Geotechnical Engineering

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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

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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 (http://maps.ottawa.ca/geoottawa/):

- 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
  - Rural residential lots
  - Forest
- East
  - O'Toole Road right-of-way
  - Agricultural land (pasture and crop land)
  - Agricultural buildings (two sheds)
  - Residential lots
- West
  - Agricultural land (pasture and crop land)
  - Residential lots
  - Wilhaven Drive
- South
  - Agricultural land (crop land)
  - Unused partially cleared land
  - 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^2, or (i.e. slightly more than 0.8 hectares (Ha)). The lots range in size from 8,043 m^2 to 11,100 m^2. The average lot size is 8,761 m^2. The lot sizes are consistent with the current City of Ottawa zoning for the property (City of Ottawa, Official Plan, Rural Designations, 2016).

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: http://www.ontario.ca/environment-and-energy/map-well-records

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

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	101.5	45
1535703	2005	1.21	6.66	77.3	84.8	23
7113105	2008	5.18	6.40	93.6 131.7	134.1	34
1513095	1956	1.83	6.40	21.0	21.0	
1513100	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	151.5	23
1512686	1969	2.44	6.10	44.5	44.5	27
1513924	1973	0.00	6.71	33.2	33.2	18
1517909	1982	5.18	6.40	57.9 78.6	82.6	9
1517920	1982	3.66	12.19	57.6	61.0	9
1534811	2004	0.61	6.70	64.6 84.4 89.3	91.7	12
1534818	2004	1.00	7.81	90.9	98.5	45
1534792	2004	1.80	6.70	66.6	70.1	10
1534791	2004	0.76	6.70	64.0 72.8	75.3	42
1533452	2002	0.61	12.80	121.9	129.5	23
1533134	2002	0.00	12.80	106.7	128.6	5
1512033	1972	0.00	6.71	27.4 68.6 87.2	88.4	23
1512515	1972	1.52	6.40	57.9 64.0 73.2	73.2	36
1512516	1972	1.22	5.49	24.4 29.0	30.5	27
1512685	1966	0.00	3.96	27.4	48.8	9
1513097	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	2008	3.05	9.14	15.0 15.2	152.4	2
7233585	2014	3.65	6.40		155.4	14
1536595	2006	0.60	12.00	121.0	128.0	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 air percussion 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 air percussion 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

effective seal into competent bedrock. The open borehole was advanced using air percussion 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 cable tool 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 cable tool 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.Reg. 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 cable tool 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.

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 air percussion 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. air percussion). 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. air percussion) 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 four most important test wells are TW5, TW6, HW and 1490 O'Toole.

Table 2 - Test Wells Summary

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
Representative Test Wells						
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

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™) 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.

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

PUMPING TESTS SUMMARY								
Well Record ID	Test date	Pumping rate (L/min)	Duration of test (hours)	Static water level (mbtoc)	Drawdown (m)	Recovery (% and time)	Transmissivity (m^2/day)	
							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
Representaive 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

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 CAMERA 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: http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth, 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.

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.

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)

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™ (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^2/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 (m^2/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

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 Cl), 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.

Table 6 - Groundwater Geochemistry - Deep Wells

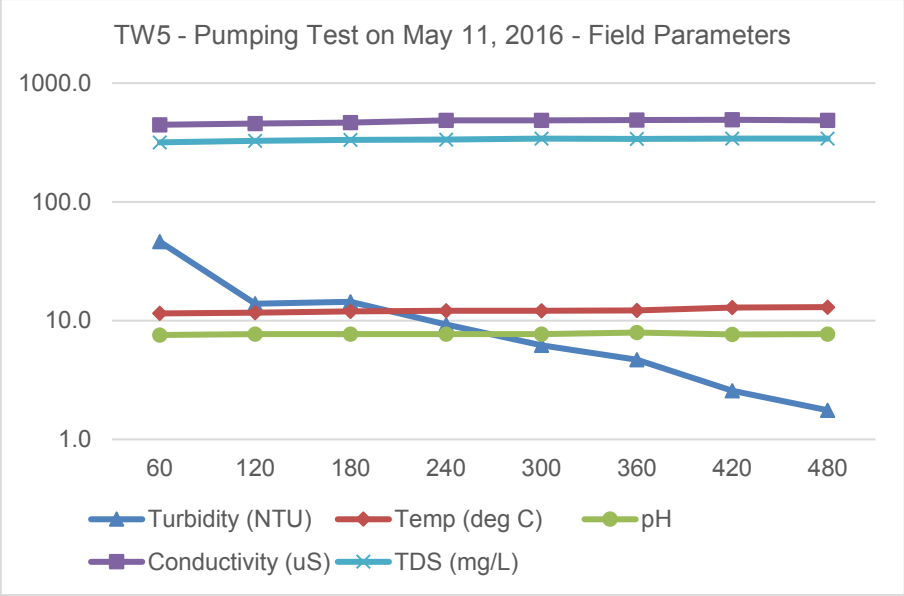
GROUNDWATER GEOCHEMISTRY - DEEP WELLS											
		ODWS	TW1		TW2		TW3		1490 O'Toole		
			03-Dec-09		01-Dec-09		02-Dec-09		16-Mar-16		22-Mar-16
Parameters	Units	Limit	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	3 Hour	6 Hour	7 hour
Microbiological Parameters (Health)											
Escherichia Coli	ct/100 mL	0[MAC]	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	0[MAC]	0	60	0	0	11	0	0	0	-
Chemical Parameters (Health)											
Fluoride	mg/L	1.5[MAC]	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[MAC]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Nitrate	mg/L	10[MAC]	0.41	0.42	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines											
Alkalinity	mg/L	500[OG]	408	403	212	213	244	244	235	241	-
Chloride	mg/L	250[AO]	718	666	153	153	304	305	16	22	-
Colour	TCU	5[AO]	<2	<2	<2	<2	10	5	2	<2	-
DOC	mg/L	5[AO]	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[AO]	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.02	<0.02	-
pH	pH units	6.5-8.5[AO]	7.81	7.85	8.18	8.18	7.88	7.93	8.06	8.1	-
Sulphate	mg/L	500[AO]	121	117	295	287	768	784	18	23	-
Hardness	mg/L	100[OG]	808	662	166	157	687	691	210	212	-
Sodium	mg/L	200[AO]	382	418	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[AO]	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[AO]	0.15	0.06	<0.01	<0.01	0.04	0.03	0.03	0.10	0.03
Total Dissolved Solids	mg/L	500[AO]	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	1[MAC]	81.7	15.4	0.7	0.3	19.4	1.3	95	>100	5
NOTE:	MAC = Maximum Acceptable Concentration; OG = Operational Guideline; AO = Aesthetic Objective										
	ODWS = Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2003)										

Shallow Wells

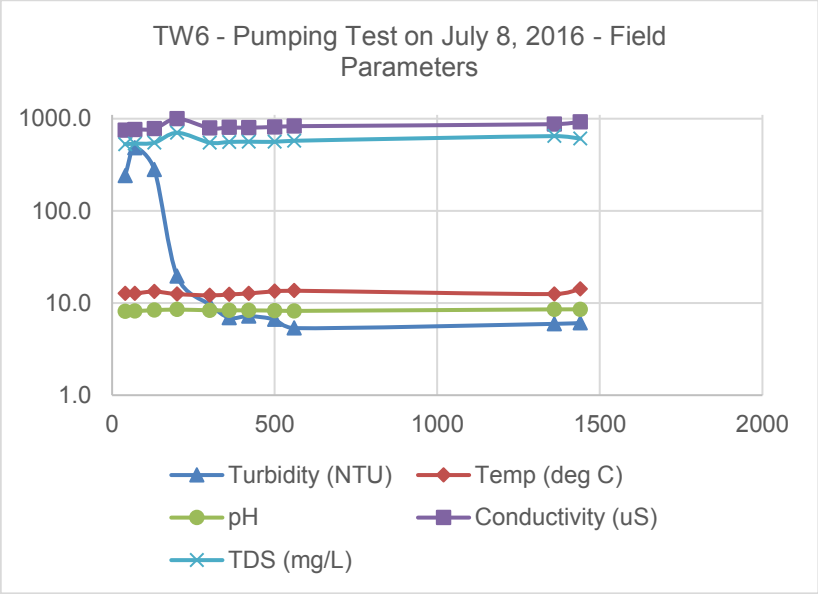
For the purpose of this report the term 'shallow wells' refers to wells that are less than 70 m in depth. All of the shallow wells are completed in the 'upper bedrock aquifer zone'. Analytical results from TW4 and TW5 are summarized in Table 7 below. Analytical results from TW6 and HW are summarized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

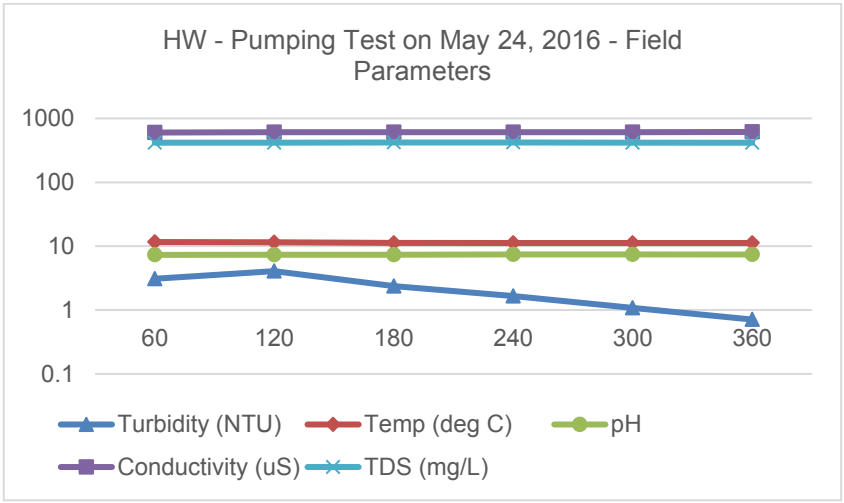


Table 7 - Groundwater Geochemistry – Shallow Wells (A)

GROUNDWATER GEOCHEMISTRY - SHALLOW WELLS (A)										
		ODWS	TW4				TW5			
			15-Dec-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 Hour
Microbiological Parameters (Health)										
Escherichia Coli	ct/100 mL	0[MAC]	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[MAC]	0	0	50	62	2	0	0	0
Chemical Parameters (Health)										
Fluoride	mg/L	1.5[MAC]	<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[MAC]	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10[MAC]	<0.10	<0.10	0.89	0.91	<0.10	<0.10	<0.10	<0.10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines										
Alkalinity	mg/L	500[OG]	193	180	266	278	242	242	258	250
Chloride	mg/L	250[AO]	43	31	69	72	20	24	21	24
Colour	TCU	5[AO]	11	10	6	5	5	9	2	<2
DOC	mg/L	5[AO]	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[AO]	<0.01	<0.01	<0.002	<0.002	<0.01	<0.01	<0.02	<0.02
pH	pH units	6.5-8.5[AO]	8.06	8.02	8.02	7.97	7.9	7.83	8.21	8.16
Sulphate	mg/L	500[AO]	27	21	34	34	14	16	13	13
Hardness	mg/L	100[OG]	206	182	338	343	257	267	260	262
Sodium	mg/L	200[AO]	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[AO]	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[AO]	<0.01	<0.01	<0.01	<0.01	0.14	0.14	0.13	0.11
Total Dissolved Solids	mg/L	500[AO]	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	<0.001
Turbidity (lab)	NTU	5[AO]	3.0	1.2	3.1	1.3	38.5	11.6	6.9	1.6
NOTE:	MAC = Maximum Acceptable Concentration; OG = Operational Guideline; AO = Aesthetic Objective									
	ODWS = Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2003)									

Table 8 - Groundwater Geochemistry – Shallow Wells (B)

GROUNDWATER GEOCHEMISTRY - SHALLOW WELLS (B)								
		ODWS	TW6			HW		
			17-Dec-11		09-Jul-16	08-Dec-09		24-May-16
Parameters	Units	Limit	6 Hour	22 Hour	24 Hour	3 Hour	6 Hour	6 Hour
Microbiological Parameters (Health)								
Escherichia Coli	ct/100 mL	0 MAC	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/1 mL	not specified	14	14	-	8	5	16
Total Coliforms	ct/100 mL	0 MAC	0	0	-	90	2	0
Chemical Parameters (Health)								
Fluoride	mg/L	1.5 MAC	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 MAC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrate	mg/L	10 MAC	<0.10	<0.10	0.12	<0.10	<0.10	<0.10
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines								
Alkalinity	mg/L	500 OG	263	285	296	257	258	283
Chloride	mg/L	250 AO	41	106	94	24	25	39
Colour	TCU	5 AO	12	11	<2	7	<2	<2
DOC	mg/L	5 AO	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 AO	<0.01	<0.01	<0.02	0.06	0.01	<0.02
pH	pH units	6.5-8.5 AO	8.38	8.42	8.27	7.74	7.76	7.96
Sulphate	mg/L	500 AO	42	63	61	19	20	19
Hardness	mg/L	100 OG	70	70	98	274	277	341
Sodium	mg/L	200 AO	141	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 AO	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 AO	0.01	<0.01	<0.01	0.04	0.04	0.03
Total Dissolved Solids	mg/L	500 AO	457	644	597	377	382	408
Tannin & Lignin	mg/L	not specified	n/a	<0.1	<0.1	<0.1	<0.1	<0.1
Phenols	mg/L	not specified	n/a	<0.001	<0.001	<0.001	<0.001	<0.001
Turbidity (lab)	NTU	5 AO	27.7	5.8	4.6	15.1	6.7	1.6
NOTE:	MAC = Maximum Acceptable Concentration; OG = Operational Guideline; AO = Aesthetic Objective							
	ODWS = Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2003)							

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 ''upper bedrock aquifer zone' 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

GROUNDWATER GEOCHEMISTRY - ADDITIONAL PARAMETERS				
		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[OG]	0.01	<0.01
Arsenic	mg/L	0.025[IMAC]	<0.001	<0.001
Boron	mg/L	5[IMAC]	0.05	0.02
Barium	mg/L	1[MAC]	0.14	0.18
Beryllium	mg/L	not specified	<0.0005	<0.0005
Cadmium	mg/L	0.005[MAC]	<0.0001	<0.0001
Chromium	mg/L	0.05[MAC]	<0.001	<0.001
Copper	mg/L	1.0[AO]	<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[MAC]	<0.001	<0.001
Antimony	mg/L	0.006[MAC]	<0.0005	<0.0005
Sellenium	mg/L	0.01[MAC]	<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[MAC]	<0.001	<0.001
Zinc	mg/L	5[AO]	<0.01	<0.01
Mercury	mg/L	0.001[MAC]	<0.0001	<0.0001
Petroleum Hydrocarbons				
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

MAC = Maximum Acceptable Concentration; OG = Operational Guideline; AO = Aesthetic Objective
ODWS = Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2003)

Table 10 - Groundwater Geochemistry - VOCs

BEDROCK GROUNDWATER GEOCHEMISTRY - VOCs			
PARAMETER	**UNITS**	**HW**	***ODWS LIMIT***
		24-May-16	
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*[MAC]
1,2-dichlorobenzene	ug/L	<0.4	*200*[MAC] / *3*[AO]
1,2-dichloroethane	ug/L	<0.2	*5*[MAC]
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*[MAC] / *1*[AO]
Benzene	ug/L	<0.5	*5*[MAC]
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*[MAC]
Chloroform	ug/L	<0.5	-
Dibromochloromethane	ug/L	<0.3	-
Dichlorodifluoromethane	ug/L	<0.5	-
Dichloromethane	ug/L	<4.0	*50*[MAC]
Ethylbenzene	ug/L	<0.5	*2.4*[AO]
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*[MAC] / *30*[AO]
o-xylene	ug/L	<0.4	-
Styrene	ug/L	<0.5	-
t-1,2-Dichloroethylene	ug/L	<0.4	-
t-1,3-Dichloropropylene	ug/L	<0.2	-
Tetrachloroethylene	ug/L	<0.3	*30*[MAC]
Toluene	ug/L	<0.5	*24*[AO]
Trichloroethylene	ug/L	<0.3	*5*[MAC]
Trichlorofluoromethane	ug/L	<0.5	-
Vinyl Chloride	ug/L	<0.2	*2*[MAC]
Xylene; total	ug/L	<0.5	*300*[AO]

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

GROUNDWATER GEOCHEMISTRY - OFFSITE WELLS				
		ODWS	1753 Wilhaven	1865 Wilhaven
Parameters	**Units**	**Limit**	07-Jul-16	07-Jul-16
Microbiological Parameters (Health)				
Escherichia Coli	ct/100 mL	0[MAC]	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[MAC]	5	11
Chemical Parameters (Health)				
Fluoride	mg/L	1.5[MAC]	<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[MAC]	<0.10	<0.10
Nitrate	mg/L	10[MAC]	0.6	2.23
Chemical Parameters with Aesthetic Objectives/ Operational Guidelines				
Alkalinity	mg/L	500[OG]	273	347
Chloride	mg/L	250[AO]	16	153
Colour	TCU	5[AO]	3	3
DOC	mg/L	5[AO]	2.0	2.8
Conductivity	uS/cm	not specified	529	1220
Hydrogen Sulfide	mg/L	0.05[AO]	<0.02	<0.02
pH	pH units	6.5-8.5[AO]	7.86	7.83
Sulphate	mg/L	500[AO]	16	85
Hardness	mg/L	100[OG]	288	452
Sodium	mg/L	200[AO]	9	84
Calcium	mg/L	not specified	107	135
Potassium	mg/L	not specified	<1	5
Iron	mg/L	0.3[AO]	0.06	0.03
Magnesium	mg/L	not specified	5	28
Manganese	mg/L	0.05[AO]	<0.01	<0.01
Total Dissolved Solids	mg/L	500[AO]	344	793
Tannin & Lignin	mg/L	not specified	<0.1	<0.1
Phenols	mg/L	not specified	<0.001	<0.001
Turbidity (lab)	NTU	5[AO]	0.5	0.3
MAC = Maximum Acceptable Concentration; OG = Operational Guideline; AO = Aesthetic Objective ODWS = Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2003)				

The analytical results from 1753 Wilhaven Drive show that one parameter (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 (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 x 5 = 18.75 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.

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 COMPARION				
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 Ottawa	326	2.72	13.6	1,630
CMHC	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.

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.

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.

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.

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 aquifer 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

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 aquifer.

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.

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.

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.

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.

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.

- 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-title-master-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). https://dr6j45jk9xcmk.cloudfront.net/documents/4410/a-wwbmp-title-master-table-of-contents-chapter-1.pdf

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.

- Future owners of individual onsite wastewater treatment systems should familiarize themselves with basic safety and maintenance information which is available at: http://www.omafra.gov.on.ca/english/environment/facts/sep_smart.htm

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

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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.

9.0 REFERENCES

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Appendix 1

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

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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 Ottawa.

FILE NO. **PH1236**

REMARKS

HOLE NO. **TP 1-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.50
TOPSOIL 0.23							
Brown **SILTY SAND** with clay		G	1				
0.81						1	99.50
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders		G	2				
3.02						2	98.50
End of Test Pit						3	97.50
Refusal on inferred bedrock @ 3.02m depth							
(Water infiltration @ 2.6m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1236**

REMARKS

HOLE NO. **TP 2-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.25
TOPSOIL 0.25		G	1				
Brown **SILTY CLAY** 1.22						1	98.25
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders 1.65		G	2				
GLACIAL TILL: Coarse sand with gravel, clay, cobbles and boulders 2.44						2	97.25
End of Test Pit (Water infiltration @ 0.9m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. PH1236

REMARKS

HOLE NO. TP 3-09

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.10
TOPSOIL 0.25							
Brown **SILTY CLAY,** some sand 0.60		G	1				
GLACIAL TILL: Grey-brown silty clay with sand, gravel and cobbles 0.86		G	2				
		G	3			1	98.10
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders		G	4			2	97.10
2.72							
End of Test Pit (Water infiltration @ 1.6m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

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Ottawa, Ontario

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FILE NO. **PH1236**

REMARKS

HOLE NO. **TP 4-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.50
TOPSOIL 0.25							
Brown **SILTY CLAY,** some sand and gravel 0.71		G	1				
		G	2			1	99.50
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 2.34						2	98.50
End of Test Pit Refusal on inferred bedrock surface @ 2.34m depth (Water infiltration @ 1.6m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

▽

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

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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REMARKS

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

FILE NO. **PH1236**

HOLE NO. **TP 5-09**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.80
TOPSOIL 0.23							
Brown **SILTY SAND** with clay 0.60		G	1				
Red-brown **SILTY CLAY** 0.94		G	2			1	98.80
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders						2	97.80
2.59							
End of Test Pit							
(Water infitlration @ 1.0m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

▽

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

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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.

FILE NO. PH1236

REMARKS

HOLE NO. TP 6-09

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.60
TOPSOIL 0.30		G	1				
Brown **SILTY CLAY,** some sand						1	98.60
1.47							
Interlayered **SAND** and **SILTY CLAY** 1.68		G	2				
Stiff, brown **SILTY CLAY**						2	97.60
- grey by 2.3m depth							
2.59							
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders 2.74		G	3				
End of Test Pit							
(Water infiltration @ 1.5m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

▽

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

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1236**

REMARKS

HOLE NO. **TP 7-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.20		
TOPSOIL 0.23									
Brown **SANDY SILT,** trace clay 1.07						1	98.20		▽
GLACIAL TILL: Brown fine to coase sand with gravel, cobbles and boulders - grey by 2.1m depth		G	1			2	97.20		
2.90									
End of Test Pit (Water infiltration @ 1.1m depth)									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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REMARKS

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

FILE NO. **PH1236**

HOLE NO. **TP 8-09**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.00		
TOPSOIL 0.25									
Brown **SANDY SILT,** trace clay						1	98.00		▽
2.41						2	97.00		
Brown fine to medium sand with clay seams 2.84									
Firm, grey **SILTY CLAY** 3.05		G	1			3	96.00		
End of Test Pit (Water infiltration @ 1.5m depth)									

Water Content % scale: 20 40 60 80

Shear Strength (kPa) scale: 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1236**

REMARKS

HOLE NO. **TP 9-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.80
TOPSOIL 0.28							
Brown **SANDY SILT,** trace clay						1	98.80
1.58							
Firm, brown **SILTY CLAY**		G	1				
1.83						2	97.80
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders							
3.05						3	96.80
End of Test Pit							
(Water infiltration @ 0.8m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

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REMARKS

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

FILE NO. **PH1236**

HOLE NO. **TP10-09**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.50		
TOPSOIL 0.25									
Brown **SANDY SILT,** trace clay						1	98.50		
1.98									
Firm, grey **SILTY CLAY** with sand						2	97.50		
3.56									
GLAICAL TILL: Grey silty clay with sand, gravel, cobbles and boulders 3.81						3	96.50		
End of Test Pit									
(Water infiltration @ 0.9m depth)									

Water Content % scale: 20 40 60 80

Shear Strength (kPa) scale: 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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REMARKS

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

FILE NO. **PH1236**

HOLE NO. **TP11-09**

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.30
TOPSOIL 0.30							
Brown **SANDY SILT,** trace clay						1	98.30
2.34						2	97.30
Grey **SILTY CLAY,** trace sand						3	96.30
3.50							
GLACIAL TILL: Grey silty sand with clay, gravel, cobbles and boulders 3.83							
End of Test Pit							
(Water infiltration @ 2.0m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

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

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SOIL PROFILE AND TEST DATA

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FILE NO. **PH1236**

REMARKS

HOLE NO. **TP12-09**

BORINGS BY Hydraulic Shovel DATE 3 Dec 09

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	100.50	20 40 60 80	
TOPSOIL 0.28									
GLACIAL TILL: Brown silty sand with clay, gravel, cobbles and boulders						1	99.50		
						2	98.50		▽
2.90									
End of Test Pit (Water infiltration @ 2.1m depth)								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

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, %
LL	-	Liquid limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
Pi	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

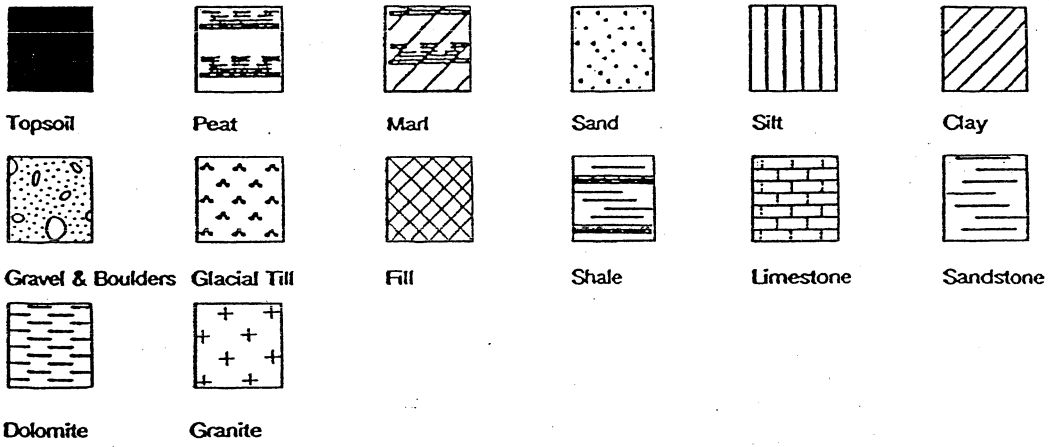
CONSOLIDATION TEST

p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	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.

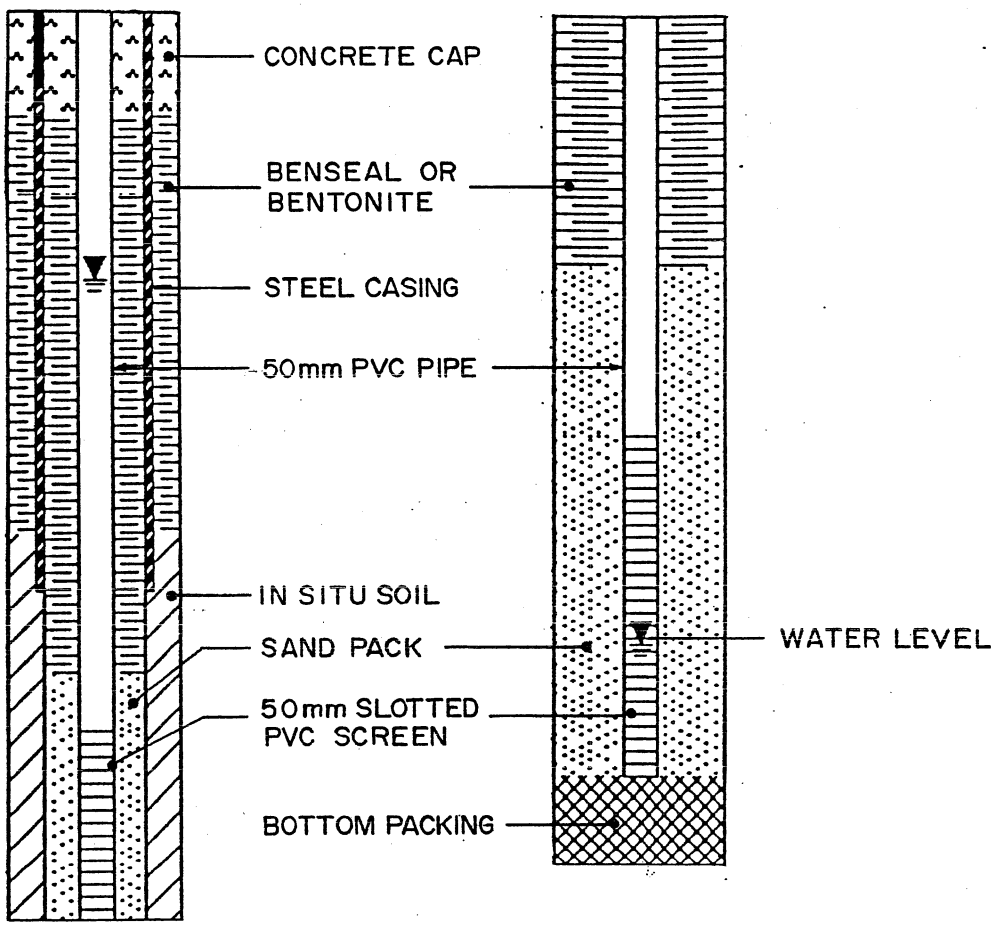
STRATA PLOT

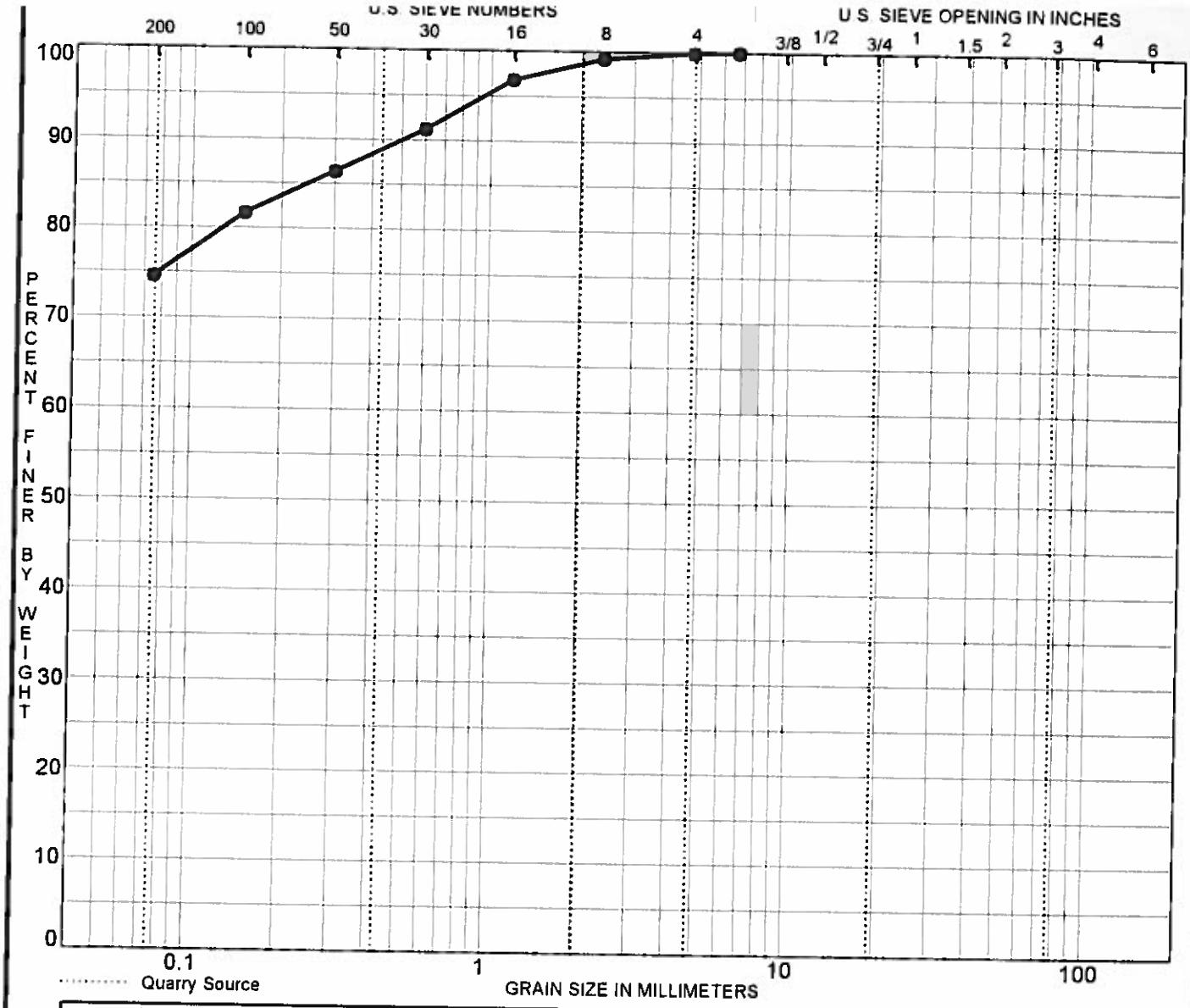


MONITORING WELL AND PIEZOMETER CONSTRUCTION

Monitoring Well Construction

Piezometer Construction





SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP 2-09	G1	SILTY CLAY						
⧗									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP 2-09	G1	6.70				0.1	25.3	74.6	
⧗										
▲										
★										

