- •	ž						
Magnesium	Ē		ۍ د						
Potassium			\$				Q ·	ZOS ;	J C
Sodium	E I	, 60	5				Q	5.0	mg/L
lion	E :	3 6	44.0				٥ ٧	0.05	Mg/L
Manganese	HQFL	5	<u>:</u>						
							4		
						Į			

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

APPROVIDE WIlson Increased Lab Supervisor

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

Methods references and/or edditional QA/DC information available on request.

EXOVO Accutest

Age. IN 절 mg/L mg/L mg/L mg/L Water
GUIDELINE 2011-12-28 ODWSOG 6.5-8.5 903 000 5.5 0.0 500 250 5 1.5 0.05 2 원 800 8 1129385 PH1236 11040 MAC BG 222 A SG 8 % 8 MAC ð ð Date Submitted: Report Number: P.O. Number: Project: Matrix: 46 933064 2011-12-19 TW5-WS2 Sample Date: Sample (D: CAB ID: 1000 0.01 5 0.5 0.1 0.02 0.1 0.02 2-22-1967 1967 1967 1967 1967 mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L APEN APEN PARAMETER Total Dissolved Sollds (COND - CALC) Chain of Custody Number: 114763 Attention: Mr. Robert Passmore 28 Concourse Gate, Unit 1 INVOICE: Paterson Group Inc. Dissolved Organic Carbon Client: Paterson Group Total Kjeldahi Nitrogen Nepean, ON Hardness as CaCO3 Alkalinity as CaCO3 Hydrogen Sulphide V-NH3 (Ammonla) K2E 717 N-NO2 (Nitrite) N-NO3 (Nitrate) **Fannin & Lignin** Magnesium Potassium ion Balance Conductivity Turbidity Calcium Sulphate Phenols Fluoride Chloride Colour

MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

H2S MRL elevated due to sample turbidity.

Manganese

Sodium

Results relate only to the parameters tested on the samples submitted. APPROVAL: (ATT)
Lama Wilson

Inorganic Lab Supervisor

Methods references and/or additional QA/QC information available on request.

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Russell Chown Attention:

Invoice to:

Paterson Group

2016-05-12 2016-05-15 PH 1236 61686 Report Number: Date Submitted: Date Reported: Project: COC #:

1607368

Page 1 of 2

Dear Russell Chown:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

09:04:11 -04'00' Dzeletovic 2016.05.15 Dragana megave Archetoric

Dragana Dzeletovic

APPROVAL:

Team Leader, Microbiology

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

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## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

Mr. Russell Chown K2E 7T7

Attention:

PO#:

Paterson Group

Invoice to:

2016-05-12 1607368 Report Number: Date Submitted: Date Reported:

2016-05-15

PH 1236 61686 Project: COC #:

1239628 Water 2016-05-11 TW5 WS2		2	0	0	0	0
1239627 Water 2016-05-11 TW5 WS1		4	0	0	0	0
Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	Guideline		MAC-0			MAC-0
	Units	ct/1mL	ct/100mL	ct/100mL	ct/100mL	ct/100mL
	MRL	0	0	0	0	0
	Analyte	Heterotrophic Plate Count	Escherichia Coli	Faecal Coliforms	Faecal Streptococcus	Total Coliforms
	Group	Microbiology	Others			

\* = Guideline Exceedence
All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates
analysis was completed in Mississauga, Ontario).
Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1

additional QA/QC information available on request. 146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

Page 2 of 2

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Russell Chown

Attention:

Paterson Group Invoice to:

2016-05-12 2016-05-19 PH 1236 61686 Report Number: Date Submitted: Date Reported: Project: COC #:

1607381

Page 1 of 8

#### Dear Russell Chown:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

Rebecca Koshy 2016.05.19 20:14:30 -04,00

Rebecca Koshy

APPROVAL:

Project Manager

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water

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## Certificate of Analysis

Exova

Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

P0#:

Paterson Group Invoice to:

5-19 36 -05-12 1607381 Report Number:

61686	COC #:
PH 1236	Project:
2016-05	Date Reported:
2016-05	Date Submitted:

1239666 Water	2016-05-11 TW5 WS2		262*	1.01	343	250	24	<2	527	1.3	<0.10	<0.10	<0.10	8.16	13	<0.0001	<0.0001	0.01	<0.001	0.05	0.14	<0.0005	82	<0.0001	<0.001	<0.001	0.18	4
1239665 Water	2016-05-11 TW5 WS1		260*	0.98	343	258	21	2	527	1.4	<0.10	<0.10	<0.10	8.21	13								81				0.70*	4
Lab I.D. Sample Matrix Sample Type	Sampling Date Sample I.D.	Guideline	OG-100		AO-500	06-500	AO-250	AO-5		AO-5	MAC-1.5	MAC-1.0	MAC-10.0	6.5-8.5	AO-500	MAC-0.001		0G-0.1	IMAC-0.025	IMAC-5.0	MAC-1.0			MAC-0.005	MAC-0.05	AO-1.0	AO-0.3	
		Units	mg/L		mg/L	mg/L	mg/L	TCU	mS/cm	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		MRL	_	0.01	_	2	_	2	2	0.5	0.10	0.10	0.10	1.00	_	0.0001	0.0001	0.01	0.001	0.01	0.01	0.0005	_	0.0001	0.001	0.001	0.03	~
		Analyte	Hardness as CaCO3	lon Balance	TDS (COND - CALC)	Alkalinity as CaCO3	O	Colour	Conductivity	DOC	L	N-NO2	N-NO3	Hd	SO4	Hg	Ag	A	As	В	Ba	Be	Ca	Cd	Ö	Cu	Fe	エ
		Group	Calculations			General Chemistry										Mercury	Metals											

## Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).

Results relate only to the parameters tested on the samples submitted. Methods references and/or additional QA/QC information available on request.

## Certificate of Analysis

Exova

Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

Mr. Russell Chown Attention:

K2E 7T7

PO#:

Paterson Group Invoice to:

2016-05-12 2016-05-19 PH 1236 1607381 Report Number: Date Submitted: Date Reported:

61686 Project: COC #:

1239666 Water	2016-05-11 TW5 WS2		14	0.11*	<0.005	15	<0.005	<0.001	<0.0005	<0.001	1.02	<0.0001	<0.001	<0.01	<0.08	0.1	<0.001	0.05	9'0>	<0.02	<0.1	1.6
1239665 Water	2016-05-11 TW5 WS1		14	0.13*		14										0.1	<0.001	0.05		<0.02	<0.1	*6 <b>.</b> 9
Lab I.D. Sample Matrix	Sample Type Sampling Date Sample I.D.	Guideline		AO-0.05		AO-200		MAC-0.010	IMAC-0.006	MAC-0.01			MAC-0.02	AO-5.0	0G-0.15					AO-0.05		AO-5.0
		Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NTU
		MRL	_	0.01	0.005	2	0.005	0.001	0.0005	0.001	0.001	0.0001	0.001	0.01	0.08	0.1	0.001	0.01	9.0	0.02	0.1	0.1
		Analyte	Mg	Mn	Mo	Na	Ī	Pb	Sb	Se	Sr	Ē	D	Zn	Organic Nitrogen	Total Kjeldahl Nitrogen	Phenols	N-NH3	PO4	S2-	Tannin & Lignin	Turbidity
		Group	Metals												Nutrients		Phenois	Subcontract				

### Guideline = ODWSOG

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group

Invoice to:

1607381 Report Number: Date Submitted: Date Reported:

2016-05-12 2016-05-19 PH 1236

61686 Project: COC #:

#### QC Summary

A	Analyte	Blank	QC % Rec	QC Limits
Run No 307658	Analysis/Extraction Date 2016-05-13	Analyst	SKH	
Method M SM3120B-3500C	3-3500C			
Calcium		<1 mg/L	102	90-110
Potassium		<1 mg/L	101	87-113
Magnesium		<1 mg/L	101	76-124
Sodium		<2 mg/L	105	82-118
Run No 307679	Analysis/Extraction Date 2016-05-17	Analyst	NP	
Method SM 4110C				
Chloride		<1 mg/L	86	88-112
SO4		<1 mg/L	101	89-110
Run No 307740	Analysis/Extraction Date 2016-05-13	Analyst	KA	
Method EPA 200.8				
Iron		<0.03 mg/L	86	92-107
Manganese		<0.01 mg/L	66	94-106
Run No 307744	Analysis/Extraction Date 2016-05-13	Analyst	NP	
Method C SM4500-NO3-F	NO3-F			
N-NO2		<0.10 mg/L	110	80-120
N-NO3		<0.10 mg/L	87	80-120

### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates \* = Guideline Exceedence analysis was completed in Mississauga, Ontario).

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group

Invoice to:

1607381 Report Number: Date Submitted: Date Reported:

2016-05-12 2016-05-19

PH 1236 61686 Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 307769 Analysis/Extraction Date 2016-05-14	Analyst	KA	
Method M SM3112B-3500B			
Mercury	<0.0001 mg/L	66	76-123
Run No 307866 Analysis/Extraction Date 2016-05-16	Analyst	AET	
Method C SM4500-H+B			
Alkalinity (CaCO3)	<5 mg/L	105	90-110
Conductivity	<5 uS/cm	66	90-110
ш	<0.10 mg/L	93	90-110
Hd	6.29	99	90-110
Run No 307867 Analysis/Extraction Date 2016-05-17	Analyst	AET	
Method C SM2120C			
Colour	<2 TCU	100	80-120
Run No 307899 Analysis/Extraction Date 2016-05-17	Analyst	AET	
Method C SM5310C			
200	<0.5 mg/L	101	84-116
Run No 307908 Analysis/Extraction Date 2016-05-18	Analyst	K A	
Method EPA 200.8			
Silver	<0.0001 mg/L	26	901-76
Aluminum	<0.01 mg/L	101	89-111

#### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates \* = Guideline Exceedence

analysis was completed in Mississauga, Ontario). Results relate only to the parameters tested on the samples submitted.

Methods references and/or additional QA/QC information available on request.

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group Invoice to:

2016-05-12 1607381 Report Number: Date Submitted: Date Reported:

61686

2016-05-19 PH 1236 Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Arsenic	<0.001 mg/L	101	93-106
Boron (total)	<0.01 mg/L	104	88-112
Barium	<0.01 mg/L	104	91-109
Beryllium	<0.0005 mg/L	26	93-107
Cadmium	<0.0001 mg/L	101	93-107
Chromium Total	<0.001 mg/L	86	94-106
Copper	<0,001 mg/L	66	93-106
lron	<0.03 mg/L	102	92-107
Manganese	<0.01 mg/L	100	94-106
Molybdenum	<0.005 mg/L	103	94-106
Nickel	<0.005 mg/L	100	94-106
Lead	<0.001 mg/L	104	70-130
Antimony	<0.0005 mg/L	96	80-120
Selenium	<0.001 mg/L	103	91-108
Strontium	<0.001 mg/L	103	89-110
Thallium	<0.0001 mg/L	101	95-105
Uranium	<0.001 mg/L	103	94-106
Zinc	<0.01 mg/L	101	94-106

### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates \* = Guideline Exceedence analysis was completed in Mississauga, Ontario).

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

Paterson Group Invoice to:

PO#:

1607381 Report Number: Date Submitted: Date Reported:

2016-05-12 2016-05-19 PH 1236

61686 Project: COC #:

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 308060 Analysis/Extraction Date 2016-05-16	Analyst	AET	
Method SUBCONTRACT P-INORG			
N-NH3	<0.01 mg/L	105	
Phenols	<0.001 mg/L		69-132
S2-	<0.02 mg/L	98	
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	95	81-126
Turbidity	<0.1 NTU		
Run No 308156 Analysis/Extraction Date 2016-05-13	Analyst	ЯК	
Method SUBCONTRACT P-INORG			
PO4			
Run No 308159 Analysis/Extraction Date 2016-05-19	Analyst	ЯК	
Method C Ion Balance			
lon Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Method C SM4500-Norg-C			

### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario). Results relate only to the parameters tested on the samples submitted.

\* = Guideline Exceedence

Methods references and/or additional QA/QC information available on request.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON K2E 7T7

Mr. Russell Chown

Attention:

PO#:

Paterson Group

Invoice to:

1607381 Report Number: Date Submitted: Date Reported:

2016-05-12 2016-05-19

61686

PH 1236 Project: COC #:

#### QC Summary

nalyte	Blank	QC % Rec	QC Limits

146 Colonnade Rd. Unit 8, Ottawa, ON K2E 7Y1

#### **EXOVA** ACCUTEST

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Report Number: Date: Date Submitted: 1129213 2011-12-19

TW6 2011-12-16

Nepean, ON

K2E 7T7 Attention: Mr. Robert Passmore

Project:

PH1236

INVOICE: Paterson Group Inc.

P.O. Number:

11636

Chain of Custody Number: 141380					400		Matrix:		Water	
	The state of the s	LAB ID:	932598		and the same of				GUIDELIN	E
	Sarr	ple Date:	2011-12-16						REPORT -	
	Q	ample ID:	TW6 - WS1 -				- Herris - A		ODWSOG	
		ampio io:	16/18/11				1 3		ODWSOG	)
			Jornarii							
	UNITS	MRL						TYPE	LIMIT	UNITS
PARAMETER	UNITS							MAC	0	CFU/100r
otal Coliforms	CFU/100mL		0				1	MAC	ő	CFU/100
Escherichia Coli	CFU/100mL		0			1	1	MAC	U	0, 0, 100
leterotrophic Plate Count	CFU/1mL		14			4				
aecal Coliforms	CFU/100mL		0					7		4
Faecal Streptococcus	CFU/100mL		0							
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MRL = Method Reporting Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:



TCU TIES はなる A P 五百 智量 정말 Water 2011-12-21 2011-12-17 ODWSOG 6.5-8.5 0.03 1.0 5 1.5 0.05 8 5 8 읈 PH1236 250 1129218 11636 MAC 8 8 8 8 8 A A O MAC 2 2 2 ð ð Date Submitted: Report Number: P.O. Number: Project: Matrix: Z011-12-17 TW6-22hr-17/12/11 932640 285 108 11 991 0.9 1.00 <0.01 6.10 6.3 6.0 6.10 8.42 6.10 8.42 6.10 1.06 1.06 Sample Date: Sample ID: LABID 2000 0.01 5 0.05 0.01 0.01 0.01 mg/L TCU US/cm mg/L mg/L mg/L PARAMETER Total Dissolved Solids (COND - CALC) Chain of Custody Number: 150750 28 Concourse Gale, Unit 1 Attention: Mr. Robert Passmore INVOICE: Paterson Group Inc. Dissolved Organic Carbon Client: Paterson Group otal Kjeldahl Nitrogen Nepean, ON **Jardness as CaCO3** Alkalinity as CaCO3 N-NH3 (Ammonia) N-NO2 (Nitrite) N-NO3 (Nitrata) Hydrogen Sulphide KZE TT7 Fannin & Lignin on Balance Conductivity Aagnesium Manganese Potassium **Furbidity** Sulphate Sodium Fluoride Calcium Phenois Chloride

MRL = Method Reporting Limit INC = Incomplete AO \* Assthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment: APPROVAL:

Loma Wilson
Inorganic Lab Supervisor

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

#### **EXOVA** ACCUTEST

#### **REPORT OF ANALYSIS**



Client: Paterson Group

28 Concourse Gate, Unit 1

Nepean, ON **K2E 7T7** 

Attention: Mr. Robert Passmore

Report Number:

Date:

2930079 2009-12-10 HW

Date Submitted:

2009-12-08

Project:

PH1236

P.O. Number:

7875

Water

INVOICE: Paterson Group Inc. Matrix: GUIDELINE Chain of Custody Number: 105473 765936 765935 LAB ID:

Citalii di duatoty itamos.		LAB ID:	765935	/00930						
	Sami	ole Date:	2009-12-08	2009-12-08				1		
	Sa	mple ID:	HW WS1	HW WS2		1		i	ODWSOG	ľ
						]		1		
									LIMIT	UNITS
	UNITS	MRL						TYPE		CFU/100mL
PARAMETER	CFU/100mL		90	2	<u> </u>	1		MAC	0	CFU/100mL
Total Coliforms			ō	lo		1		MAC	ן י	CFO/100mL
Escherichia Coli	CFU/100mL		8	5		Į.			i	]
Heterotrophic Plate Count	CFU/1mL			Ö		1	i	A		
Faecal Coliforms	CFU/100mL		0	2	1	]	1	A	1	
Faecal Streptococcus	CFU/100mL		0	1 -	Ì		1	A	1	
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MRL = Method Reporting Limit NC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration Comment:

**Drinking Water Coordinator** 

## REPORT OF ANALYSIS

Exova | | ·

Client: Paterson Group 28 Concourse Gate, Unit 1 Nepean, ON KZE 717

INVOICE: Paterson Group Inc. Chain of Custody Number: 105473

Attention: Mr. Robert Passmore

Report Number:
Date:
Date Submitted:
Project:
P.O. Number:

PH1236

2930081 2009-12-09 2009-12-08

P.O. Number: 7875 Matrix: Water

Chain of Custody Number: 105473						Matrix:		Water	
		LABID:	765939	765940		7		GUIDELINE	
	Sami	Sample Date:	2009-12-08	2009-12-08					
	. R	Sample ID:	HW WS1	HW WSZ				ODWSOG	
PARAMETER	UNITS	MR					TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	2	257	258			90	200	mg/L
Chloride	mg/L	-	24	25			Q V	250	mg/L
Colour	- 2	2	7	8			QV	ĸ	TCU
Conductivity	uS/cm	S	280	587					ľ
Dissolved Organic Carbon	mg/L	0.5	1.6	1.3			ΑO	ເດ	mg/L
Fluoride	mg/L	0.1	0.11	0.11			MAC	ر. تن	mg/L
Hydrogen Sulphide	mg/L	0.0	90:0	0.01			90	0.05	шд∕Г
N-NH3 (Ammonia)	mg/L	0.02	<0.02	90:0					
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10			MAC	1.0	mg/L
N-NO3 (Nitrate)	щg/L	0.1	<0.10	0.10			MAC	10.0	mg/L
H			7.74	7.76				6.5-8.5	
Phenois	mg/L	0.001	<0.001	<0.001					
Sulphate	mg/L	-	19	20			Q V	200	mg/L
Tannin & Lignin	mg/L	0.1	£0.1	0.1					
Total Dissolved Solids (COND - CALC)	mg/L	ıo	377	382			<b>A</b> O	200	mg/L
Totał Kjeldahl Nitrogen	mg/L	0.1	01.0	<0.10					
Turbidity	Ę	0.1	15.1	6.7			MAC	0; 0:	Ē
Hardness as CaCO3	mg/L	-	274	277			ဗ	100	mg/L
Ion Balance	·	0.0	0.92	0.92					
Calcium	твЛ	-	8	9					
Magnesium	mg/L	-	12	12					
Potassium	mg/L	_	2	8					Ì
Sodium	твЛ	~	4	4			Q Q	200	mg/L
not light	mg/L	0.03	0.78	0.50			ð	0.3	mg/L
Manganese	mg/L	0.01	0.04	0.04			Q Q	0.05	mg/L

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

APPROVAL:
Ewan McRobbe
Inorganic Lab Supervisor

#### **OFFSITE WELLS + TW6**

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Russell Chown Attention:

Paterson Group Invoice to:

2016-07-11 PH1236 2016-07-09 56558 Report Number: Date Submitted: Date Reported: Project: COC #:

1611722

Page 1 of 2

#### Dear Russell Chown:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

10:21:24 -04'00' Krista Quantrill 2016.07.11

Krista Quantrill

APPROVAL:

Laboratory Supervisor, Microbiology

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests in drinking water

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group Invoice to:

2016-07-09 2016-07-11 1611722 Report Number: Date Submitted: Date Reported:

PH1236 56558

Project: COC #:

1249955 Water 2016-07-07 1865 Willhaven Dr.		196	0	0	0	***
1249954 Water - 2016-07-07 1753 Willhaven Dr.		39	0	0	0	2*
Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	Guideline		MAC-0			MAC-0
	Units	ct/1mL	ct/100mL	ct/100mL	ct/100mL	ct/100mL
	MRL	0	0	0	0	0
	Analyte	Heterotrophic Plate Count	Escherichia Coli	Faecal Coliforms	Faecal Streptococcus	Total Coliforms
	Group	Microbiology	Others			

## Certificate of Analysis



154 Colonnade Rd South Paterson Group Client:

Vepean, ON

Mr. Russell Chown Attention:

Paterson Group Invoice to:

Project: COC #:

2016-07-18 PH1236 2016-07-09 56558 Report Number: Date Submitted: Date Reported:

1611723

Page 1 of 6

#### Dear Russell Chown:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692)

Report Comments:

Should Monette 2016.07.18 15:23:54 -04'00'

APPROVAL:

Team Leader, Inorganics Shyla Monette

All analysis is completed in Ottawa, Ontario (unless otherwise indicated).

Exova Ottawa is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on our CALA scope of accreditation. It can be found at http://www.cala.ca/scopes/2602.pdf Exova (Ottawa) is certified and accredited for specific parameters by OMAFRA, Ontario Ministry of Agriculture, Food and Rural Affairs (for farm soils). Licensed by Ontario MOE for specific tests

Exova (Mississauga) is accredited for specific parameters by SCC, Standards Council of Canada (to ISO 17025)

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Exova recommends consulting the official provincial or federal guideline as required.

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group Invoice to:

2016-07-09 2016-07-18 1611723 Report Number: Date Submitted: Date Reported:

PH1236 56558 Project: COC #:

				Lab I.D. Sample Matrix	1249956 Water	1249957 Water	1249958 Water
				Sample Type Sampling Date Sample I.D.	2016-07-07 1753 Willhaven Dr.	2016-07-07 1865 Willhaven Dr.	2016-07-09 TW6-WS
Group	Analyte	MRL	Units	Guideline			
Calculations	Hardness as CaCO3	_	mg/L	OG-100	288*	452*	98
1	lon Balance	0.01			0.98	0.97	0.95
	TDS (COND - CALC)	-	mg/L	AO-500	344	793*	*265
eneral Chemistry	Alkalinity as CaCO3	2	mg/L	002-500	273	347	296
	Ö	_	mg/L	AO-250	16	153	94
	Colour	2	TCU	AO-5	က	က	<2
	Conductivity	2	uS/cm		529	1220	919
	DOC	0.5	mg/L	AO-5	2.0	2.8	1.0
	L	0.10	mg/L	MAC-1.5	<0.10	0.11	0.68
	N-NO2	0.10	mg/L	MAC-1.0	<0.10	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC-10.0	09.0	2.23	0.12
	Hd	1.00		6.5-8.5	7.86	7.83	8.27
	SO4	-	mg/L	AO-500	16	85	61
	Turbidity	0.1	NTC	AO-5.0	0.5	0.3	4.6
Metals	Ca	_	mg/L		107	135	21
	Fe	0.03	mg/L	AO-0.3	90.0	0.03	0.10
	₹	-	mg/L		<b>\</b>	5	5
	Mg	_	mg/L		2	28	11
	Mn	0.01	mg/L	AO-0.05	<0.01	<0.01	<0.01
	Na	2	mg/L	AO-200	<b>o</b>	84	168
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		<0.1	0.3	0.3
Phenols	Phenols	0.001	mg/L		<0.001	<0.001	<0.001
Subcontract	N-NH3	0.01	mg/L		0.03	0.11	0.25
	S2-	0.02	mg/L	AO-0.05	<0.02	<0.02	<0.02
	Tannin & Lignin	0.1	mg/L		<0.1	<0.1	<0.1

General

### Guideline = ODWSOG

\* = Guideline Exceedence

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted.

## Certificate of Analysis



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON K2E 7T7

Mr. Russell Chown Attention:

PO#:

Paterson Group Invoice to:

1611723 Report Number: Date Submitted: Date Reported:

2016-07-09 2016-07-18 PH1236

56558

Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 311052 Analysis/Extraction Date 2016-07-11	Analyst	AET	
Method C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 311088 Analysis/Extraction Date 2016-07-11	Analyst	NΡ	
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	26	80-120
Run No 311122 Analysis/Extraction Date 2016-07-12	Analyst	AET	
Method C SM2120C			
Colour	<2 TCU	100	90-110
Run No 311149 Analysis/Extraction Date 2016-07-12	Analyst	SKH	
Method M SM3120B-3500C			
Calcium	<1 mg/L	96	90-110
Potassium	<1 mg/L	101	87-113
Magnesium	<1 mg/L	94	76-124
Sodium	<2 mg/L	100	82-118
Run No 311182 Analysis/Extraction Date 2016-07-12	Analyst	NP	
Method C SM4500-NO3-F			

#### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates analysis was completed in Mississauga, Ontario).

\* = Guideline Exceedence

Methods references and/or additional QA/QC information available on request. Results relate only to the parameters tested on the samples submitted.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown

Attention:

Paterson Group Invoice to: PO#:

1611723 Report Number: Date Submitted: Date Reported:

2016-07-09 2016-07-18 PH1236

56558

Project: COC #:

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	97	80-120
Run No 311211 Analysis/Extraction Date 2016-07-12	Analyst	AET	
Method C SM4500-H+B			
Alkalinity (CaCO3)	7/6ш <b>5</b> >	103	90-110
Conductivity	<5 uS/cm	66	90-110
Ш	<0.10 mg/L	103	90-110
Hd	6.02	66	90-110
Run No 311264 Analysis/Extraction Date 2016-07-12	Analyst	NP	
Method SM 4110			
Chloride	<1 mg/L	101	90-110
SO4	<1 mg/L	103	90-110
Run No 311270 Analysis/Extraction Date 2016-07-11	Analyst	AET	
Method SUBCONTRACT P-INORG			
N-NH3	<0.01 mg/L	66	
Phenois	<0.001 mg/L	96	69-132
S2-	<0.02 mg/L	102	
Tannin & Lignin	<0.1 mg/L	110	
Total Kjeldahl Nitrogen	<0.1 mg/L	96	81-126

#### Guideline = ODWSOG

All analysis completed in Ottawa, Ontario (unless otherwise indicated by \*\* which indicates \* = Guideline Exceedence

Methods references and/or additional QA/QC information available on request. analysis was completed in Mississauga, Ontario). Results relate only to the parameters tested on the samples submitted.

## **Certificate of Analysis**



Paterson Group Client:

154 Colonnade Rd South

Nepean, ON

K2E 7T7

Mr. Russell Chown Attention:

Paterson Group

Invoice to:

PO#:

1611723 Report Number: Date Submitted: Date Reported:

2016-07-09 2016-07-18

56558

Project: COC #:

PH1236

#### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 311287 Analysis/Extraction Date 2016-07-13	Analyst	Υ¥	
Method EPA 200.8			
lron	<0.03 mg/L	101	92-107
Manganese	<0.01 mg/L	96	94-106
Run No 311340 Analysis/Extraction Date 2016-07-14	Analyst	SCM	
Method C SM5310C			
DOC	<0.5 mg/L	94	84-116
Run No 311491 Analysis/Extraction Date 2016-07-18	Analyst	SCM	
Method C Ion Balance			
lon Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			

#### **Hydrogeological and Terrain Analysis**



Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

#### Appendix 4

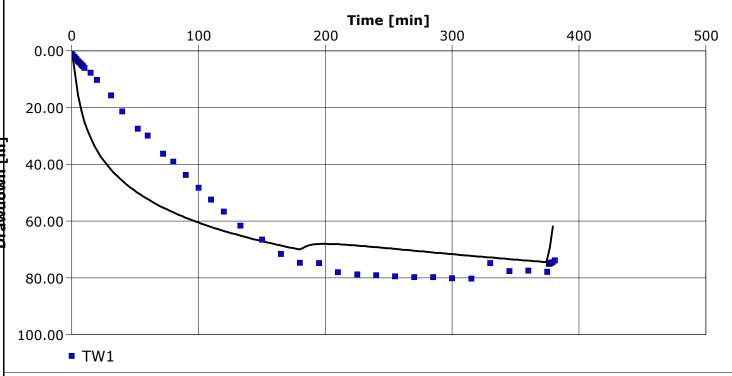
- Aquifer Analysis
- Well Interference Model
- LSI-RSI Calculations
- Nitrate Impact Assessment Calculations
- Offsite Well Owner Interviews

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5

Pumping Test Analysis Report
Project: Wilhaven
Number: PH1236
Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW1	Pumping Well: TW1
Test Conducted by: RAP		Test Date: 01/02/2016
Analysis Performed by:	Theis (linear)	Analysis Date: 01/02/2016
A 16 TILL 440.00	D: 1	

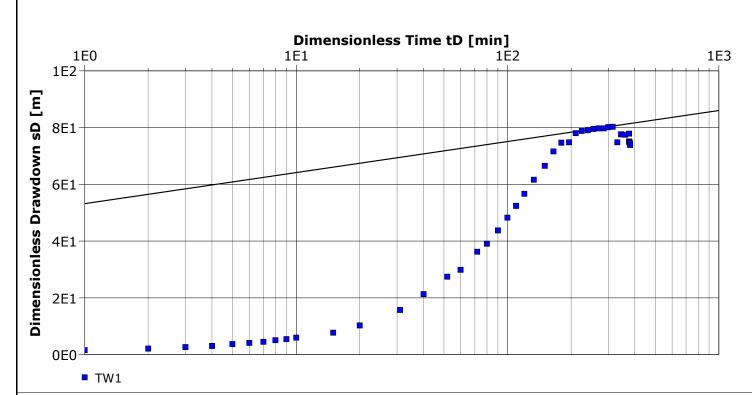
Aquifer Thickness: 146.00 m Discharge: variable, average rate 0.1796 [l/s]



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW1	7.98 × 10 <sup>-2</sup>	5.47 × 10 <sup>-4</sup>		0.03	

Pumping Test Analysis Report
Project: Wilhaven
Number: PH1236
Client: F. Farsi

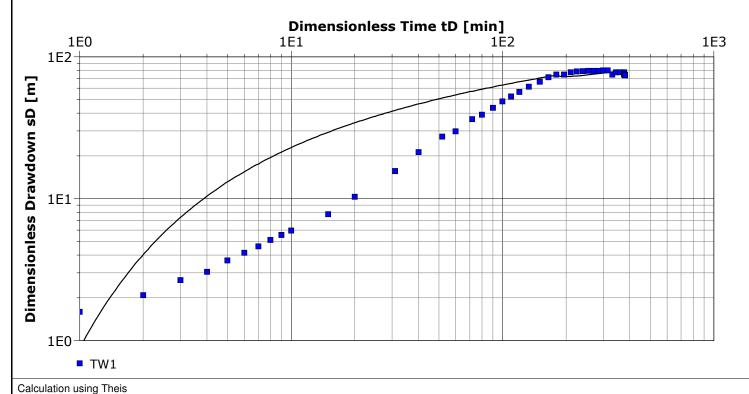
Location: Cumberland, ON	Pumping Test: Pumping Test of TW1	Pumping Well: TW1
Test Conducted by: RAP		Test Date: 01/02/2016
Analysis Performed by:	Cooper Jacob I	Analysis Date: 14/03/2016
Aquifer Thickness: 146.00 m	Discharge: variable, average rate 0.1796 [l/s]	



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW1	2.59 × 10 <sup>-1</sup>	1.78 × 10 <sup>-3</sup>		0.03	

Pump	ing Test Analysis Report
Projec	t: Wilhaven
Numbe	er: PH1236
Client:	F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW1	Pumping Well: TW1	
Test Conducted by: RAP		Test Date: 01/02/2016	
Analysis Performed by:	Theis (log-log)	Analysis Date: 19/07/2016	
Aquifer Thickness: 146.00 m	Discharge: variable, average rate 0.1796 [l/s]		



addition doing made					
Observation Well Transmissivity Hydraulic Conductivity		Storage coefficient	Radial Distance to PW		
	[m²/d]	[m/d]		[m]	
TW1	6.90 × 10 <sup>-2</sup>	4.73 × 10 <sup>-4</sup>		0.03	

Pumping Test Analysis Report
Project: Wilhaven
Number: PH1236

				Client:	F. Farsi				
Location: Cumberland, ON			Pumping Test: Pumping Test of TW1 Pump			Pumping	ng Well: TW1		
Test Conducted by: RAP				Test Date: 01/02/2016					
Aquifer Thickness: 146.00 m			Discharge: variable, average rate 0.1796 [l/s]						
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well		T [m²/d]	K [m/d]	S
1	Theis (linear)		01/02/2016	Theis	TW1		7.98 × 10 <sup>-2</sup>	5.47 × 10 <sup>-4</sup>	
2	Cooper Jacob I		14/03/2016	Cooper & Jacob I	TW1		2.59 × 10 <sup>-1</sup>	1.78 × 10 <sup>-3</sup>	
3	Theis (log-log)		19/07/2016	Theis	TW1		6.90 × 10 <sup>-2</sup>	4.73 × 10 <sup>-4</sup>	
						Average	1.36 × 10 <sup>-1</sup>	9.32 × 10 <sup>-4</sup>	

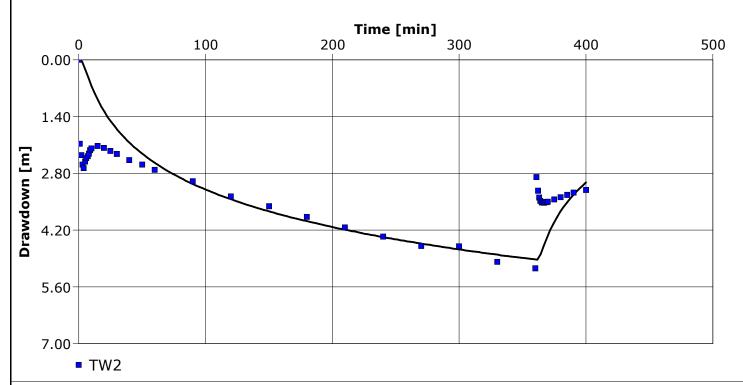
**Pumping Test Analysis Report** 

Project: 1370 Wilhaven

Number: PH1236 Client: F. Farsi

Pumping Test: Pumping Test of TW2 Pumping Well: TW2	
	Test Date: 01/02/2016
Theis	Analysis Date: 01/02/2016

Aquifer Thickness: 104.00 m Discharge: variable, average rate 0.31 [l/s]

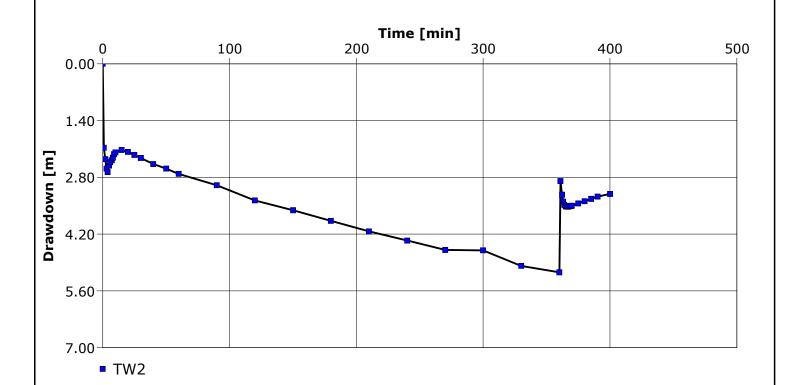


Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW2	1.53 × 10 <sup>0</sup>	1.47 × 10 <sup>-2</sup>		0.03	

Pumping Test Analysis Report
Project: 1370 Wilhaven
Number: PH1236

Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW2	Pumping Well: TW2		
Test Conducted by: RAP		Test Date: 01/02/2016		
Analysis Performed by:	Time-Drawdown	Analysis Date: 01/02/2016		
Aquifer Thickness: 104.00 m	Discharge: variable, average rate 0.31 [l/s]			



Pumping Test Analysis Report				
Project: 1370 Wilhaven				
Number: PH1236				

Location: Cumberland, ON	Pumping Test: Pumping Test of TW2	Pumping Well: TW2
Test Conducted by: RAP		Test Date: 01/02/2016
A '/ TI'   101.00	D: 1	

Client: F. Farsi

Aquifer Thickness: 104.00 m		Discharge: variable, average rate 0.31 [l/s]						
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/d]	K [m/d]	S
1	Theis		01/02/2016	Theis	TW2	1.53 × 10 <sup>0</sup>	1.47 × 10 <sup>-2</sup>	

**Pumping Test Analysis Report** 

Project: 1730 Wilhaven

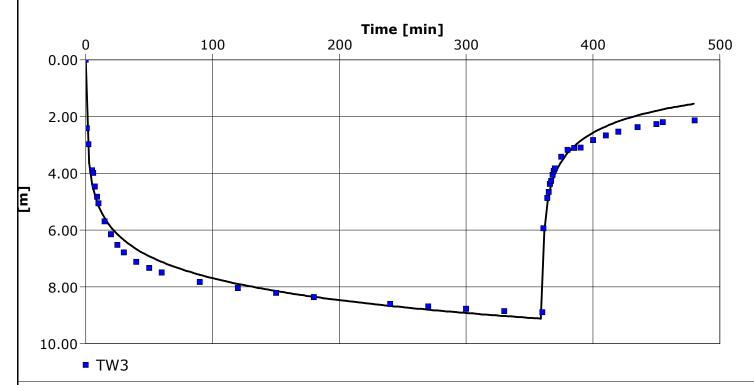
F. Farsi

Number: PH1236

Client:

Location: Cumberland, ON	Pumping Test: Pumping Test of TW3	Pumping Well: TW3		
Test Conducted by: RAP		Test Date: 01/02/2016		
Analysis Performed by:	Theis (linear)	Analysis Date: 01/02/2016		
4 1/				

Aquifer Thickness: 128.00 m Discharge: variable, average rate 0.25 [l/s]



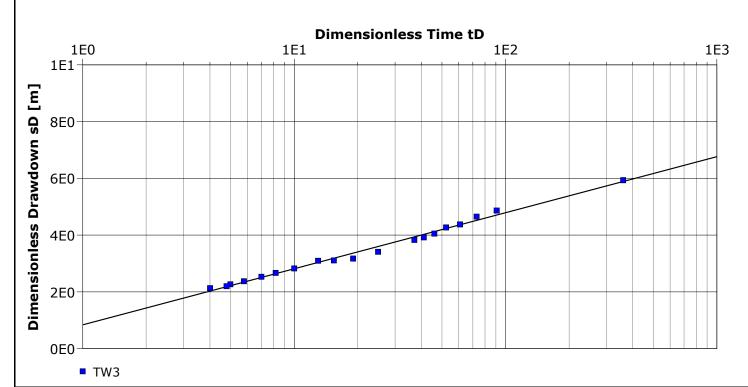
Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW3	1.54 × 10 <sup>0</sup>	1.20 × 10 <sup>-2</sup>		0.03	

Pumping Test Analysis Report

Project: 1730 Wilhaven

Number: PH1236
Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW3	Pumping Well: TW3		
Test Conducted by: RAP		Test Date: 01/02/2016		
Analysis Performed by:	Theis RECOVERY	Analysis Date: 01/02/2016		
Aquifer Thickness: 128.00 m	Discharge: variable, average rate 0.25 [l/s]			



### Calculation using THEIS & JACOB

Observation Well	Transmissivity	Hydraulic Conductivity	Radial Distance to PW	
	[m²/d]	[m/d]	[m]	
TW3	2.00 × 10 <sup>0</sup>	1.56 × 10 <sup>-2</sup>	0.03	

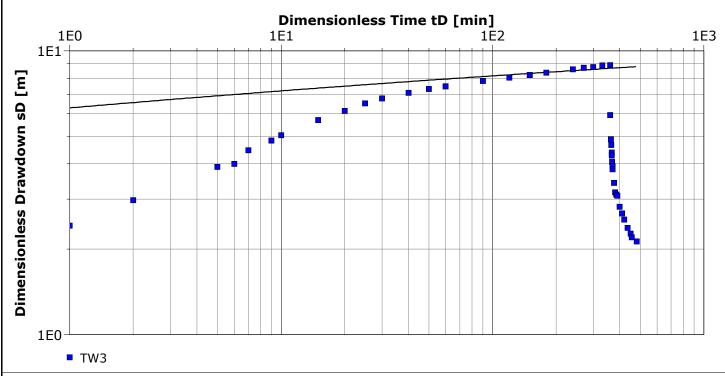
**Pumping Test Analysis Report** 

Project: 1730 Wilhaven

Number: PH1236

Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW3	Pumping Well: TW3
Test Conducted by: RAP		Test Date: 01/02/2016
Analysis Performed by:	Theis (log-log)	Analysis Date: 19/07/2016
Aquifer Thickness: 128.00 m	Discharge: variable, average rate 0.25 [l/s]	



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW3	1.53 × 10 <sup>0</sup>	1.19 × 10 <sup>-2</sup>		0.03	

Pumping Test Analysis Report
Project: 1730 Wilhaven
Number: PH1236

 $1.69 \times 10^{0}$ 

Average

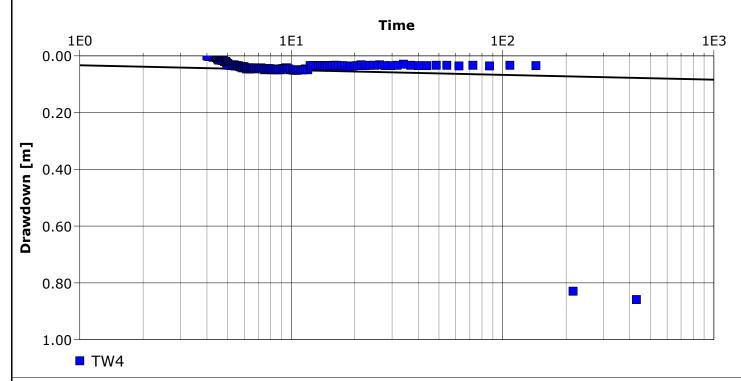
 $1.32 \times 10^{-2}$ 

Client: F. Farsi

Location: Cumberland, ON		Pumping Test: Pumping Test of TW3		Pumping Well: TW3					
Test Conducted by: RAP						Test Date: 01/02/2016			
Aquifer Thickness: 128.00 m			Discharge: va	ariable, average rate	0.25 [l/s]				
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well		T [m²/d]	K [m/d]	S
1	Theis (linear)		01/02/2016	Theis	TW3		1.54 × 10 <sup>0</sup>	1.20 × 10 <sup>-2</sup>	
2	Theis RECOVERY		01/02/2016	Theis Recovery	TW3		2.00 × 10 <sup>0</sup>	1.56 × 10 <sup>-2</sup>	
3	Theis (log-log)		19/07/2016	Theis	TW3		1.53 × 10 <sup>0</sup>	1.19 × 10 <sup>-2</sup>	

Pumpi	ng Test Analysis Report
Project:	Wilhaven
Number	r: PH1236
Client:	Fred Farsi

Location: Cumberland ON	Pumping Test: Pumping Test 1	Pumping Well: TW4	
Test Conducted by: AO		Test Date: 12/06/2015	
Analysis Performed by:	Theis RECOVERY	Analysis Date: 02/11/2015	
Aquifer Thickness: 2.50 m	Discharge: variable, average rate 1.7451 [l/s]		



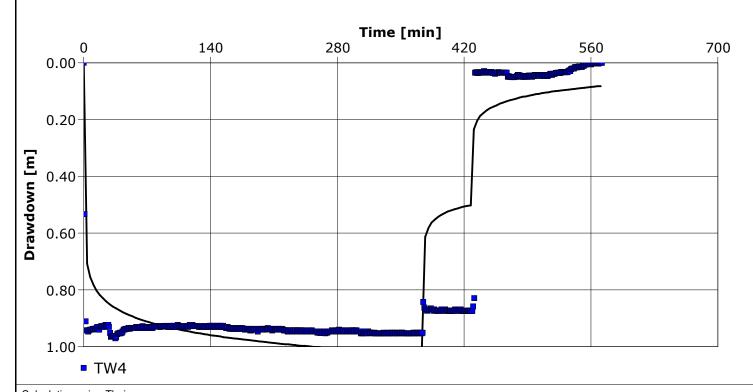
### Calculation using THEIS & JACOB

Observation Well	Transmissivity	Hydraulic Conductivity	Radial Distance to PW	
	[m²/d]	[m/d]	[m]	
TW4	1.62 × 10 <sup>3</sup>	6.48 × 10 <sup>2</sup>	0.25	

Project: Wilhaven
Number: PH1236

Location: Cumberland ON	Pumping Test: Pumping Test 1	Pumping Well: TW4	
Test Conducted by: AO		Test Date: 12/06/2015	
Analysis Performed by:	Theis (linear)	Analysis Date: 19/07/2016	
Aquifer Thickness: 2.50 m	Discharge: variable, average rate 1.7451 [l/s]		