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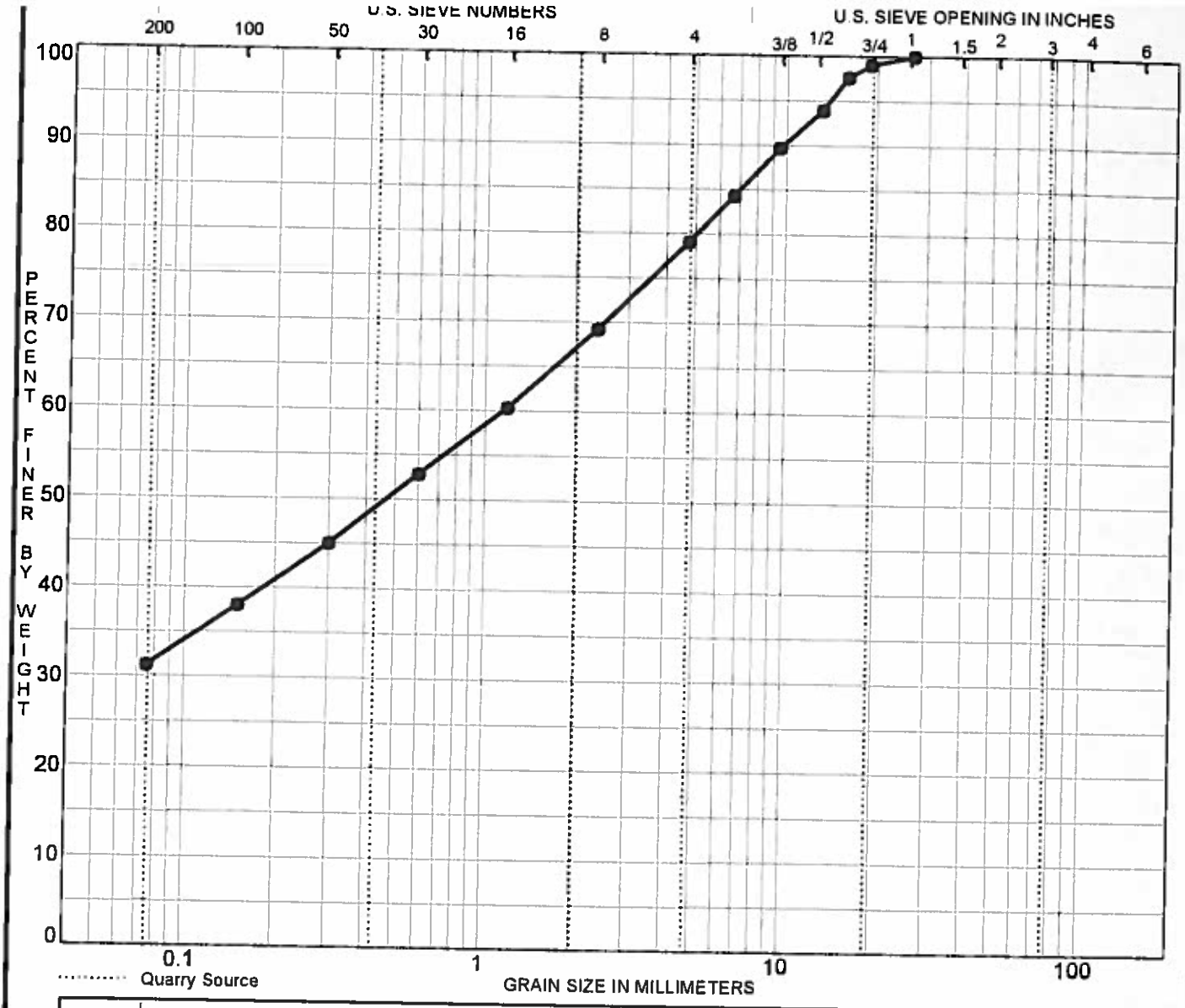
GRAIN SIZE DISTRIBUTION



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP 6-09	G3	GLACIAL TILL (MARINE)						
⧗									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP 6-09	G3	26.50	1.15			20.9	47.9	31.2	
⧗										
▲										
★										

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DATE 3 Dec 09

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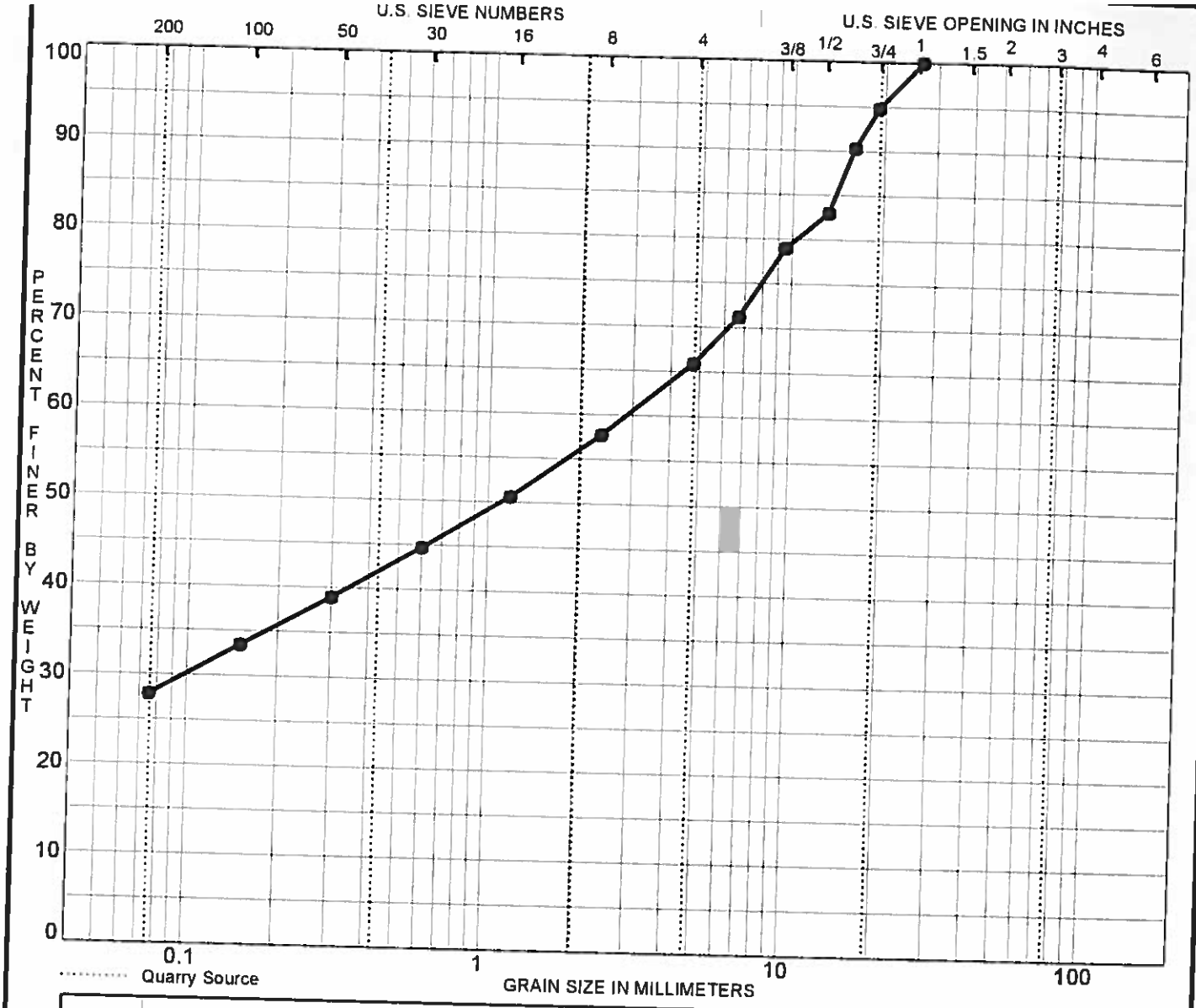
GRAIN SIZE DISTRIBUTION



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP 7-09	G1	GLACIAL TILL (MARINE)						
⧗									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP 7-09	G1	26.50	2.87	0.098		34.1	38.1	27.8	
⧗										
▲										
★										

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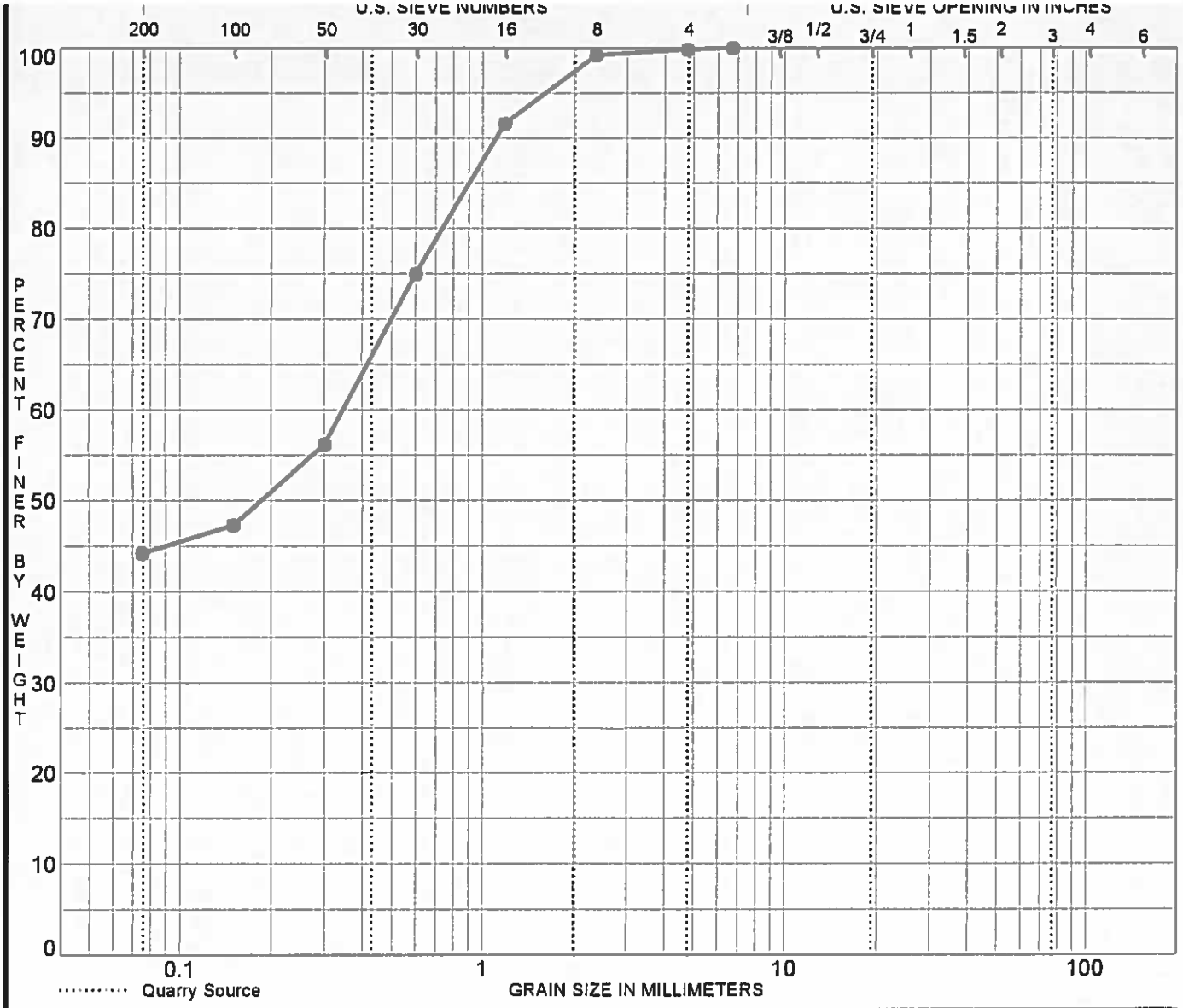
GRAIN SIZE DISTRIBUTION



SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP 9-09	G1	SANDY CLAYEY SILT						
⧗									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP 9-09	G1	6.70	0.35			0.2	55.6	44.2	
⧗										
▲										
★										

CLIENT 2183144 Ontario Limited
FILE NO. PH1236
PROJECT Terrain Analysis & Hydrogeological Study - 1730 Wilhaven Drive
DATE 3 Dec 09

patersongroup Consulting Engineers
28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION

Appendix 2

- **MOECC Water Well Records**

A 089388

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Sticker supplied by MOE) A089388

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

TW1

TW1

7134727

Well Owner's Information

First Name: FRED | Last Name / Organization: FARS | E-mail Address: | Well Constructed by Well Owner: 9218314 Ontario

Mailing Address (Street Number/Name): 1285 Byrnes Terrace | Municipality: Cumberland | Province: Ont | Postal Code: K4C 1A9 | Telephone No. (inc. area code):

Well Location

Address of Well Location (Street Number/Name): #1730 Wilhaven Drive | Township: Cumberland | Lot: N P L D # 7 | Concession:

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Cumberland | Province: Ontario | Postal Code:

UTM Coordinates: Zone: 18 | Easting: 465558 | Northing: 5038365. | Municipal Plan and Sublot Number: PLAN RP 50R 844 | Other: PART 2

NAD 8 3

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sandy Clay + Gravel			0'	12'6"
	Grey + Black Limestone			12'6"	500'

Test Well #1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20'	10'	Neat Cement Slurry	4.68
10'	0'	Neat Bentonite Slurry	8.4

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	20'
5 7/8"	Open Hole		20'	500'

Construction Record - Screen

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

Status of Well

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

Test #1

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	20'	6"
20'	500'	5 7/8"

Well Contractor and Well Technician Information

Business Name of Well Contractor: Air Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): RR #1 | Municipality: Richmond

Province: ONT | Postal Code: K0A 2Z0 | Business E-mail Address:

Bus. Telephone No. (inc. area code): (613)838-2170 | Name of Well Technician (Last Name, First Name): Purcell Shannon

Well Technician's Licence No. | Signature of Technician and/or Contractor | Date Submitted: Oct 23 2009

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 300'

Pumping rate (l/min / GPM): 1

Duration of pumping: ___ hrs + 0 min

Final water level end of pumping (m/ft): 219'

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

Recommended pump depth (m/ft): 490'

Recommended pump rate (l/min / GPM): 1

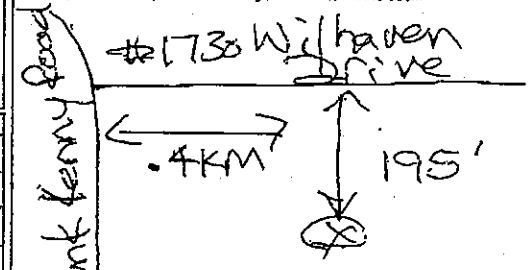
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	46'7"		219'
1	51'8"	1	193'
2	54'6"	2	193'
3	58'	3	192'8"
4	61'6"	4	192'5"
5	64'8"	5	192'1"
10	84'9"	10	190'3"
15	96'7"	15	188'9"
20	114'	20	186'7"
25	128'5"	25	184'9"
30	142'8"	30	183'1"
40	169'8"	40	178'
50	194'6"	50	173'2"
60	219'	60	168'

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test well #1

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2009/11/13	Audit No. Z 102654
	Date Work Completed 2009/10/05	

0506E (12/2007)

Ministry's Copy

TW2

TW2

7134728

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well (If Below) A089412

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name: FRED | Last Name / Organization: FARSI | E-mail Address: 9218314@ontario | ☐ Well Constructed by this Owner

Mailing Address (Street Number/Name): 1235 bylines Terrace | Municipality: Cumberland | Province: Ont | Postal Code: K4C 1A9 | Telephone No. (incl. area code)

Well Location

Address of Well Location (Street Number/Name): #1730 Wilhaven Drive | Township: Cumberland | Lot: N.P.L.D of E | Concession: 7

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Cumberland | Province: Ontario | Postal Code

UTM Coordinates: NAD 8 3 | Zone: 18 | Easting: 465796 | Northing: 5038121 | Other | Municipal Plan and Sub-lot Number: PLAN #RP 50R 844 Part 2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sandy Clay + Gravel			0'	12'
Grey + Brown	Limestone			12'	360'

Test Well #2

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
2.0'	1.0'	Neat Cement Slurry	4.68
1.0'	0	Neat Bentonite Slurry	8.4

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	22'
5 7/8"	Open hole		20'	360'

Construction Record - Screen

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

Status of Well

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

TW #2

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	20'	6"
20'	360'	5 7/8"

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 300

Pumping rate (l/min / GPM): 12

Duration of pumping: 1 hr + 0 min

Final water level end of pumping (m/ft): 205.7"

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

Recommended pump depth (m/ft): 300'

Recommended pump rate (l/min / GPM): 12

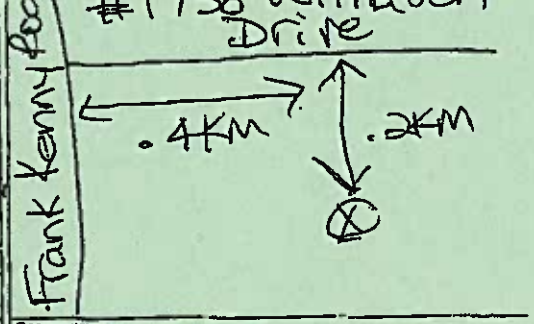
Well production (l/min / GPM): 12

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	195'		205'7"
1	177'	1	190'9"
2	180'4"	2	185'5"
3	183'2"	3	183'4"
4	185'4"	4	182'5"
5	187'6"	5	179'7"
10	193'2"	10	175'9"
15	197'1"	15	174'7"
20	199'	20	173'5"
25	200'	25	172'6"
30	200'9"	30	171'7"
40	202'	40	170'
50	203'8"	50	169'5"
60	205'7"	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #2

Well Contractor and Well Technician Information

Business Name of Well Contractor: Ark Rock DRILLING Co LTD | Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): Box 1 | Municipality: Richmond | Province: ONT | Postal Code: K0A 2Z0 | Business E-mail Address

Bus. Telephone No. (incl. area code): 613 838 2170 | Name of Well Technician (Last Name, First Name): PURCELL SHANNON

Well Technician's Licence No. | Signature of Technician and/or Contractor | Date Submitted: 10/22/2009

Well owner's information package delivered: ☒ Yes ☐ No | Date Package Delivered: 2009/11/13 | Date Work Completed: Dec 9/09

Ministry Use Only: Audit No. Z102633 | Received

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Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

We A 089359 (Print Below) A089359

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

TW3

TW3

7134729

Well Owner's Information

First Name: FRED — Last Name / Organization: FARST — E-mail Address: — Well Constructed by Well Owner

Mailing Address (Street Number/Name): 185 Byrnes Terrace — Municipality: Cumberland — Province: Ont — Postal Code: K4C1A9 — Telephone No. (inc. area code): 9218314

Well Location

Address of Well Location (Street Number/Name): #1730 Wilhaven Drive — Township: Cumberland — Lot: N P/L D&E — Concession: 7

County/District/Municipality: Ottawa-Carleton — City/Town/Village: Cumberland — Province: Ontario — Postal Code:

UTM Coordinates: Zone — Easting — Northing — Municipal Plan and Sublot Number — Other: PLAN # RP50R844 PART 2

NAD 8 3 18 466005 5038417

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Clay & Gravel			0'	11'
	Grey Lime Stone			11'	337'
	Grey + Brown	limestone		337'	405'
	Green	Limestone		405'	422'
	Black	Shale		422'	440'

Test Well # 3

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
30'	10'	Neat Cement Slurry	4.68
10'	0'	Neat Bentonite Slurry	12.5

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	+2'	30'
5 7/8"	Open hole		30'	440'

Construction Record - Screen

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

Other, specify TW3

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water				Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
430'	☐ Fresh	☐ Untested	☐ Gas	☐ Other, specify	0'	30'	6"
Water found at Depth (m/ft)	☐ Fresh	☐ Untested	☐ Gas	☐ Other, specify	30'	440'	5 7/8"
Water found at Depth (m/ft)	☐ Fresh	☐ Untested	☐ Gas	☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 300'

Pumping rate (l/min / GPM):

Duration of pumping: hrs + 5 min

Final water level end of pumping (m/ft): 211'9"

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

Recommended pump depth (m/ft): 300'

Recommended pump rate (l/min / GPM): 6

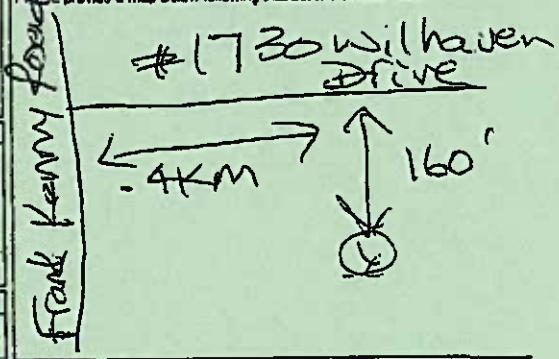
Well production (l/min / GPM): 6

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		178'4"		211'9"
1	1	185'4"	1	201'
2	2	187'9"	2	196'
3	3	190'	3	194'
4	4	192'1"	4	192'6"
5	5	193'7"	5	191'
10	10	199'5"	10	186'
15	15	202'9"	15	181'3"
20	20	204'9"	20	178'4"
25	25	206'2"	25	
30	30	206'9"	30	
40	40	208'4"	40	
60	60	210'	50	
	60	211'9"	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test well #3

Well Contractor and Well Technician Information

Business Name of Well Contractor: AR Rock Drilling Co Ltd — Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): [illegible] — Municipality: Richmond

Province: ONT — Postal Code: K0A2Z0 — Business E-mail Address:

Bus. Telephone No. (inc. area code): 6138382178 — Name of Well Technician (Last Name, First Name): PURCELL Shannon

Well Technician's Licence No. — Signature of Technician and/or Contractor — Date Submitted: [illegible]

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: 2008/11/13

Date Work Completed: 2008/10/10

Ministry Use Only — Audit No.: Z102630 — Received

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **A106363**

TW4

Well Record

Regulation 903 Ontario Water Resources Act

7175490

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
FRED	FARSI		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
1730 WILHAVEN DR	OTTAWA CARELTON	ONT	K2E 7T7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1730 WILHAVEN DR.	FORMERLY CUMBERLAND	N PT OF D & E	7

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARELTON	OTTAWA	Ontario	K2E 7T7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	446604	5038452		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	CLAY		SOFT	0	12
GREY	CLAY		SOFT	12	14½
BROWN	SAND	GRAVEL		14½	17
BRDWN	LIMESTONE			17	28

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	.384

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0½	20
6	OPEN HOLE		20	28

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	9⅞
20	28	6

Results of Well Yield Testing

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

If pumping discontinued, give reason: _____

Pump intake set at (m/ft): 25

Pumping rate (l/min / GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 2.05

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

Recommended pump depth (m/ft): 25

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

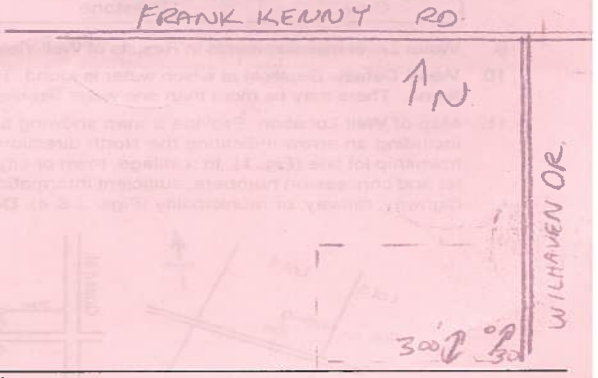
Well production (l/min / GPM): 15+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	.4		
1	2.0	1	.45
2	2.05	2	.45
3	2.05	3	.4
4	2.05	4	.4
5	2.05	5	.4
10	2.05	10	.4
15	2.05	15	.4
20	2.05	20	.4
25	2.05	25	.4
30	2.05	30	.4
40	2.05	40	.4
50	2.05	50	.4
60	2.05	60	.4

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
T. SAUNDERS DRILLING LTD	4 1 8 7 1 9

Business Address (Street Number/Name)	Municipality
RR#1	BRAESIDE

Province	Postal Code	Business E-mail Address
ONT.	K0A 1G0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6 1 3 6 2 3 5 6 4 8	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T 5 1 1 7	Troy Saunders	Y Y Y Y M M D D

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	M M D D Y Y Y Y	M M D D Y Y Y Y

Ministry Use Only

Audit No. z131190

Received

0506E (2007/12)

Well Owner's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A115887

TW5

7175491

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
FRED	FARSI		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1730 WILHAVEN DR.	OTTAWA CARELTON	ONT.	K1E 7T7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1730 WILHAVEN DR	FORMERLY CUMBERLAND	N PT LTS ONE	7

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARELTON	OTTAWA	Ontario	K1E 7T7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	465793	5013982148	NORTH PARTS OF LOTS ONE	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	CLAY		SOFT	0	11½
GREY	CLAY			11½	14½
GREY	SAND	GRAVEL		14½	30
BROWN	LIMESTONE			30	51½
GREY	LIMESTONE			51½	80

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	33½	BENTONITE SLURRY	.704

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0+2	33½
6	OPEN HOLE		33½	80

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
51½	☐	☐ Fresh ☒ Untested ☐ Other, specify	0	33½	9¾
73	☐	☐ Fresh ☐ Untested ☐ Other, specify	33½	80	6
	☐	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 75

Pumping rate (l/min / GPM): 5

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 33.1

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

Recommended pump depth (m/ft): 75

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

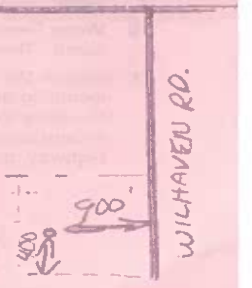
Well production (l/min / GPM): 5+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	6.5		
1	12.1	1	28.2
2	14.3	2	23.5
3	16.3	3	21.5
4	18.1	4	19.9
5	19.4	5	18.3
10	23.9	10	13.1
15	26.7	15	10.0
20	28.6	20	8.5
25	29.8	25	7.5
30	30.8	30	7.2
40	32.1	40	7.0
50	32.7	50	6.9
60	33.1	60	6.85

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
J. SAUNDERS DRILLING LTD	4817

Business Address (Street Number/Name)	Municipality
RR#1	BRAESIDE

Province	Postal Code	Business E-mail Address
ONT.	K0A 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 623 5648	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
15117	Troy Saunders	2016/11/16

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2016/11/16	Audit No. z131189
	Date Work Completed: 2016/11/16	Received

Well Owner's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): **Tag#: A124333**

TW6

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
FRED	FARSI		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1730 WILHAVEN DR.	OTTAWA CARELTON	ONT.	K2E7T7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1730 WILHAVEN DR.	FORMERLY CUMBERLAND	N PT OF ONE	7

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARELTON	OTTAWA	Ontario	K2E7T7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465163	5013810		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	CLAY		SOFT	0	4½
BROWN	SAND	STONES		4½	6½
BROWN	LIMESTONE	LAYERS GREY LIMESTONE		6½	227

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	.256

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0+2	20
6	OPEN HOLE		20	

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
55	☐	☐ Fresh ☒ Untested ☐ Other, specify	0	20	9¾
	☐	☐ Fresh ☐ Untested ☐ Other, specify	20		6
	☐	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 200

Pumping rate (l/min / GPM): 2

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 57.0

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

Recommended pump depth (m/ft): 215

Recommended pump rate (l/min / GPM): 2

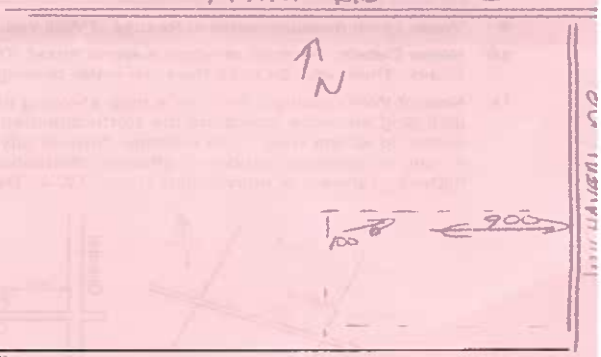
Well production (l/min / GPM): 2

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		14.0		
1	1	11.6	1	55.9
2	2	12.4	2	54.8
3	3	13.7	3	54.3
4	4	15.2	4	53.8
5	5	16.3	5	53.5
10	10	22.1	10	51.4
15	15	26.9	15	49.5
20	20	31.2	20	47.6
25	25	32.8	25	45.7
30	30	32.9	30	44.0
40	40	40.8	40	40.6
50	50	49.5	50	37.4
60	60	57.0	60	35.0

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
T. SAUNDERS DRILLING LTD	4181719

Business Address (Street Number/Name)	Municipality
RR#1	BRAESIDE

Province	Postal Code	Business E-mail Address
ONT	K0A1K0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 623 5618	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
71517	Troy Saunders	21 11 2016

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 21 11 2016

Date Work Completed: 21 11 2016

Ministry Use Only

Audit No. z131191

Received

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Well Owner's Copy

TW7

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

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

Tag#: A124334

Well Record

Regulation 903 Ontario Water Resources Act

Page ___ of ___

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1730 WILHAVEN DR.	FORMERLY CUMBERLAND	N PT 01 DTE	

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARLETON	OTTAWA	Ontario	K2E 7T7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465719	5038274		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	LOAM			0	1±
BROWN	CLAY		DENSE	1±	3
BROWN	GRAVEL	STONES		3	8±
BROWN	LIMESTONE			8±	80

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	.224

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0+2	20
6	OPEN HOLE		20	80

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	9¾
20	80	6

Results of Well Yield Testing

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

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 75

Pumping rate (l/min / GPM): 1

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 34.0

If flowing give rate (l/min / GPM): —

Recommended pump depth (m/ft): 75

Recommended pump rate (l/min / GPM): 1

Well production (l/min / GPM): .25

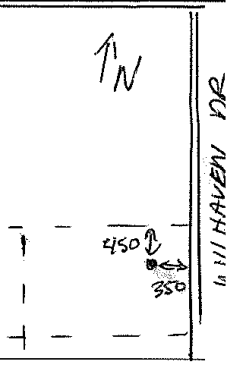
Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	4.8			
1	10.0	1	32.6	
2	10.9	2	32.3	
3	11.5	3	31.7	
4	12.0	4	30.6	
5	12.6	5	29.4	
10	15.3	10	27.8	
15	17.8	15	27.0	
20	20.5	20	26.3	
25	22.2	25	25.7	
30	24.4	30	25.1	
40	27.7	40	23.7	
50	31.1	50	22.6	
60	34.0	60	21.2	

Map of Well Location

Please provide a map below following instructions on the back.

FRANK KENNY



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
T. SAUNDERS DRILLING LTD	4879

Business Address (Street Number/Name)	Municipality
RR#1	BRAESIDE

Province	Postal Code	Business E-mail Address
ONT.	K0A 1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6136235648	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T5117	Troy Saunders	2012/01/06

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2011/12/06	Audit No. Z131192
	Date Work Completed: 2011/12/06	JAN 24 2012 Received

0506E (2007/12)

Ministry's Copy

Ontario Ministry of Environment and Energy

WATER WELL RECORD

House Well (HW)

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

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	Cumberland	7				D

Owner's surname: Fitzpatrick — First Name: Earle & — Address of Well Location: 1730 Wilhaven Drive Ont. K0A1S0 Cumberland — Date completed: 30/09/03 (day/month/year)

Zone — Easting — Northing

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Till	Boulders	Dense	0	10
Grey	Till	"	"	10	14
Grey	limestone Rock	Shale	Layered	14	83

WATER RECORD

Water found at - feet	Kind of water		
60	☑ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
8 3/4"	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		0	26
6 1/4"	☑ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	+2	26
6"	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		26	83

SCREEN

Slot No. — Diameter inches — Length feet — Material and type — Depth at top of screen feet

PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	26	Cement grout

PUMPING TEST

Pumping test method: ☑ Pump ☐ Bailer — Pumping rate: 7 GPM — Duration of pumping: 1 Hours 0 Mins

Static level: 2 feet — Water level end of pumping: 83 feet

Water levels during ☐ Pumping ☑ Recovery

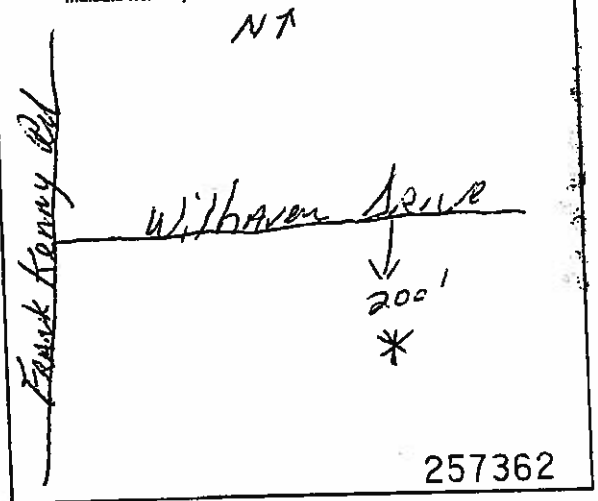
15 minutes	30 minutes	45 minutes	60 minutes
22 feet	22 feet	22 feet	22 feet

If flowing give rate: GPM — Pump intake set at: 83 feet — Water at end of test: ☐ Clear ☑ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 70 feet — Recommended pump rate: 6 GPM

LOCATION OF WELL

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



257362

FINAL STATUS OF WELL

☑ Water supply ☐ Observation well ☐ Test hole ☐ Recharge well
☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering
☐ Unfinished ☐ Replacement well

WATER USE

☑ Domestic ☐ Stock ☐ Irrigation ☐ Industrial
☐ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning
☐ Not use ☐ Other

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☑ Rotary (air)
☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting
☐ Driving ☐ Digging ☐ Other

Name of Well Contractor: Bourgeois well drilling — Well Contractor's Licence No: 1414

Address: Hoot Owl

Name of Well Technician (Driller): Raymond — Well Technician's Licence No: T-0264

Submission date: 30/09/03 (day/mo/yr)

MINISTRY USE ONLY

0506 (06/02) Front Form

CONTRACTOR'S COPY

1490 O'Toole

Ontario — Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Page 3 of 3

Measurements recorded in: ☑ Metric ☐ Imperial

We Tag#: A173263 (below)

173263

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Jean	Gauthier		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1529 Frank-Kenny Rd	Cumberland	ON	K4C1W9	613 907 2917

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1490 O'Toole Rd	1490 O'Toole Rd. Cumberland	DRP	7

County/District/Municipality	City/Town/Village	Province	Postal Code
Lot DRP Con OTTAWA City	Cumberland	Ontario	K4C1W9

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	466335	5032400	4R-28736	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		~~Clay~~ Soft	0	3.63
Grey	SHALE		Loose	3.63	4.54
Grey	Limestone		Hard	4.54	103.03

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
12.12	0	Cement Grout	240 kgs.

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 98 98

Pumping rate (l/min / GPM): 22.00

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping (m/ft): 37.51

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

Recommended pump depth (m/ft): 102.00

Recommended pump rate (l/min / GPM): 22.00

Well production (l/min / GPM): 13.50

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	0.90		33.51
1	1.57	1	35.61
2	2.00	2	34.96
3	2.77	3	34.17
4	3.57	4	33.57
5	4.74	5	32.84
10	9.24	10	29.39
15	13.86	15	25.01
20	17.20	20	22.57
25	20.09	25	19.00
30	22.58	30	15.92
40	27.50	40	10.64
50	32.40	50	6.65
60	37.51	60	3.56

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☑ Rotary (Reverse) 191R ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
25.40	Open Hole		0	12.12
15.55	Steel	0.48	+1.21	12.12

Construction Record - Screen

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

Status of Well

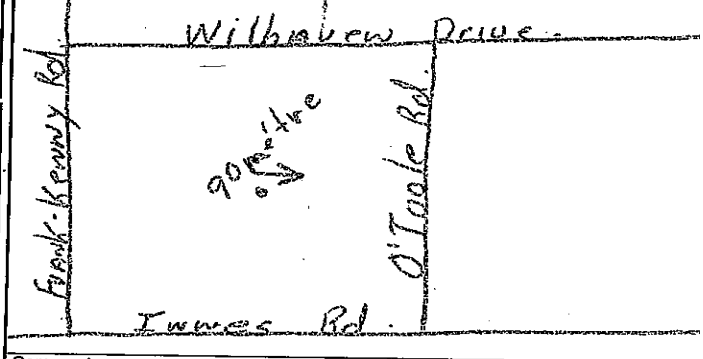
☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
60.10 ☐ Gas	☑ Fresh ☐ Untested ☐ Other, specify	0	103.03	15.55
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DXR-WATER-well Drilling	6010

Business Address (Street Number/Name)	Municipality
1763 - Route 200 west	Navan

Province	Postal Code	Business E-mail Address
ON	K0A3K0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 835 2554	Monette Mark

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
7373		20 05 15

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	20 15 MAY 15	20 15 MAY 15

Ministry Use Only

Audit No Z 197757

Received

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Well Owner's Copy

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

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

11 **1531266** Municipality 1501 Con CON 07

County or District: OTTAWA - Carleton
Township/Borough/City/Town/Village: Cumberland
Address: 1592 - Wilhaven Dr
Con block tract survey, etc.: Con 7
Lot: D
Date completed: 05/07/00 (day/month/year)

21 Northing / NC / Elevation / RC / Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see Instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Clay	Boulder	Loose	0	7
Grey	limestone		Hard	7	35
Brown	SHALE		Broken	35	55
Grey	limestone		Hard	55	203

31
32

41 WATER RECORD

Water found at - feet	Kind of water
100	2 Fresh; 3 Sulphur; 4 Minerals; 5 Gas
176	2 Fresh; 3 Sulphur; 4 Minerals; 5 Gas
	1 Fresh; 2 Salty; 3 Sulphur; 4 Minerals; 5 Gas
	1 Fresh; 2 Salty; 3 Sulphur; 4 Minerals; 5 Gas
	1 Fresh; 2 Salty; 3 Sulphur; 4 Minerals; 5 Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/8	1 Steel; 2 Galvanized; 3 Concrete; 4 Open hole; 5 Plastic	1.88	0	20
6	1 Steel; 2 Galvanized; 3 Concrete; 4 Open hole; 5 Plastic		20	203
	1 Steel; 2 Galvanized; 3 Concrete; 4 Open hole; 5 Plastic			

SCREEN

Sizes of opening (Slot No.) / Diameter (inches) / Length (feet)
Material and type / Depth at top of screen (feet)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	20	Cement grout #30

71 PUMPING TEST

Pumping test method: 1 Pump ☐ 2 Baler
Pumping rate: 2 GPM
Duration of pumping: 2 Hours 00 Mins
Water levels during: ☐ 1 Pumping 2 Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
10 feet	200 feet	160 feet	135 feet	120 feet	100 feet

If flowing give rate: GPM
Pump intake set at: 200 feet
Water at end of test: 2 Clear ☐ Cloudy
Recommended pump type: ☐ 1 Shallow 2 Deep
Recommended pump setting: 195 feet
Recommended pump rate: 1 1/2 GPM

FINAL STATUS OF WELL

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

WATER USE

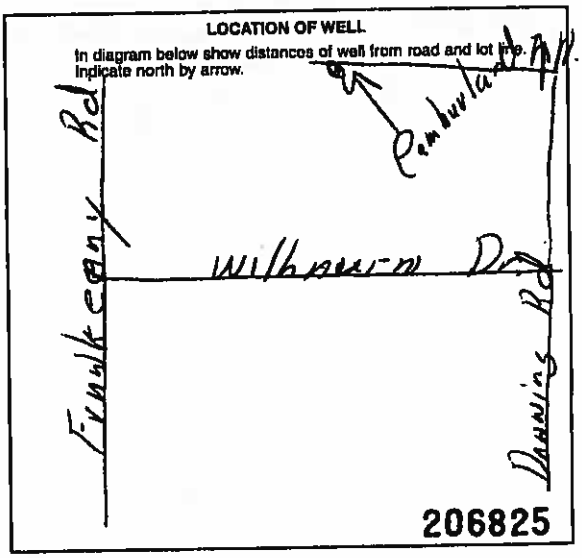
1 Domestic; 2 Stock; 3 Irrigation; 4 Industrial; 5 Commercial; 6 Municipal; 7 Public supply; 8 Cooling & air conditioning; 9 Not use; 10 Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



206825

Name of Well Contractor: D&R WATER WELL DRILLING
Well Contractor's Licence No.: 6006
Address: St-Albert ont
Name of Well Technician: Dave Desnoyers
Well Technician's Licence No.: T-0625
Signature of Technician/Contractor:
Submission date: 04/07/00 (day/mo/yr)

MINISTRY USE ONLY
Date source
Contractor: 6006
Date received: AUG 08 2000
Date of inspection
Inspector
Remarks: CSS.ES0

0506 (11/98) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

Well Tag Number (Place sticker and mail number below): A000750 / A 000750

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 3

Instructions for Completing Form

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- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN 15011 CON CN 07 LOT D

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): 1550 Wilhaven Dr.
RR#/Street Number/Name
Township: Cumberland
City/Town/Village: Cumberland
Lot: 01E
Concession: 7
Site/Compartment/Block/Tract etc.: Pt Lt 11 Plan 4R17732

GPS Reading: NAD 83 Zone 18 Easting 465296 Northing 5038057
Unit Make/Model: Magellan
Mode of Operation: GPS
Differentiated / Undifferentiated / Averaged

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay		Soft	0	1.818
Grey	Shale	Gravel	Loose	1.818	3.030
Grey	Limestone		Hard	3.030	30.30

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	3.63	22.23

Water Record

Water found at Metres: 4.24 m
Kind of Water: ✓ Fresh; Sulphur; Gas; Salty; Minerals; Other:
After test of well yield, water was: X Clear and sediment free; Other, specify
Chlorinated: X Yes; No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.55	✓ Steel; Fibreglass; Plastic; Concrete; Galvanized	1.88	0	3.63
	Steel; Fibreglass; Plastic; Concrete; Galvanized			
	Steel; Fibreglass; Plastic; Concrete; Galvanized			
Screen				
Outside diam	Steel; Fibreglass; Plastic; Concrete; Galvanized; Slot No.			
No Casing or Screen				
	✓ Open hole		3.63	30.30

Test of Well Yield

Pumping test method: Submersible

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres) 28.7	Static Level	0.45		[illegible]
Pumping rate - (litres/min) 18	1	1.69	1	1.69
Duration of pumping 1 hrs + 00 min	2	2.00	2	1.69
Final water level end of pumping metres	3	2.16	3	1.69
Recommended pump type: ☐ Shallow ✓ Deep	4	2.33	4	2.16
Recommended pump depth. 28.7 metres	5	2.44	5	2.16
Recommended pump rate. 22.5 (litres/min)	10	2.92	10	3.57
If flowing give rate - (litres/min)	15	3.26	15	3.57
If pumping discontinued, give reason	20	3.57	20	3.57
	25	3.80	25	4.00
	30	4.00	30	4.00
	40	4.36	40	4.00
	50	5.84	50	4.36
	60	5.84	60	5.84

Plugging and Sealing Record

✓ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	3.63	Cement Grout	

Method of Construction

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

Water Use

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

Final Status of Well

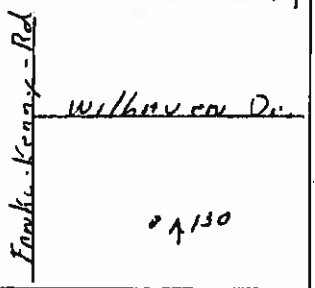
✓ Water Supply; ☐ Recharge well; ☐ Unfinished; ☐ Abandoned, (Other)
☐ Observation well; ☐ Abandoned, insufficient supply; ☐ Dewatering
☐ Test Hole; ☐ Abandoned, poor quality; ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: Dan-Water-Well-Drilling
Well Contractor's Licence No.: 6006
Business Address (street name, number, city etc.): St-Albert-ON
Name of Well Technician (last name, first name): Louis Desnoyers
Well Technician's Licence No.: T-625
Signature of Technician/Contractor: X [signature]
Date Submitted YYYY MM DD: 2004 04 30

Location of Well

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



Audit No. Z 00840
Date Well Completed YYYY MM DD: 2004 03 17
Was the well owner's information package delivered? X Yes No
Date Delivered YYYY MM DD: 2004 04 06

Ministry Use Only

Data Source
Contractor: 6006
Date Received: MAY 11 2004
Date of Inspection YYYY MM DD
Remarks
Well Record Number: 1534621

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ✓ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (P): A 004837 — A004837

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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Ministry Use Only

MUN 1501 CON COM 07 LOT D

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa Carleton

Township: Cumberland

Lot: D+E

Concession: 7

RR#/Street Number/Name: 1600 Wilhaven

City/Town/Village: Cumberland

Site/Compartment/Block/Tract etc.: Part 2 Plan 4R17732

GPS Reading: NAD 83 Zone 18 Easting 465378 Northing 5038139

Unit Make/Model: Magellan

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify ___

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Clay fill			0	1.8
grey+green	limestone			1.8	67.4

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	67.4	14.9

Water Record

Water found at Metres	Kind of Water	Other
126 m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals NOT TESTED
161 m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals
___ m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify: NOT TESTED

Chlorinated: ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		6.1	67.4

Test of Well Yield

Pumping test method: Submersible pump

Pump intake set at (metres): 29.9

Pumping rate (litres/min): 18.2

Duration of pumping: 1 hrs + ___ min

Final water level end of pumping: 29.9 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 61 metres

Recommended pump rate: 18.2 litres/min

If flowing give rate (litres/min): ___

If pumping discontinued, give reason: ___

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		4.32		29.9
1		5.33	1	29.57
2		6.25	2	29.28
3		7.08	3	29.14
4		7.97	4	28.62
5		8.78	5	28.55
10		12.34	10	28.42
15		16.40	15	28.34
20		20.07	20	28.31
25		23.55	25	26.50
30		26.58	30	25.74
40		29.68	40	22.32
50		25.9	50	19.16
60		25.9	60	19.08

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
6.1	0	Cement Slurry	0.1271

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: A. Rock Drilling Ltd. — Well Contractor's Licence No: 1119

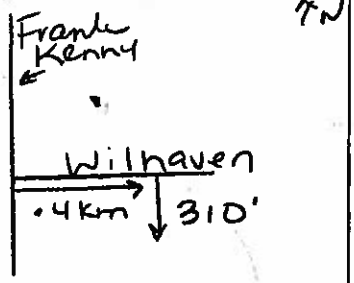
Business Address (street name, number, city etc.): RR#1 Richmond, Ont

Name of Well Technician (last name, first name): Purcell Shannon — Well Technician's Licence No: 12122

Signature of Technician/Contractor: X [signature] — Date Submitted: 2004 06 09

Location of Well

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



Audit No. Z 04945 — Date Well Completed: 2004 06 17

Was the well owner's information package delivered? ☑ Yes ☐ No — Date Delivered: 2004 06 19

Ministry Use Only

Data Source: ___ — Contractor: 1119

Date Received: JUL 06 2004 — Date of Inspection: ___

Remarks: ___ — Well Record Number: 1534787

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐

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Ontario | Ministry of the Environment

Well Tag Number (Place sticker and print number below): A014099 / A 014099

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 3

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- Please print clearly in blue or black ink only.

Ministry Use Only: MUN 1501 | CON C&N | LOT 07

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): OTTAWA - Carleton
Township: Cumberland
Lot: D-E
Concession: Conc. 7
RR#/Street Number/Name: 1530 promenade Willmuw
City/Town/Village: Cumberland - ottawa
Site/Compartment/Block/Tract etc.: SR-17732
GPS Reading: NAD 83 | Zone 18 | Easting 465184 | Northing 5038059
Unit Make/Model: Magellan
Mode of Operation: UTM | Undifferentiated | Averaged | Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay	Boulder	Loose	0	3.03
Grey	Limestone		Hard.	3.03	96.96
				96.96	97.09
				97.09	99.39

Hole Diameter

Depth From	Metres To	Diameter Centimetres
0	6.06	22.23

Water Record

Water found at Metres	Kind of Water			
22.26	☑ Fresh	☐ Sulphur	☐ Gas	☐ Salty
96.96	☑ Fresh	☐ Sulphur	☐ Gas	☐ Salty
	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty

☐ Minerals ☐ Other

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify

Chlorinated ☐ Yes ☑ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	7.27
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
15.55	Open hole		7.27	99.39

Test of Well Yield

Pumping test method: Submersible

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		6.80		32.10
1	1	7.24	1	31.40
2	2	7.43	2	31.06
3	3	7.92	3	30.46
4	4	8.42	4	30.10
5	5	8.89	5	29.81
10	10	10.90	10	28.29
15	15	13.49	15	26.80
20	20	16.33	20	25.47
25	25	18.94	25	24.38
30	30	21.89	30	23.25
40	40	25.44	40	21.50
50	50	28.97	50	19.90
60	60	32.10	60	17.25

Pump intake set at (metres): 20.60
Pumping rate (litres/min): 13.65
Duration of pumping: 1 hrs + 60 min
Final water level end of pumping: metres
Recommended pump type: ☐ Shallow ☑ Deep
Recommended pump depth: 96.96 metres
Recommended pump rate: 96.0 litres/min
If flowing give rate (litres/min):
If pumping discontinued, give reason.

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.06	Cement Grout	120 Kg

Method of Construction

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

Water Use

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

Final Status of Well

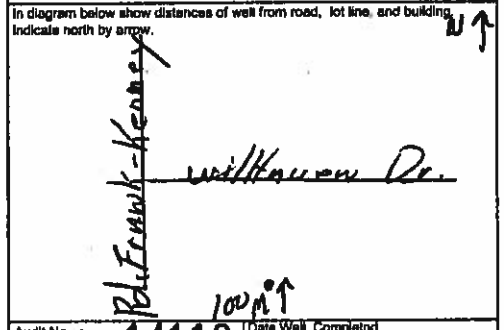
☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: DXR-WATER-well-Drilling
Well Contractor's Licence No.: 6006
Business Address (street name, number, city etc.): St-Albert
Name of Well Technician (last name, first name): Desjovais, Louis
Well Technician's Licence No.: T-625
Date Submitted: 2004/06/08
Signature of Technician/Contractor: X Louis Desjovais

Location of Well

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



Audit No.: Z 14112
Date Well Completed: YYYY 2004 MM 05 DD 04
Was the well owner's information package delivered? Yes
Date Delivered: YYYY MM DD

Ministry Use Only

Data Source
Contractor: 6006
Date Received: JUL 13 2004
Date of Inspection: YYYY MM DD
Remarks
Well Record Number: 1534819

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☑

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Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A014115 / A014115

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

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- Please print clearly in blue or black ink only.

Ministry Use Only: MUN 15011 CON LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): OTTAWA City | Township: Cumberland | Lot: 18 | Concession:

RR#/Street Number/Name: 1260 - Carthica ST. 19.00 | City/Town/Village: | Site/Compartment/Block/Tract etc.: SOM-182

GPS Reading | NAD: 83 | Zone: 18 | Easting: 466578 | Northing: 5039998 | Unit Make/Model: Magellan | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify: UTM

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Yellow	Sand	Gravel 75.00	Soft	0	4.81
Grey	Limestone	100.00	Hard	4.81	100.00

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.06	22.23

Water Record

Water found at Metres	Kind of Water		
53.03	☑ Fresh	☐ Salty	☐ Sulphur / Minerals
	☑ Gas	☐ Other:	
89.39	☑ Fresh	☐ Salty	☐ Sulphur / Minerals
	☐ Gas	☐ Other:	
	☐ Fresh	☐ Salty	☐ Sulphur / Minerals
	☐ Gas	☐ Other:	

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.59	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	6.66
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
15.59	☑ Open hole		6.66	100.00

Test of Well Yield

Pumping test method: Submerged

Pump intake set at (metres): 60.60

Pumping rate (litres/min): 6750

Duration of pumping: 1 hrs + 20 min

Final water level end of pumping: 53.56 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 60.6 metres

Recommended pump rate: 120.00 (litres/min)

If flowing give rate (litres/min):

If pumping discontinued, give reason:

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		15.40		54.54
1	1	17.40	1	50.72
2	20.00		2	47.02
3	22.27		3	45.01
4	24.99		4	42.04
5	26.83		5	40.04
10	37.70		10	34.82
15	28.55		15	32.49
20	54.54		20	33.81
25	54.54		25	33.11
30	54.54		30	31.92
40	54.54		40	29.13
50	54.54		50	26.11
60	54.54		60	24.89

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.06	Cement + Sand	100 Kg

Method of Construction

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

Water Use

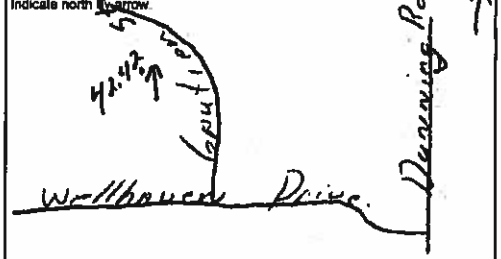
☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Well Contractor/Technician Information

Name of Well Contractor: D.A.R. WATER well Drilling | Well Contractor's Licence No.: 6006

Business Address (street name, number, city etc.): 5th Line - Ottawa

Name of Well Technician (last name, first name): Desilets, Shawn | Well Technician's Licence No.: 7-625

Signature of Technician/Contractor: [signature] | Date Submitted: YYYY MM DD

Audit No. Z 14138 | Date Well Completed: 2004 08 04

Was the well owner's information package delivered? ☑ Yes ☐ No | Date Delivered: 2004 08 17

Ministry Use Only

Data Source | Contractor: 6006

Date Received: OCT 07 2004 | Date of Inspection: YYYY MM DD

Remarks | Well Record Number: 1535079

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☑ *Cette formule est disponible en français*

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A 014129 / A014129

Well Record

Regulation 903 Ontario Water Resources Act

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- All metric measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN 15011 CON CON LOT 07

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): OTTAWA City — Township: Cumberland — Lot: E-D — Conc.: 7

RR#/Street Number/Name: 1495 Frank-Kenny-Rd. — City/Town/Village: Cumberland — Site/Compartment/Block/Tract etc.: 4R-11132

GPS Reading: NAD (8|3) Zone 18 Easting 465170 Northing 5037881 — Unit Make/Model: MAGELLAN — Mode of Operation: UTM — ☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Brown	Clay	Boulder	Soft	0	3.03
Grey	Limestone		Hard	3.03	101.51

OTTAWA

18 465170

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	6.06	22.23

Water Record

Water found at Metres	Kind of Water		
28.97	☐ Fresh	☐ Sulphur	☐ Gas
	☐ Salty	☐ Minerals	☐ Other:
___ m	☐ Fresh	☐ Sulphur	☐ Gas
	☐ Salty	☐ Minerals	☐ Other:
___ m	☐ Fresh	☐ Sulphur	☐ Gas
	☐ Salty	☐ Minerals	☐ Other:

After test of well yield, water was ☑ Clear and sediment free ☐ Other, specify

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.55	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	6.66
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
15.23	☐ Open hole		6.66	101.51

Test of Well Yield

Pumping test method: Submersible

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at (metres) 91.50	Static Level	2.04		14.10
Pumping rate (litres/min) 45.50	1	3.23	1	11.52
Duration of pumping 1 hrs + 00 min	2	4.90	2	10.28
Final water level end of pumping 14.10 metres	3	5.73	3	8.06
Recommended pump type: ☐ Shallow ☑ Deep	4	6.44	4	7.33
Recommended pump depth 75.75 metres	5	6.83	5	6.57
Recommended pump rate 45.50 (litres/min)	10	8.73	10	7.07
	15	10.02	15	6.52
If flowing give rate - (litres/min) 0	20	11.25	20	6.97
	25	11.74	25	6.78
If pumping discontinued, give reason.	30	12.18	30	6.69
	40	13.06	40	6.51
	50	13.62	50	6.32
	60	14.18	60	6.23

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at From	Depth set at To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.06	Cement Grout	120 kg.

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: D & R. WATER well Drilling — Well Contractor's Licence No.: 6006

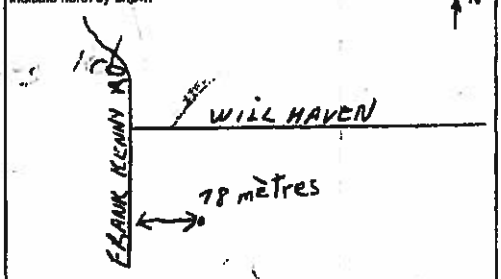
Business Address (street name, number, city etc.): St. Albert - ON

Name of Well Technician (last name, first name): Desnoyers, Louis — Well Technician's Licence No.:

Signature of Technician/Contractor: X [signature] — Date Submitted YYYY MM DD: 2004 09 30

Location of Well

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



Audit No. Z 14152 — Date Well Completed YYYY MM DD: 2004 09 24

Was the well owner's information package delivered? ☑ Yes ☐ No — Date Delivered YYYY MM DD: 2004 09 30

Ministry Use Only

Data Source — Contractor: 6006

Date Received OCT 07 2004 — Date of Inspection YYYY MM DD

Remarks — Well Record Number: 1535083

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐ *Cette formule est disponible en français*

1535703

Ontario Ministry of the Environment

Well Tag Number (Place sticker and Plate number below)
A 014069
A014069

Well Record
Regulation 903 Ontario Water Resources Act

page 2 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 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): OTTAWA - City
Township: Cumberland
Lot: Sub-Pack 1
Concession: 9
RR#/Street Number/Name: 1620 + Wilhaven Dr
City/Town/Village: Cumberland
Site/Compartment/Block/Tract etc.: 1R-19732
GPS Reading: NAD 83 | Zone 18 | Easting 465567 | Northing 5032212
Unit Make/Model: Magellan
Mode of Operation: GPS ☐ Differentiated ☐ Averaged ☐ Differentiated, specify
Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Brown	Clay	Small - Boulders	Loose.	0	1.21
Grey	Limestone	Sandstone.	Hard.	1.21	64.94

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.06	25.40

Water Record

Water found at (Metres)	Kind of Water
22.27	☑ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☑ Clear and sediment free ☐ Other, specify
Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From	Depth To (Metres)
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	6.66
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		6.66	64.94

Test of Well Yield

Pumping test method: Submersible

	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at (metres) 72.72	Static Level	18.24		64.94
Pumping rate (litres/min) 22.75	1	19.06	1	63.06
Duration of pumping 1 hrs + 00 min	2	20.36	2	61.10
Final water level end of pumping 64.94 metres	3	21.16	3	59.96
Recommended pump type: ☐ Shallow ☐ Deep	4	22.24	4	58.56
Recommended pump depth 63.39 metres	5	23.26	5	57.15
Recommended pump rate 22.75 (litres/min)	10	27.92	10	55.20
If flowing give rate (litres/min)	15	32.01	15	53.04
If pumping discontinued, give reason:	20	35.63	20	50.16
	25	39.78	25	49.32
	30	43.84	30	48.20
	40	50.79	40	46.56
	50	57.06	50	45.02
	60	64.94	60	43.80

Plugging and Sealing Record ☑ Annular space ☐ Abandonment

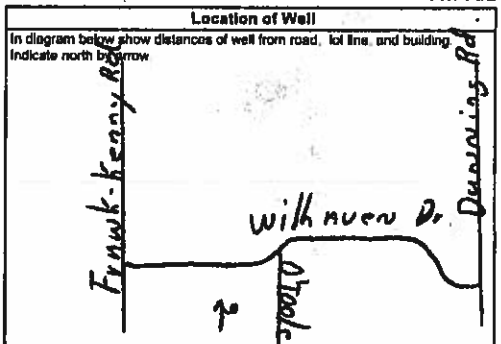
Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.06	Cement Grout	120 kg.

Method of Construction
☑ Cable Tool ☑ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☑ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well
☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

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



Audit No. Z 14210
Date Well Completed: 2005 / 10 / 22
Was the well owner's information package delivered? ☑ Yes ☐ No
Date Delivered: 2005 / 10 / 22

Well Contractor/Technician Information

Name of Well Contractor: DAN WATER well Drilling
Well Contractor's Licence No.: 6006
Business Address (street name, number, city etc.): PO Box 98 St-Albert-ON
Name of Well Technician (last name, first name): Desnoyers Louis
Well Technician's Licence No.: T-625
Signature of Technician/Contractor: X Louis Desnoyers
Date Submitted: 2005 / 10 / 22

Ministry Use Only

Data Source	Contractor: 6006
Date Received: AUG 10 2005	Date of Inspection
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☑ *Cette formule est disponible en français*

7113105

Ontario Ministry of the Environment

Measurements recorded in: X Metric ☐ Imperial

Well 1 **A076053** Below)

A076053

Well Record

Regulation 903 Ontario Water Resources Act

Page ___ of ___

Well Owner's Information

[redacted]

Address of Well Location (Street Number/Name): 1649 Wilhaven Rd.

Township: Cumberland Lot: 21 Concession: 2

County/District/Municipality: Ottawa - Carleton

City/Town/Village: Cumberland

Province: Ontario Postal Code:

UTM Coordinates Zone Easting Northing

NAD 83 18 465915 5038323

Municipal Plan and Sublot Number: Plan 4R-15934 PART 1

Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sand / Earth			0	5.18
Grey	Limestone			5.18	134.11

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
6.40	0	Neat Cement Slurry	.1816

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
X Percussion
☐ Other, specify

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.88	steel	.48	1.6	6.40
15.23	open hole		6.40	134.11

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth	Kind of Water			Hole Diameter Depth From	To	Diameter (cm/in)
93.57	Fresh	X	Untested			
134.11	Gas		Other, specify	0	134.11	15.23
Water found at Depth	Kind of Water					
	Gas		Other, specify			
Water found at Depth	Kind of Water					
	Gas		Other, specify			

Results of Well Yield Testing

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

How was water determined, give details:

Pump intake set at (m/ft): 91.44

Pumping rate (l/min / GPM): 34.07

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 7.96

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

Recommended pump depth (m/ft): 34.07

Recommended pump rate (l/min / GPM): 34.07

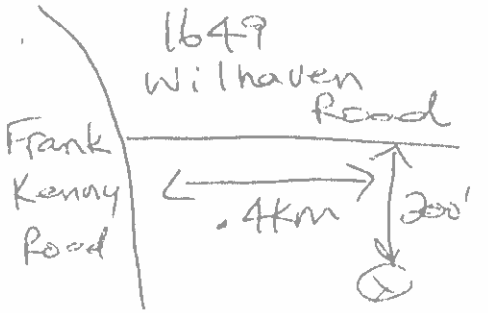
Well production (l/min / GPM): 6

Disinfected? X Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	0	7.80		7.96
1	7.20		1	7.40
2	7.26		2	7.50
3	7.30		3	7.30
4	7.34		4	7.20
5	7.40		5	7.18
10	7.50		10	7.16
15	7.56		15	7.16
20	7.57		20	7.16
25	7.76		25	
30	7.80		30	
40	7.84		40	
50	7.92		50	
60	7.96		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: AIR ROCK DRILLING CO LTD

Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): RR 1

City/Town: Richmond

Province: Ont

Postal Code: K0A2Z0

Business E-mail Address:

Telephone No. (inc. area code): 6138382190

Name of Well Technician (Last Name, First Name): Purcell, Shannon

Well Technician's Licence No.: 12120

Signature of Technician and/or Contractor: [signature]

Date Submitted: 20080930

Well owner's information package delivered: X Yes ☐ No

Date Package Delivered: 20080904

Date Work Completed: 20080820

Ministry Use Only

Audit No Z 82447

Received:

Ministry's Copy

UTM 18Z 416510E
9R 5013818210N
Elev 9R 02910
Basin 25 - 11
O.F Con I Lot 22

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

RECEIVED
JUL 12 1956
GEOLOGICAL BRANCH
DEPARTMENT of MINES

1513095

Water-Well Record

County or Territorial District.....Russell.....Township, Village, Town or City.....Cumberland.....
Con. 1 O.F. Lot 22 Street and Number (if in Village, Town or City).....
Owner [redacted] Address Cumberland Ontario
Date completed 22 (day) 5 (month) 56 (year)

Pipe and Casing Record

Casing diameter(s) 4 inches
Length(s) 21 Feet
Type of screen
Length of screen

Pumping Test

Static level 9 feet
Pumping rate 8 gpm
Pumping level 14 Feet
Duration of test 1 hour

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
Red Sand	0	6	69Feet	60 Feet	fresh
Lime stone rock	6	69			

Water Record

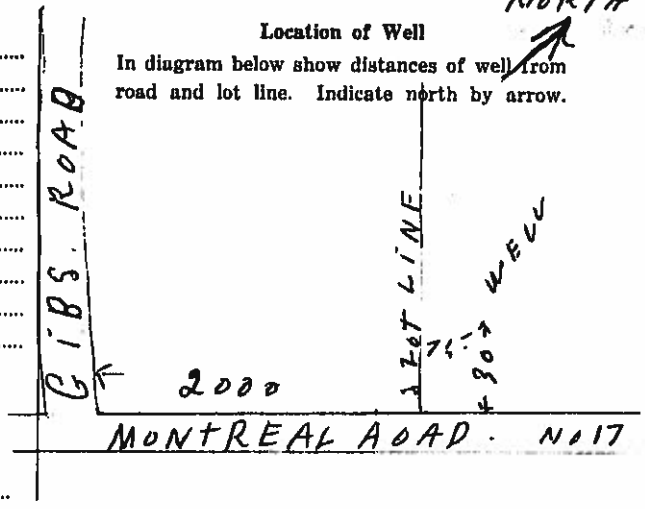
For what purpose(s) is the water to be used?
Domestic
Is water clear or cloudy? clear
Is well on upland, in valley, or on hillside?
hillside
Drilling firm T. H. Adams
Address Burdman's Bridge
Ottawa, Ontario
Name of Driller T. H. Adams
Address Burdman's Bridge
Ottawa, Ontario
Licence Number 42

I certify that the foregoing statements of fact are true.