Client: Fred Farsi

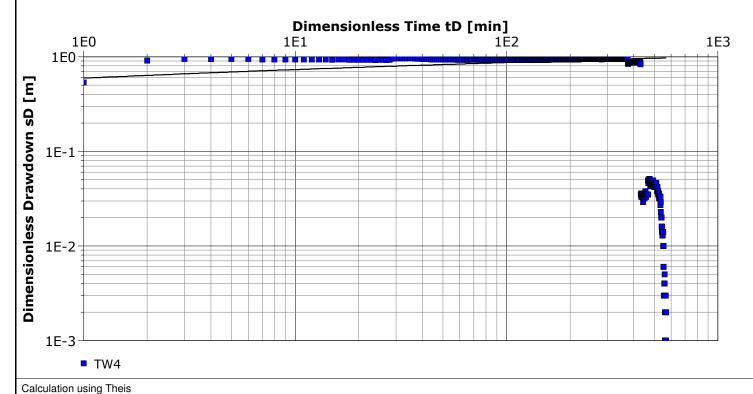


Calculation using Theis						
Observation Well Transmissivity		Hydraulic Storage coefficient Conductivity		Radial Distance to PW		
	[m²/d]	[m/d]		[m]		
TW4	1.89 × 10 <sup>2</sup>	7.56 × 10 <sup>1</sup>		0.25		

Pumping Test Analysis Report			
Project: Wilhaven			
Number: PH1236			

Location: Cumberland ON	Pumping Test: Pumping Test 1	Pumping Well: TW4	
Test Conducted by: AO		Test Date: 12/06/2015	
Analysis Performed by:	Theis (log-log)	Analysis Date: 19/07/2016	
Aquifer Thickness: 2.50 m	Discharge: variable, average rate 1.7451 [l/s]		

Client: Fred Farsi



Observation Well Transmissivity		Hydraulic Conductivity	Storage coefficient	Radial Distance to PW			
	[m²/d]	[m/d]		[m]			
TW4	8.64 × 10 <sup>1</sup>	3.46 × 10 <sup>1</sup>		0.25			

Paterson Group
Hydrogeology
154 Colonnade Road South
Ottawa, ON, K2E 7J5
Project: Wilhaven
Number: PH1236
Client: Fred Farsi

					Client: F	red Farsi				
Location: Cumberland ON			Pumping Test: Pumping Test 1			Pumping Well: TW4				
Tes	t Conducted by: AO		Test Date: 12/06/2015			5				
Aquifer Thickness: 2.50 m			Discharge: va	Discharge: variable, average rate 1.7451 [l/s]						
	Analysis Name	Analysis Performed by	Analysis Date	Method n	ame	Well		T [m²/d]	K [m/d]	S
1	Theis RECOVERY		02/11/2015	Theis Re	covery	TW4		1.62 × 10 <sup>3</sup>	6.48 × 10 <sup>2</sup>	
2	Theis (linear)		19/07/2016	Theis		TW4		1.89 × 10 <sup>2</sup>	7.56 × 10 <sup>1</sup>	
3	Theis (log-log)		19/07/2016	Theis		TW4		8.64 × 10 <sup>1</sup>	3.46 × 10 <sup>1</sup>	

 $6.32 \times 10^{2}$ 

Average

 $2.53 \times 10^{2}$ 

**Pumping Test Analysis Report** 

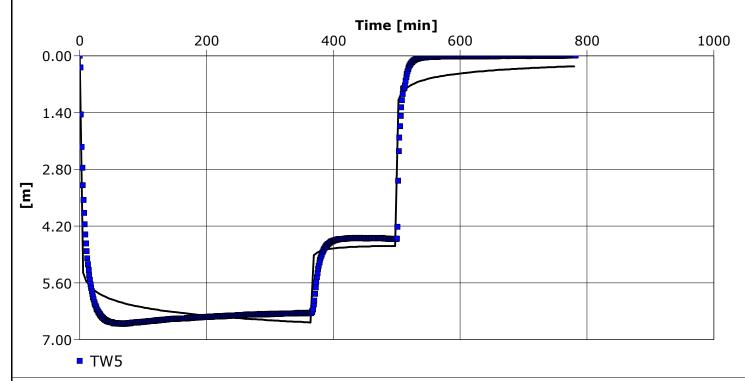
Project: Wilhaven - pumping test TW5

Number: PH1236

Client: Fred Farsi

Pumping Test: Pumping Test 1	Pumping Well: TW5		
	Test Date: 11/05/2016		
Theis (linear)	Analysis Date: 12/05/2016		

Aquifer Thickness: 15.24 m Discharge: variable, average rate 0.32046 [l/s]



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW5	8.36 × 10 <sup>0</sup>	5.49 × 10 <sup>-1</sup>		0.07	

**Pumping Test Analysis Report** 

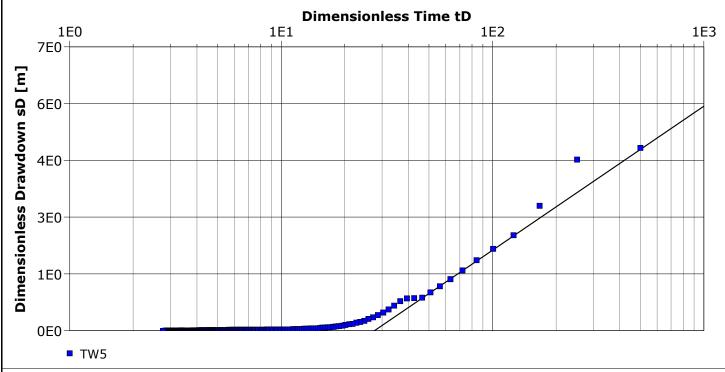
Project: Wilhaven - pumping test TW5

Number: PH1236

Client: Fred Farsi

Test Date: 11/05/2016
Analysis Date: 25/05/2016

Aquifer Thickness: 15.24 m Discharge: variable, average rate 0.32046 [l/s]



Calculation using THEIS & JACOB

Observation Well	Transmissivity Hydraulic Conductiv		Radial Distance to PW	
	[m²/d]	[m/d]	[m]	
TW5	1.43 × 10 <sup>0</sup>	9.36 × 10 <sup>-2</sup>	0.07	

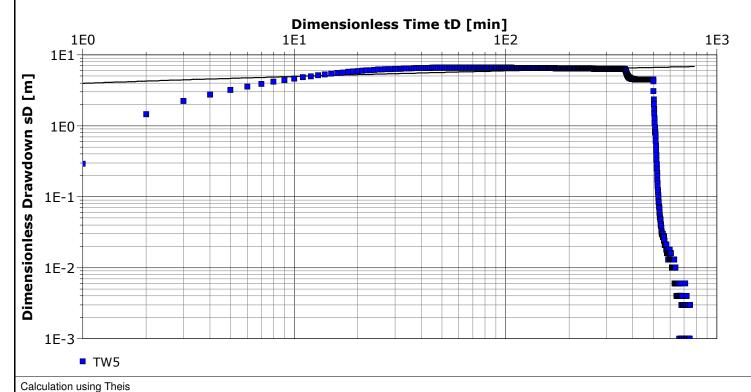
**Pumping Test Analysis Report** 

Project: Wilhaven - pumping test TW5

Number: PH1236

Client: Fred Farsi

Location: 1730 Wilhaven Drive	Pumping Test: Pumping Test 1	Pumping Well: TW5	
Test Conducted by: MM		Test Date: 11/05/2016	
Analysis Performed by:	Theis (log-log) Analysis Date: 19/07/2016		
Aquifer Thickness: 15.24 m	Discharge: variable, average rate 0.32046 [l/s]		



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW5	2.56 × 10 <sup>0</sup>	1.68 × 10 <sup>-1</sup>		0.07	

**Pumping Test Analysis Report** 

Project: Wilhaven - pumping test TW5

Number: PH1236

Fred Farsi

Client:

Location: 1730 Wilhaven DrivePumping Test: Pumping Test 1Pumping Well: TW5Test Conducted by: MMTest Date: 11/05/2016

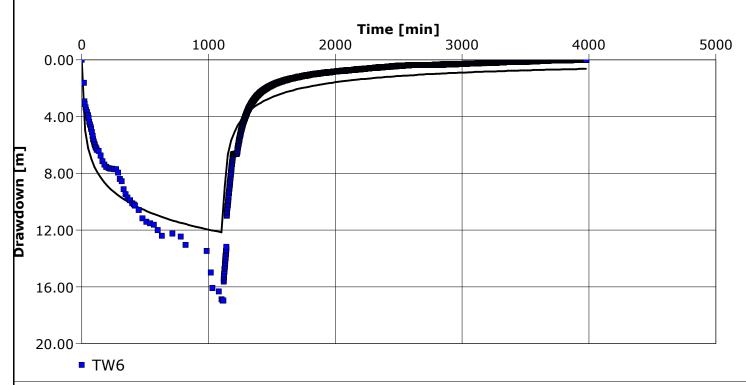
Aguifer Thickness: 15.24 m	Discharge: variable, average rate 0.32046 [l/s]

			_					
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/d]	K [m/d]	S
1	Theis (linear)		12/05/2016	Theis	TW5	8.36 × 10 <sup>0</sup>	5.49 × 10 <sup>-1</sup>	
2	Theis RECOVERY		25/05/2016	Theis Recovery	TW5	1.43 × 10 <sup>0</sup>	9.36 × 10 <sup>-2</sup>	
3	Theis (log-log)		19/07/2016	Theis	TW5	2.56 × 10 <sup>0</sup>	1.68 × 10 <sup>-1</sup>	
					Average	4.11 × 10 <sup>0</sup>	2.70 × 10 <sup>-1</sup>	

Pumping Test Analysis Report		
Project:	Wilhaven	
Number	r: PH1236	
Client:	Fred Farsi	

Location: 1730 Wilhaven Drive, Cumberland,	<b>⊕N</b> mping Test: Pumping Test 1	Pumping Well: TW6	
Test Conducted by: MM and RLC	Test Date: 08/07/2016		
Analysis Performed by:	Theis (linear)	Analysis Date: 19/07/2016	

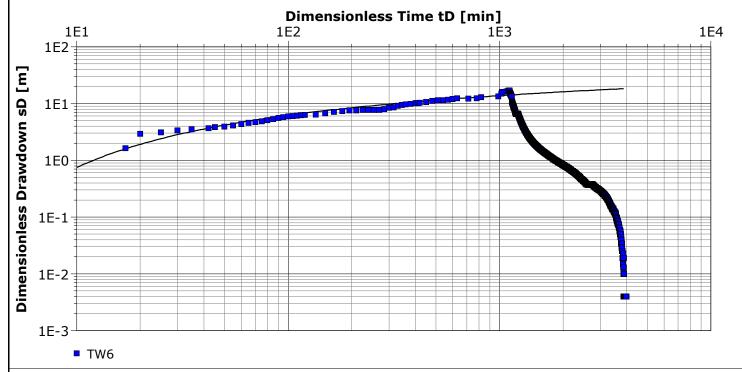
Aquifer Thickness: 63.00 m Discharge: variable, average rate 0.046 [l/s]



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW6	1.63 × 10 <sup>-1</sup>	2.59 × 10 <sup>-3</sup>		0.07	

Pumping Test Analysis Report
Project: Wilhaven
Number: PH1236
Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland	Pumping Well: TW6	
Test Conducted by: MM and RLC	Test Date: 08/07/2016	
Analysis Performed by:	Theis (log-log)	Analysis Date: 19/07/2016
Aquifer Thickness: 63.00 m		



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
TW6	1.04 × 10 <sup>-2</sup>	1.65 × 10 <sup>-4</sup>		0.07	

Pumping Test Analysis Report

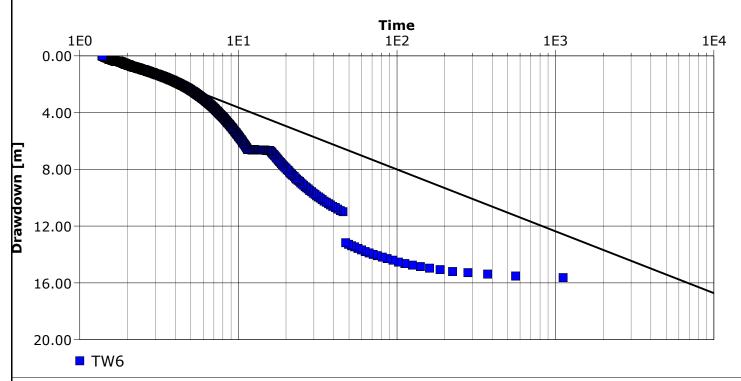
Project: Wilhaven

Number: PH1236

Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland,	Pumping Well: TW6		
Test Conducted by: MM and RLC			Test Date: 08/07/2016
Analysis Performed by:	Theis RECOVERY		Analysis Date: 19/07/2016

Aquifer Thickness: 63.00 m Discharge: variable, average rate 0.046 [l/s]



### Calculation using THEIS & JACOB

Observation Well	Transmissivity	Hydraulic Conductivity	Radial Distance to PW	
	[m²/d]	[m/d]	[m]	
TW6	1.67 × 10 <sup>-1</sup>	2.65 × 10 <sup>-3</sup>	0.07	

**Paterson Group Pumping Test Analysis Report** Hydrogeology Project: Wilhaven 154 Colonnade Road South Ottawa, ON, K2E 7J5 Number: PH1236 Client: Fred Farsi Location: 1730 Wilhaven Drive, Cumberland, @Mmping Test: Pumping Test 1 Pumping Well: TW6 Test Conducted by: MM and RLC Test Date: 08/07/2016 Aquifer Thickness: 63.00 m Discharge: variable, average rate 0.046 [l/s] Analysis Name Analysis Performed by Analysis Date Method name Well T [m<sup>2</sup>/d] K [m/d] S  $2.59 \times 10^{-3}$ 1 Theis (linear) 19/07/2016 Theis TW6  $1.63 \times 10^{-1}$  $1.04 \times 10^{-2}$  $1.65 \times 10^{-4}$ 2 Theis TW6 Theis (log-log) 19/07/2016 TW6 Theis RECOVERY  $1.67 \times 10^{-1}$  $2.65 \times 10^{-3}$ 3 19/07/2016 Theis Recovery

 $1.80 \times 10^{-3}$ 

 $1.13 \times 10^{-1}$ 

Average

**Pumping Test Analysis Report** 

Project: Wilhaven - p-test HW on 24may16 by MM

Number: PH1236

Fred Farsi

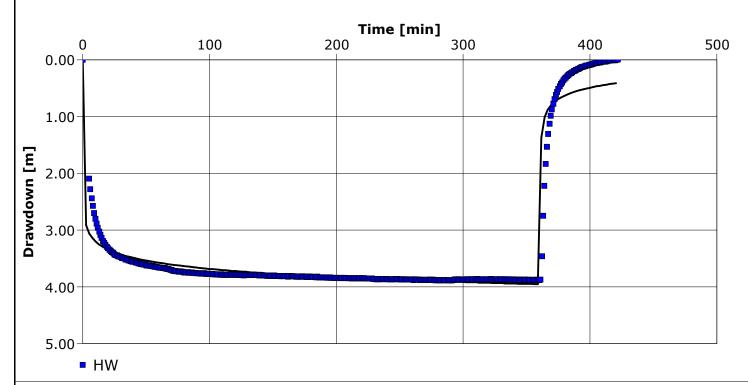
Location: 1730 Wilhaven Drive, Cumberland, Pumping Test: Pumping Test 1 Pumping Well: HW

Test Conducted by: MM Test Date: 24/05/2016

Analysis Performed by: Theis (linear) Analysis Date: 25/05/2016

Client:

Aquifer Thickness: 22.00 m Discharge: variable, average rate 0.35 [l/s]