Date July 2 Thos H Adams
Signature of Licensee

Location of Well

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



Form 5

31G/11W

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

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

11 | 5601301 | MUNICIP 56003 | CON 0E C 01

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Russell	Cumberland	~~Lot. from Ottawa R.~~ OF 1	022

[redacted]	ADDRESS	DATE COMPLETED
	Cumberland, Ont.	DAY 28 MO. 11 YR. 70

21 | UTM ZONE 18 | EASTING 465350 | NORTHING 5038850 | RC 4 | ELEVATION 0300 | RC 6 | BASIN CODE 25T

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
blue	clay & bolders			0	5
grey	limestone			5	150

1513100

31 | 6005T 1005T 13 | 01502 15T

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0150	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	~~20~~ 0020
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0150
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE 0005 GPM | DURATION OF PUMPING 02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING ☒ PUMPING ☐ RECOVERY: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
010 FEET	140 FEET	055 FEET	080 FEET	110 FEET	140 FEET

IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT 140 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 140 FEET | RECOMMENDED PUMPING RATE 0004 GPM.

0000.0 GPM /FT. SPECIFIC CAPACITY

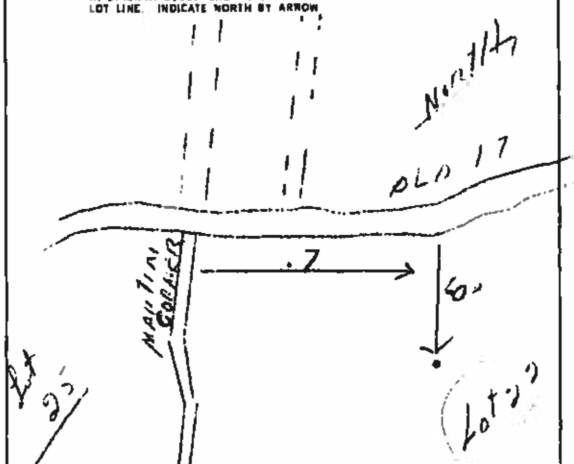
FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

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

LOCATION OF WELL

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



DRILLERS REMARKS:

CONTRACTOR

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

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

NAME OF DRILLER OR BORER	LICENCE NUMBER
G. Charbonneau	

SIGNATURE OF CONTRACTOR: Gerard Charbonneau | SUBMISSION DATE: DAY 28 MO. 11 YR. 70

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	1504	230271

DATE OF INSPECTION: | INSPECTOR: P/Km

REMARKS:

OWRC COPY

7100598

Ontario Ministry of the Environment

Well Tag No. (Sticker Below) A 072326

A072326

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

[redacted]

Part A: Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR): #201 King Arthur

Township: Cumberland

Lot: 23

Concession: 1

County/District/Municipality: Ottawa - Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

UTM Coordinates NAD 83: Zone 18, Easting 465240, Northing 5038423

GPS Unit Make: Magellan

Model:

Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
	Clay + Sand			0	3.96
	Black + Grey Limestone			3.96	152.39

Plan 50R-7034 SL 10 *

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
10.06	0	Neat Cement Slurry	.4086

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Public ☐ Commercial ☐ Not used
☐ Rotary (Conventional) ☐ Jetting ☒ Domestic ☐ Municipal ☐ Dewatering
☐ Rotary (Reverse) ☐ Driving ☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Rotary (Air) ☐ Digging ☐ Irrigation ☐ Cooling & Air Conditioning
☒ Air percussion ☐ Boring ☐ Industrial
☐ Other, specify ☐ Other, specify

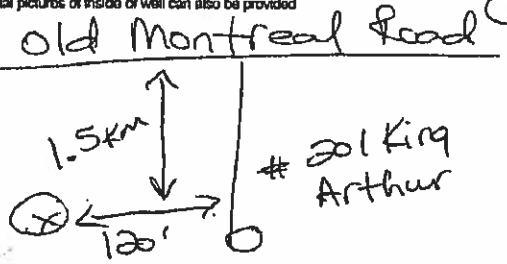
Status of Well

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

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- digital pictures of inside of well can also be provided

N/A



Date Well Completed (yyyy/mm/dd): 2007-12-11

Was the well owner's information package delivered? ☒ Yes ☐ No

Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd): 2007-12-18

Well Contractor and Well Technician Information

Business Name of Well Contractor: AIR ROCK DRILLING CO. LTD.

Well Contractor's Licence No.: 1119

Business Address (Street No./Name, number, RR): RR#1

Municipality: RICHMOND

Province: ONT

Postal Code: K0A 2Z0

Business E-mail Address:

Bus. Telephone No. (inc. area code): 613 838 3821

Name of Well Technician (Last Name, First Name): Desaulniers Ken

Well Technician's Licence No.: 7411

Signature of Technician:

Date Submitted (yyyy/mm/dd): 2008-01-07

0506E (11/2006)

Ministry's Copy

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand free state

NOT TESTED

If pumping discontinued, give reason:

Pumping test method: SubPump

Pump intake set at (Metres): 91.44

Pumping rate (Litres/min): 22.71

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (Metres): 54.70

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 91.44 Metres (3 HP 599m)

Recommended pump rate (Litres/min): 22.71

If flowing give rate (Litres/min):

Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level	39.90	Static Level	54.70
1	30.72	1	53.70
2	31.73	2	52.48
3	32.56	3	52.7
4	33.26	4	51.30
5	34.27	5	50.98
10	37.33	10	47.3
15	40.70	15	45.92
20	42.65	20	45.4
25	45.10	25	43.82
30	46.90	30	42.76
40	50.49	40	40.87
50	52.7	50	39.32
60	54.70	60	37.91

Water Details

Water found at Depth	Kind of Water
96 Metres ☒ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized ☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

Screen Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

No Casing and Screen Used

☒ Open Hole 0.06-152.39

Casing and Well Details

Diameter of the Hole (Centimetres): 15.55

Depth of the Hole (Metres): 152.39

Wall Thickness (Metres): .48cm

Inside Diameter of the Casing (Metres): 14.588

Depth of the Casing (Metres): 10.67

Disinfected? ☒ Yes ☐ No

Ministry Use Only

Audit No.: z60129

Well Contractor No.:

Date Received (yyyy/mm/dd): JAN 15 2008

Date of Inspection (yyyy/mm/dd):

Remarks:

7045759

Ontario Ministry of the Environment

Well Record
Regulation 903 Ontario Water Resources Act

Well T A 054029 (number below)
A054029

page ___ of ___

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN ___ CON ___ LOT ___

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa-Carleton
Township: Cumberland
Lot: 23
Concession:
RR#/Street Number/Name: # 221 King Arthur
City/Town/Village: Cumberland
Site/Compartment/Block/Tract etc.: Plan 50R-7034 3 Lot 2
GPS Reading: NAD 83 Zone 18 Easting 465346 Northing 5038477
Unit Make/Model: Magalta
Mode of Operation: ☐ Undifferentiated ☒ Dewatered ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Rock fill			0	0.91
	Sandy Clay			0.91	2.13
	Gray & Green limestone			2.13	103.63

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	103.63	14.91

Water Record

Water found at Metres	Kind of Water			
8.84	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other
99.69	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other
___	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other
___	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other

After test of well yield, water was: ☐ Clear and sediment free ☐ Other, specify
Chlorinated: ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	8.84
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		8.84	103.63

Test of Well Yield

Pumping test method: SubPump

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pumping test level (metres)	Static Level 5.57			12.65
Pumping rate (litres/min) 40.95	1	8.40	1	58.20
Duration of pumping ___ hrs + 0 min	2	10.30	2	57.90
Final water level end of pumping 10.82 metres	3	12.47	3	56.95
Recommended pump type: ☐ Shallow ☒ Deep	4	14.61	4	56.00
Recommended pump depth 91.44 metres	5	16.70	5	55.15
Recommended pump rate 40.95 (litres/min)	10	26.50	10	51.38
If flowing give rate (litres/min)	15	34.36	15	49.31
	20	41.70	20	45.30
	25	47.80	25	43.60
	30	51.58	30	42.60
	40	57.08	40	41.20
If pumping discontinued, give reason:	50	60.38	50	40.19
	60	62.05	60	39.47

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
8.84	0	Neat Cement Slurry	.1816

Method of Construction
☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☒ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use
☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well
☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information
Name of Well Contractor: AR Rock Drilling & Co Ltd — Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond Ont K0A 2Z0
Name of Well Technician (first name, last name): Purcell Shannon — Well Technician's Licence No.: 12122
Signature of Technician/Contractor: X — Date Submitted: 2007 06 18

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

Old Montreal Road
#221 King Arthur
.2KM
200'
N

Audit No. Z 65055 — Date Well Completed: 2007 05 15
Was the well owner's information package delivered? ☒ Yes ☐ No — Date Delivered: 2007 05 16

Ministry Use Only
Date Source ___ — Contractor 1119
Date Received ___ — Date of Inspection JUN 28 2007
Remarks ___ — Well Record Number ___

0506E (08/2006) Ministry's Copy

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below) A 052289

A 052289

7111538

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

[redacted]

Address of Well Location (Street Number/Name, RR) 191 King arthur

Township Cumberland

Lot 9

Concession

County/District/Municipal Ottawa Carleton

City/Town/Village Cumberland (Ottawa)

Province Ontario

Postal Code

UTM Coordinates NAD 83 Zone 18 Easting 465195 Northing 5038415

GPS Unit Make Magellan

Model Sportrack

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	clay			0	6
Brown	hardpan	gravel stone		6	9
grey	rock			9	280
Brown	rock			280	317

The well produces 4 gal per min

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	40 feet	grout	9 Bag

Method of Construction

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

Water Use

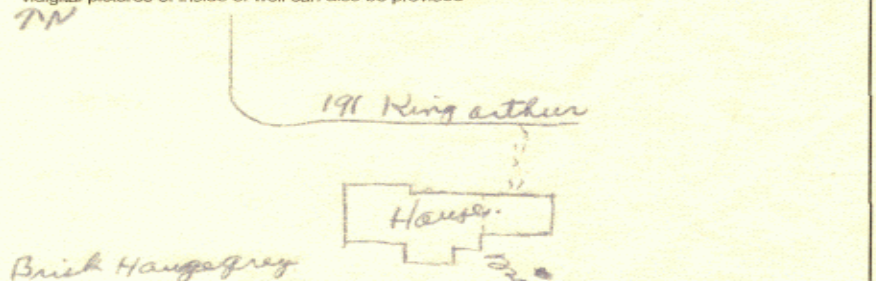
☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Status of Well

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

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed (yyyy/mm/dd) 2008

Was the well owner's information package delivered? ☑ Yes ☐ No

Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd) 2008

Well Contractor and Well Technician Information

Business Name of Well Contractor Marcus Cooper Ltd

Well Contractor's Licence No. 1517

Business Address (Street No./Name, number, RR)

Municipality Marion

Province Ontario

Postal Code K0A 1M0

Business E-mail Address

Bus. Telephone No. (inc. area code) 613-764-7134

Name of Well Technician (Last Name, First Name) Marcus Cooper

Well Technician's Licence No. 126

Signature of Technician Marcus Cooper

Date Submitted (yyyy/mm/dd) 2008-25 pm

Results of Well Yield Testing

Check box if after test of well yield, water was:
☑ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method Bailer

Pump intake set at (Metres) 190 feet

Pumping rate (Litres/min) 4 gal per min

Duration of pumping ___ hrs + ___ min

Final water level end of pumping (Metres) 50.00

Recommended pump type ☐ Shallow ☑ Deep

Recommended pump depth 295 feet Metres

Recommended pump rate (Litres/min) 5 gal per minute

If flowing give rate (Litres/min)

Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level	21.20	Static Level	50.00
1	29.90	1	40.01
2		2	48.01
3		3	47.00
4		4	45.99
5	29.90	5	44.85
10	28.60	10	44.10
15	27.01	15	43.91
20	28.05	20	41.90
25	29.30	25	40.00
30	35.90	30	38.80
40	41.60	40	37.90
50	45.10	50	37.00
60	50.00	60	36.00

Water Details

Water found at Depth		Kind of Water
280 Metres feet	☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth		Kind of Water
Metres	☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Water found at Depth		Kind of Water
Metres	☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized
☑ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☑ Yes ☐ No

Casing and Well Details

Diameter of the Hole (Centimetres) 6 inch

Depth of the Hole (Metres) 312 feet

Wall Thickness (Metres) 188

Inside Diameter of the Casing (Metres) 6 inch

Depth of the Casing (Metres) 43 feet

Ministry Use Only

Audit No. Z 69184

Well Contractor No.

Date Received (yyyy/mm/dd) SEP 18 2008

Date of Inspection (yyyy/mm/dd)

Remarks

0506E (11/2006)

Contractor's Copy

7129154

Ontario — Ministry of the Environment

Well A 086962 (See Instructions Below)
086962

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 3

Measurements recorded in: ☑ Metric ☐ Imperial

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): 211- King - Arthur St
Township: Cumberland
Lot: 11
Concession: 3
County/District/Municipality: OTTAWA. City
City/Town/Village: Cumberland.
Province: Ontario
Postal Code: K4C0A2
Other
UTM Coordinates: Zone 18 Easting 465405 Northing 5034452 NAD 8 3
Municipal Plan and Sublot Number: 4M-1302

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Clay	Boulders	loose Hard	0	3.63
Grey	Limestone			3.63	151.51

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	12.12	Cement Grout	120kg

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☑ Rotary (Reverse) AIR ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☑ Other, specify WATER-percuss

Well Use

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

Status of Well

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.86	Steel	0.48	70.45	12.12

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	To	Diameter (cm/in)
16.6	☑ Fresh ☐ Untested ☐ Gas ☐ Other, specify	0	12.12	15.86
	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify	12.12	151.5	15.54
	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify			

Results of Well Yield Testing

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

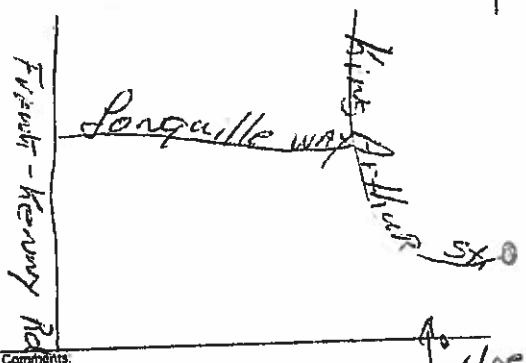
If pumping discontinued, give reason:

Pump intake set at (m/ft): 54.54
Pumping rate (l/min / GPM): 13.50
Duration of pumping: 1 hrs + 20 min
Final water level end of pumping (m/ft):
If flowing give rate (l/min / GPM):
Recommended pump depth (m/ft): 148.4ft
Recommended pump rate (l/min / GPM): 22.50
Well production (l/min / GPM): 9.00
Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	6.01		42.08
1	5.77	1	40.85
2	6.25	2	40.73
3	6.20	3	40.60
4	7.44	4	40.50
5	8.08	5	40.41
10	11.29	10	39.88
15	14.30	15	39.57
20	17.72	20	39.16
25	21.12	25	38.78
30	24.23	30	38.38
40	30.35	40	37.60
50	36.32	50	36.86
60	42.08	60	36.12

Map of Well Location

Please provide a map below following instructions on the back



Comments:

153 metre

Well Contractor and Well Technician Information

Business Name of Well Contractor: DKR-WATER-well-Drilling
Well Contractor's Licence No: 6106
Business Address (Street Number/Name): 1763- Route 900 west
Municipality: Nation
Province: ON
Postal Code: K0A3C0
Business E-mail Address:
Bus Telephone No (inc. area code): 6137827-4958
Name of Well Technician (Last Name, First Name): Desnoyers, Louis
Well Technician's Licence No: 1625
Signature of Technician and/or Contractor:
Date Submitted: 2009 08 18

Well owner's information package delivered: ☑ Yes ☐ No
Date Package Delivered: 2009 08 18
Date Work Completed: 2009 07 10

Ministry Use Only

Audit No: Z099704
SEP 03 2009

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D050E (12/2007)

M 18 465450
4 5038170
5 0325
25

3/6/6e...

1512686

~~1510719~~

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District: Carleton
Township, Village, Town or City: Cumberland
Con. 7? Lot: D
Date completed: 21 April 1969 (day month year)
Owner: [redacted] (print in block letters)
Address: Cumberland, Ont.

Casing and Screen Record

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

Pumping Test

Static level: 10'
Test-pumping rate: 8 G.P.M.
Pumping level: 60'
Duration of test pumping: 2 hrs.
Water clear or cloudy at end of test: clear
Recommended pumping rate: 6 G.P.M.
with pump setting of 60 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
loam	0	3	146	fresh
loose rock & clay	3	8		
grey limestone	8	146		

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

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

Drilling or Boring Firm: G. Charbonneau, Diamond & Cable Drilling,
Address: R. R. 1, Box 194, Orleans, Ont.

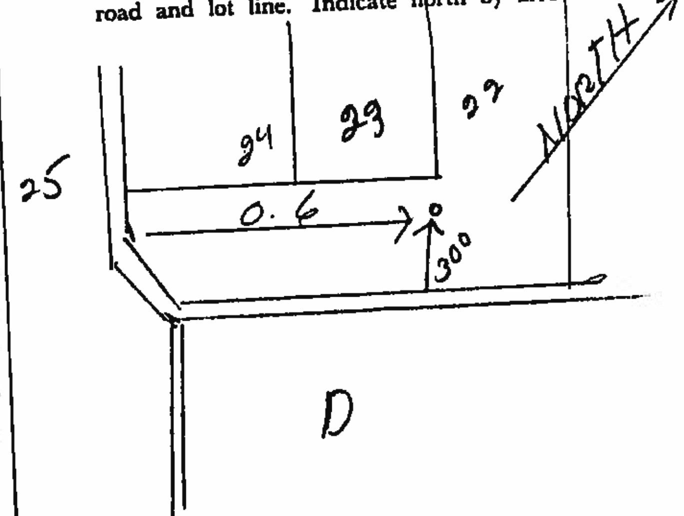
Licence Number: 3395
Name of Driller or Borer: G. Charbonneau,
Address: R. R. 1, Orleans, Ont.
Date: 21 April 1969.

(Signature of Licensed Drilling or Boring Contractor)

Form 7
OWRC COPY

Location of Well

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



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MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

ONTARIO

1513924

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

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	DATE COMPLETED
Carleton	Cumberland	1st. Con. D	DAY 31 MO 05 YR 73

ADDRESS: R. R. 1, Cumberland, Ont.

LOT	CON.	EASTING	NORTHING	ELEVATION	BASIN CODE
W½		46220	5038.330	0.338	46

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
grey	limestone			0	109

31 6/09/73/ 32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0109	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6-OD 06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	250	0	0022

SCREEN

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

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN (FEET)

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE	(CEMENT GROUT / CLAY PACKER ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0004 GPM | DURATION OF PUMPING: 02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
004 FEET	070 FEET	050 FEET	025 FEET	004 FEET	004 FEET

IF FLOWING GIVE RATE: GPM | PUMP INTAKE SET AT: 100 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 100 FEET | RECOMMENDED PUMPING RATE: 0004 GPM

0005 GPM/FT SPECIFIC CAPACITY

FINAL STATUS OF WELL

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

WATER USE 01

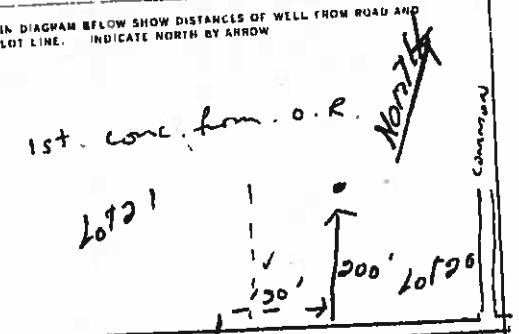
1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING

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

LOCATION OF WELL

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



DRILLERS REMARKS

CONTRACTOR

NAME OF WELL CONTRACTOR: C. Charbonneau, Diamond & Cable Drilling | LICENCE NUMBER: 1504

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

NAME OF DRILLER OR BORER: Leo Bourgeois | LICENCE NUMBER

SIGNATURE OF CONTRACTOR: Léo Bourgeois | SUBMISSION DATE: DAY 31 MO 5 YR 73

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1504 | DATE RECEIVED

DATE OF INSPECTION | INSPECTOR: K.

REMARKS: P R WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-081

3166

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

(11) 1517909 MUNICIP 1501 CON Con 06

COUNTY OR DISTRICT: Ottawa-Carleton
TOWNSHIP BOROUGH CITY TOWN VILLAGE: Cumberland
CON BLOCK TRACT SURVEY ETC: Conc. 6
LOT: C
OWNER: [redacted]
ADDRESS: Box E; Cumberland, Ontario
DATE COMPLETED: DAY 18 MO 00 YR 82
(20) UTM ZONE 18 NORTHING 5037399 EASTING 466499 ELEVATION 0340 DATUM CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH FEET FROM	TO
			Large Loose Layers	0	17
Gray	Limestone			17	271
Gray	Limestone				

(31) 0201 72 15 77 74 0371 21 15
(32)

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0190'	1 [X] FRESH 2 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
0258'	1 [X] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL
	1 [ ] FRESH 3 [ ] SULPHUR; 2 [ ] SALTY 4 [ ] MINERAL

(51) CASING & OPEN HOLE RECORD

CASING DIAM (INCHES)	MATERIAL	WALL THICKNESS (INCHES)	OPEN HOLE FROM	TO
06	1 [X] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE	188	0	0021
06	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [X] OPEN HOLE		21	0271
	1 [ ] STEEL 2 [ ] GALVANIZED 3 [ ] CONCRETE 4 [ ] OPEN HOLE			

SCREEN

TYPE OF OPENING | SLOT NO. | DIAMETER (INCHES) | LENGTH (FEET) | MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN (FEET)

(61) PLUGGING & SEALING RECORD

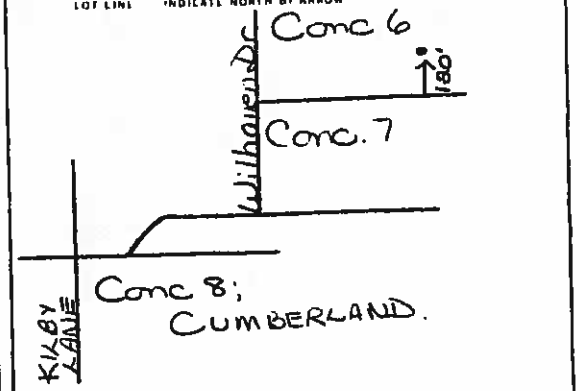
DEPTH SET AT (FEET) FROM | TO | MATERIAL AND TYPE | CEMENT GROUT / LEAD PACKER ETC.

(71) PUMPING TEST

PUMPING TEST METHOD: 1 [ ] PUMP 2 [X] BAILER
PUMPING RATE: 0002 GPM
DURATION OF PUMPING: 01 HRS 00 MINS
STATIC LEVEL: 030 FEET
WATER LEVEL END OF PUMPING: 250 FEET
WATER LEVELS DURING: 1 [X] PUMPING 2 [ ] RECOVERY
10 MINUTES: 250 FEET
20 MINUTES: 250 FEET
30 MINUTES: 250 FEET
40 MINUTES: 250 FEET
IF FLOWING GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 [X] CLEAR 2 [ ] CLOUDY
RECOMMENDED PUMP TYPE: [ ] SHALLOW [X] DEEP
RECOMMENDED PUMP SETTING: 250 FEET
RECOMMENDED PUMPING RATE: 0002 GPM

LOCATION OF WELL

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



DRILLERS REMARKS:

FINAL STATUS OF WELL (1)
1 [X] WATER SUPPLY 2 [ ] OBSERVATION WELL 3 [ ] TEST HOLE 4 [ ] RECHARGE WELL 5 [ ] ABANDONED INSUFFICIENT SUPPLY 6 [ ] ABANDONED POOR QUALITY 7 [ ] UNFINISHED

WATER USE 01
1 [X] DOMESTIC 2 [ ] STOCK 3 [ ] IRRIGATION 4 [ ] INDUSTRIAL 5 [ ] COMMERCIAL 6 [ ] MUNICIPAL 7 [ ] PUBLIC SUPPLY 8 [ ] COOLING OR AIR CONDITIONING 9 [ ] NOT USED [ ] OTHER

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

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd. LICENCE NUMBER: 1558
ADDRESS: Box 490; Stittsville, Ont. K0A 3G0
NAME OF DRILLER OR BORER: J. Mooney LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: [signature] SUBMISSION DATE: DAY 21 MO 06 82

OFFICE USE ONLY

DATA SOURCE 1 CONTRACTOR 1558 DATE RECEIVED 05 10 82
DATE OF INSPECTION: INSPECTOR: OP/LM
REMARKS: 55165

MINISTRY OF THE ENVIRONMENT COPY

FORM NO 0506--8--77 FORM 7

3166

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1517920

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

MUNICIP V501 CON CAN LOT C

COUNTY OR DISTRICT: OTTAWA-CARLETON
TOWNSHIP BOROUGH CITY, TOWN VILLAGE: CUMBERLAND
CON 6
ADDRESS: CUMBERLAND
DATE COMPLETED: DAY 25 MO 09 YR 82

[redacted]

UTM 18 EASTING 466499 NORTHING 5037399 ZC 14 ELEVATION 0340 ZC 14 BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH FEET FROM	TO
BROWN	HARD PAN	BOULDERS		0	12
GREY	LIMESTONE			12	189
BLACK	SHALE			189	200

31 0012614112 | 0189215 | 0200817

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0189	1 ☑ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH FEET FROM	TO
6 5/4	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	1.88	0	40
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SLOT NO. OF OPENING | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT SAND PACKER ETC.)
0	HO	CEMENT

71 PUMPING TEST

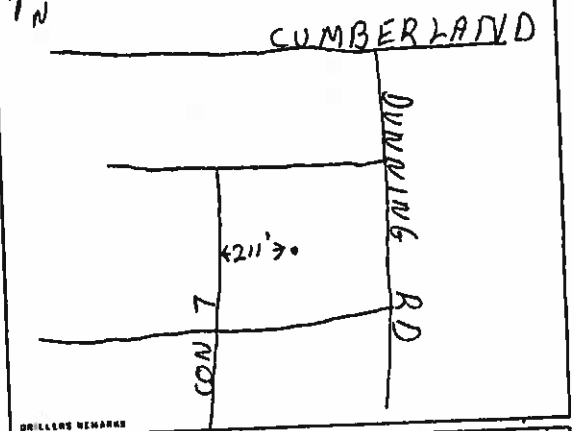
PUMPING TEST METHOD 1 ☐ PUMP 2 ☑ BAILER
PUMPING RATE 0004 GPM
DURATION OF PUMPING 01 HOURS 20 MINS
WATER LEVELS DURING 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
038 FEET	195 FEET	100 FEET	130 FEET	190 FEET	195 FEET

TO FLOWING GIVE RATE GPM
PUMP INTAKE SET AT 198 FEET
WATER AT END OF TEST 1 ☐ CLEAR 2 ☑ CLOUDY
RECOMMENDED PUMP TYPE ☐ SHALLOW ☑ DEEP
RECOMMENDED PUMP SETTING 198 FEET
RECOMMENDED PUMPING RATE 0002 +½ GPM

LOCATION OF WELL

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



DRILLERS REMARKS

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

WATER USE 01
1 ☑ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED 10 ☐ OTHER

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

CONTRACTOR

NAME OF WELL CONTRACTOR: YVON GENIER WELL DRILLING | LICENCE NUMBER 2351
ADDRESS: RR4 CASSELMAN KOA-1MO
NAME OF DRILLER OR BORER: YVON GENIER | LICENCE NUMBER 2351
SIGNATURE OF CONTRACTOR: Yvon Genier | SUBMISSION DATE DAY ____ MO ____ YR ____

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 2351 | DATE RECEIVED 07 10 82
DATE OF INSPECTION | INSPECTION OP/LM
REMARKS
CSSIGS

FORM NO 0506—77 FORM 7

MINISTRY OF THE ENVIRONMENT COPY

Ontario — Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Well Tag Number (Place sticker and print number below): A014599

Instructions for Completing Form

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

Ministry Use Only: MUN 15011 CON CON C 1 LOT 23

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa Carleton

Township: Cumberland | Lot: 23 | Concession: 1

RR#/Street Number/Name: old montreal Rd

City/Town/Village: Cumberland | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 18 | Easting 466143 | Northing 5038619

Unit Make/Model: magellan | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Clay			0	0.61
black	Shale	grey limestone		0.61	24.7
grey	limestone	dark brown shale		24.7	31.7
dark brown	shale			31.7	35
grey	limestone	dark brown shale		35.0	91.7

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	91.7	15.24

Water Record

Water found at Metres	Kind of Water		
64.6	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals	☐ Gas ☐ Other: not tested
84.4	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals	☐ Gas ☐ Other: not tested
89.3	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals	☐ Gas ☐ Other:

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

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		6.1	91.7

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres) 90	Static Level	39.37		
Pumping rate - (litres/min) 12	1	41.13	1	41.83
Duration of pumping 6 hrs 45 min	2	41.40	2	41.72
Final water level end of pumping 43.24 metres	3	41.60	3	41.86
Recommended pump type. ☐ Shallow ☑ Deep	4	41.78	4	41.96
Recommended pump depth 85.3 metres	5	41.94	5	42.05
Recommended pump rate 12 (litres/min)	10	42.52	10	42.10
If flowing give rate - (litres/min)	15	42.64	15	42.10
If pumping discontinued, give reason.	20	43.07	20	42.04
	25	43.22	25	41.99
	30	43.33	30	41.93
	40	43.48	40	41.79
	50	43.55	50	41.74
	60	43.64	60	41.74

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
6.1	0	Cement slurry	0.2043

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: A.R. Rock Drilling Co Ltd | Well Contractor's Licence No. 1119

Business Address (street name, number, city etc.): RR#1 Richmond, Ont

Name of Well Technician (last name, first name): Turkell Shannon | Well Technician's Licence No. TO122

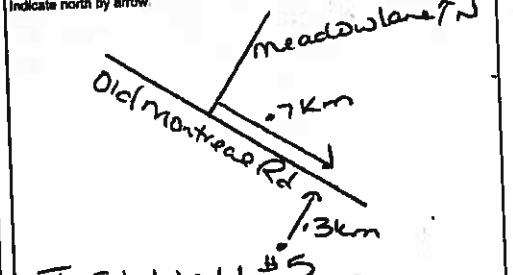
Signature of Technician/Contractor: x [signature] | Date Submitted YYYY MM DD: 2004 07 16

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☑

Location of Well

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



Audit No. Z 14561 | Date Well Completed YYYY MM DD: 2004 06 29

Was the well owner's information package delivered? ☑ Yes ☐ No | Date Delivered YYYY MM DD: JUL

Ministry Use Only

Data Source | Contractor 1119

Date Received YYYY MM DD: JUL 21 2004 | Date of Inspection YYYY MM DD

Remarks | Well Record Number: 1534811

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (Place sticker and print number below): A-014100 / A 014100

Well Record

Regulation 903 Ontario Water Resources Act

page 1 of 3

Instructions for Completing Form

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- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 5611 CON OF 01 LOT 20

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): OTTAWA - Carleton

Township: Cumberland

Lot: 3

Concession:

RR#/Street Number/Name: 1270 Guthrie St.

City/Town/Village: Cumberland

Site/Compartment/Block/Tract etc.: SOM-183

GPS Reading: NAD 83 Zone 18 Easting 466676 Northing 5039806

Unit Make/Model: Magellan

Mode of Operation: cctm

☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see Instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Grey	SHALE		loose	0	1.00
Grey	Limestone		Hard	1.00	98.48

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	7.87	22.23

Water Record

Water found at m: Kind of Water: ☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other:

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

Chlorinated? ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	0	7.87
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
15.55	Open hole		7.87	98.48

Test of Well Yield

Pumping test method: Submersible

Pump intake set at (metres): 60.60

Pumping rate (litres/min): 45.00

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping: 57.57 metres

Recommended pump type: ☐ Shallow ☑ Submersible

Recommended pump depth: 82.00 metres

Recommended pump rate: 45.00 (litres/min)

If flowing give rate (litres/min):

If pumping discontinued, give reason:

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	8.46		57.57
1	10.81	1	65.10
2	12.80	2	53.02
3	15.10	3	56.01
4	17.15	4	49.26
5	19.59	5	47.02
10	32.10	10	36.36
15	32.26	15	28.10
20	32.56	20	24.66
25	47.50	25	26.54
30	49.25	30	18.40
40	52.30	40	13.60
50	54.60	50	9.90
60	57.57	60	8.46

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	0.66	Cement Grout	160 kg

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: D&R Water Well Drilling — Well Contractor's Licence No.: 6006

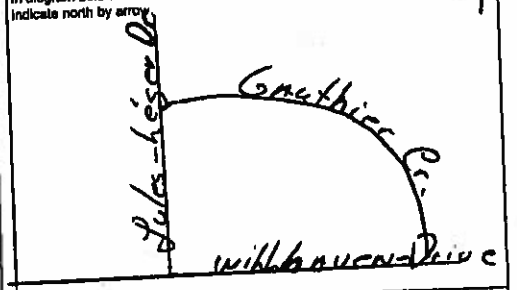
Business Address (street name, number/city etc.): 57 Albert - Ont

Name of Well Technician (last name, first name): Desrosiers, Denis — Well Technician's Licence No.: 1625

Signature of Technician/Contractor: [signature] — Date Submitted: 2004/06/02

Location of Well

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



Audit No. Z 14111

Date Well Completed: 2004/06/01

Was the well owner's information package delivered? ☐ Yes ☑ No

Date Delivered

Ministry Use Only

Data Source

Contractor: 6006

Date Received: JUL 13 2004

Date of Inspection

Remarks

Well Record Number: 1534818

Cette formule est disponible en français

Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐

0506E (06/03)

Ontario Ministry of the Environment

Well Tag Number (A 004706
A004706

Well Record
Regulation 903 Ontario Water Resources Act

page ___ of ___

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- Please print clearly in blue or black ink only.

Ministry Use Only
MUN 1501 | CON CON | LOT 23

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa Carleton
Township: Cumberland. Lot: 23 Concession: 1
RR#/Street Number/Name: [redacted] Old Montreal Rd
City/Town/Village: Cumberland
Site/Compartment/Block/Tract etc.:
GPS Reading: NAD 83 Zone 18 Easting 465143 Northing 5038701
Unit Make/Model: Magellan
Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
	Clay	Gravel		0	1.8
green+grey		limestone		1.8	70.1

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	70.1	14.9

Water Record

Water found at Metres	Kind of Water	Other
66.4	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Gas ☐ Other:	NOT TESTED
___ m	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Gas ☐ Other:	
___ m	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Other:	

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify NOT TESTED
Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
	Casing			
15.88	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	Screen			
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No. ___		
	No Casing or Screen			
	☑ Open hole		6.1	70.1

Test of Well Yield DataRec cl July 2

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres) 55	Static Level	48.85		
Pumping rate - (litres/min) 10	1	47.3	1	51.46
Duration of pumping 2 hrs + ___ min	2	47.35	2	51.18
Final water level end of pumping 53 metres	3	47.40	3	51.0
Recommended pump type: ☐ Shallow ☑ Deep	4	47.45	4	50.85
Recommended pump depth 64 metres	5	47.50	5	50.72
Recommended pump rate 10 (litres/min)	10	47.65	10	50.38
If flowing give rate - (litres/min)	15	47.81	15	50.23
If pumping discontinued, give reason.	20	47.87	20	50.14
	25	47.90	25	50.07
	30	48.92	30	49.99
	40	50.07	40	49.87
	50	50.41	50	49.75
	60	50.87	60	49.65

Plugging and Sealing Record ☑ Annular space ☐ Abandonment

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

Method of Construction
☐ Cable Tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☐ Rotary (air) ☑ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Water Use
☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public Supply ☑ Not used ☐ Cooling & air conditioning ☐ Other

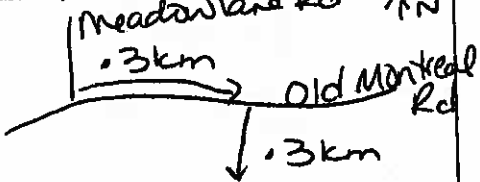
Final Status of Well
☐ Water Supply ☐ Observation well ☑ Test Hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Unfinished ☐ Dewatering ☐ Replacement well ☐ Abandoned, (Other)

Well Contractor/Technician Information
Name of Well Contractor: Ar Rock Drilling Ltd. Well Contractor's Licence No. 1119
Business Address (street name, number, city etc.): RR#1 Richmond, Ont
Name of Well Technician (last name, first name): Shannon Purcell Well Technician's Licence No. T2122
Signature of Technician/Contractor: X [signature] Date Submitted YYYY MM DD 2004 07 16

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐

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



Test Well # 4

Audit No Z 04920 Date Well Completed YYYY 2004 MM 04 DD 21
Was the well owner's information package delivered? ☐ Yes ☑ No Date Delivered YYYY MM DD NA

Ministry Use Only
Data Source Contractor 1119
Date Received JUL 21 2004 Date of Inspection YYYY MM DD
Remarks Well Record Number 1534792

Cette formule est disponible en français

Ontario — Ministry of the Environment

Well Record
Regulation 903 Ontario Water Resources Act

Well Tag Number: A004707
A004707

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 Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only
MUN 5011 CON CON LOT 23

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa Carleton
Township: Cumberland. Lot: 23 Concession: 1
RR#/Street Number/Name: Old Montreal Rd
City/Town/Village: Cumberland
Site/Compartment/Block/Tract etc.
GPS Reading: NAD 83 Zone 18 Easting 466143 Northing 5033870
Unit Make/Model: maquan
Mode of Operation: ☐ Undifferentiated ☒ Alternated ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see Instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
	Sand & clay			0	0.76
grey+green	limestone			0.76	75.3

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	75.3	14.91

Water Record

Water found at ___ Metres	Kind of Water
72 m	☒ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Gas ☐ Other: NOT
64.0 m	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Gas ☐ Other: USED
___ m	☐ Fresh ☐ Sulphur ☐ Salty ☐ Minerals ☐ Gas ☐ Other

After test of well yield, water was: ☒ Clear and sediment free ☐ Other, specify: NOT tested
Chlorinated: ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		6.1	75.3

Test of Well Yield

Data Rec'd Jul 2

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres) 51	Static Level	39.56		
Pumping rate - (litres/min) 42	1		1	44.52
Duration of pumping 6 hrs + 44 min	2	41.99	2	44.52
Final water level end of pumping 46.16 metres	3	42.23	3	44.44
Recommended pump type ☐ Shallow ☒ Deep	4	42.51	4	44.38
Recommended pump depth. 70 metres	5	42.89	5	44.36
Recommended pump rate. 42 (litres/min)	10	43.82	10	43.96
If flowing give rate - (litres/min)	15	44.56	15	43.84
	20	45.14	20	43.49
	25	45.4	25	
If pumping discontinued, give reason.	30	45.69	30	43.17
	40	45.98	40	
	50		50	43.93
	60	46.18	60	42.71

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

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

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

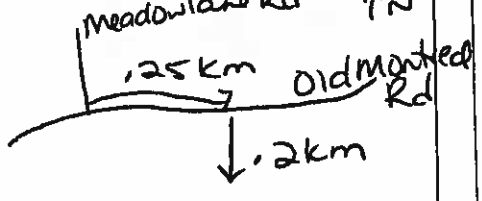
Name of Well Contractor: A1 Rock Drilling Ltd. Well Contractor's Licence No.: 1119
Business Address (street name, number, city etc.): RR#1 Richmond Ont
Name of Well Technician (last name, first name): Shannon Purcell Well Technician's Licence No.: T2122
Signature of Technician/Contractor: [signature] Date Submitted: 2004 07 16

0506E (09/03)

Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐

Location of Well

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



Test well #2

Audit No. Z 04919 Date Well Completed: 2004 04 20
Was the well owner's information package delivered? ☐ Yes ☒ No Date Delivered: NA

Ministry Use Only

Data Source: Contractor 1119
Date Received: JUL 21 2004 Date of Inspection
Remarks: Well Record Number: 1534791

Cette formule est disponible en français

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

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

11 | 1533452 | Municipality: 15011 | Con

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
City of Ottawa	Cumberland	Will Haven Plan 44-840	12

[redacted]

Address: 1287 George Vanier Cumberland

Date completed: 16 (day) Dec (month) 02 (year)

21 | UTM Zone | Easting | Northing | RC | Elevation | RC | Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	To
brown	fill		Hard	0	2
grey	limestone		layered	2	425

31

32

41 WATER RECORD

Water found at - feet	Kind of water
400	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	To
8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	42
6 1/4	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	1.88	+2	42
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic		42	425

SCREEN

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

Material and type | Depth at top of screen: feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0	40	cement grout

71 PUMPING TEST

Pumping test method: 1 ☐ Pump 2 ☑ Bailer | Pumping rate: 1 GPM | Duration of pumping: 1 Hours 0 Mins

Water levels during: 1 ☐ Pumping 2 ☑ Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
70 feet	420 feet	420 feet	400 feet	375 feet	350 feet

If flowing give rate: GPM | Pump intake set at: feet | Water at end of test: ☐ Clear ☑ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep | Recommended pump setting: feet | Recommended pump rate: 5 GPM

FINAL STATUS OF WELL

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

WATER USE

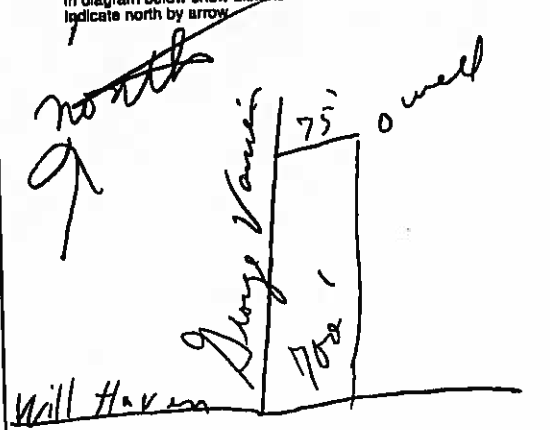
1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



252804

Name of Well Contractor	Well Contractor's Licence No.
Gilles Bourgeois	1414

Address: 517 A 16 en

Name of Well Technician	Well Technician's Licence No.
Alain Bourgeois	0-2710

Signature of Technician/Contractor: [signature] | Submission date: 16 (day) Dec (mo) 02 (yr)

MINISTRY USE ONLY

Data source | Contractor: 1414 | Date received: DEC 20 2002

Date of inspection | Inspector

Remarks: CSS.ES2

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

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

1533134

OTTAWA-CARLETON

County or District: City of Ottawa
Township/Borough/City/Town/Village: Cumberland
Con, block, tract, survey, etc.: Plan 50M-183
Lot: 2
Address: 1312 Matthew Cumberland
Date completed: 23 08 02 (day, month, year)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	L. mistone		layered	0	230
white	sandstone		Hard	230	395
Brown	lime stone		layered	395	422

41 WATER RECORD

Water found at - feet	Kind of water
350	1 Fresh, 2 Salty, 3 Sulphur, 4 Minerals, 5 Gas
	1 Fresh, 2 Salty, 3 Sulphur, 4 Minerals, 5 Gas
	1 Fresh, 2 Salty, 3 Sulphur, 4 Minerals, 5 Gas
	1 Fresh, 2 Salty, 3 Sulphur, 4 Minerals, 5 Gas
	1 Fresh, 2 Salty, 3 Sulphur, 4 Minerals, 5 Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
8 1/2	1 Steel, 2 Galvanized, 3 Concrete, 4 Open hole, 5 Plastic		0	42
6 1/4	1 Steel, 2 Galvanized, 3 Concrete, 4 Open hole, 5 Plastic	1.88	+2	42
6"	1 Steel, 2 Galvanized, 3 Concrete, 4 Open hole, 5 Plastic		42	422

SCREEN

Sizes of opening (Slot No.) | Diameter (inches) | Length (feet)
Material and type | Depth at top of screen (feet)

61 PLUGGING & SEALING RECORD

68 Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	42	cement grout

71 PUMPING TEST

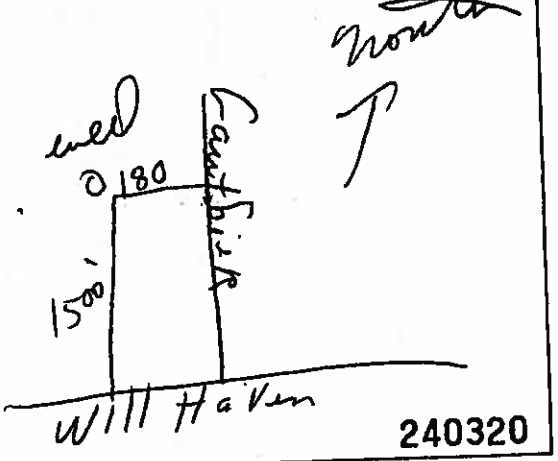
Pumping test method: 1 ☐ Pump, 2 ☐ Bailer
Pumping rate: 1 GPM
Duration of pumping: 1 Hours 0 Mins
25 Water levels during: 1 ☐ Pumping, 2 ☐ Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
120 feet	420 feet	375 feet	360 feet	340 feet	315 feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☐ Cloudy
Recommended pump type: ☐ Shallow ☐ Deep
Recommended pump setting: 410 feet
Recommended pump rate: 1 GPM

LOCATION OF WELL

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



240320

FINAL STATUS OF WELL

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

WATER USE

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

METHOD OF CONSTRUCTION

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

Name of Well Contractor: Gilles Bourgeois
Well Contractor's Licence No.: 1414
Address: St Albert On
Name of Well Technician: Jean Alain Bourgeois
Well Technician's Licence No.: 02710
Signature of Technician/Contractor: Gilles Bourgeois
Submission date: 23 08 02 (day, month, year)

MINISTRY USE ONLY

Data source
Contractor: 1414
Date received: SEP 13 2002
Date of inspection
Inspector
Remarks: CSS.ES2

0506 (07/00) Front Form 9

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The Ontario Water Resources Commission Act

WATER WELL RECORD

91G6e

Water management in Ontario
1. PRINT ONLY IN SPACES PROVIDED
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11 | 1512033 | MUNICIP. 15011 | CON. CON 07

COUNTY OR DISTRICT: Carleton
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland
CON., BLOCK, TRACT, SURVEY, ETC: 7
LOT: ~~2D~~ D

[redacted]

ADDRESS: 889 Elcott Dr. Ottawa
DATE COMPLETED: DAY 29 MO. 08 YR. 72

21 | UTM ZONE 18 | EASTING 465420 | NORTHING 5038170 | RC. 4 | ELEVATION 0220 | RC. 4 | BASIN CODE 25

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
Grey	limestone		broken	0	7
Grey	limestone		med. hard	7	90
Blue	limestone		" "	90	290

31 | 0090215 | 0290315

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0090	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0225	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0286	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
~~5 1/2~~	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ ~~OPEN HOLE~~	188	0	~~22~~ 0022
05	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		22	~~290~~ 0290
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

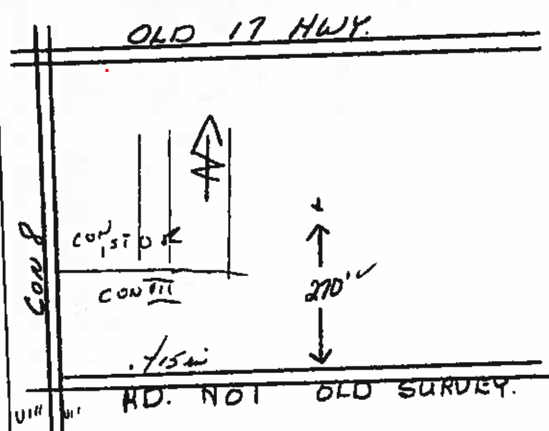
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0005 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
022 FEET	070 FEET	050 FEET	070 FEET	070 FEET	070 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY
IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 100 FEET
RECOMMENDED PUMPING RATE: 0004 GPM
000.1 GPM/FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS.

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

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

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

CONTRACTOR
NAME OF WELL CONTRACTOR: CAPITAL WATER SUPPLY LTD — LICENCE NUMBER 1558
ADDRESS: BOX 490 STITTSVILLE ONT.
NAME OF DRILLER OR BORER: E. MAURICE — LICENCE NUMBER
SIGNATURE OF CONTRACTOR: Walter Kavanagh
SUBMISSION DATE: DAY 30 MO. 8 YR. 72

OFFICE USE ONLY
DATA SOURCE: 1 | CONTRACTOR: 1558 | DATE RECEIVED: 041072
DATE OF INSPECTION | INSPECTOR
REMARKS
P K
WI

OWRC COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

1467 316 4W

Water management in Ontario

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11 | 1512515 | MUNICIP. 15011 | CON. 0F | 01 | 022

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
RUSSELL CARLETON	CUMBERLAND	I OF / OK	23

ADDRESS: [redacted]

DATE COMPLETED: DAY 02 MO 08 YR 72

21	ZONE	EASTING	NORTHING	RC	ELEVATION	RC	BASIN CODE
	18	465280	5038760	4	0325	6	25T

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
RED	SAND	FILL		0	5
GREY	LIMESTONE			5	240

31 | 0005128801 | 0240215

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0190	☒ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
0210	☒ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
0240	☒ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL
	☐ 1 FRESH ☐ 2 SALTY ☐ 3 SULPHUR ☐ 4 MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
06 (~~6¼~~)	☒ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE	188	0	0021 (~~21~~)
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☒ 4 OPEN HOLE			0240
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE: | DEPTH TO TOP OF SCREEN: FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☐ 1 PUMP ☒ 2 BAILER | PUMPING RATE 0010 GPM | DURATION OF PUMPING 02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: ☒ 1 PUMPING ☐ 2 RECOVERY — 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
015 FEET	050 FEET	025 FEET	035 FEET	045 FEET	050 FEET

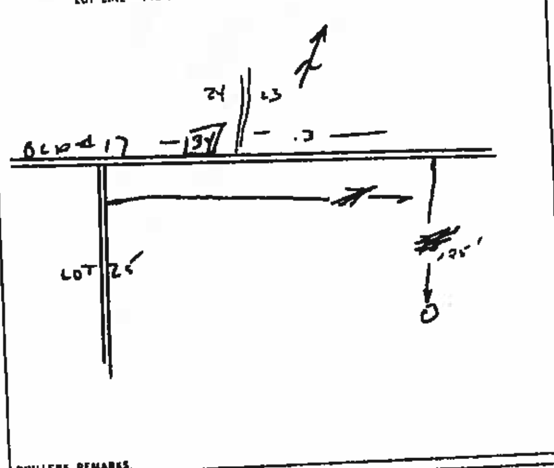
IF FLOWING, GIVE RATE: — | PUMP INTAKE SET AT 75 FEET | WATER AT END OF TEST: ☒ 1 CLEAR ☐ 2 CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING 100 FEET | RECOMMENDED PUMPING RATE 0008 GPM

0002 GPM/FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS.

FINAL STATUS OF WELL	☒ 1 WATER SUPPLY ☐ 2 OBSERVATION WELL ☐ 3 TEST HOLE ☐ 4 RECHARGE WELL ☐ 5 ABANDONED, INSUFFICIENT SUPPLY ☐ 6 ABANDONED, POOR QUALITY ☐ 7 UNFINISHED
WATER USE 07	☐ 1 DOMESTIC ☐ 2 STOCK ☐ 3 IRRIGATION ☐ 4 INDUSTRIAL ☐ OTHER TRAILER CAMP ☐ 5 COMMERCIAL ☐ 6 MUNICIPAL ☒ 7 PUBLIC SUPPLY ☐ 8 COOLING OR AIR CONDITIONING ☐ 9 NOT USED
METHOD OF DRILLING	☒ 1 CABLE TOOL ☐ 2 ROTARY (CONVENTIONAL) ☐ 3 ROTARY (REVERSE) ☐ 4 ROTARY (AIR) ☐ 5 AIR PERCUSSION ☐ 6 BORING ☐ 7 DIAMOND ☐ 8 JETTING ☐ 9 DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: K. McLaughlin (signature) | LICENCE NUMBER:

ADDRESS: 1110 FISHER AVE OTTAWA

NAME OF DRILLER OR BORER: F. FLEURY | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: (signature) | SUBMISSION DATE DAY ___ MO ___ YR ___

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	3701	101172

DATE OF INSPECTION: | INSPECTOR: K

REMARKS: | P K | WI

OWRC COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

1470

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
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1512516

COUNTY OR DISTRICT: RUSSELL (CARLETON)

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: CUMBERLAND

CON. BLOCK, TRACT, SURVEY, ETC.: 1ST FROM OTT. RD.

LOT: 22

DATE COMPLETED: DAY 08 MO 08 YR 72

ADDRESS: [redacted]

ZONE: 18 EASTING: 465400 NORTHING: 5013820

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
RED	SAND	FILL		0	4
GREY	LIMESTONE			4	100

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0080	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0095	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0078
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

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

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0010 GPM

DURATION OF PUMPING: 02 HOURS 00 MINS.

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	10 MINUTES	20 MINUTES	30 MINUTES	40 MINUTES	60 MINUTES
010 FEET	020 FEET	013 FEET	016 FEET	020 FEET	020 FEET	

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: 30 FEET

WATER AT END OF TEST: ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

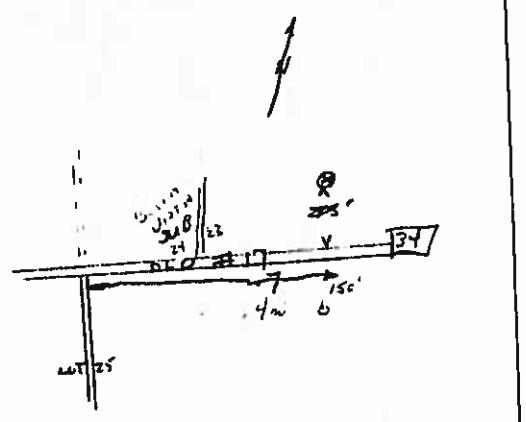
RECOMMENDED PUMP SETTING: 075 FEET

RECOMMENDED PUMPING RATE: 0006 GPM

001.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS:

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

WATER USE 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED ☐ OTHER

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

CONTRACTOR

NAME OF WELL CONTRACTOR: W. J. MOLOUGHNEY LTD. LICENCE NUMBER

ADDRESS: 1110 FISHER AVE OTTAWA

NAME OF DRILLER OR BORER: F. FLEURY LICENCE NUMBER

SIGNATURE OF CONTRACTOR: W. J. Moloughney SUBMISSION DATE DAY 8 MO 8 YR 72

OFFICE USE ONLY

DATA SOURCE: 1 CONTRACTOR: 3701 DATE RECEIVED: 101172

DATE OF INSPECTION: INSPECTOR: K

REMARKS: P WI

OWRC COPY

31 G/6e

CO

UTM 18 465718 E

5R 5031692 N

Elev. 5R 03401

1512685

WATER RESOURCES REPORT No 462

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 25 Russell (~~county~~)

County or District

Township, Village, Town or City Cumberland

Con. 7 Lot ~~N~~ C

Date completed 28 (day) July (month) 1966 (year)

Owner [redacted]

Address R.R. 1 - Cumberland, Ont.

Casing and Screen Record

Inside diameter of casing 6 3/16

Total length of casing 13

Type of screen -

Length of screen -

Depth to top of screen -

Diameter of finished hole 6

Pumping Test

Static level 70

Test-pumping rate 125 GPH XXXXX

Pumping level 90

Duration of test pumping 1 hr.

Water clear or cloudy at end of test clear

Recommended pumping rate 125 GPH XXXX

with pump setting of 120 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Limestone	0	160	90	fresh

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

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

Drilling or Boring Firm J.B. DUFRESNE & CO. LIMITED

Address 1014 Maitland Ave., Ottawa 5, Ont.

Licence Number 2030

Name of Driller or Borer R. Laniel

Address 6 Bellevue - Lucerne, Que.

Date July 28th 1966

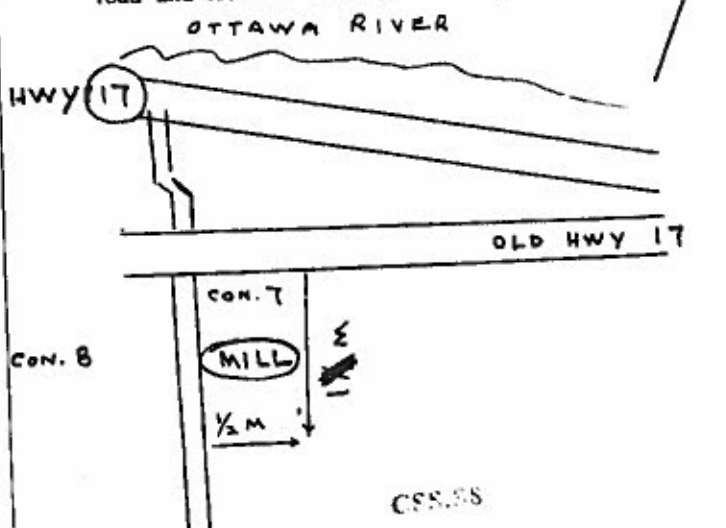
(Signature of Licensed Drilling or Boring Contractor)
for J.B. Dufresne & Co. Limited

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



UTM 18 4650 21 10 E
5R 5018 7610 N
Elev. 6R 0320

1513097

56 No. 327

The Ontario Water Resources Commission Act

WATER WELL RECORD

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

Con. 1st. Con. from Ottawa R. Lot 22 Date completed 20 January 1966 (day, month, year)

Owner [redacted] (print in block letters) Address 4102 Lakewood, Detroit 14, Michigan, U.S.A.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 25'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 35'

Test-pumping rate 6 G.P.M.

Pumping level 50'

Duration of test pumping 3 hrs.

Water clear or cloudy at end of test clear

Recommended pumping rate 6 G.P.M.

with pump setting of 75 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
clay & loose rock	0	4		
loose rock ~~rock & limestone~~	4	10		
grey limestone	10	112	112	fresh

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

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

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

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

Licence Number 2156

Name of Driller or Borer G. Charbonneau

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

Date 20 January 1966.

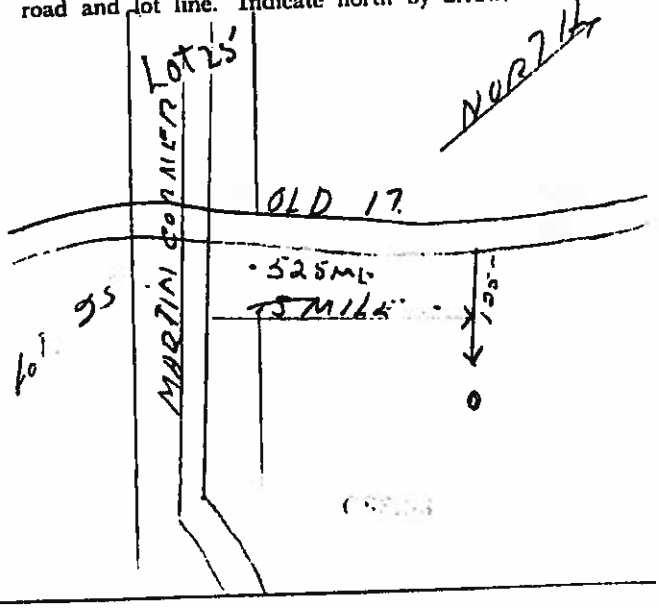
Gérard Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



7175488

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
Tag#: A124334

Well Record
Regulation 903 Ontario Water Resources Act

Page ___ of ___

[redacted]

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1730 WILHAVEN DR.	FORMERLY CUMBERLAND	N PT 01 CON E	

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARLETON	OTTAWA	Ontario	K2E 7T7

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465719	5038274		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	LOAM			0	1±
BROWN	CLAY		DENSE	1½	3
BROWN	GRAVEL	STONES		3	8½
BROWN	LIMESTONE			8½	80

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	20	BENTONITE SLURRY	.224

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	STEEL	.188	0 +2	20
6	OPEN HOLE		20	80

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	20	9¾
20	80	6

Results of Well Yield Testing

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

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 75

Pumping rate (l/min / GPM): 1

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 34.0

If flowing give rate (l/min / GPM): —

Recommended pump depth (m/ft): 75

Recommended pump rate (l/min / GPM): 1

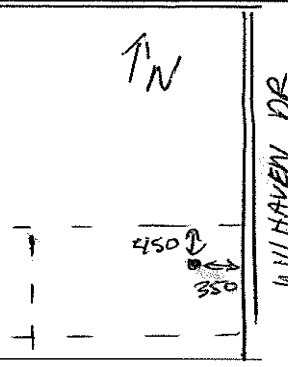
Well production (l/min / GPM): .25

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		4.8		
1	10.0		1	32.6
2	10.9		2	32.3
3	11.5		3	31.7
4	12.0		4	30.6
5	12.6		5	29.4
10	15.3		10	27.8
15	17.8		15	27.0
20	20.5		20	26.3
25	22.2		25	25.7
30	24.4		30	25.1
40	27.7		40	23.7
50	31.1		50	22.6
60	34.0		60	21.2

Map of Well Location

Please provide a map below following instructions on the back.
FRANK KENNY



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
T. SAUNDERS DRILLING LTD	4819

Business Address (Street Number/Name)	Municipality
RR#1	BRAESIDE

Province	Postal Code	Business E-mail Address
ONT.	K0A1G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6136235648	SAUNDERS TROY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T5117	Troy Saunders	2012 01 06

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2011/12/06	2011/12/06

Ministry Use Only
Audit No. Z131192
JAN 24 2012
Received

0506E (2007/12) © Queen's Printer for Ontario, 2007 — Ministry's Copy

31G/6e

UTM | 1 | 8 | Z | 4 | 6 | 4 | 8 | 5 | 0 | E
| 5 | R | 5 | 0 | 3 | 8 | 9 | 0 | 1 | 0 | N

Elev. | 5 | R | 0 | 3 | 1 | 2 |

Basin | 2 | 5 |

1512688

WATER RESOURCES DIVISION
56 No 464
SEP 1 8 1967
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

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

Con. 7 Lot E ~~W~~ Date completed 6 (day) apri. (month) 67. (year)

[redacted] dress Cumberland R.N.1.

Casing and Screen Record

Inside diameter of casing

Total length of casing 17'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 6"

Pumping Test

Static level 10'

Test-pumping rate 18 G.P.M.

Pumping level 50'

Duration of test pumping 2 hrs.

Water clear or cloudy at end of test clear.

Recommended pumping rate 6 G.P.M.

with pump setting of 50' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Clay. loos rocks	0	7		
Rock limston.	4	140'	140	140

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

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

Drilling or Boring Firm G. CHARBONNEAU DRILLING Orleans Ont.

(owner)

Address

Licence Number 3593

Name of Driller or Borer

Address Orleans R.R.N.1. 194.