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
HW	1.14 × 10 <sup>1</sup>	5.19 × 10 <sup>-1</sup>		0.07	

**Pumping Test Analysis Report** 

Project: Wilhaven - p-test HW on 24may16 by MM

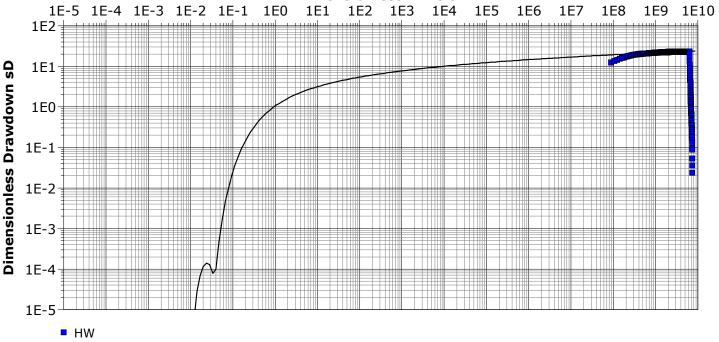
Number: PH1236

Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland,	<b>⊕N</b> mping Test: Pumping Test 1	Pumping Well: HW
Test Conducted by: MM	Test Date: 24/05/2016	
Analysis Performed by:	Thies (log-log)	Analysis Date: 25/05/2016

Aquifer Thickness: 22.00 m Discharge: variable, average rate 0.35 [l/s]

#### **Dimensionless Time tD**



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
HW	1.43 × 10 <sup>1</sup>	6.49 × 10 <sup>-1</sup>		0.07	

**Pumping Test Analysis Report** 

Project: Wilhaven - p-test HW on 24may16 by MM

Number: PH1236

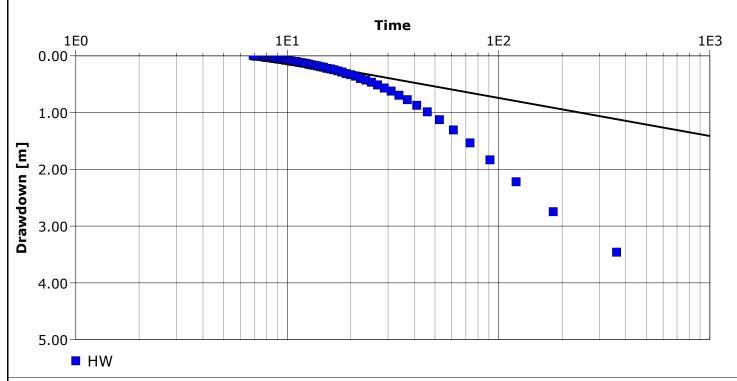
Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, Pumping Test: Pumping Test 1 Pumping Well: HW

Test Conducted by: MM Test Date: 24/05/2016

Analysis Performed by: Theis RECOVERY Analysis Date: 25/05/2016

Aquifer Thickness: 22.00 m Discharge: variable, average rate 0.35 [l/s]



Calculation using THEIS & JACOB

Observation Well	Transmissivity	Hydraulic Conductivity	Radial Distance to PW	
	[m²/d]	[m/d]	[m]	
HW	8.25 × 10 <sup>0</sup>	3.75 × 10 <sup>-1</sup>	0.07	

Pumping Test I	Analysis Report
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Project: Wilhaven - p-test HW on 24may16 by MM

Number: PH1236

Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland,	<b>⊕N</b> mping Test: Pumping Test 1	Pumping Well: HW
Test Conducted by: MM		Test Date: 24/05/2016

100	Tool Conducted by Nillin					Tool Dat	.0. 2 1/00/20		
Aqu	ifer Thickness: 22.00	) m	Discharge: variable, average rate 0.35 [l/s]						
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well		T [m²/d]	K [m/d]	S
1	Theis (linear)		25/05/2016	Theis	HW		1.14 × 10 <sup>1</sup>	5.19 × 10 <sup>-1</sup>	
2	Thies (log-log)		25/05/2016	Theis	HW		1.43 × 10 <sup>1</sup>	6.49 × 10 <sup>-1</sup>	
3	Theis RECOVERY		25/05/2016	Theis Recovery	HW		8.25 × 10 <sup>0</sup>	3.75 × 10 <sup>-1</sup>	
	Ave						1.13 × 10 <sup>1</sup>	5.14 × 10 <sup>-1</sup>	

Pumping Test Analysis Report

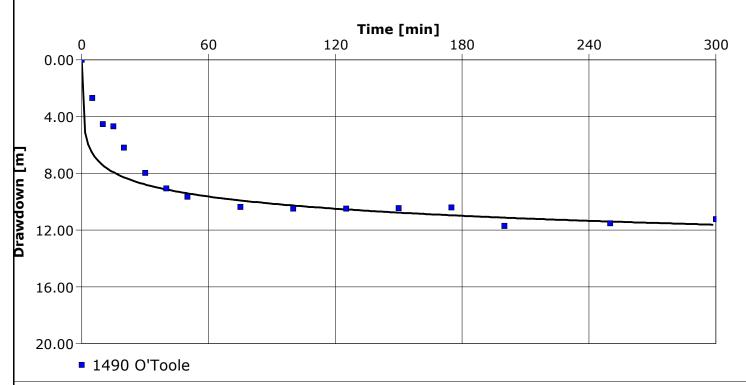
Project: Wilhaven

Number: PH1236

Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland,	Pumping Well: 1490 O'Toole	
Test Conducted by: Kollard Associates Inc.	Test Date: 16/03/2016	
Analysis Performed by:	Theis (linear)	Analysis Date: 19/07/2016
4 1/	D	

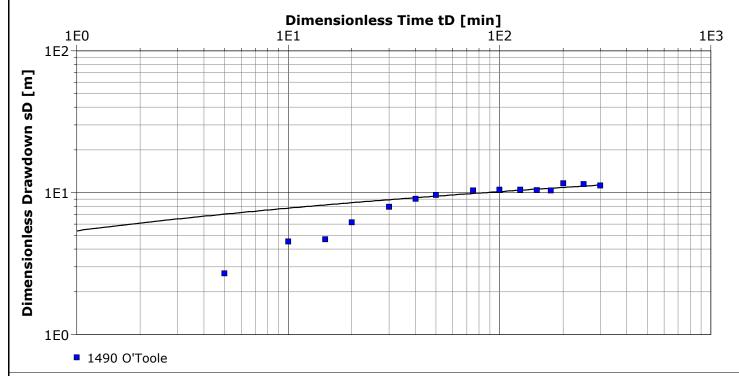
Aquifer Thickness: 91.00 m Discharge Rate: 24 [l/s]



Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
1490 O'Toole	1.34 × 10 <sup>2</sup>	1.47 × 10 <sup>0</sup>		0.07	

Pumping Test Analysis Report
Project: Wilhaven
Number: PH1236
Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland	Pumping Well: 1490 O'Toole	
Test Conducted by: Kollard Associates Inc.	Test Date: 16/03/2016	
Analysis Performed by:	Theis (log-log)	Analysis Date: 19/07/2016
Aquifer Thickness: 91.00 m	Discharge Rate: 24 [l/s]	



Calculation using	a Theis	
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Observation Well	Transmissivity	Hydraulic Conductivity	Storage coefficient	Radial Distance to PW	
	[m²/d]	[m/d]		[m]	
1490 O'Toole	1.59 × 10 <sup>2</sup>	1.75 × 10 <sup>0</sup>		0.07	

Paterson Group
Hydrogeology
154 Colonnade Road South
Ottawa, ON, K2E 7J5

Project: Wilhaven
Number: PH1236
Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, @Nmping Test: Pumping Test 1

Pumping Test Analysis Report
Project: Wilhaven
Project: Wilhaven
Number: PH1236
Client: Fred Farsi

Tes	Test Conducted by: Kollard Associates Inc.  Test D					Test Da	te: 16/03/20	16	
Aquifer Thickness: 91.00 m Discharge Rate: 24 [l/s]									
	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well		T [m²/d]	K [m/d]	S
1	Theis (linear)		19/07/2016	Theis	1490 O'Too	le	1.34 × 10 <sup>2</sup>	1.47 × 10 <sup>0</sup>	
2	Theis (log-log)		19/07/2016	Theis	1490 O'Too	le	1.59 × 10 <sup>2</sup>	1.75 × 10 <sup>0</sup>	
	Average						1.46 × 10 <sup>2</sup>	1.61 × 10 <sup>0</sup>	

## patersongroup

### Wilhaven

## **Determination of Potential Well Interference**

PH1236

Pumping Rate (Q) m3/day 2.25

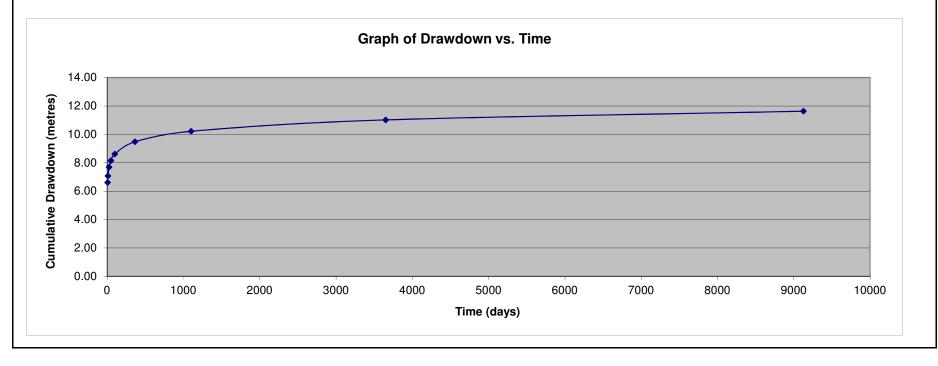
Transmissivity (T) m2/day 7.5 Transmissivity is average of results from TW5, HW and 1490 O'Toole

Average Well Spacing (m) r 56

Coefficient of Storage S 1.00E-06 Storativity is approximate - based on Paterson's knowledge of Ottawa aquifers

Notes: Analysis Assumes Continuous Pumping of 29 Wells

	1st Well Grouping 2n		2nd Well Gr	2nd Well Grouping		3rd Well Grouping	
Time (days)	u	W(u)	u	W(u)	u	W(u)	Drawdown
5	8.3E-06	11.12	2.5E-05	10.02	4.2E-05	9.51	6.61
10	4.2E-06	11.81	1.3E-05	10.71	2.1E-05	10.20	7.07
25	1.7E-06	12.73	5.0E-06	11.63	8.3E-06	11.12	7.68
50	8.3E-07	13.42	2.5E-06	12.32	4.2E-06	11.81	8.15
100	4.2E-07	14.11	1.3E-06	13.02	2.1E-06	12.50	8.61
365	1.1E-07	15.41	3.4E-07	14.31	5.7E-07	13.80	9.48
1100	3.8E-08	16.51	1.1E-07	15.41	1.9E-07	14.90	10.21
3650	1.1E-08	17.71	3.4E-08	16.61	5.7E-08	16.10	11.01
9125	4.6E-09	18.63	1.4E-08	17.53	2.3E-08	17.02	11.63



# patersongroup

Wilhaven PH1236

## **Langlier Saturation Index (LSI) Calculation**

(Langlier, 1936)

LSI = pH - pHs A = (Log10 [TDS] - 1) / 10pHs = (9.3 + A + B) - (C + D)  $B = -13.12 \times Log10 (oC + 273) + 34.55$ Where: C = Log10 [Ca2 + as CaCO3] - 0.4D = Log10 [alkalinity as CaCO3]

TW6	inputs					
pН	8.27	Α	0.18			
TDS	597	В	2.32			
Hardness	98	С	1.59			
Alkalinity	296	D	2.47			
Temp.	13					
		pHs =	7.74			
		LSI =	0.5	$\neg$		
LSI	Effect					
0.5 to 2	Water is super saturated and	o precipitate a scale layer of calcium carbonate (sca	ale forming but non-corrosiv	e)		
0 to 0.5	Water is super saturated and tends to precipitate a scale layer of calcium carbonate (slightly scale forming and corrosive).					
0	Water is saturated (in equilibrium) with calcium carbonate. A scale layer of calcium carbonate is neither precipitated nor dissolved.					
0 to -0.5	Water is under saturated and tends to dissolve solid calcium carbonate (slightly corrosivebut non-scale forming).					
-0.5 to -2	Water is under saturated and tends to dissolve solid calcium carbonate (seriously corrosive).					

## Ryznar Stability Index (RSI) Calculation

(Ryznar, 1944)

RSI = 2(pHs) - pH

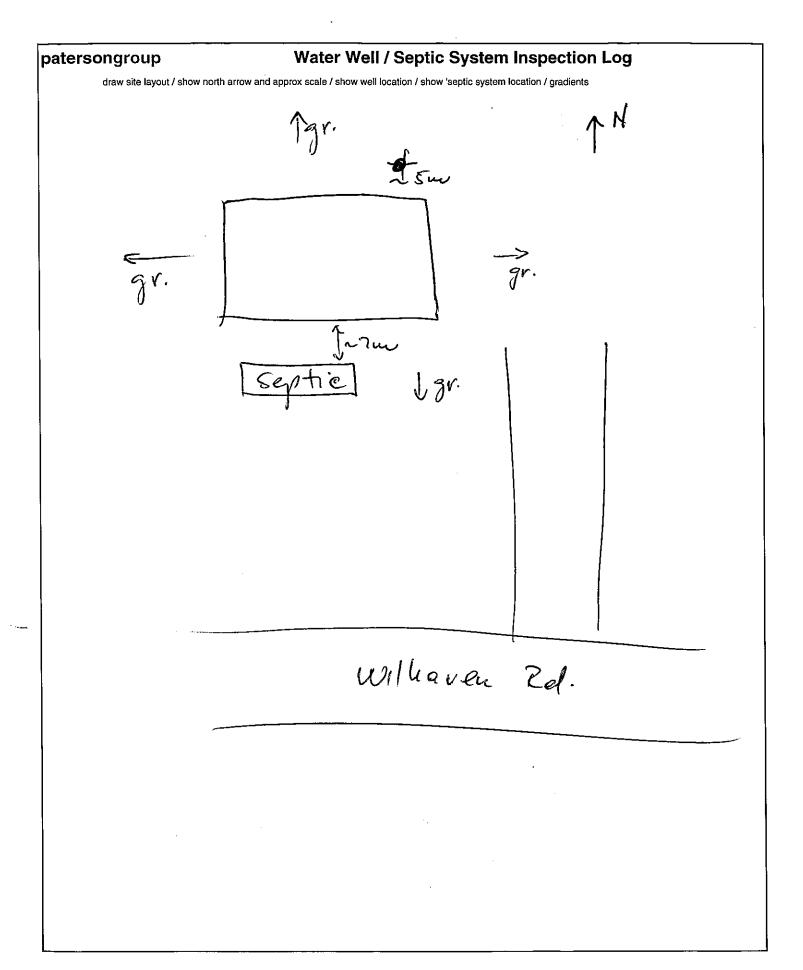
	<u></u>			
		RSI =	7.2	
RSI	Effect			•
	Heavy scale will form			
5.5 to 6.2	Scale will form			
6.2 to 6.8	No scale or corrosion			
6.8 to 8.8	Water is aggresively corrosive			
>8.5	Water is very agressively corrosive	-		

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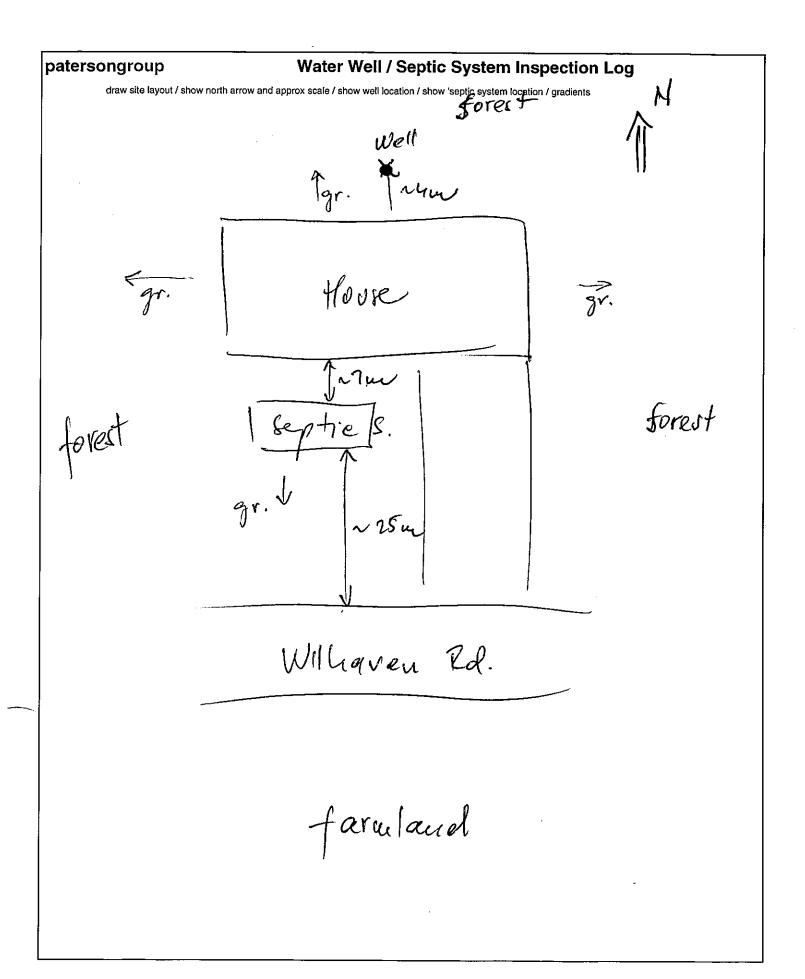
## Wilhaven

PRE DEVELOPMENT CO	NDITIONS	POST DEVELOPMENT CONDITIONS			
Groundwater Flow Through	NOT USED	Groundwater Flow Through	NOT USED		
Background Nitrate Concentration (C <sub>b</sub> ) =	0 -mg/L	Background Nitrate Concentration (C <sub>b</sub> ) =	0 -mg/L		
<del>lydraulic Conductivity (k) =</del>	<del>0 -m/s</del>	Hydraulic Conductivity (k) =	0 -m/s		
Horizontal Gradient (i) =	0	Horizontal Gradient (i) =	θ		
Length (L) =	<del>0 -m</del>	Length (L) =	<del>0 -m</del>		
Aquifer Thickness (t) =	<del>0</del> -m	Aquifer Thickness (t) =	<del>0 -m</del>		
Groundwater Flow (Q <sub>b</sub> ) =	0 -m <sup>3</sup> /day	Groundwater Flow (Q <sub>b</sub> ) =	0 -m³/day		
nfiltration Factors		Infiltration Factors			
Городгарну	0.30	Topography	0.30		
Soil	0.24 weighted	Soil	0.26 weighted		
Cover	0.13 weighted	Cover	0.12 weighted		
	Total 0.67		Total 0.68		
Site Characteristics		Site Characteristics			
Area of Site :	199,161 m <sup>2</sup>	Area of Site :	199,161 m <sup>2</sup>		
		Area of each roof:	525 m <sup>2</sup>		
		Total of roof areas:	11,025 m <sup>2</sup>		
		Area of each driveway:	200 m <sup>2</sup>		
		Total of driveway areas:	4200 m <sup>2</sup>		
		Length of roadways:	753 m		
		Width of roadways:	8 m		
		Total area of roadways:	6024		
		Impervious Area	21,249 m <sup>2</sup>		
		Percent Impervious Area =	10.67 %		
nfiltration Area =	199,161 m <sup>2</sup>	Infiltration Area =	177,912 m <sup>2</sup>		
Septic Effluent		Septic Effluent			
Concentration of Effluent (Cs) =	0 mg/L	Concentration of Effluent (Cs) =	40 mg/L		
Daily Sewage Flow (Qs)=	0 m <sup>3</sup>	Daily Sewage Flow (Qs)=	21 m <sup>3</sup>		
nfiltration Calculation		Infiltration Calculation			
litrate concentration in precipitation $(C_i) =$	0 mg/L	Nitrate concentration in precipitation $(C_i) =$	0 mg/L		
reciptation (from Environment Canada climate normals)	943.4 mm/yr	Preciptation (from Environment Canada climate normals)	943.4 mm/yr		
urplus Water (Environment Canada)	300 mm/yr	Surplus Water (Environment Canada)	384 mm/yr		
actored Water Surplus =	200 mm/yr	Factored Water Surplus =	261 mm/yr		
otal volume of Infiltration	39,785 m <sup>3</sup>	Infiltraion % due to stormwater management measures	78%		
		Runoff volume (all water running off impervious areas)	20,046 m <sup>3</sup>		
		Minimum 'storminf' volume (25mm event, Stantec, 2016)	15,550 m <sup>3</sup> /year		
m, , , , , , , , , , , , , , , , , , ,	3		43 m³/day		
filtration flow entering the system (Q <sub>i</sub> ) =	109 m <sup>3</sup> /day	Infiltration Flow Entering the System (Q <sub>i</sub> ) =	127 m <sup>3</sup> /day		
lass Balance Model (MOEE, 1995)		Infiltration Flow Entering the System (Q <sub>i</sub> with 'storminf') = 170 m <sup>3</sup> /day  Mass Balance Model (MOEE, 1995)			
$C_T = (Q_b C_b + Q_e C_e + Q_i C_i)/(Q_b + Q_e + Q_i) = Cumulativ$	re Nitrate Concentration	$C_T = (Q_bC_b + Q_eC_e + Q_iC_i)/(Q_b + Q_e + Q_i) = Cumulative$	Nitrate Concentration		
b = flow entering the system across the upgradient area	0 m <sup>3</sup> /day	$Q_b$ = flow entering the system across the upgradient area	0 m <sup>3</sup> /day		
b = background nitrate concentration	0 mg/L	C <sub>b</sub> = background nitrate concentration	0 mg/L		
l <sub>e</sub> = flow entering the system from the septic drainfield	0 m <sup>3</sup> /day	$Q_n$ = flow entering the system from the septic drainfield	21 m <sup>3</sup> /day		
e = concentration of nitrates in the septic effluent	0 mg/L	C <sub>e</sub> = concentration of nitrates in the septic effluent	40 mg/L		
$Q_i$ = flow entering the system from infiltration	109 m <sup>3</sup> /day	Q <sub>i</sub> = flow entering the system from infiltration (with 'storminf')	170 m <sup>3</sup> /day		
c <sub>i</sub> = Concentration of nitrates in the infiltrate	0 mg/L	$C_i$ = Concentration of nitrates in the infiltrate	0 mg/L		
	C <sub>T</sub> = 0.0 mg/L		C <sub>T</sub> = 4.399 mg/L		
	$C_T = 0.0 \text{ mg/L}$				

patersongroup	Water Well / S	Septic System I	nspection Log
Address:	1865 Wilharm CR	Project Number:	PH1236
Name of Property Owne		Mathieu	<u>(13 833 03</u> 2/
Date of Inspection:	-r: <u>CLAUde</u> - DULY 7, 2016 - MM	Owner telephone N	
Paterson Rep:	MM		
		; }	
Well Details	(pit less	_	
Is well casing exposed a	above ground surface ?	′ Y /(N)	Length of stickup:
Does owner have a cop	y of the 'water well record'? Y PN	Try to obtain a copy or g	et datails (take a photo)
How old is the well?	$\sim$ 1979 In what year was the	house built ?	1977
Depth of well ?	Depth of well casing	?	
Who drilled the well?			check well cap for driller ID
Water Quality			
Taste?	,		
Odour?	9.009		
Colour ?	9000		
Hardness ?	yes		
History of bacteria testir	ng?	0	
1	related comments or issues ?	No	7 <del></del>
' ' '	a ^		
Water treatment details	: cofferer		•
SAMPLING DETAILS:	<del>- J</del>		
	Copy of results to well owner ? (get contact	t details / email address)	Klomath & Gmail.com
	Temp pH Cor		os
Water Quantity			
Size of pump in well?		Type of pump?	_
Pumping rate ?			
Depth of pump in well?		4 /	has owner ever seen it layed out on surface ?
Any water quantity relat	ed comments or issues?	when till	11Kg POO!
Has the well ever run dr	y? yes	/	
Septic System	draw location on sketch		
Class 4? Tertiary treatment ?	<b>?</b>	_	
Have there been any pr	oblems with the septic system?	Y /(N)	
Environmental Concer	ns / s		
Surface water?	oolkeg in the offile	ig	
Septic System?	No.		1 11.5
Land use?	rested around, t	aru au a	10 199 S
Neighbouring properties	? torested		
Potential sources of cor	ntamination (onsite and offsite) ?		0 - 11
	rns Poolicy In the following the following well location and location of septic system.	love (road	x 5Q1+ 1
Please sketch the site layout s	showing well location and location of septic system -	on reverse side of this sheet	t ,
1			•



patersongroup	Water Well / S	Septic System In	spection Log
Address:	73 Wilhar Dr.	Project Number:	PH
Name of Property Owne		ach - Ch	elsey labrecque
Date of Inspection:	July 7, 2016	Owner telephone No:	1613 827 5004
Paterson Rep:	MM	·	
		11	
Well Details			6
Is well casing exposed a	above ground surface ?	(Y)/ N	Length of stickup: O. Pu
	y of the 'water well record' ? Y / (N)	Try to obtain a copy or get	datails (take a photo)
How old is the well?	$\sim$ /980 $_{\odot}$ In what year was the	house built?	~ 1980
Depth of well ?	Depth of well casing	?	
Who drilled the well?			check well cap for driller ID
Water Quality			
Taste?	4		
Odour?	Good, uo odi	our	
Colour?	elear	<del></del>	
Hardness ?	No		
History of bacteria testi	ng?		
Any other water quality	related comments or issues ?	NO	
	- 0 A		
Water treatment details	: Soffauer	· <del></del>	
SAMPLING DETAILS:			<u> </u>
	Copy of results to well owner? (get contact		
	Temp pH Cor	nd TD:	S
Water Quantity	; •		
Size of pump in well?		Type of pump?	
Pumping rate ?			has away over aggs it layed out as surface 2. A/
Depth of pump in well f			has owner ever seen it layed out on surface?
Has the well ever run d	ted comments or issues?		
has the well ever full d	No Mo		
Septic System	draw location on sketch		
Class 4 ? Tertiary treatment	?		in front ofalcoor
Have there been any p	roblems with the septic system?	Y /(N)	14 1.001
Environmental Conce	erne		
Surface water ?	cta done water	ria Fori	49,
Septic System ?	was and devit to	. ewell	<i>* * * * * * * * * *</i>
Land use ?	- of good and	ui coo - 11	00
Neighbouring propertie	es? To refred where		on I to the south
Potential sources of co	ontamination (onsite and offsite) ?	+ Javu	accep 1
Totoliiai Souloos of oc	None	" from al	and to the south
Please sketch the site lavout	t showing well location and location of septic system -	on reverse side of this sheet	
l l			



patersongroup	Water Well / Septic System Inspection Log
Address: 1649	Williaven Prive
Name of Property Owner:	
Date of Inspection: Duly 7, 8	Project Number: PH 1236
Paterson Rep: MM	No one at home
Well Details	Well not observed
Is well casing exposed above ground s	
Does owner have a copy of the 'water	well record'? Y / N Try to obtain a copy or get datails (take a photo)
How old is the well ?	In what year was the well drilled ?
Depth of well ?	Depth of well casing ?
Who drilled the well ?	
Water Quality	
Taste ?	
Odour ?	
Colour ?	
Hardness ?	
History of bacteria testing ?	
Any other water quality realyed comme	ents or issues ?
, , , , , , , , , , , , , , , , , , , ,	
	02.97
Water Quantity	
Size of pump in well ?	Type of pump ?
Pumping rate ?	
Depth of pump in well ?	X 9 X
Any water quantity related comments of	or issues ?
and the Lord	004 - 400
	(4)
Environmental Concerns	
Surface water ?	
Sentic System 2	
Land use? Ye h'd-	
Neighbouring properties?	vuelaced-N, w, 5, forested-E
Potential sources of contamination (or	neite and offsite) ?
Potential sources of contamination (or	isite and orisite) :
3/11/4	
Places eketch the site layout showing	well location and location of septic system - on reverse side of this sheet

# patersongroup Water Well / Septic System Inspection Log draw site layout / show north arrow and approx scale / show well location / show 'septic system location / gradients //649

-area flat

1620

~ 400 m to TW6

· TW6

patersongroup	Water Well / Septic System Inspection Log
Address: 16	20 Wilhaven Drive
Name of Property Owner:	
	7, 2016 Project Number: PH 12 36
Paterson Rep:	1 M
raterson riep.	No one of lover.
Well Details	No one at hone well not observed
Is well casing exposed above grou	und surface?  Y / N  Length of stickup:
	ater well record' ? Y / N Try to obtain a copy or get datails (take a photo)
How old is the well ?	In what year was the well drilled ?
Depth of well ?	Depth of well casing ?
Who drilled the well ?	
Water Quality	
Taste ?	
Odour ?	Value Value
Colour ?	2.79/
Hardness ?	
History of bacteria testing?	
Any other water quality realyed co	mments or issues ?
Water Quantity	Type of pump ?
Size of pump in well ? Pumping rate ?	Type of pump ?
Depth of pump in well ?	
Any water quantity related comme	ente or issues ?
Any water quantity related comme	TILS OF ISSUES :
D. W. I. W.	20071 77
Environmental Concerns	
Surface water ?	
Septic System ?	A
Land use? ren'el	ential.
Neighbouring properties?	sid to the N, farmewel E, S, W
Potential sources of contamination	
	1 1 11/2
-	- Investock at the property (llames)
Please sketch the site layout show	ving well location and location of septic system - on reverse side of this sheet

## Water Well / Septic System Inspection Log

draw site layout / show north arrow and approx scale / show well location / show 'septic system location / gradients

patersongroup

Wilhaven Dr.