Date April 6/67

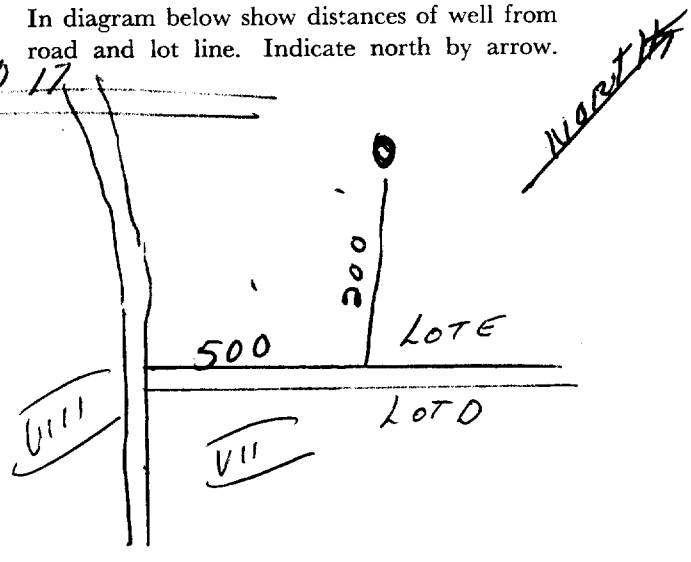
Gerard Charbonneau
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

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



The Ontario Water Resources Commission Act

WATER WELL RECORD

1512689

316/6 W

Water management in Ontario

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

11 | 560 1240 | MUNICIP. 5600 B | CON. CON | LOT 07

COUNTY OR DISTRICT: Russell
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Cumberland
CON. 7
BLOCK, TRACT, SURVEY, ETC.
LOT E
OWNER (SURNAME FIRST): Johannsen Co. Ltd.
ADDRESS: R.R. 3 Fallowfield Sta. Ottawa
DATE COMPLETED: DAY 01 MO Oct YR 70

21 | UTM ZONE 18 | EASTING 446561 | NORTHING 5038250 | RC. A | ELEVATION 0325 | RC. ST | BASIN CODE 25T

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
brown	fill			0	1
grey	limestone		hard	1	310
bluish	granite		hard	310	323

31 | 0991091 | 03/02/15 | 0323321

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0220	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0280	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. (INCHES)	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE	188	0	~~22~~ 0322
06			22	~~290~~
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		290	0290 ~~323~~
05	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0323

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

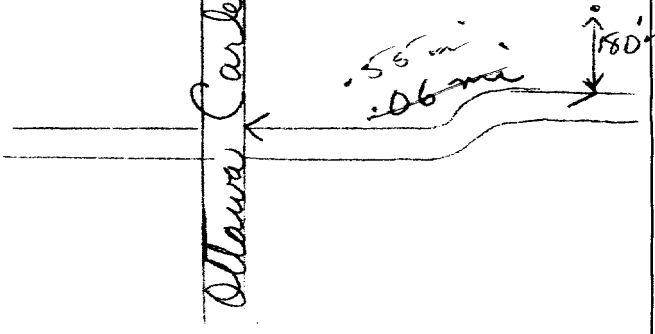
PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER
PUMPING RATE: 0008 GPM
DURATION OF PUMPING: 02 HOURS 00 MINS.
STATIC LEVEL: 030 FEET
WATER LEVEL END OF PUMPING: 200 FEET
WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
070 FEET	130 FEET	200 FEET	200 FEET

IF FLOWING, GIVE RATE: GPM.
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 250 FEET
RECOMMENDED PUMPING RATE: 005 GPM.
000.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

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



DRILLERS REMARKS:

FINAL STATUS OF WELL (54): 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE (55-56) 01: 1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; ☐ OTHER; 9 ☐ NOT USED

METHOD OF DRILLING (57): 1 ☒ CABLE TOOL (~~290~~ 323); 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☒ ~~ROTARY (AIR)~~ (~~0 290~~); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply — LICENCE NUMBER: 1558
ADDRESS: 14 Ashford Dr
NAME OF DRILLER OR BORER: W. Lavarack & E. Maurice — LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: Walter Lavarack — SUBMISSION DATE: DAY MO YR

OWRC COPY

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1558 | DATE RECEIVED: 021270
DATE OF INSPECTION | INSPECTOR
REMARKS:
P
WI

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

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

11

1533753

SHEET 1 OF 2

Municipality	Con.	
15011	CON	07

1P50R-844 Park 1

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
OTTAWA - Carleton	Cumberland.	Conc 7	D

[redacted]

Address	Date completed (day / month / year)
1542 - wilhaven Dr.	29/01/03

21 | UTM | Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
				0	245

31

32

41 WATER RECORD

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

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/8	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	20
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		20	
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

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

Material and type	Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☐ Annular space ☑ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0	245	old - Blug bentonite. 41 Bags.

71 PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
1 ☐ Pump 2 ☐ Bailer	GPM	Hours Mins

Static level	Water level end of pumping	Water levels during 1 ☐ Pumping 2 ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
feet	feet	feet	feet	feet	feet

If flowing give rate	Pump intake set at	Water at end of test
GPM	feet	☐ Clear ☐ Cloudy

Recommended pump type	Recommended pump setting	Recommended pump rate
☐ Shallow ☐ Deep	feet	GPM

FINAL STATUS OF WELL

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

WATER USE

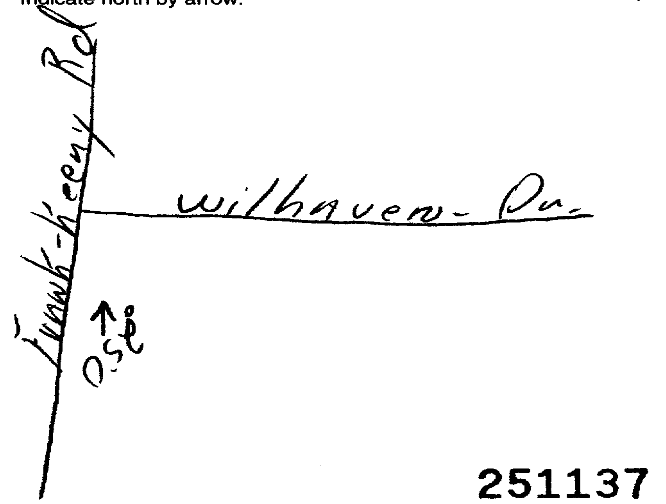
1 ☑ Domestic
2 ☐ Stock
3 ☐ Irrigation
4 ☐ Industrial
5 ☐ Commercial
6 ☐ Municipal
7 ☐ Public supply
8 ☐ Cooling & air conditioning
9 ☐ Not use
10 ☐ Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



251137

Name of Well Contractor	Well Contractor's Licence No.
D&R-WATER-well-Drilling	6006
Address: St-Albert-ont	
Name of Well Technician: Louis Desnoyers	Well Technician's Licence No.: T-625
Signature of Technician/Contractor: [signature]	Submission date: 29/01/03 (day mo yr)

MINISTRY USE ONLY

Data source	Contractor	Date received
	6006	APR 04 2003
Date of inspection	Inspector	
Remarks	CSS.ES3	

2 - MINISTRY OF THE ENVIRONMENT COPY

0506 (07/00) Front Form 9

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

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

1533753 SHEET 2 OF 2

15011 CON 07

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Carleton	Cumberland		D

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
[redacted]	R.R. 1, Cumberland, Ont.	DAY 8 MO. 10 YR. 76

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
brown	hardpan			0	12
brown	slate			12	130
grey	sand stone			130	150
brown	slate			150	245

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER		
245	☒ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERAL	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERAL	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERAL	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERAL	
	☐ FRESH ☐ SALTY	☐ SULPHUR ☐ MINERAL	

CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE	188	0	21
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

PLUGGING & SEALING RECORD

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

PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
☐ PUMP air ☐ BAILER	2 GPM	1 HOURS ____ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING ☐ PUMPING ☒ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
15 FEET	245 FEET	215 FEET	185 FEET	155 FEET	125 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	235 FEET	☒ CLEAR ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	235 FEET	2 GPM

LOCATION OF WELL

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

DRILLERS REMARKS:

FINAL STATUS OF WELL

☒ WATER SUPPLY
☐ OBSERVATION WELL
☐ TEST HOLE
☐ RECHARGE WELL
☐ ABANDONED, INSUFFICIENT SUPPLY
☐ ABANDONED, POOR QUALITY
☐ UNFINISHED

WATER USE

☒ DOMESTIC
☐ STOCK
☐ IRRIGATION
☐ INDUSTRIAL
☐ COMMERCIAL
☐ MUNICIPAL
☐ PUBLIC SUPPLY
☐ COOLING OR AIR CONDITIONING
☐ OTHER
☐ NOT USED

METHOD OF DRILLING

☐ CABLE TOOL
☐ ROTARY (CONVENTIONAL)
☐ ROTARY (REVERSE)
☒ ROTARY (AIR)
☐ AIR PERCUSSION
☐ BORING
☐ DIAMOND
☐ JETTING
☐ DRIVING

CONTRACTOR

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

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

NAME OF DRILLER OR OWNER: L. Bourgeois — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: [signature] — SUBMISSION DATE: DAY 8 MO. 9 YR. 76

OWNER'S COPY

OFFICE USE ONLY

APR 0 4 2003

CSS.ES3

FORM 7 MOE 07-091

7040752

Ontario Ministry of the Environment

Well Tag No. (Sticker above) A 052474

A052474

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa-Carleton

Township: Cumberland

Lot: 23

Concession:

RR# / Street Number / Name: #100 King Arthur

City/Town/Village: Cumberland

Site/Compartment/Block/Tract etc.: Plan 50R-10345 Lot 22

GPS Reading: NAD 83 | Zone: 18 | Easting: 465112 | Northing: 5038909

Unit Make/Model: Magellan

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
	Clay & Gravel			0	11.58
	Grey Limestone			11.58	73.15

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	73.15	14.91

Water Record

Water found at Metres	Kind of Water			
53 m	☑ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other
73.15 m	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other:
___ m	☐ Fresh	☐ Sulphur	☐ Gas	☐ Salty	☐ Minerals	☐ Other:

After test of well yield, water was: ☐ Clear and sediment free ☐ Other, specify: TESTED

Chlorinated? ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.88	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	18.29
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		17.68	73.15

Test of Well Yield

Pumping test method: Submersible

	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Static Level	0	6.85		26.00
1	9.48	1	22.40	
2	11.10	2	20.15	
3	12.33	3	17.80	
4	13.44	4	16.01	
5	14.39	5	14.62	
10	17.69	10	10.48	
15	19.45	15	9.37	
20	21.22	20	7.26	
25	22.16	25	6.85	
30	23.10	30		
40	24.12	40		
50	25.06	50		
60	26.00	60		

Pump intake set at (metres): 60.96

Pumping rate (litres/min): 56.78

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 26.00 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 60.96 metres

Recommended pump rate: 56.78 (litres/min)

If flowing give rate (litres/min):

If pumping discontinued, give reason: ✓

Plugging and Sealing Record ☑ Annular space ☐ Abandonment

Depth set at Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
17.68	0	Neat Cement Slurry	.4086

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: D.R. Rock Drilling Co. Ltd. — Well Contractor's Licence No.: 1119

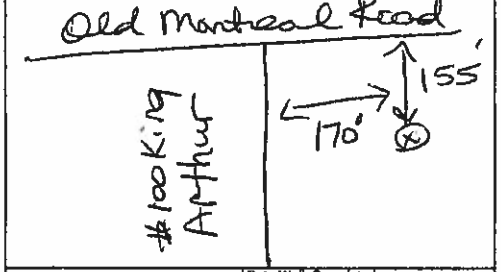
Business Address (street name, number, city etc.): RR#1 Richmond Ont K0A 2Z0

Name of Well Technician (last name, first name): Purcell Shannon — Well Technician's Licence No.: T2122

Signature of Technician/Contractor: X [signature] — Date Submitted: 2009 01 09

Location of Well

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



Audit No.: Z 55562

Date Well Completed: 2006 12 19

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered: 2006 12 15

Ministry Use Only

Data Source | Contractor: 1119

Date Received: FEB 12 2007 | Date of Inspection

Remarks | Well Record Number

0506E (08/2006)

Ministry's Copy

Cette formule est disponible en français

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

Ontario

WATER WELL RECORD

1513931

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

11 | 1513931 | MUNICIP 1501 | COR | OF | 01

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Carleton	Cumberland	~~Lot 0.33~~ OFI	023

[redacted] R.1, CUMBERLAND — DATE COMPLETED: DAY 16 MO 08 YR 73

NORTHING 038662 | RC 4 | ELEVATION 0285 | RC 5 | BASIN CODE 26 | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
grey	clay & boldars			0	5
brown	shale			5	15
grey	limestone			15	125

OWRC C-9

31 | 000520513 | 001561717 | 012521515

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0125	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0022
06	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0125
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

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

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	0009 GPM	02 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
035 FEET	040 FEET	1 ☐ PUMPING 2 ☒ RECOVERY	035 FEET	035 FEET	035 FEET	035 FEET

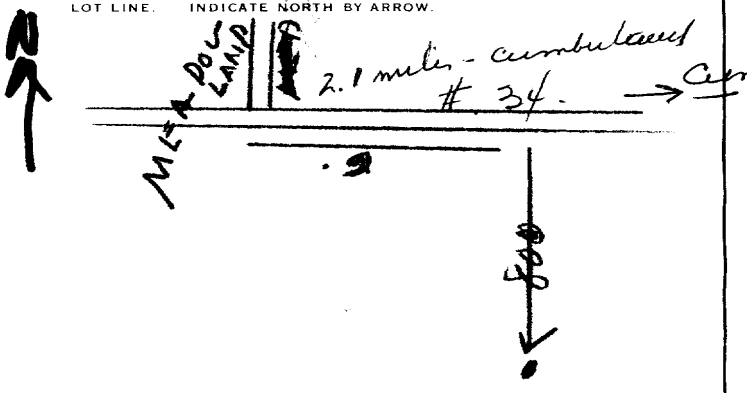
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	50 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	050 FEET	0009 GPM

001.8

LOCATION OF WELL 6438

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



DRILLERS REMARKS:

FINAL STATUS OF WELL 54: 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE 55-56: 01 — 1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING 57: 4 — 1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☒ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: C. Charbonneau, Diamond & Cable Drilling — LICENCE NUMBER: 1504

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

NAME OF DRILLER OR BORER: Leo Bourgeois — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: [signature] — SUBMISSION DATE: DAY 16 MO. 8 YR. 73

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DATA SOURCE 58: 1 — CONTRACTOR 59-62: 1504 — DATE RECEIVED 63-68: 180374

DATE OF INSPECTION — INSPECTOR

REMARKS: CSS.58

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

Ontario Ministry of the Environment

Well Tag Number A004811

A004811

1534816

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only

MUN 1501 CON CON 01 LOT 23

Well Owner's Information and Location of Well Information

[redacted]

Ottawa Carleton | Cumberland | 23 | 1

RR#/Street Number/Name: Old Montreal Rd | City/Town/Village: Cumberland | Site/Compartment/Block/Tract etc.

GPS Reading | NAD: 83 | Zone: 18 | Easting: 461915 | Northing: 5038871 | Unit Make/Model: magellan | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Clay			0	3.4
grey+green	limestone		mixed	3.4	73.1

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	73.1	14.91

Water Record

Water found at ___ Metres	Kind of Water
65.8	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: Not tested
69.5	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: tested
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☒ Clear and sediment free ☐ Other, specify Not tested

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	6.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		6.1	73.1

Test of Well Yield Data Recorded July 2

Pumping test method

Pump intake set at - (metres) 55

Pumping rate - (litres/min) 45

Duration of pumping 7 hrs + 19 min

Final water level end of pumping 49.57 metres

Recommended pump type. ☐ Shallow ☒ Deep

Recommended pump depth. 70 metres

Recommended pump rate. 55 (litres/min)

If flowing give rate - (litres/min) —

If pumping discontinued, give reason. —

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		30.8		
1		32.6	1	39.33
2		33.41	2	38.93
3		34.06	3	38.68
4		34.90	4	38.51
5		35.02	5	38.30
10		36.54	10	38.05
15		37.60	15	37.85
20		38.47	20	37.68
25		39.06	25	
30		39.44	30	37.52
40			40	37.33
50		40.87	50	37.19
60		41.82	60	37.04

Plugging and Sealing Record ☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
6.1	3.4	Cement slurry	0.1362
3.4	0	Bentonite slurry	0.227

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: A-Rod Drilling Ltd | Well Contractor's Licence No.: 1119

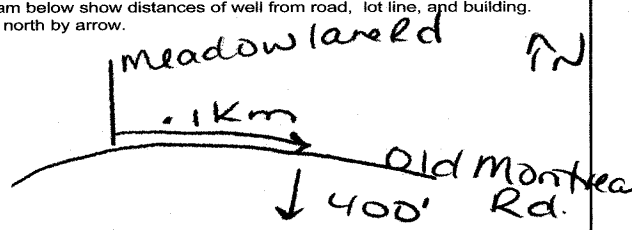
Business Address (street name, number, city etc.): RR#1 Richmond, ONT

Name of Well Technician (last name, first name): Shannon Purcell | Well Technician's Licence No.: T2122

Signature of Technician/Contractor: x [signature] | Date Submitted: 2004 07 16

Location of Well

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



Test well #1

Audit No. Z 04918 | Date Well Completed: 2004 04 19

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered: NA

Ministry Use Only

Data Source | Contractor: 1119

Date Received: JUL 21 2004 | Date of Inspection

Remarks | Well Record Number: 1534816

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐ *Cette formule est disponible en français*

7109809

Ontario — Ministry of the Environment

Measurements recorded in: X Metric ☐ Imperial

Well Tag No. (A 066502)
A066508

Well

Regulation 903 Ontario Water Re

Page

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): #171 King Arthur

Township: Cumberland

Lot: 23

Concession: 1

County/District/Municipality: Ottawa Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

UTM Coordinates: Zone 18 Easting 465000 Northing 5013506

Municipal Plan and Subdivision Number: SR-7034 S/L 7

Other:

NAD 83

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

General Colour	Most Common Material	Other Materials	General Description	Depth (mft) From	Depth (mft) To
Grey	Clay			0	3.05
Blue/Grey & Brown	Limestone			3.05	152.39

Annular Space

Depth Set at (mft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (imp gal)
9.14	0	Neat Cement Slurry	27.24

Method of Construction

Cable Tool; Diamond; Rotary (Conventional); Jetting; Rotary (Reverse); Driving; Boring; Digging; Air Percussion; Other, specify

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (mft) From	Depth (mft) To
15.80	Steel	.48	+.6	9.14
15.23	Open hole		9.14	152.39

Status of Well

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

Construction Record - Screen

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

Water Details

Water found at Depth (mft)	Kind of Water	Fresh	Untested
82.90	X Gas; Other, specify		
	Gas; Other, specify		
	Gas; Other, specify		

Hole Diameter

Depth (mft) From	Depth (mft) To	Diameter (cm/in)
0	152.39	15.23

Results of Well Yield Testing

After test of well yield, water was: X Clear and sand free; Other, specify; If pumping discontinued, give reason:

Pump intake set at (mft): 91.44

Pumping rate (l/min / GPM): 15.14

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (mft): 44.26

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

Recommended pump depth (mft): 143.95

Recommended pump rate (l/min / GPM): 15.14

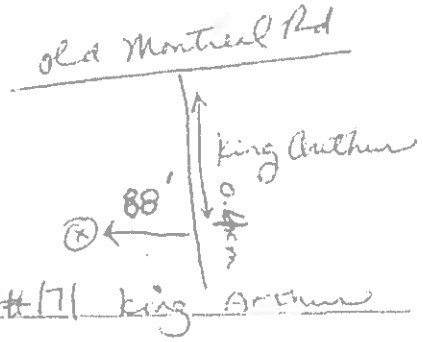
Well production (l/min / GPM): 2

Disinfected: X Yes; No

Draw Down Time (min)	Draw Down Water Level (mft)	Recovery Time (min)	Recovery Water Level (mft)
Static Level	9.05		44.26
1	8.69	1	31.50
2	9.37	2	31.20
3	16.08	3	39.11
4	10.75	4	38.98
5	11.48	5	38.15
10	15.86	10	37.84
15	19.34	15	37.04
20	22.80	20	36.23
25	25.96	25	35.45
30	29.72	30	
40	35.28	40	
50	40.70	50	
60	44.86	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: A1K Rock Drilling Co. Ltd.

Well Contractor's Licence No.: 1179

Business Address (Street Number/Name): 1211

Municipality: Richmond

Province: ON

Postal Code: K0A 2Z0

Business E-mail Address:

Bus. Telephone No. (inc. area code): (613) 838-2190

Name of Well Technician (Last Name, First Name): Graham, Ryan

Well Technician's Licence No.: T34814

Signature of Technician and/or Contractor: [signature]

Date Submitted: 2008/08/04

Ministry's Copy

Well owner's information package delivered: X Yes; No

Date Package Delivered: 2008/06/11

Date Work Completed: 2008/06/10

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Audit No. Z 80803

AUG 14 2008

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Ontario — Ministry of the Environment

7233585

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A123491 **Tag#: A123491**

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Metric Homes (1979) Inc.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
114 Arbourbrook Blvd	Carp	Ontario	K0A 1L0	6138368079

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
161 King Arthur Street	Cumberland		

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Cumberland	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465103	5038567		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Packed	0	3.65
Gray	Limestone	Cloured Layers	Medium	3.65	151.78
Gray	Limestone	Coloured Layers	Medium	151.78	155.44

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
6.40	0	Grouted - Cement	.21m3

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.86	Steel	.48	+ .45	6.40

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.40	15.89
6.40	151.78	15.23
151.78	155.44	14.28

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 91.43

Pumping rate (l/min / GPM): 13.65

Duration of pumping: 1 hrs + 20 min

Final water level end of pumping (m/ft): 78

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

Recommended pump depth (m/ft): 91.43

Recommended pump rate (l/min / GPM): 13.65

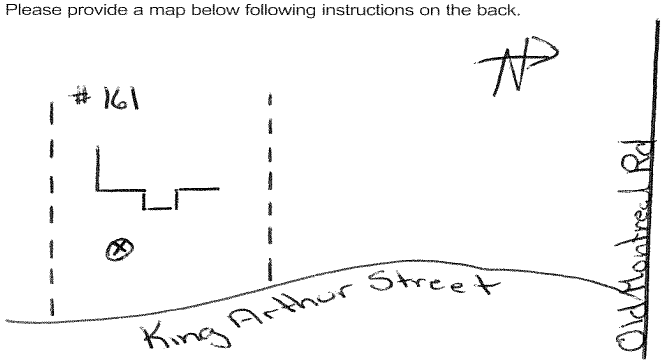
Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	16.75		
1	18.80	1	76.20
2	19.27	2	75.09
3	19.80	3	74.38
4	20.50	4	73.88
5	20.94	5	73.28
10	23.90	10	71.53
15	26.75	15	69.37
20	29.40	20	66.70
25	32.95	25	65.35
30	35.	30	63.55
40	39.	40	59.85
50		50	57.09
60	47.10	60	54.25

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
P.O. Box 490	Stittsville	Ontario	K2S 1A6	office@capitalwater.ca

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138361766	Miller; Stephen	0097		2014 09 16

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2014 09 12	2014 09 04

Ministry Use Only

Audit No. Z188557

Received DEC 12 2014

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Ministry's Copy

Ontario Ministry of the Environment

Well Tag No. (Sticker) A 038772

A038772

Well Record

Regulation 903 Ontario Water Resources Act

1536595

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 Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): City of Ottawa

Township: Cumberland

Lot: 5 A 20

Concession: 1 (05)

RR#/Street Number/Name: 1292 Tube Leger DR

City/Town/Village: Cumberland

Site/Compartment/Block/Tract/etc.: Plan 5M-182

GPS Reading: NAD 8 3 | Zone 18 | Easting 4 7 6 8 5 4 3 E | Northing 5 0 3 9 9 2 8

Unit Make/Model: Mayflower unit

Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
Grey	Sand		Soft	0	0.60
Grey	limestone		layered	0.60	12.800

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	12.80	2127
12.80	12.80	1555

Water Record

Water found at Metres	Kind of Water			
12.80 m	☑ Fresh	☐ Salty	☐ Sulphur	☐ Minerals
☐ Gas	☐ Other:			
___ m	☐ Fresh	☐ Salty	☐ Sulphur	☐ Minerals
☐ Gas	☐ Other:			
___ m	☐ Fresh	☐ Salty	☐ Sulphur	☐ Minerals
☐ Gas	☐ Other:			

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

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.55	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48	+0.60	12.80
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		12.80	12.800

Test of Well Yield

Pumping test method: 3 H.P.

Pump intake set at - (metres): 120

Pumping rate - (litres/min): 10

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 45.09 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 120 metres

Recommended pump rate: 30 (litres/min)

If flowing give rate - (litres/min):

If pumping discontinued, give reason.

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	9.60		29.09
1		1	24.12
2		2	24.00
3		3	23.80
4		4	23.48
5	12.10	5	23.22
10	12.92	10	22.36
15	13.70	15	21.04
20	15.40	20	20.25
25	16.42	25	19.90
30	17.34	30	19.25
40	18.30	40	18.50
50	22.42	50	19.09
60	25.09	60	17.75

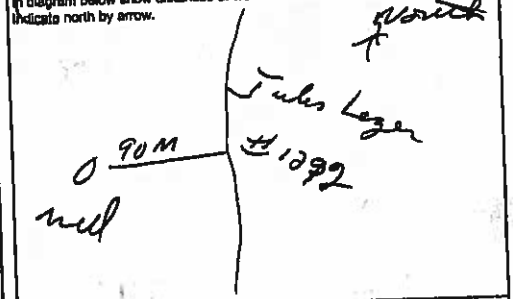
Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	12.80	Cement Grout	6 bags

Location of Well

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



Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: Cliffs Bore Well

Well Contractor's Licence No.: 1114

Business Address (street name, number, city etc.): [illegible]

Name of Well Technician (last name, first name): [illegible]

Well Technician's Licence No.: 0-193

Signature of Technician/Contractor: [signature]

Date Submitted: 06 10 31

Audit No.: Z 51952

Date Well Completed: 06 09 17

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered: 06 10 20

Ministry Use Only

Data Source

Contractor: 1414

Date Received: AUG 23 2006

Date of Inspection

Remarks

Well Record Number

0506E (09/03)

☐ Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy

Cette formule est disponible en français

Ontario — Ministry of the Environment

Measurements recorded in: ☑ Metric ☐ Imperial

Well A 098394 (Below)

A098394

7144357

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 3

[redacted]

Address of Well Location (Street Number/Name): 5301- Georges Vanier- Dr | Township: Cumberland. | Lot: 13 | Concession:

County/District/Municipality: OTTAWA - City | City/Town/Village: Cumberland. | Province: Ontario | Postal Code: K4C 1E1

UTM Coordinates: NAD 83 | Zone: 18 | Easting: 464105 | Northing: 5038874 | Municipal Plan and Sublot Number: 4M-840 | Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	limestone.			0	150.15

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
10.60	1.51	Cement + bents	200kg.

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.86	Steel	.48	+1.51	150.15

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth	Kind of Water	Hole Depth From (m/ft)	Hole Depth To (m/ft)	Hole Diameter (cm/in)
56.06 (m/ft) ☐ Gas	☑ Fresh ☐ Untested ☐ Other, specify	0	10.60	15.86
131.81 (m/ft) ☐ Gas	☑ Fresh ☐ Untested ☐ Other, specify	10.60	150.15	15.55
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70.90

Pumping rate (l/min / GPM): 13.50

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping (m/ft): 48.93

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

Recommended pump depth (m/ft): 134.84

Recommended pump rate (l/min / GPM): 22.50

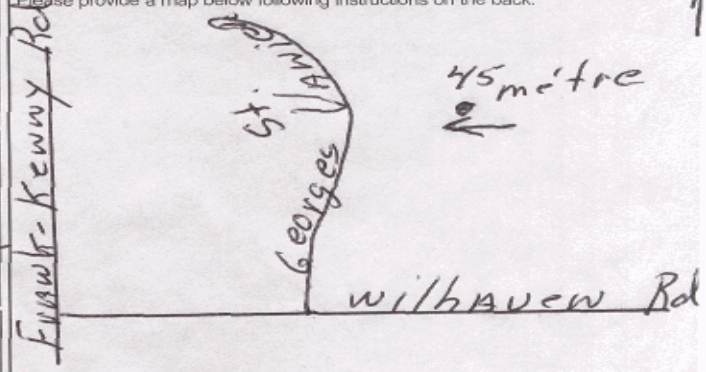
Well production (l/min / GPM): 4.5

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	9.09		48.93
1	13.52	1	47.04
2	16.05	2	46.12
3	18.02	3	45.09
4	19.27	4	44.15
5	21.42	5	43.18
10	25.04	10	41.09
15	29.60	15	39.23
20	32.81	20	37.40
25	35.79	25	35.58
30	37.93	30	34.08
40	40.01	40	32.96
50	44.82	50	29.01
60	48.93	60	27.11

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: DXR-WATER-well-Drilling | Well Contractor's Licence No.: 6006

Business Address (Street Number/Name): 1763- Route 200 west | Municipality: Nation

Province: ON | Postal Code: K0A3C0 | Business E-mail Address:

Bus. Telephone No. (inc. area code): 6139875598 | Name of Well Technician (Last Name, First Name): Desnoyers Louis

Well Technician's Licence No.: 1625 | Signature of Technician and/or Contractor: Louis Desnoyers | Date Submitted: 2010/04/17

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2010/04/12

Date Work Completed: 2010/04/12

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Audit No. Z 099742

Received MAY 06 2010

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Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Place Sticker and/or Print Below) A076804 **A076804**

Page ____ of ____

Measurements recorded in: [X] Metric [ ] Imperial

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): Lot 14 Camelot Estates

Township: Cumberland

Lot: 23

Concession: 10

County/District/Municipality: Ottawa Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

UTM Coordinates: Zone: 18 Easting: 465203 Northing: 5038556 NAD

Municipal Plan and Sublot Number:

Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Clay	Stones	Packed	0	1.82
Gray	Limestone	Light Colours	Medium	1.82	77.72
Gray	Limestone	Dark Layers		77.72	91.43

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
6.4	0	Crouted Cement Slurry	.21m³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.86	Steel	.48	+.45	6.4

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Fresh	X Untested
86.86m 88.38m	[X] Other, specify		
Water found at Depth (m/ft)	Kind of Water	Fresh	Untested
	[ ] Gas [ ] Other, specify		
Water found at Depth (m/ft)	Kind of Water	Fresh	Untested
	[ ] Gas [ ] Other, specify		

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.4	15.86
6.4	83.81	15.23
83.81	91.43	14.75

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump Intake set at (m/ft): 83.81

Pumping rate (l/min / GPM): 31.85

Duration of pumping: 2 hrs + 30 min

Final water level end of pumping (m/ft): 36.43

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

Recommended pump depth (m/ft): 60.95

Recommended pump rate (l/min / GPM): 31.85

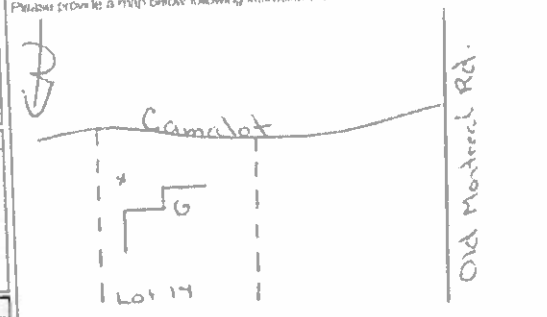
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	22.10		
1	24.06	1	34.10
2	25.55	2	33.15
3	26.36	3	32.44
4	27.27	4	31.62
5	27.80	5	30.94
10	30	10	28.77
15	31.20	15	27.41
20	32.07	20	26.82
25	32.80	25	26.31
30	33.25	30	25.97
40	34.01	40	25.48
50	34.53	50	25.18
60	34.98	60	25.02

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Capital Water Supply Ltd.

Well Contractor's Licence No: 1558

Business Address (Street Number/Name): Box 490

Municipality: Stittsville

Province: Ontario

Postal Code: K2S 1A6

Business E-mail Address: office@capitalwater.ca

Business Telephone No. (inc. area code): 6138361766

Name of Well Technician (Last Name, First Name): Miller, Stephen

Well Technician's Licence No: 0097

Signature of Technician and/or Contractor:

Date Submitted: 2009031

Ministry's Copy

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

Date Package Delivered: 2009032

Date Work Completed: 2009031

Ministry Use Only

Audit No: Z095333

APR 06 2009

Received

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Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. A 066502 — A066502

7109809

Well

Regulation 903 Ontario Water Re

Page

[redacted]

Address of Well Location (Street Number/Name): #171 King Arthur

Township: Cumberland

Lot: 23

Concession: 1

County/District/Municipality: Ottawa Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

UTM Coordinates — Zone: 18 Easting: 465120 Northing: 5038506

NAD 83

Municipal Plan and Sublot Number: #50R-7034 S/L 7

Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Clay			0	3.05
Bluish Grey & Brown	Limestone			3.05	152.39

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
9.14	0	Neat Cement Slurry	2724

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.88	Steel	.48	+.6	9.14
15.23	Openhole		9.14	152.39

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	152.39	15.23

Results of Well Yield Testing

After test of well yield, water was:

- [ ] Clear and sand free
- [ ] Other, specify TESTED

If pumping discontinued, give reason:

Pump intake set at (m/ft): 91.44

Pumping rate (l/min / GPM): 15.14

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 44.26

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

Recommended pump depth (m/ft): 143.95

Recommended pump rate (l/min / GPM): 15.14

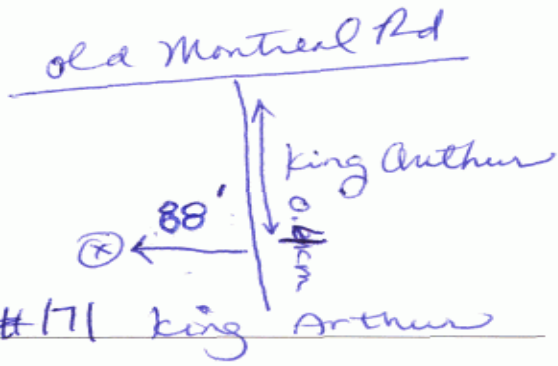
Well production (l/min / GPM): 2

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	9.05		44.86
1	8.60	1	39.55
2	9.37	2	39.20
3	10.08	3	39.11
4	10.79	4	38.98
5	11.48	5	38.95
10	15.86	10	39.84
15	19.34	15	37.04
20	22.80	20	36.25
25	25.96	25	35.45
30	29.72	30	
40	35.28	40	
50	40.70	50	
60	44.86	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: ARK Rock Drilling Co. Ltd — Well Contractor's Licence No.: 1179

Business Address (Street Number/Name): RR1 — Municipality: Richmond

Province: Ont — Postal Code: K0A2Z0 — Business E-mail Address:

Bus. Telephone No. (inc. area code): 6039382190 — Name of Well Technician (Last Name, First Name): Graham, Ryan

Well Technician's Licence No.: T3484 — Signature of Technician and/or Contractor: [signature] — Date Submitted: 20080801

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

Date Package Delivered: 2008 06 19

Date Work Completed: 2008 06 19

Ministry Use Only

Audit No. Z 80803

Received AUG 14 2008

0506E (12/2007)

Ministry's Copy

Ontario Ministry of the Environment

Well Tag No. (Sticker below) A 043496

A043496

Well Record

Regulation 903 Ontario Water Resources Act

1536743

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 Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Ottawa-Carleton

Township: Cumberland | Lot: 23 | Concession:

RR#/Street Number/Name: #181 King Arthur Street

City/Town/Village: Cumberland | Plan 50R-7034 | Lot 8

GPS Reading | NAD: 83 | Zone: 18 | Easting: 465132 | Northing: 5038432

Unit Make/Model: Napelton | Mode of Operation: ☐ Undifferentiated ☐ Differentiated, specify ☒ Averaged

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
	Clay			0	0.46
	Grey &	Black limestone		0.46	103.63

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	103.63	15.07

Water Record

Water found at Metres / Kind of Water

- 100.71 ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT TESTED
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☐ Clear and sediment free ☐ Other, specify NOT TESTED

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	7.31
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		6.71	103.63

Test of Well Yield

Pumping test method: SubPump

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	28.7		17.80
1	3.70	1	15.30
2	4.50	2	14.40
3	5.05	3	13.50
4	5.60	4	12.50
5	6.15	5	11.80
10	8.35	10	8.80
15	9.80	15	7.00
20	11.20	20	6.00
25	12.00	25	5.03
30	12.50	30	4.01
40	13.10	40	2.87
50	15.20	50	
60	17.80	60	

Pumping rate (litres/min): 27.1

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 80 metres

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 92 metres

Recommended pump rate: 27.1 (litres/min)

If flowing give rate (litres/min):

If pumping discontinued, give reason:

Pump intake set at (metres): 99

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
6.71	0	Neat Cement Slurry	.1362

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

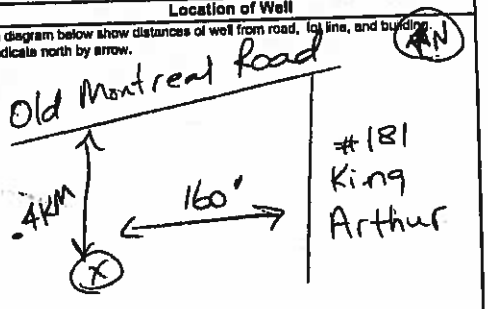
Business Address (street name, number, city etc.): RR#1 Richmond Ont K0A 2Z0

Name of Well Technician (last name, first name): Purcell Shannon | Well Technician's Licence No.: T0122

Signature of Technician/Contractor: X [signature] | Date Submitted: 2006 07 27

Location of Well

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



Audit No.: Z 48602 | Date Well Completed: 2006 07 27

Was the well owner's information package delivered? ☒ Yes ☐ No | Date Delivered: 2006 08 08

Ministry Use Only

Data Source | Contractor: 1119

Date Received: OCT 17 2006 | Date of Inspection | Well Record Number

Remarks

Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐

0506E (08/03)

Cette formule est disponible en français

Ontario — Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Place Sticker and/or Print Below): A076803 **A076803**

Page ____ of ____

Measurements recorded in: [X] Metric [ ] Imperial

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): Lot 15 Camelot

Township: Cumberland

Lot: 23

Concession: 10

County/District/Municipality: Ottawa Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

Municipal Plan and Sublot Number:

Other:

UTM Coordinates: Zone: 18 Easting: 465179 Northing: 5038608 NAD 83

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Clay		Packed	0	3.65
Gray	Limestone	Light Colours	Medium	3.65	79.24
Gray	Limestone	Dark Layer	Medium	79.24	93.26

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
6.4	0	Grouted Cement	.21m3

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.86	Steel	.48	+.45	6.4

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water: Fresh / Untested / Gas / Other, specify
88.38-89.91	[ ] [X] [ ] [ ]
Water found at Depth (m/ft)	Kind of Water: Fresh / Untested / Gas / Other, specify
	[ ] [ ] [ ] [ ]
Water found at Depth (m/ft)	Kind of Water: Fresh / Untested / Gas / Other, specify
	[ ] [ ] [ ] [ ]

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.4	15.86
6.4	83.81	15.23
83.81	93.26	14.75

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 83.81

Pumping rate (l/min / GPM): 18.2

Duration of pumping: 2 hrs + min

Final water level end of pumping (m/ft): 50.69

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

Recommended pump depth (m/ft): 68.57

Recommended pump rate (l/min / GPM): 18.20

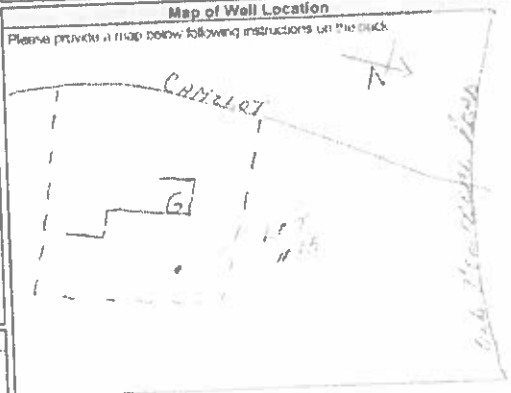
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		18.29		
1	1	18.39	1	48.57
2	2	18.80	2	47.96
3	3	19.21	3	47.37
4	4	19.66	4	46.74
5	5	19.98	5	46.19
10	10	23.49	10	43.45
15	15	27.03	15	40.57
20	20	29.68	20	38.64
25	25	32.15	25	36.84
30	30	34.79	30	35.03
40	40	38.12	40	32.26
50	50	41.19	50	30.07
60	60	43.59	60	28.89

Map of Well Location

Please provide a map below following instructions on the back.



Comments

Well Contractor and Well Technician Information

Business Name of Well Contractor: Capital Water Supply Ltd.

Well Contractor's Licence No: 1556

Business Address (Street Number/Name): Box 490

Municipality: Stittsville

Province: Ontario

Postal Code: K2S 1A6

Business E-mail Address: office@capitalwater.ca

Business Telephone No. (inc. area code): 6138361766

Name of Well Technician (Last Name, First Name): Miller, Stephen

Well Technician's Licence No: 0097

Signature of Technician and/or Contractor:

Date Submitted: 2009/03/18

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

Date Package Delivered: 2009/03/20

Date Work Completed: 2009/03/14

Ministry Use Only

Audit No: Z095334

Received: APR 06 2009

Ministry's Copy

0506E (12/2005)

Ontario — Ministry of the Environment

Well Record

tion 903 Ontario Water Resources Act

Page ____ of ____

Well Tag No. (Place Sticker and/or Print Below): A068294 **A 068294**

Measurements recorded in: [X] Metric [ ] Imperial

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): 1353 Jules Leger Dr.

County/District/Municipality: Ottawa Carleton

Township: Cumberland

Lot: 19

Concession: BF

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

Other:

Municipal Plan and Subdot Number:

UTM Coordinates: Zone: NAD 8 3 1 8 | Easting: 466597 | Northing: 5038700

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

General Colour	Most Common Material	Other Materials	General Description	Depth (mft) From	To
Gray	Limestone	Dark Layers	Medium Hard	0	76.19

Annular Space

Depth Set at (mft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (mft³)
6.40	0	Grouted Bentonite Slurry	.110m3

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (mft) From	To
15.86	Steel	.48	+2.74	6.40

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth (mft) From	To	Diameter (cm/in)
12.19mft	[X] Fresh [ ] Untested [ ] Gas [ ] Other, specify	0	6.40	15.86
72.84mft	[X] Fresh [ ] Untested [ ] Gas [ ] Other, specify	6.40	76.19	15.55
(mft)	[ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (mft): 60.95

Pumping rate (l/min / GPM): 54.6

Duration of pumping: 1 hrs + ____ min

Final water level end of pumping (mft): 5.22

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

Recommended pump depth (mft): 22.85

Recommended pump rate (l/min / GPM): 45.5

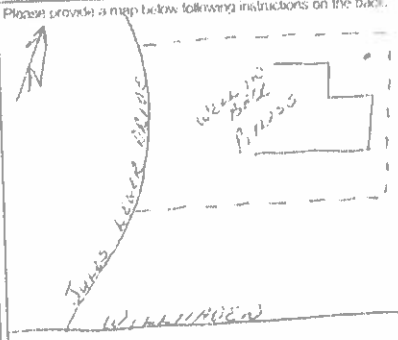
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (mft)	Recovery Time (min)	Recovery Water Level (mft)
Static Level		2.32		
1	1	3.85	1	3.46
2	2	4.43	2	2.76
3	3	4.74	3	2.55
4	4	4.89	4	2.48
5	5	4.99	5	2.44
10	10	5.12	10	2.36
15	15	5.16	15	2.32
20	20	5.17	20	
25	25	5.20	25	
30	30	5.22	30	
40	40	5.22	40	
50	50	5.22	50	
60	60	5.22	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Capital Water Supply Ltd.

Well Contractor's Licence No: 1558

Business Address (Street Number/Name): Box 490

Municipality: Stittsville

Province: Ontario

Postal Code: K2S 1A6

Business E-mail Address: office capitalwater.ca

Bus Telephone No. (inc. area code): 613 836 1766

Name of Well Technician (Last Name, First Name): Miller, Stephen

Well Technician's Licence No: 0097

Signature of Technician and/or Contractor

Date Submitted: 2009 04 30

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

Date Package Delivered: 2009 04 30

Date Work Completed: 2009 04 28

Ministry Use Only

Audit No: Z095313

MAY 20 2009

Ministry's Copy

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Place Sticker and/or Print Below): A068314 **A 068314**

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

[redacted]

Well Location

Address of Well Location (Street Number/Name): Lot 18 - Camelot

Township: Cumberland

Lot: B.F.

Concession: 24

County/District/Municipality: Ottawa Carleton

City/Town/Village: Cumberland

Province: Ontario

Postal Code:

UTM Coordinates: Zone: Easting: Northing:

NAD 8 3 1 8 4 6 5 0 8 0 5 0 3 8 7 3 1

Municipal Plan and Sublot Number:

Other:

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Soil	Broken Rock	Fill	0	1.82
Brown	Clay		Packed	1.82	3.65
Gray	Limestone	Green Layers	Soft	3.65	86.86

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
6.40	0	Grouted Bentonite Slurry	.110m³

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.86	Steel	.48	+.45	6.40

Construction Record - Screen

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

Status of Well

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.40	15.86
6.40	86.86	15.23

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 79.24

Pumping rate (l/min / GPM): 13.65

Duration of pumping: 1 hrs + 30 min

Final water level end of pumping (m/ft): 18.67

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

Recommended pump depth (m/ft): 60.95

Recommended pump rate (l/min / GPM): 22.75

Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	9.33		
1	10.13	1	11.57
2	10.65	2	16.96
3	11.10	3	16.42
4	11.15	4	15.88
5	11.87	5	15.35
10	13.47	10	13.05
15	14.37	15	11.40
20	15.33	20	10.42
25	16.05	25	9.86
30	16.59	30	9.63
40	17.50	40	9.38
50	17.91	50	9.33
60	18.26	60	

Map of Well Location

Please provide a map below following instructions on the back.

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: Capital Water Supply Ltd.

Well Contractor's Licence No: 1558

Business Address (Street Number/Name): Box 490

Municipality: Stittsville

Province: Ontario

Postal Code: K2S1A6

Business E-mail Address: office@capitalwater.ca

Bus. Telephone No. (inc. area code): 6138361766

Name of Well Technician (Last Name, First Name): Miller, Stephen

Well Technician's Licence No.: 0097

Signature of Technician and/or Contractor:

Date Submitted: 2008 11 18

Ministry's Copy

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

Date Package Delivered: 2008 11 17

Date Work Completed: 2008 11 14

Ministry Use Only

Audit No.: Z 84446

Received: FEB 12 2009

05084 11/2007

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Ontario Ministry of the Environment

Well Tag No. (Sticker or Print Number below): A 012597 / A 012597

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Address of Well Location (County/District/Municipality): Same (Ottawa)

Township: Cumberland (Ottawa) | Lot: C. IV. 4 | Concession: 7

RR#/Street Number/Name: 1553 Frank Kenny Cumberland (Ottawa)

City/Town/Village: Ottawa | Site/Compartment/Block/Tract etc.

GPS Reading | NAD: 83 | Zone: 18 | Easting: 456447 | Northing: 5033750

Unit Make/Model: Magellan | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
Grey	Sand Ron	stone		0	4
Grey	rock			4	200

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	200	6 inch

Water Record

Water found at - Metres	Kind of Water	
178 m	☐ Fresh ☑ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:	
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:	
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:	

After test of well yield, water was: ☐ Clear and sediment free ☑ Other, specify Cloudy

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
6 in	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188	0	38
	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method: Sub.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres) 175	Static Level	19.6		37.50
Pumping rate - (litres/min) 22	1	27.10	1	37.40
Duration of pumping 1 hrs + 1/4 min	2	27.11	2	36.87
Final water level end of pumping 37.50 metres	3	27.12	3	36.47
Recommended pump type: ☐ Shallow ☑ Deep	4	27.17	4	36.00
Recommended pump depth. 180 metres	5	27.21	5	35.61
Recommended pump rate. 15 (litres/min)	10	27.58	10	34.53
If flowing give rate - (litres/min)	15	34.08	15	34.28
If pumping discontinued, give reason. ✓	20	36.00	20	33.60
	25	38.01	25	33.78
	30	38.10	30	31.90
	40	36.34	40	32.80
	50	37.00	50	29.71
	60	37.50	60	28.12

Final 28.06

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	37	grout	5 Bag.

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

Name of Well Contractor: Mauricie Cayer Ltée | Well Contractor's Licence No.: 1517

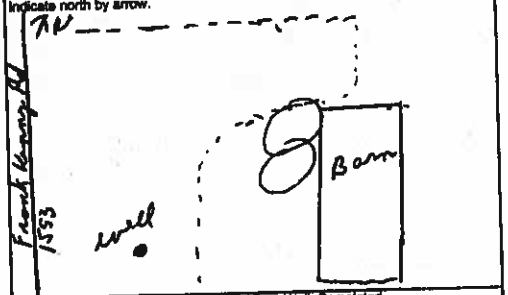
Business Address (street name, number, city etc.): Casselman Ont

Name of Well Technician (last name, first name) | Well Technician's Licence No.

Signature of Technician/Contractor: X [signature] | Date Submitted YYYY MM DD: 2005 07 29

Location of Well

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



Audit No. Z 33424 | Date Well Completed YYYY MM DD: 2005 07 29

Was the well owner's information package delivered? ☑ Yes ☐ No | Date Delivered YYYY MM DD: 2005

Ministry Use Only

Data Source | Contractor: 1517

Date Received YYYY MM DD: AUG 29 2005 | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Appendix 3

- **Laboratory Certificates of Analysis – Groundwater**

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 2929721
Date: 2009-12-07
Date Submitted: 2009-12-04

TW1

Project: PH1236

P.O. Number:

INVOICE: Paterson Group Inc.
Chain of Custody Number: 11723

Matrix: Water

	LAB ID:	764880	764881				GUIDELINE		
	Sample Date:	2009-12-03	2009-12-03				ODWSOG		
	Sample ID:	TW1 WS1	TW1 WS2						
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		0	60			MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0	0			MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		135	291					
Faecal Coliforms	CFU/100mL		0	0					
Faecal Streptococcus	CFU/100mL		2	11					

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

Comment:

APPROVAL:
Dragana Dzeletovic
Microbiology Analyst

B-145 Colonnade Road, Ottawa, ON, K2E 7Y1

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 11723

Report Number: 2929698
Date: 2009-12-08
Date Submitted: 2009-12-04

Project: PH1236

P.O. Number: 7873
Matrix: Water

			LAB ID:	764828	764829				GUIDELINE		
			Sample Date:	2009-12-03	2009-12-03						
			Sample ID:	TW1 WS1	TW1 WS2				ODWSOG		
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		408	403				OG	500	mg/L
Chloride	mg/L	1		718	666				AO	250	mg/L
Colour	TCU	2		<2	<2				AO	5	TCU
Conductivity	uS/cm	5		3200	3040						
Dissolved Organic Carbon	mg/L	0.5		1.7	1.5				AO	5	mg/L
Fluoride	mg/L	0.1		0.12	0.16				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.1		<0.1	<0.1				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.13	0.14						
N-NO2 (Nitrite)	mg/L	0.1		<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1		0.41	0.42				MAC	10.0	mg/L
pH				7.81	7.85					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		121	117				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		0.1	0.3						
Total Dissolved Solids (COND - CALC)	mg/L	5		2080	1980				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		0.39	0.23						
Turbidity	NTU	0.1		81.7	15.4				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		808	662				OG	100	mg/L
Ion Balance		0.01		1.06	1.08						
Calcium	mg/L	1		246	199						
Magnesium	mg/L	1		47	40						
Potassium	mg/L	1		5	5						
Sodium	mg/L	2		382	418				AO	200	mg/L
Iron	mg/L	0.03		5.51	0.73				AO	0.3	mg/L
Manganese	mg/L	0.01		0.15	0.06				AO	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:
H2S MRL elevated due to sample turbidity.

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

Certificate of Analysis

EXOVA

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

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:

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

Shyla Monette
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 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.

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

Group	Analyte	MRL	Units	Guideline	1231376 Water 2016-03-16 TW1-3hr Sample	1231377 Water 2016-03-16 TW1-6hr Sample
	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.					
Calculations	Hardness as CaCO3	1	mg/L	OG-100	210*	212*
	Ion Balance	0.01			1.05	1.04
	TDS (COND - CALC)	1	mg/L	AO-500	326	353
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500	235	241
	Cl	1	mg/L	AO-250	16	22
	Colour	2	TCU	AO-5	2	<2
	Conductivity	5	uS/cm		502	543
	DOC	0.5	mg/L	AO-5	1.8	1.5
	F	0.10	mg/L	MAC-1.5	0.25	0.41
	N-NO2	0.10	mg/L	MAC-1.0	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC-10.0	<0.10	<0.10
	pH	1.00		6.5-8.5	8.06	8.10
	SO4	1	mg/L	AO-500	18	23
	Turbidity	0.1	NTU	AO-5.0	95.0*	>100
Metals	Ca	1	mg/L		61	62
	Fe	0.03	mg/L	AO-0.3	0.62*	1.47*
	K	1	mg/L		6	7
	Mg	1	mg/L		14	14
	Mn	0.01	mg/L	AO-0.05	0.03	0.10*
	Na	2	mg/L	AO-200	34	40
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.2	0.2
Phenols	Phenols	0.001	mg/L		<0.001	<0.001
Subcontract	N-NH3	0.01	mg/L		0.11	0.11
	S2-	0.02	mg/L	AO-0.05	<0.02	<0.02
	Tannin & Lignin	0.1	mg/L		0.2	0.3

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

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

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 304805 **Analysis/Extraction Date** 2016-03-17 **Analyst** AET			
Method C SM2130B			
Turbidity	<0.1 NTU	101	73-127
Run No 304836 **Analysis/Extraction Date** 2016-03-21 **Analyst** AET			
Method C SM2120C			
Colour	<2 TCU	98	80-120
Run No 304866 **Analysis/Extraction Date** 2016-03-18 **Analyst** SKH			
Method M SM3120B-3500C			
Calcium	<1 mg/L	101	90-110
Potassium	<1 mg/L	103	87-113
Magnesium	<1 mg/L	101	76-124
Sodium	<2 mg/L	101	82-118
Run No 304890 **Analysis/Extraction Date** 2016-03-18 **Analyst** NP			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	97	80-120
N-NO3	<0.10 mg/L	95	80-120
Run No 304895 **Analysis/Extraction Date** 2016-03-19 **Analyst** K A			
Method EPA 200.8			

Guideline = ODWSOG *** = Guideline Exceedence**
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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: 1603877
Date Submitted: 2016-03-17
Date Reported: 2016-03-23
Project: 160128
COC #: 167385

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Iron	<0.03 mg/L	98	92-107
Manganese	<0.01 mg/L	98	94-106
Run No 304900 Analysis/Extraction Date 2016-03-18 Analyst AET			
Method C SM4500-H+B			
Alkalinity (CaCO3)	<5 mg/L	99	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	99	90-110
pH	6.08	99	90-110
Run No 304919 Analysis/Extraction Date 2016-03-18 Analyst NP			
Method SM 4110C			
Chloride	<1 mg/L	101	90-112
SO4	<1 mg/L	104	90-110
Run No 304929 Analysis/Extraction Date 2016-03-21 Analyst AET			
Method C SM5310C			
DOC	<0.5 mg/L	104	84-116
Run No 305063 Analysis/Extraction Date 2016-03-23 Analyst SDC			
Method SUBCONTRACT P			
N-NH3	<0.01 mg/L	96	
Phenols	<0.001 mg/L	88	

Guideline = ODWSOG *** = Guideline Exceedence**

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

QC Summary

Analyte	Blank	QC % Rec	QC Limits
S2-	<0.02 mg/L	100	
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	102	
Run No 305064 **Analysis/Extraction Date** 2016-03-23 **Analyst** SCM			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			

Guideline = ODWSOG *** = Guideline Exceedence**
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Methods references and/or additional QA/QC information available on request.

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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
Project: 160128
COC #: 167385

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:

APPROVAL: Krista Quantrill 2016.03.19 12:13:08 -04'00'

Krista Quantrill
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.

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Certificate of Analysis

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
Project: 160128
COC #: 167385

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1231387 Water 2016-03-16 TW1-3Hr Sample	1231388 Water 2016-03-16 TW1-6Hr Sample
Microbiology	Heterotrophic Plate Count	0	ct/1mL			90	153
Others	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Total Coliforms	0	ct/100mL	MAC-0		0	0

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.
Analytical Method: AMBCOLM1
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

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Exova

Client:	Kollaard Associates Inc. 210 Prescott St., Box 189 Kemptville, ON K0G 1J0	Report Number:	1604190
Attention:	Ms. Colleen Vermeersch	Date Submitted:	2016-03-23
PO#:		Date Reported:	2016-03-24
Invoice to:	Kollaard Associates Inc.	Project:	160128
		COC #:	175693

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:

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

Nadine Pinsonneault
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 http://www.cala.ca/scopes/2602.pdf.

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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

Client: Kollaard Associates Inc.
210 Prescott St., Box 189
Kemptville, ON
K0G 1J0
Attention: Ms. Colleen Vermeersch
PO#:
Invoice to: Kollaard Associates Inc.

Report Number: 1604190
Date Submitted: 2016-03-23
Date Reported: 2016-03-24
Project: 160128
COC #: 175693

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1232101 / Water / / 2016-03-22 / TW1
General Chemistry	Turbidity	0.1	NTU	AO-5.0	5.0
Metals	Fe	0.03	mg/L	AO-0.3	0.48*
	Mn	0.01	mg/L	AO-0.05	0.03

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 108473

Report Number: 2929469
Date: 2009-12-03
Date Submitted: 2009-12-01

Project: PH1236

P.O. Number: 7873
Matrix: Water

TW2

			LAB ID:	764211	764212				GUIDELINE		
			Sample Date:	2009-12-01	2009-12-01				ODWSOG		
			Sample ID:	TW2 WS1	TW2 WS2						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL			0	0				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL			0	0				MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL			>500	>500						
Faecal Coliforms	CFU/100mL			0	0						
Faecal Streptococcus	CFU/100mL			0	0						

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

Comment:

APPROVAL:
Krista Quantrill
Drinking Water Coordinator

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 2929470
Date: 2009-12-08
Date Submitted: 2009-12-01
Project: PH1236
P.O. Number: 7873
Matrix: Water

INVOICE: Paterson Group Inc.
Chain of Custody Number: 108473

								GUIDELINE		
		LAB ID:	764213	764214				ODWSOG		
		Sample Date:	2009-12-01	2009-12-01						
		Sample ID:	TWS WS1	TW2 WS2						
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	212	213				OG	500	mg/L
Chloride	mg/L	1	153	153				AO	250	mg/L
Colour	TCU	2	<2	<2				AO	5	TCU
Conductivity	uS/cm	5	1500	1480						
Dissolved Organic Carbon	mg/L	0.5	0.9	0.9				AO	5	mg/L
Fluoride	mg/L	0.1	1.94	1.96				MAC	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	0.20	0.19						
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10				MAC	10.0	mg/L
pH			8.18	8.18					6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	295	287				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5	975	962				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.24	0.23						
Turbidity	NTU	0.1	0.7	0.3				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	166	157				OG	100	mg/L
Ion Balance		0.01	1.03	1.01						
Calcium	mg/L	1	35	33						
Magnesium	mg/L	1	19	18						
Potassium	mg/L	1	5	5						
Sodium	mg/L	2	272	266				AO	200	mg/L
Iron	mg/L	0.03	<0.03	<0.03				AO	0.3	mg/L
Manganese	mg/L	0.01	<0.01	<0.01				AO	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 McRobbie
Inorganic Lab Supervisor

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 108474

Report Number: 2929599
Date: 2009-12-07
Date Submitted: 2009-12-03

TW3

Project: PH1236

P.O. Number: 7873
Matrix: Water

	LAB ID:	764594	764595				GUIDELINE		
	Sample Date:	2009-12-02	2009-12-02				ODWSOG		
	Sample ID:	TW3 WS1	TW3 WS2						
PARAMETER	UNITS	MRL					TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		11	0			MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0	0			MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		181	11					
Faecal Coliforms	CFU/100mL		0	0					
Faecal Streptococcus	CFU/100mL		2	0					

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

Comment:

APPROVAL:
Dragana Dzeletovic
Microbiology Analyst

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

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 108474

Report Number: 2929600
Date: 2009-12-07
Date Submitted: 2009-12-03

Project: PH1236

P.O. Number:
Matrix: Water

								GUIDELINE		
LAB ID:			764596	764597				ODWSOG		
Sample Date:			2009-12-02	2009-12-02						
Sample ID:			TW3 WS1	TW3 WS2						
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	244	244				OG	500	mg/L
Chloride	mg/L	1	304	305				AO	250	mg/L
Colour	TCU	2	10	5				AO	5	TCU
Conductivity	uS/cm	5	2730	2780						
Dissolved Organic Carbon	mg/L	0.5	1.7	1.6				AO	5	mg/L
Fluoride	mg/L	0.1	0.61	0.63				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.1	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.46	0.46						
N-NO2 (Nitrite)	mg/L	0.1	<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10	<0.10				MAC	10.0	mg/L
pH			7.88	7.93					6.5-8.5	
Phenols	mg/L	0.001	<0.001	<0.001						
Sulphate	mg/L	1	768	784				AO	500	mg/L
Tannin & Lignin	mg/L	0.1	0.2	0.4						
Total Dissolved Solids (COND - CALC)	mg/L	5	2180	2220				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.58	0.64						
Turbidity	NTU	0.1	19.4	1.3				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	687	691				OG	100	mg/L
Ion Balance		0.01	0.98	0.97						
Calcium	mg/L	1	173	173						
Magnesium	mg/L	1	62	63						
Potassium	mg/L	1	8	8						
Sodium	mg/L	2	345	340				AO	200	mg/L
Iron	mg/L	0.03	1.55	0.06				AO	0.3	mg/L
Manganese	mg/L	0.01	0.04	0.03				AO	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:
764596: H2S MRL elevated due to sample turbidity.

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

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

8-146 Colonnade Road Ottawa, ON, K2E 7Y1

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1129193 TW4
Date: 2011-12-21
Date Submitted: 2011-12-16

Project: PH1238

INVOICE: Paterson Group Inc.
Chain of Custody Number: 99228

P.O. Number: 11041
Matrix: Water

			LAB ID:	932535	932536				GUIDELINE		
			Sample Date:	2011-12-15	2011-12-15						
			Sample ID:	TW4-WS1	TW4-WS2				ODWSOG		
PARAMETER	UNITS	MRL		TREATED	TREATED				TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		193	180				OG	500	mg/L
Chloride	mg/L	1		43	31				AO	250	mg/L
Colour	TCU	2		11	10				AO	5	TCU
Conductivity	uS/cm	5		551	481						
Dissolved Organic Carbon	mg/L	0.5		4.2	4.3				AO	5	mg/L
Fluoride	mg/L	0.1		<0.10	<0.10				MAC	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				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1		0.55	0.43				MAC	10.0	mg/L
pH				8.06	8.02					6.5-8.5	
Phenols	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				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		206	182				OG	100	mg/L
Ion Balance		0.01		0.98	0.96						
Calcium	mg/L	1		76	68						
Magnesium	mg/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

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

APPROVAL:
Lorna Wilson
Inorganic Lab Supervisor

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

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510551
Date Submitted: 2015-06-12
Date Reported: 2015-06-25
Project: PH1236
COC #: 52212

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:

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

Nadine Pinsonneault
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 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.

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510551
Date Submitted: 2015-06-12
Date Reported: 2015-06-25
Project: PH1236
COC #: 52212

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1180969 Water 2015-06-12 TW4 WS1	1180970 Water 2015-06-12 TW4 WS2
Calculations	Hardness as CaCO3	1	mg/L	OG-100		338*	343*
	Ion Balance	0.01				1.07	1.05
	TDS (COND - CALC)	1	mg/L	AO-500		506*	514*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500		266	278
	Cl	1	mg/L	AO-250		69	72
	Colour	2	TCU	AO-5		6*	5
	Conductivity	5	uS/cm			778	791
	DOC	0.5	mg/L	AO-5		3.0	3.3
	F	0.10	mg/L	MAC-1.5		<0.10	<0.10
	N-NO2	0.10	mg/L	MAC-1.0		<0.10	<0.10
	N-NO3	0.10	mg/L	MAC-10.0		0.89	0.91
	pH	1.00		6.5-8.5		8.02	7.97
	SO4	1	mg/L	AO-500		34	34
	Tannin & Lignin	0.1	mg/L			0.2	0.2
	Turbidity	0.1	NTU	AO-5.0		3.1	1.3
Metals	Ca	1	mg/L			124	126
	Fe	0.03	mg/L	AO-0.3		0.18	0.08
	K	1	mg/L			1	<1
	Mg	1	mg/L			7	7
	Mn	0.01	mg/L	AO-0.05		<0.01	<0.01
	Na	2	mg/L	AO-200		42	44
Nutrients	N-NH3	0.05	mg/L			<0.05	<0.05
	Total Kjeldahl Nitrogen	0.07	mg/L			0.51	0.14
Phenols-4AAP	Phenols	0.002	mg/L			<0.002	<0.002
Sulphide	S2-	0.002	mg/L	AO-0.05		<0.002	<0.002

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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510551
Date Submitted: 2015-06-12
Date Reported: 2015-06-25
Project: PH1236
COC #: 52212

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 288745 **Analysis/Extraction Date** 2015-06-13 **Analyst** C F			
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	97	92-107
Manganese	<0.01 mg/L	99	94-106
Run No 288805 **Analysis/Extraction Date** 2015-06-15 **Analyst** NP			
Method C SM4500-NO3-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 **Analyst** AET			
Method C SM4500-H+B			
Alkalinity (CaCO3)	<5 mg/L	98	90-110
Conductivity	<5 uS/cm	101	90-110
F	<0.10 mg/L	99	90-110
pH	6.21	100	90-110
Run No 288815 **Analysis/Extraction Date** 2015-06-16 **Analyst** SKH			

Guideline = ODWSOG *** = Guideline Exceedence**
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510551
Date Submitted: 2015-06-12
Date Reported: 2015-06-25
Project: PH1236
COC #: 52212

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Method M SM3120B-3500C			
Calcium	<1 mg/L	100	90-110
Potassium	<1 mg/L	99	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 **Analyst** NP			
Method SM 4110			
Chloride	<1 mg/L	99	90-110
SO4	<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	<0.05 mg/L	99	
Run No 289322 **Analysis/Extraction Date** 2015-06-17 **Analyst** AET			

Guideline = ODWSOG *** = Guideline Exceedence**

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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510551
Date Submitted: 2015-06-12
Date Reported: 2015-06-25
Project: PH1236
COC #: 52212

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			
Method Exova Edmonton-SM5200-S2 E			
S2-	<0.002 mg/L	103	
Run No 289344 **Analysis/Extraction Date** 2015-06-18 **Analyst** AET			
Method Exova Edmonton-SM5310B			
DOC	<0.5 mg/L	105	
Run No 289353 **Analysis/Extraction Date** 2015-06-23 **Analyst** AET			
Method Exova Surrey-SM5550B			
Tannin & Lignin	<0.1 mg/L	103	

Guideline = ODWSOG *** = Guideline Exceedence**
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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

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510547
Date Submitted: 2015-06-12
Date Reported: 2015-06-15
Project: PH1236
COC #: 52212

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.