HOOR

gML at most ~

mostert at the property l'ames

patersongroup	po I moltres	Water Well	/ Septic System Ir	spection Log
Address:	1675		Project Number:	PH 1236
Name of Property Owne	-			
Date of Inspection:	July 7, 70	16	Owner telephone No	0:
Paterson Rep:	MM	103	Line Contrate the St. William Contract Co.	2 1/ 1
, attitudi, itapi		- Na	way of home	only - doesn't know
Well Details				well well
Is well casing exposed a	above ground surfa	ce?	Y / N	Length of stickup:
Does owner have a cop	y of the 'water well	record'? Y / N	Try to obtain a copy or ge	t datails (take a photo)
How old is the well?	4	_ In what year was t	the house built?	1 7
Depth of well ?		Depth of well casi	ng ?	
Who drilled the well?	<u> </u>			check well cap for driller ID
Water Quality				
Taste ?				
Odour?				
Colour ?				
Hardness ?	-			
History of bacteria testir	100			
Any other water quality	related comments	or issues ?	*	
Water treatment details	:		Name of the second	
SAMPLING DETAILS:				
	Copy of results to	well owner ? (get cor	ntact details / email address)	
	Temp	pH (	Cond TD	OS .
Water Quantity			2 1 12	
Size of pump in well?			Type of pump?	
Pumping rate ?				
Depth of pump in well ?				has owner ever seen it layed out on surface ?
Any water quantity relat		sues ?		
Has the well ever run d	y ?			
Centie Cunter	draw location on sketc	h .		
Septic System Class 4 ? Tertiary treatment		at		
Have there been any pr		untic system 2	Y / N	
riave there been any pr		pilo system :		
Environmental Conce	rns			
Surface water ?	11170			
Septic System ?				
Land use? Ve	siel.	v 20		6 0 1 0 11
Neighbouring propertie	s? For	ested-E	=, N; rond	farmland-SIW
Potential sources of co	ntamination (onsite	and offsite) ?		/V
NORT		7 =	an success.	
Please sketch the site layout	showing well location ar	nd location of septic syste	m - on reverse side of this sheet	

draw site layout / show north arrow and approx	scale / show well location / show 's	septic system location / gradients	<b>^</b>
1675 HOUSE	Sand Josephal	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
16 Hoose / The co	w)		
		~ 400m to	T.W6
- avea flat			

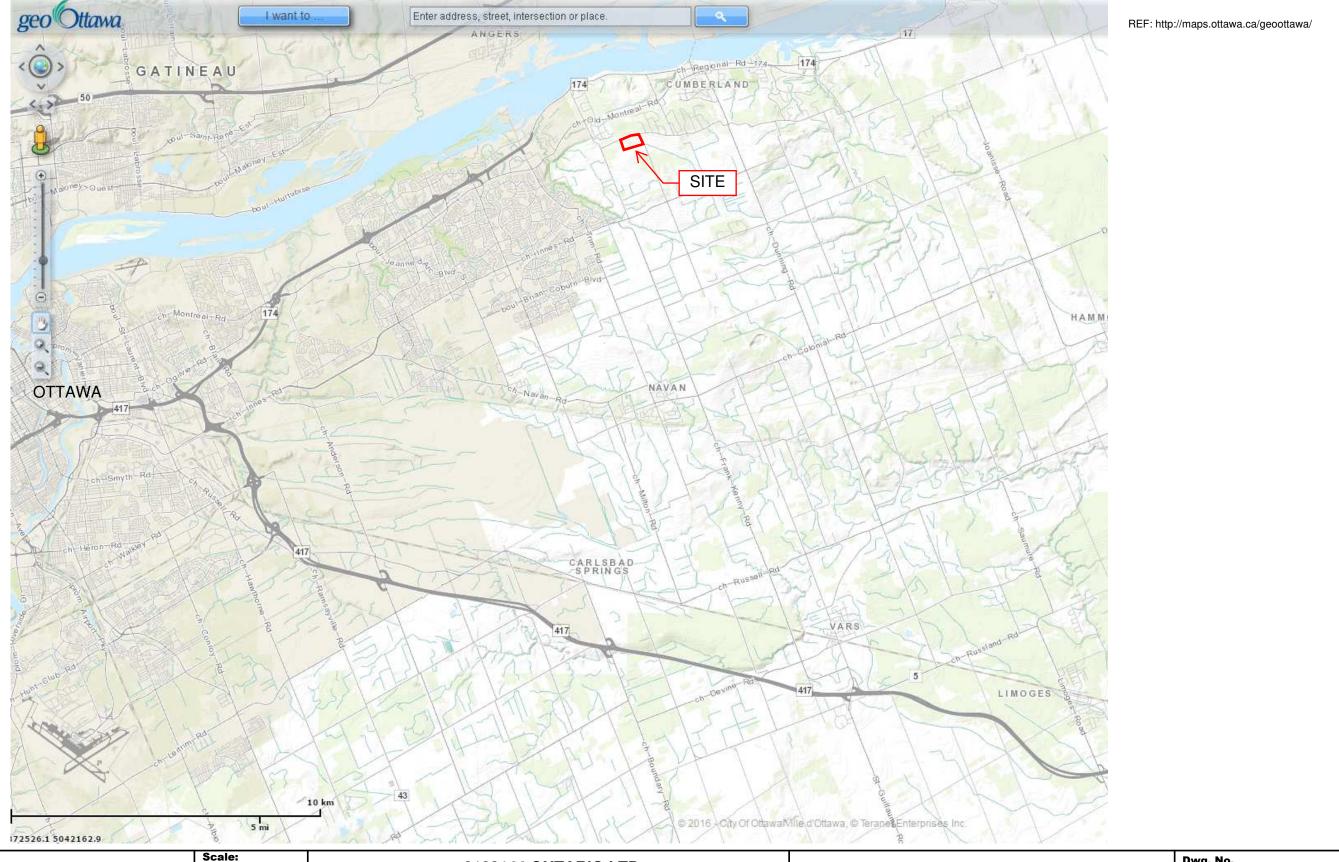
· TWE

Proposed Rural Residential Subdivision 1730 Wilhaven Drive, Cumberland, Ontario

### Appendix 5

- Figure 1 Site Location Plan
- Figure 2 MOECC Water Well Records
- Figure 3 Overburden Geology
- Figure 4 Bedrock Geology
- Figure 5 Test Hole Location Plan
- Figure 6 Cross Section
- Figure 7 Draft Plan of Survey
- Figure 8 Lot Development Plan





patersongroup consulting engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Des.:
Dwn:
Chkd:

2183144 ONTARIO LTD.

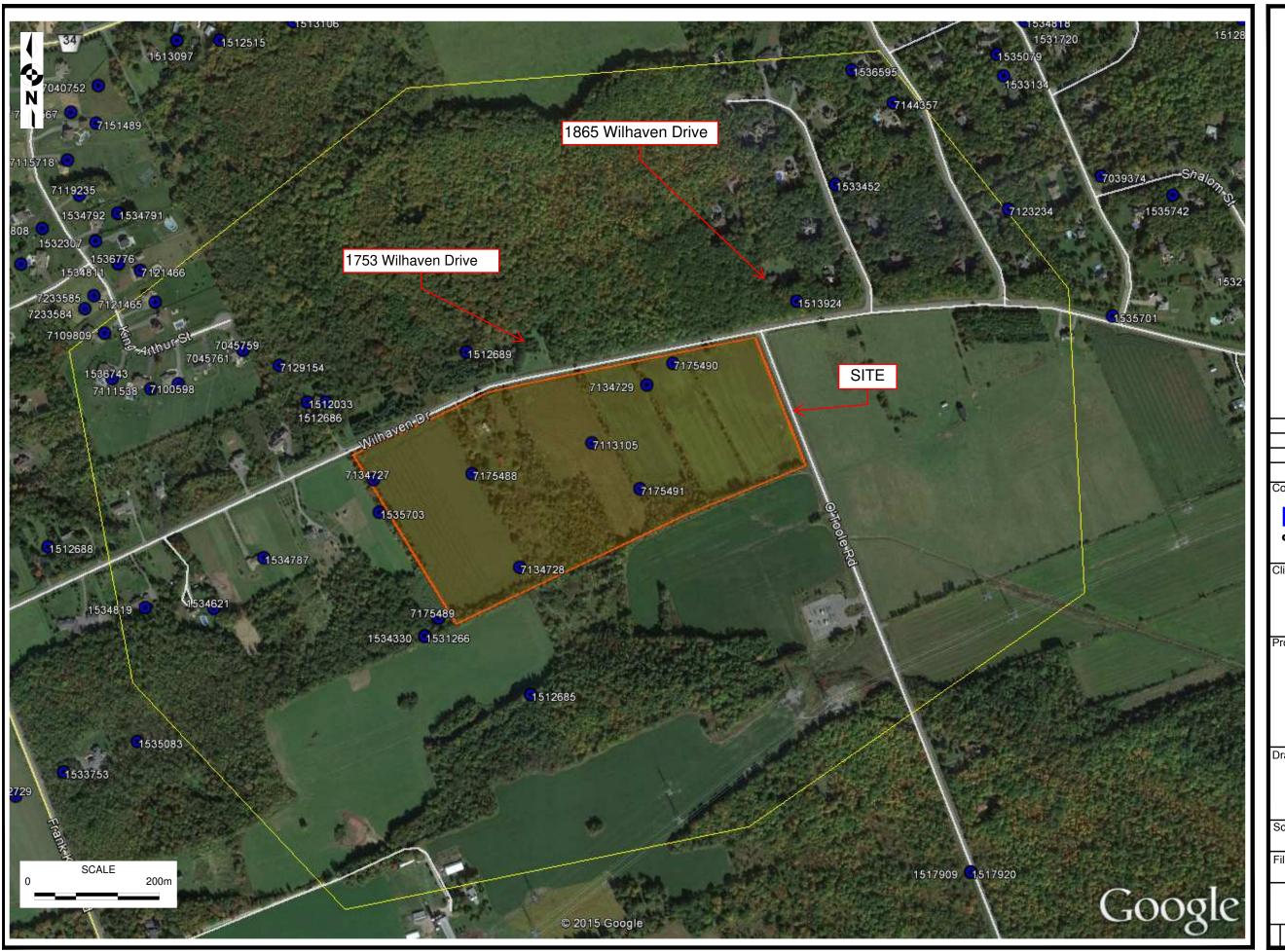
1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO

SITE LOCATION PLAN

Dwg. No.
FIGURE 1

Report No.:

Date:



DD/MM/YY	DESCRIPTION	RFV

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# patersongroup consulting engineers

Client:

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Project:

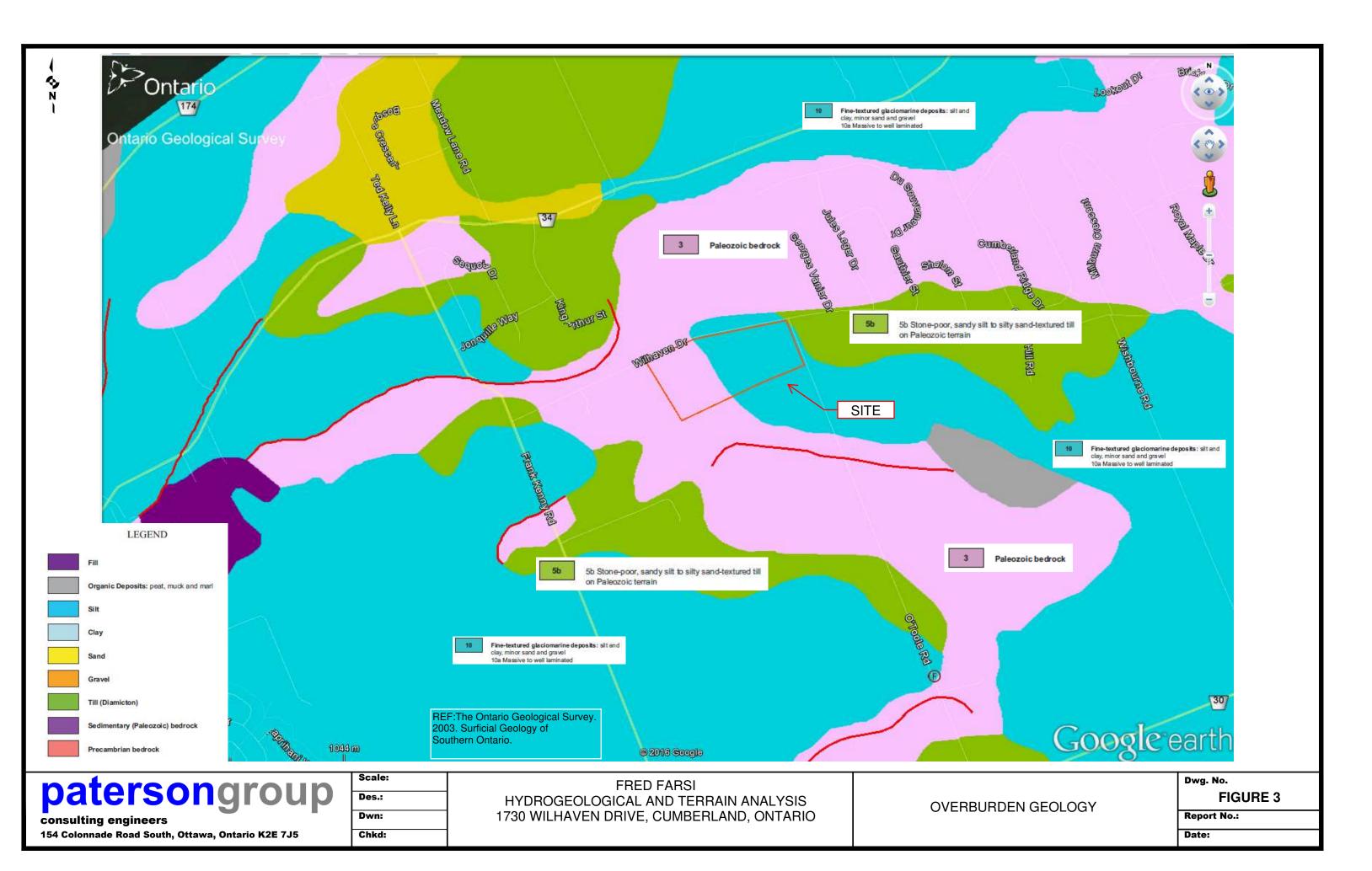
HYDROGEOLOGICAL AND TERRAIN ANALYSIS 1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO

Drawing:

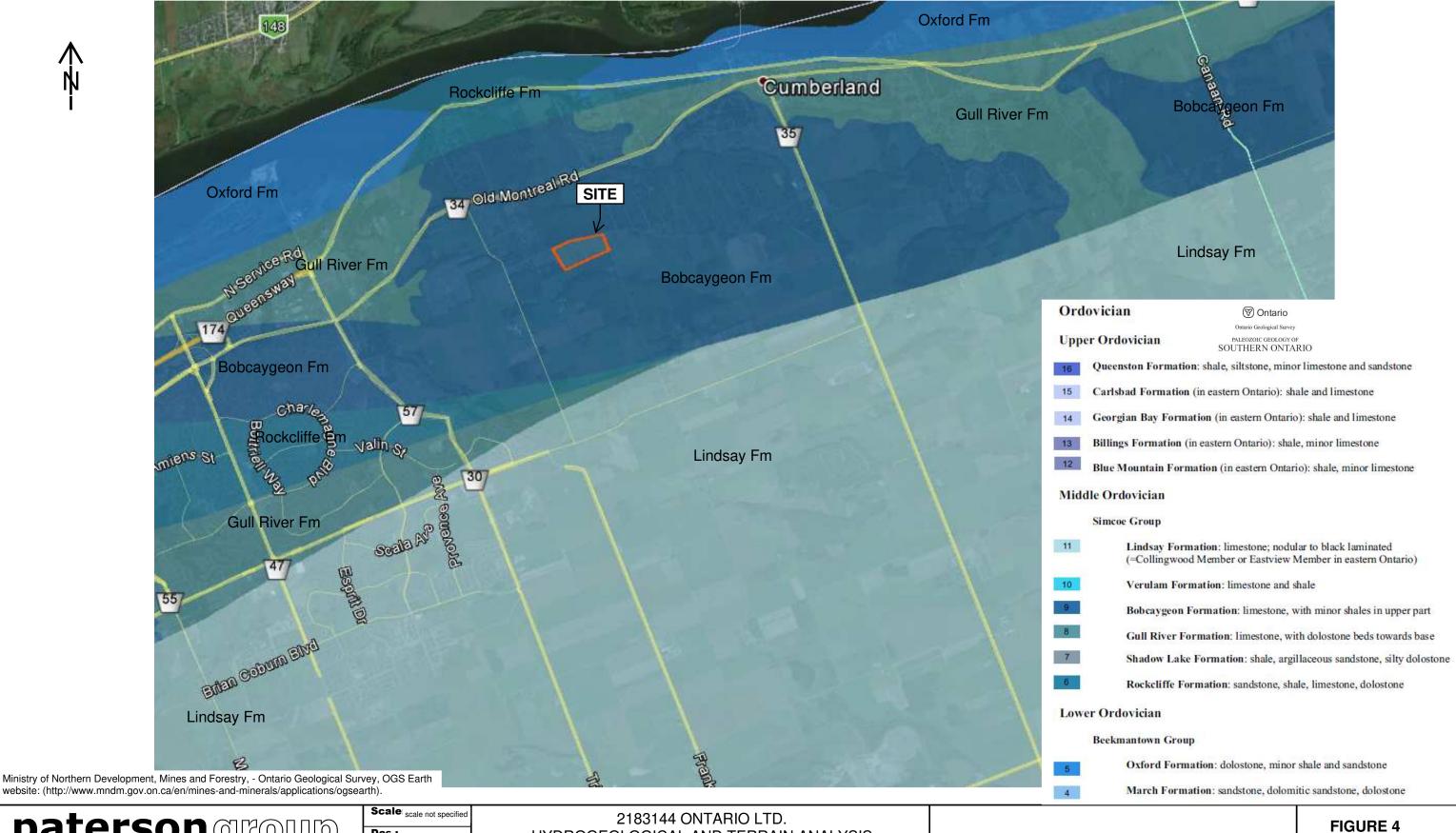
MOECC WATER WELL RECORDS

Scale:	SEE FIGURE	Drawn by:	RLC	
File:	PH1236	Checked by:	-	

FIGURE 2







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consulting engineers 154 Colonnade Road South, Ottawa, Ontario K2E 7J5 Des.: RLC

Dwn: RLC

Chkd:

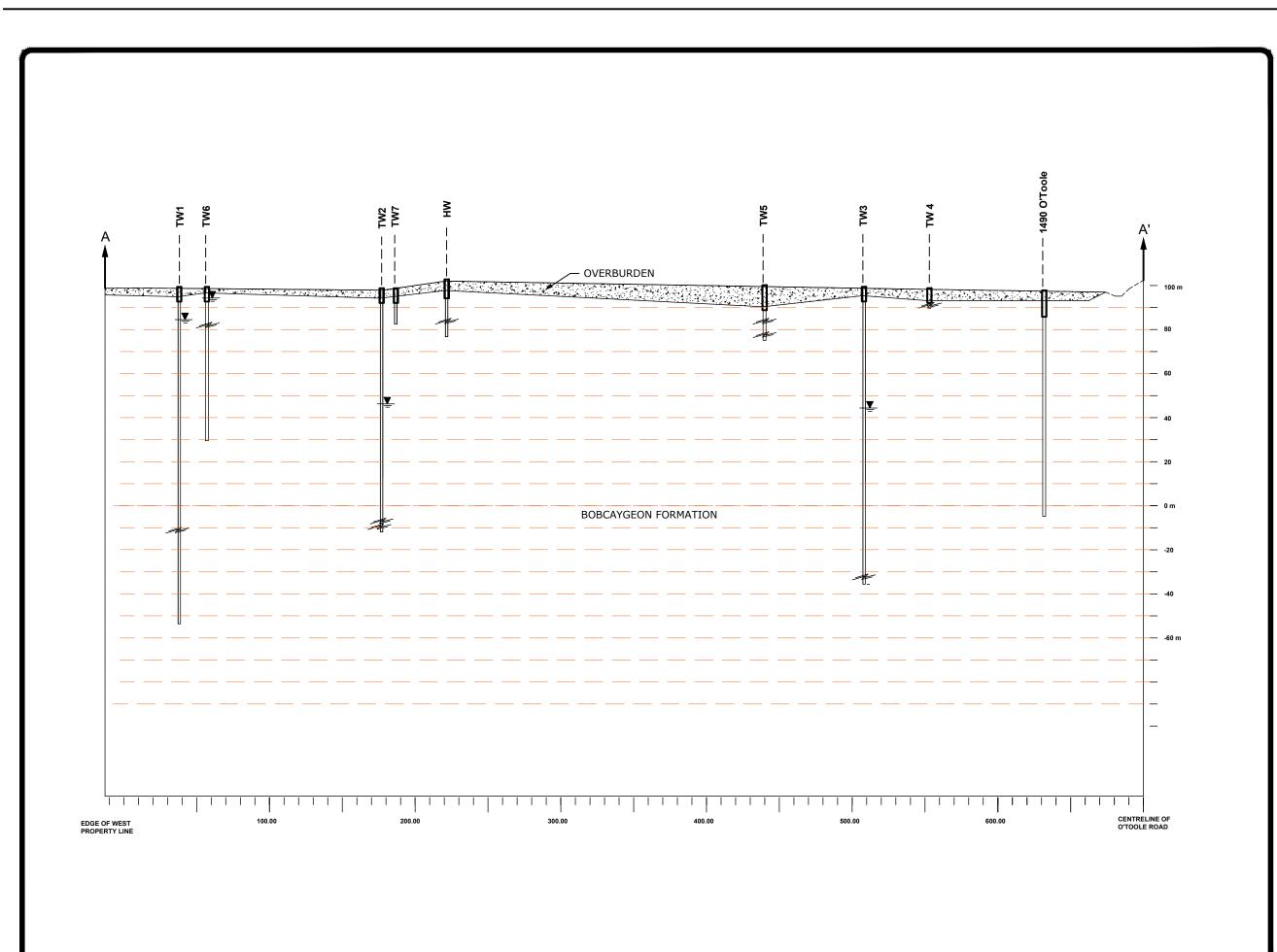
HYDROGEOLOGICAL AND TERRAIN ANALYSIS 1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO

### **BEDROCK MAPPING**

Report No.: PH1236-REP.03

2-NOV-2015





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1730 WILAVEN DRIVE CUMBERLAND, ONTARIO

**CROSS** 

**SECTION** 

1:2500

PH1236

Drawn by:

Checked by:

FIGURE 6

b:\autocad drawings\hydrogeology\ph12xx\ph1236 wilhaven\august 2016\ph1236-wilhaven - 11-aug-16.dwg

RLC

SW

Drawing:

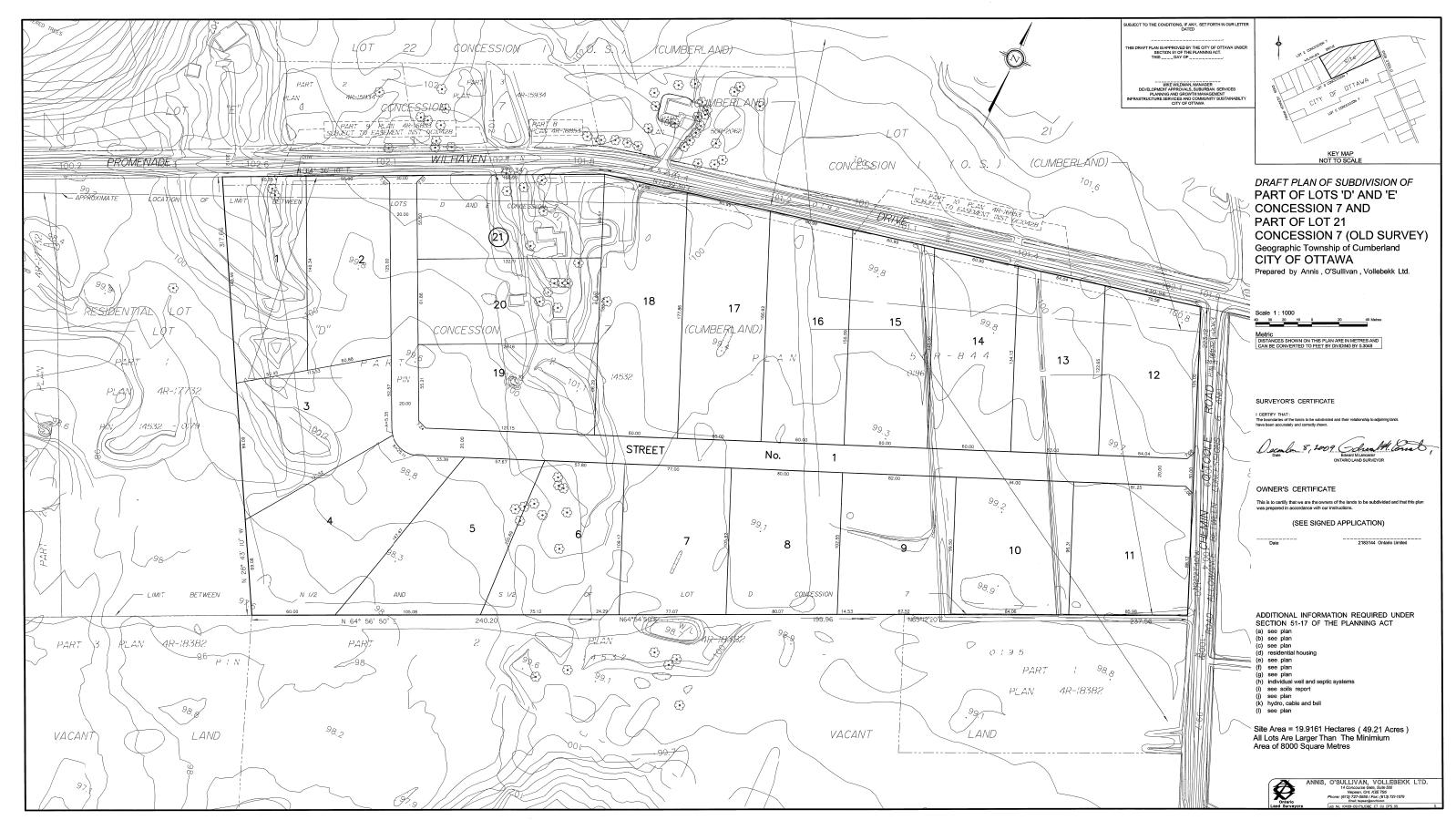
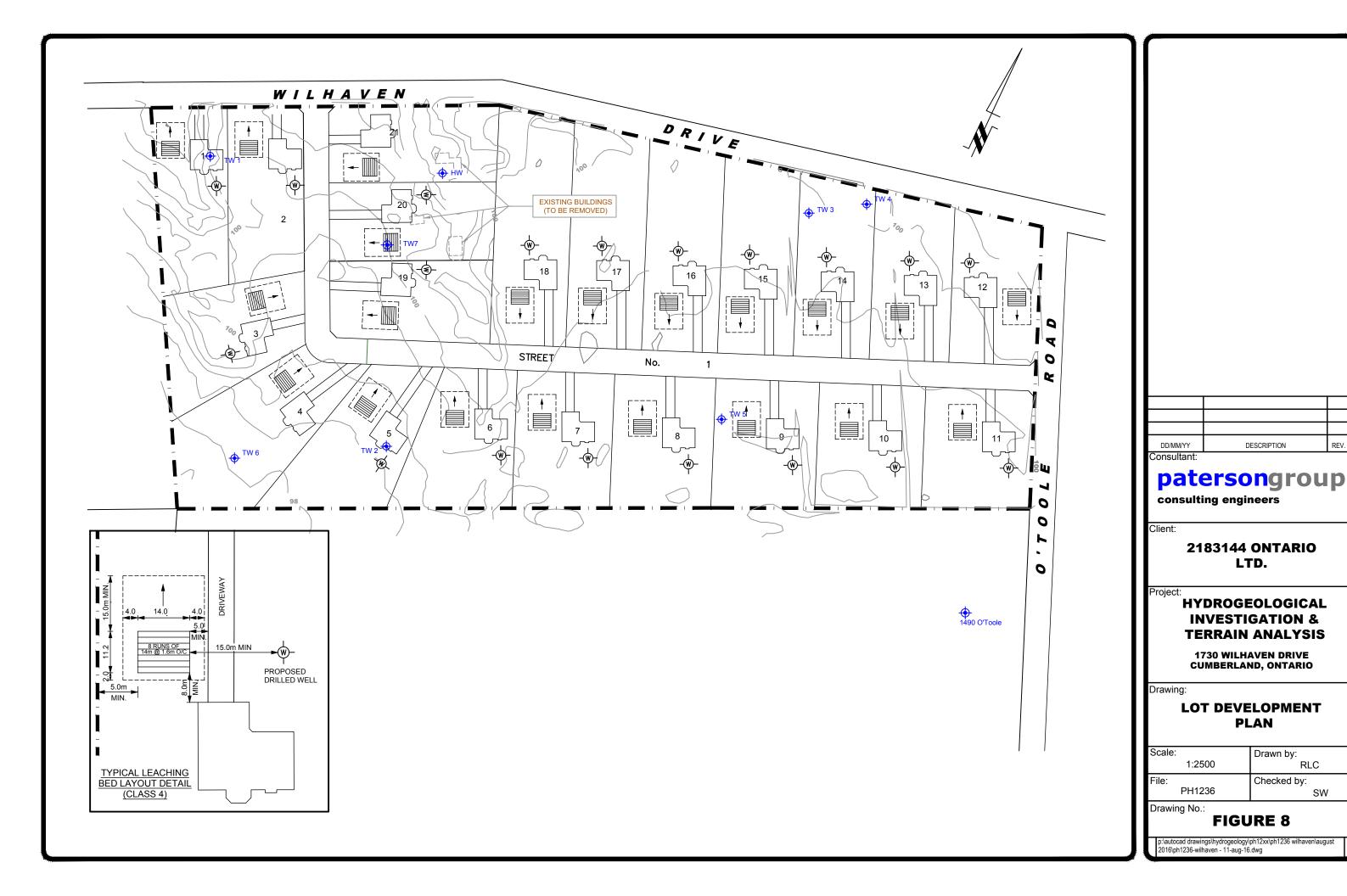


FIGURE 7
DRAFT PLAN OF SURVEY



SW