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

Krista Quantrill
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.

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Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Jamie Blakely
PO#:
Invoice to: Paterson Group

Report Number: 1510547
Date Submitted: 2015-06-12
Date Reported: 2015-06-15
Project: PH1236
COC #: 52212

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	
					1180964 Water 2015-06-12 TW4 WS1	1180965 Water 2015-06-12 TW4 WS2
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0	0	1*
	Total Coliforms	0	ct/100mL	MAC-0	50*	62*

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

TW5

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 150779

Report Number: 1129300
Date: 2011-12-22
Date Submitted: 2011-12-20

Project: PH1236

P.O. Number: 11636
Matrix: Water

			LAB ID:	932884					GUIDELINE	
			Sample Date:	2011-12-19					ODWSOG	
			Sample ID:	TW 5 - WS1 - 19/12/11						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		2						MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0						MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		5								
Faecal Coliforms	CFU/100mL		0								
Faecal Streptococcus	CFU/100mL		0								

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

Comment:

APPROVAL:
Krista Quantrill
Microbiology Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1129312
Date: 2011-12-28
Date Submitted: 2011-12-20

Project: PH1236

P.O. Number: 11636
Matrix: Water

INVOICE: Paterson Group Inc.
Chain of Custody Number: 150779

								GUIDELINE		
			LAB ID:	932906				ODWSOG		
			Sample Date:	2011-12-19						
			Sample ID:	TW5-WS1-19/12/11						
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	242					OG	500	mg/L
Chloride	mg/L	1	20					AO	250	mg/L
Colour	TCU	2	5					AO	5	TCU
Conductivity	uS/cm	5	535							
Dissolved Organic Carbon	mg/L	0.5	1.1					AO	5	mg/L
Fluoride	mg/L	0.1	0.14					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.04							
N-NO2 (Nitrite)	mg/L	0.1	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10					MAC	10.0	mg/L
pH			7.90						6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	14					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1	348					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	<0.10							
Turbidity	NTU	0.1	38.5					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	257					OG	100	mg/L
Ion Balance		0.01	1.02							
Calcium	mg/L	1	78							
Magnesium	mg/L	1	15							
Potassium	mg/L	1	6							
Sodium	mg/L	2	12					AO	200	mg/L
Iron	mg/L	0.03	1.31					AO	0.3	mg/L
Manganese	mg/L	0.01	0.14					AO	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:

APPROVED:
Lorna Wilson
Inorganic Lab Supervisor

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

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 1129385
Date: 2011-12-28
Date Submitted: 2011-12-20

Project: PH1236

P.O. Number: 11040
Matrix: Water

INVOICE: Paterson Group Inc.
Chain of Custody Number: 114763

								GUIDELINE		
			LAB ID:	933064				ODWSOG		
			Sample Date:	2011-12-19						
			Sample ID:	TW5-WS2						
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	242					OG	500	mg/L
Chloride	mg/L	1	24					AO	250	mg/L
Colour	TCU	2	9					AO	5	TCU
Conductivity	uS/cm	5	533							
Dissolved Organic Carbon	mg/L	0.5	1.2					AO	5	mg/L
Fluoride	mg/L	0.1	0.14					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.1	<0.1					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.04							
N-NO2 (Nitrite)	mg/L	0.1	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10					MAC	10.0	mg/L
pH			7.83						6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	16					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1	346					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.13							
Turbidity	NTU	0.1	11.6					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	267					OG	100	mg/L
Ion Balance		0.01	1.03							
Calcium	mg/L	1	82							
Magnesium	mg/L	1	15							
Potassium	mg/L	1	6							
Sodium	mg/L	2	13					AO	200	mg/L
Iron	mg/L	0.03	0.65					AO	0.3	mg/L
Manganese	mg/L	0.01	0.14					AO	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:
H2S MRL elevated due to sample turbidity.

APPROVAL:
Lorna Wilson
Inorganic Lab Supervisor

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

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607368
Date Submitted: 2016-05-12
Date Reported: 2016-05-15
Project: PH 1236
COC #: 61686

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:

APPROVAL: Dragana Dzeletovic 2016.05.15 09:04:11 -04'00'

Dragana Dzeletovic
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)

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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607368
Date Submitted: 2016-05-12
Date Reported: 2016-05-15
Project: PH 1236
COC #: 61686

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

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.
Analytical Method: AMBCOLM1
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

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

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'

APPROVAL: _____

Rebecca Koshy
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.

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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1239665 Water 2016-05-11 TW5 WS1	1239666 Water 2016-05-11 TW5 WS2
Calculations	Hardness as CaCO3	1	mg/L	OG-100		260*	262*
	Ion Balance	0.01				0.98	1.01
	TDS (COND - CALC)	1	mg/L	AO-500		343	343
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500		258	250
	Cl	1	mg/L	AO-250		21	24
	Colour	2	TCU	AO-5		2	<2
	Conductivity	5	uS/cm			527	527
	DOC	0.5	mg/L	AO-5		1.4	1.3
	F	0.10	mg/L	MAC-1.5		<0.10	<0.10
	N-NO2	0.10	mg/L	MAC-1.0		<0.10	<0.10
	N-NO3	0.10	mg/L	MAC-10.0		<0.10	<0.10
	pH	1.00		6.5-8.5		8.21	8.16
	SO4	1	mg/L	AO-500		13	13
Mercury	Hg	0.0001	mg/L	MAC-0.001			<0.0001
Metals	Ag	0.0001	mg/L				<0.0001
	Al	0.01	mg/L	OG-0.1			0.01
	As	0.001	mg/L	IMAC-0.025			<0.001
	B	0.01	mg/L	IMAC-5.0			0.05
	Ba	0.01	mg/L	MAC-1.0			0.14
	Be	0.0005	mg/L				<0.0005
	Ca	1	mg/L			81	82
	Cd	0.0001	mg/L	MAC-0.005			<0.0001
	Cr	0.001	mg/L	MAC-0.05			<0.001
	Cu	0.001	mg/L	AO-1.0			<0.001
	Fe	0.03	mg/L	AO-0.3		0.70*	0.18
	K	1	mg/L			4	4

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

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1239665 Water 2016-05-11 TW5 WS1	1239666 Water 2016-05-11 TW5 WS2
Metals	Mg	1	mg/L			14	14
	Mn	0.01	mg/L	AO-0.05		0.13*	0.11*
	Mo	0.005	mg/L				<0.005
	Na	2	mg/L	AO-200		14	15
	Ni	0.005	mg/L				<0.005
	Pb	0.001	mg/L	MAC-0.010			<0.001
	Sb	0.0005	mg/L	IMAC-0.006			<0.0005
	Se	0.001	mg/L	MAC-0.01			<0.001
	Sr	0.001	mg/L				1.02
	Tl	0.0001	mg/L				<0.0001
	U	0.001	mg/L	MAC-0.02			<0.001
	Zn	0.01	mg/L	AO-5.0			<0.01
Nutrients	Organic Nitrogen	0.08	mg/L	OG-0.15			<0.08
	Total Kjeldahl Nitrogen	0.1	mg/L			0.1	0.1
Phenols	Phenols	0.001	mg/L			<0.001	<0.001
Subcontract	N-NH3	0.01	mg/L			0.05	0.05
	PO4	0.6	mg/L				<0.6
	S2-	0.02	mg/L	AO-0.05		<0.02	<0.02
	Tannin & Lignin	0.1	mg/L			<0.1	<0.1
	Turbidity	0.1	NTU	AO-5.0		6.9*	1.6

Guideline = ODWSOG *** = Guideline Exceedence**
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 307658 **Analysis/Extraction Date** 2016-05-13 **Analyst** SKH			
Method M SM3120B-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	98	88-112
SO4	<1 mg/L	101	89-110
Run No 307740 **Analysis/Extraction Date** 2016-05-13 **Analyst** K A			
Method EPA 200.8			
Iron	<0.03 mg/L	98	92-107
Manganese	<0.01 mg/L	99	94-106
Run No 307744 **Analysis/Extraction Date** 2016-05-13 **Analyst** NP			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	110	80-120
N-NO3	<0.10 mg/L	87	80-120

Guideline = ODWSOG *** = Guideline Exceedence**
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 307769 **Analysis/Extraction Date** 2016-05-14 **Analyst** K A			
Method M SM3112B-3500B			
Mercury	<0.0001 mg/L	99	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	99	90-110
F	<0.10 mg/L	93	90-110
pH	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			
DOC	<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	97	94-106
Aluminum	<0.01 mg/L	101	89-111

Guideline = ODWSOG *** = Guideline Exceedence**
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Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

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	97	93-107
Cadmium	<0.0001 mg/L	101	93-107
Chromium Total	<0.001 mg/L	98	94-106
Copper	<0.001 mg/L	99	93-106
Iron	<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 *** = Guideline Exceedence**
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

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** R K			
Method SUBCONTRACT P-INORG			
PO4			
Run No 308159 **Analysis/Extraction Date** 2016-05-19 **Analyst** R K			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Method C SM4500-Norg-C			

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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1607381
Date Submitted: 2016-05-12
Date Reported: 2016-05-19
Project: PH 1236
COC #: 61686

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Organic Nitrogen			

Guideline = ODWSOG *** = Guideline Exceedence**
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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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

TW6

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 141380

Report Number: 1129213
Date: 2011-12-19
Date Submitted: 2011-12-16

Project: PH1236

P.O. Number: 11636
Matrix: Water

			LAB ID:	932598					GUIDELINE	
			Sample Date:	2011-12-16					ODWSOG	
			Sample ID:	TW6 - WS1 - 16/18/11						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		0						MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0						MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		14								
Faecal Coliforms	CFU/100mL		0								
Faecal Streptococcus	CFU/100mL		0								

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

APPROVAL:
Krista Quantrill
Microbiology Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1

Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

INVOICE: Paterson Group Inc.
Chain of Custody Number: 150750

Report Number: 1129216
Date: 2011-12-21
Date Submitted: 2011-12-17

Project: PH1236

P.O. Number: 11636
Matrix: Water

								GUIDELINE		
LAB ID:			932840					ODWSOG		
Sample Date:			2011-12-17							
Sample ID:			TW6-22hr-17/12/11							
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5	285					OG	500	mg/L
Chloride	mg/L	1	106					AO	250	mg/L
Colour	TCU	2	11					AO	5	TCU
Conductivity	uS/cm	5	991							
Dissolved Organic Carbon	mg/L	0.5	0.9					AO	5	mg/L
Fluoride	mg/L	0.1	1.00					MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01	<0.01					AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02	0.21							
N-NO2 (Nitrite)	mg/L	0.1	<0.10					MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1	<0.10					MAC	10.0	mg/L
pH			8.42						6.5-8.5	
Phenols	mg/L	0.001	<0.001							
Sulphate	mg/L	1	63					AO	500	mg/L
Tannin & Lignin	mg/L	0.1	<0.1							
Total Dissolved Solids (COND - CALC)	mg/L	1	644					AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1	0.19							
Turbidity	NTU	0.1	5.8					MAC	1.0	NTU
Hardness as CaCO3	mg/L	1	70					OG	100	mg/L
Ion Balance		0.01	1.06							
Calcium	mg/L	1	15							
Magnesium	mg/L	1	8							
Potassium	mg/L	1	4							
Sodium	mg/L	2	211					AO	200	mg/L
Iron	mg/L	0.03	0.07					AO	0.3	mg/L
Manganese	mg/L	0.01	<0.01					AO	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:

Lorna Wilson
Inorganic Lab Supervisor

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

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 2930079
Date: 2009-12-10 HW
Date Submitted: 2009-12-08

Project: PH1236

P.O. Number: 7875
Matrix: Water

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

								GUIDELINE		
	LAB ID:		765935	765936				ODWSOG		
	Sample Date:		2009-12-08	2009-12-08						
	Sample ID:		HW WS1	HW WS2						
PARAMETER	UNITS	MRL						TYPE	LIMIT	UNITS
Total Coliforms	CFU/100mL		90	2				MAC	0	CFU/100mL
Escherichia Coli	CFU/100mL		0	0				MAC	0	CFU/100mL
Heterotrophic Plate Count	CFU/1mL		8	5						
Faecal Coliforms	CFU/100mL		0	0						
Faecal Streptococcus	CFU/100mL		0	2						

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

Comment:

APPROVAL: Krista Quantrill
Drinking Water Coordinator

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

A-146 Colonnade Road, Ottawa, ON, K2E 7Y1

EXOVA ACCUTEST

REPORT OF ANALYSIS

Exova Accutest

Client: Paterson Group
28 Concourse Gate, Unit 1
Nepean, ON
K2E 7T7
Attention: Mr. Robert Passmore

Report Number: 2930081
Date: 2009-12-09
Date Submitted: 2009-12-08

Project: PH1236

P.O. Number: 7875
Matrix: Water

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

			LAB ID:	765939	765940				GUIDELINE		
			Sample Date:	2009-12-08	2009-12-08				ODWSOG		
			Sample ID:	HW WS1	HW WS2						
PARAMETER	UNITS	MRL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		257	258				OG	500	mg/L
Chloride	mg/L	1		24	25				AO	250	mg/L
Colour	TCU	2		7	<2				AO	5	TCU
Conductivity	uS/cm	5		580	587						
Dissolved Organic Carbon	mg/L	0.5		1.6	1.3				AO	5	mg/L
Fluoride	mg/L	0.1		0.11	0.11				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		0.06	0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		<0.02	0.06						
N-NO2 (Nitrite)	mg/L	0.1		<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.1		<0.10	<0.10				MAC	10.0	mg/L
pH				7.74	7.76					6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		19	20				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		<0.1	<0.1						
Total Dissolved Solids (COND - CALC)	mg/L	5		377	382				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.1		<0.10	<0.10						
Turbidity	NTU	0.1		15.1	6.7				MAC	1.0	NTU
Hardness as CaCO3	mg/L	1		274	277				OG	100	mg/L
Ion Balance		0.01		0.92	0.92						
Calcium	mg/L	1		90	91						
Magnesium	mg/L	1		12	12						
Potassium	mg/L	1		2	2						
Sodium	mg/L	2		4	4				AO	200	mg/L
Iron	mg/L	0.03		0.78	0.50				AO	0.3	mg/L
Manganese	mg/L	0.01		0.04	0.04				AO	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 McRobbie
Inorganic Lab Supervisor

OFFSITE WELLS + TW6

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611722
Date Submitted: 2016-07-09
Date Reported: 2016-07-11
Project: PH1236
COC #: 56558

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:

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

Krista Quantrill
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.

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Exova

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611722
Date Submitted: 2016-07-09
Date Reported: 2016-07-11
Project: PH1236
COC #: 56558

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1249954 Water - 2016-07-07 1753 Willhaven Dr.	1249955 Water - 2016-07-07 1865 Willhaven Dr.
Microbiology	Heterotrophic Plate Count	0	ct/1mL			39	196
Others	Escherichia Coli	0	ct/100mL	MAC-0		0	0
	Faecal Coliforms	0	ct/100mL			0	0
	Faecal Streptococcus	0	ct/100mL			0	0
	Total Coliforms	0	ct/100mL	MAC-0		5*	11*

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.
Analytical Method: AMBCOLM1
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

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611723
Date Submitted: 2016-07-09
Date Reported: 2016-07-18
Project: PH1236
COC #: 56558

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:

APPROVAL: Shyla Monette 2016.07.18 15:23:54 -04'00'

Shyla Monette
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 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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611723
Date Submitted: 2016-07-09
Date Reported: 2016-07-18
Project: PH1236
COC #: 56558

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1249956 Water 2016-07-07 1753 Willhaven Dr.	1249957 Water 2016-07-07 1865 Willhaven Dr.	1249958 Water 2016-07-09 TW6-WS
Calculations	Hardness as CaCO3	1	mg/L	OG-100		288*	452*	98
	Ion Balance	0.01				0.98	0.97	0.95
	TDS (COND - CALC)	1	mg/L	AO-500		344	793*	597*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500		273	347	296
	Cl	1	mg/L	AO-250		16	153	94
	Colour	2	TCU	AO-5		3	3	<2
	Conductivity	5	uS/cm			529	1220	919
	DOC	0.5	mg/L	AO-5		2.0	2.8	1.0
	F	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		0.60	2.23	0.12
	pH	1.00		6.5-8.5		7.86	7.83	8.27
	SO4	1	mg/L	AO-500		16	85	61
	Turbidity	0.1	NTU	AO-5.0		0.5	0.3	4.6
Metals	Ca	1	mg/L			107	135	21
	Fe	0.03	mg/L	AO-0.3		0.06	0.03	0.10
	K	1	mg/L			<1	5	5
	Mg	1	mg/L			5	28	11
	Mn	0.01	mg/L	AO-0.05		<0.01	<0.01	<0.01
	Na	2	mg/L	AO-200		9	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

Guideline = ODWSOG *** = Guideline Exceedence**
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611723
Date Submitted: 2016-07-09
Date Reported: 2016-07-18
Project: PH1236
COC #: 56558

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** NP			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	97	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 *** = Guideline Exceedence**
All analysis completed in Ottawa, Ontario (unless otherwise indicated by ** which indicates analysis was completed in Mississauga, Ontario).
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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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611723
Date Submitted: 2016-07-09
Date Reported: 2016-07-18
Project: PH1236
COC #: 56558

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)	<5 mg/L	103	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	103	90-110
pH	6.02	99	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	99	
Phenols	<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 *** = 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

Client: Paterson Group
154 Colonnade Rd South
Nepean, ON
K2E 7T7
Attention: Mr. Russell Chown
PO#:
Invoice to: Paterson Group

Report Number: 1611723
Date Submitted: 2016-07-09
Date Reported: 2016-07-18
Project: PH1236
COC #: 56558

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 311287 **Analysis/Extraction Date** 2016-07-13 **Analyst** K A			
Method EPA 200.8			
Iron	<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			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			

Guideline = ODWSOG *** = Guideline Exceedence**
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Methods references and/or additional QA/QC information available on request.

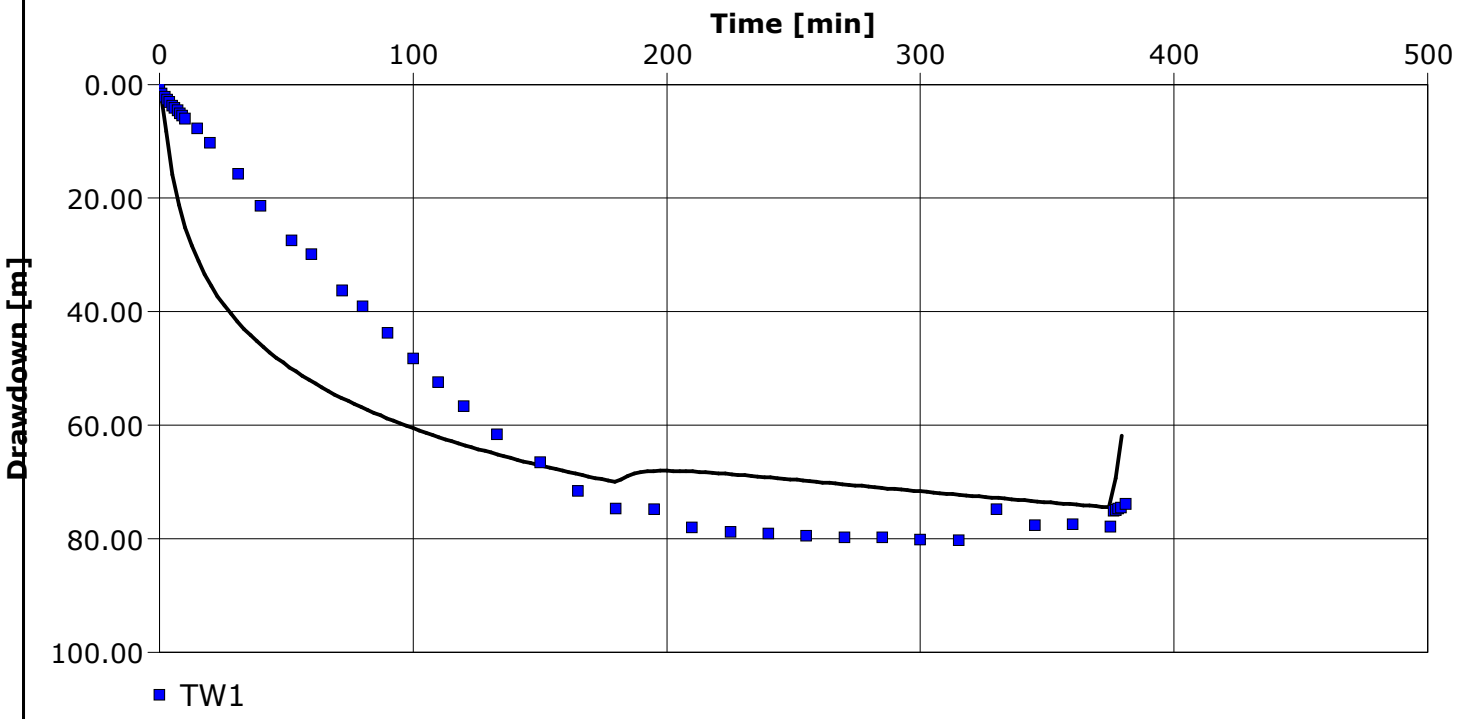
MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired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

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

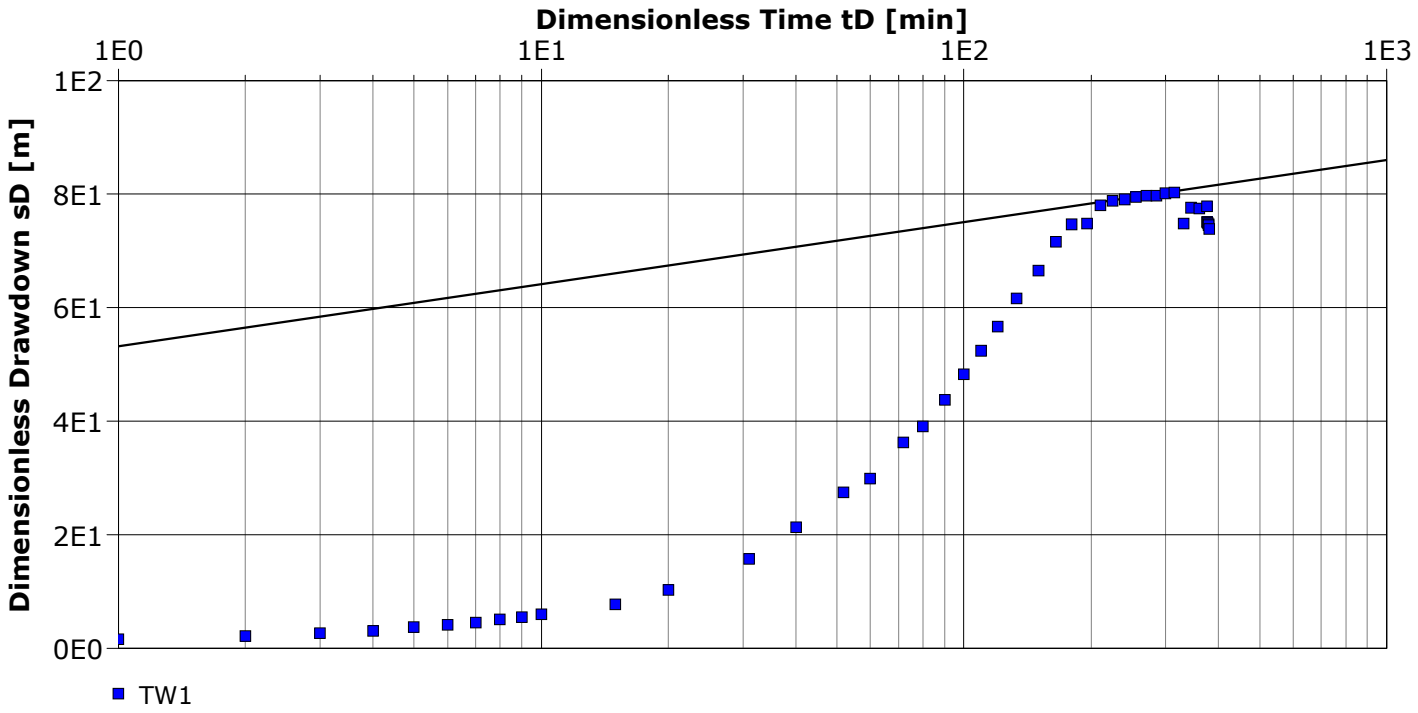


Calculation using Theis

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

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:	Cooper Jacob I	Analysis Date: 14/03/2016
Aquifer Thickness: 146.00 m	Discharge: variable, average rate 0.1796 [l/s]	

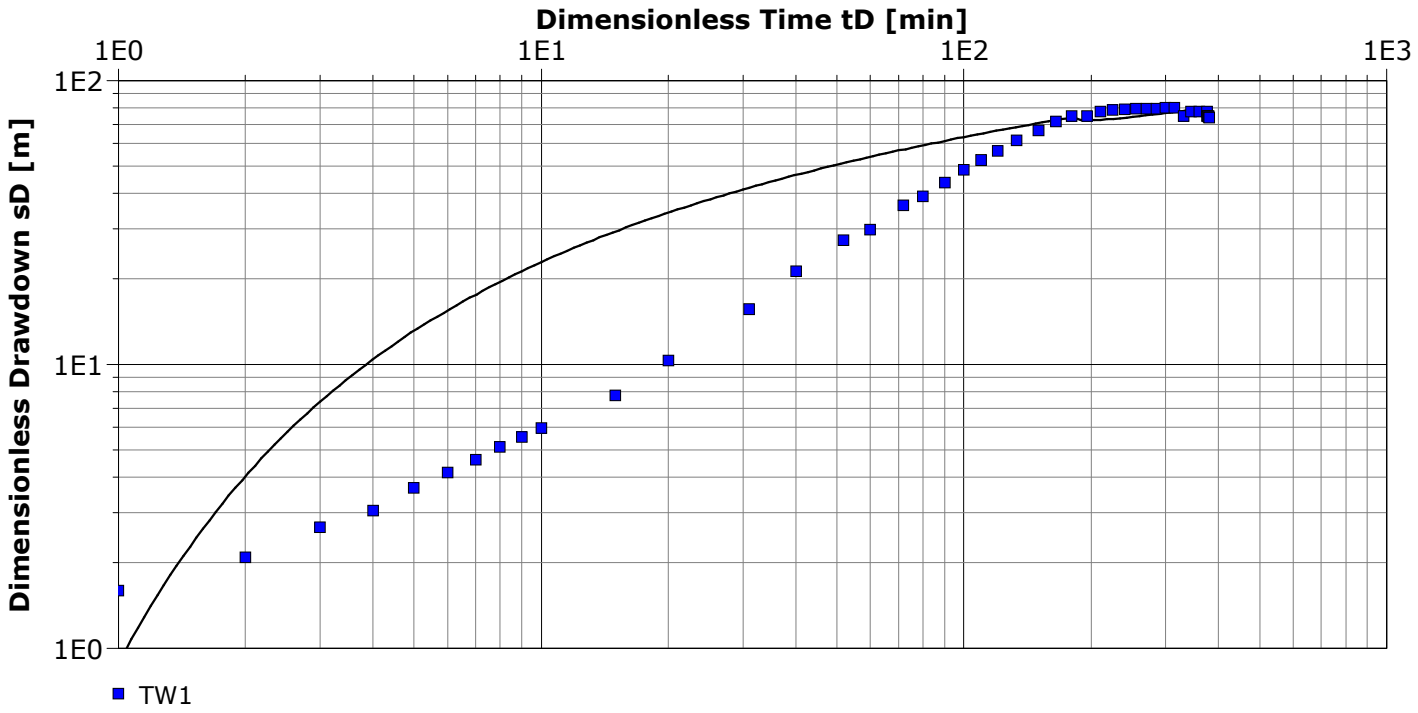


Calculation using COOPER & JACOB

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

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 (log-log)	Analysis Date: 19/07/2016
Aquifer Thickness: 146.00 m	Discharge: variable, average rate 0.1796 [l/s]	



Calculation using Theis

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW1	6.90×10^{-2}	4.73×10^{-4}		0.03	

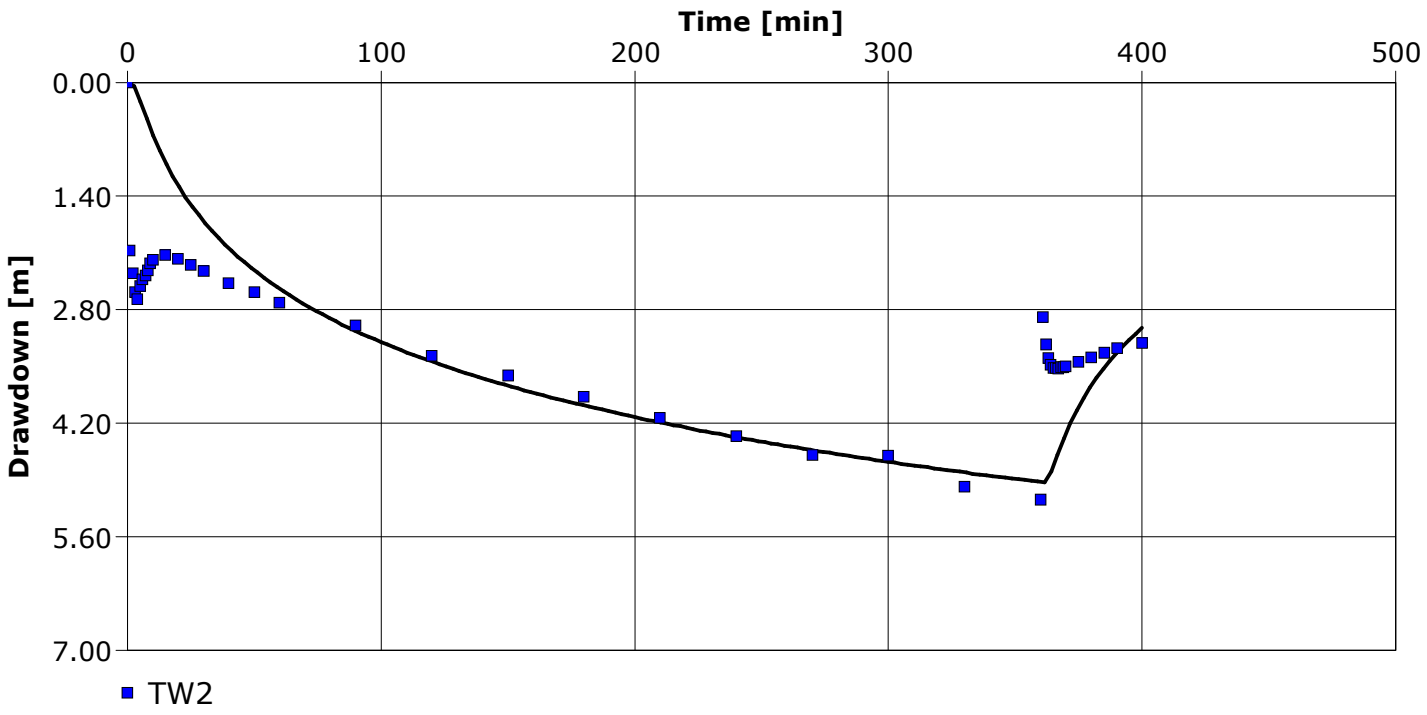
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven
	Number: PH1236
	Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW1	Pumping Well: TW1
Test Conducted by: RAP		Test Date: 01/02/2016
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^{-2}	5.47×10^{-4}	
2	Cooper Jacob I		14/03/2016	Cooper & Jacob I	TW1	2.59×10^{-1}	1.78×10^{-3}	
3	Theis (log-log)		19/07/2016	Theis	TW1	6.90×10^{-2}	4.73×10^{-4}	
					Average	1.36×10^{-1}	9.32×10^{-4}	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**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:	Theis	Analysis Date: 01/02/2016
Aquifer Thickness: 104.00 m	Discharge: variable, average rate 0.31 [l/s]	

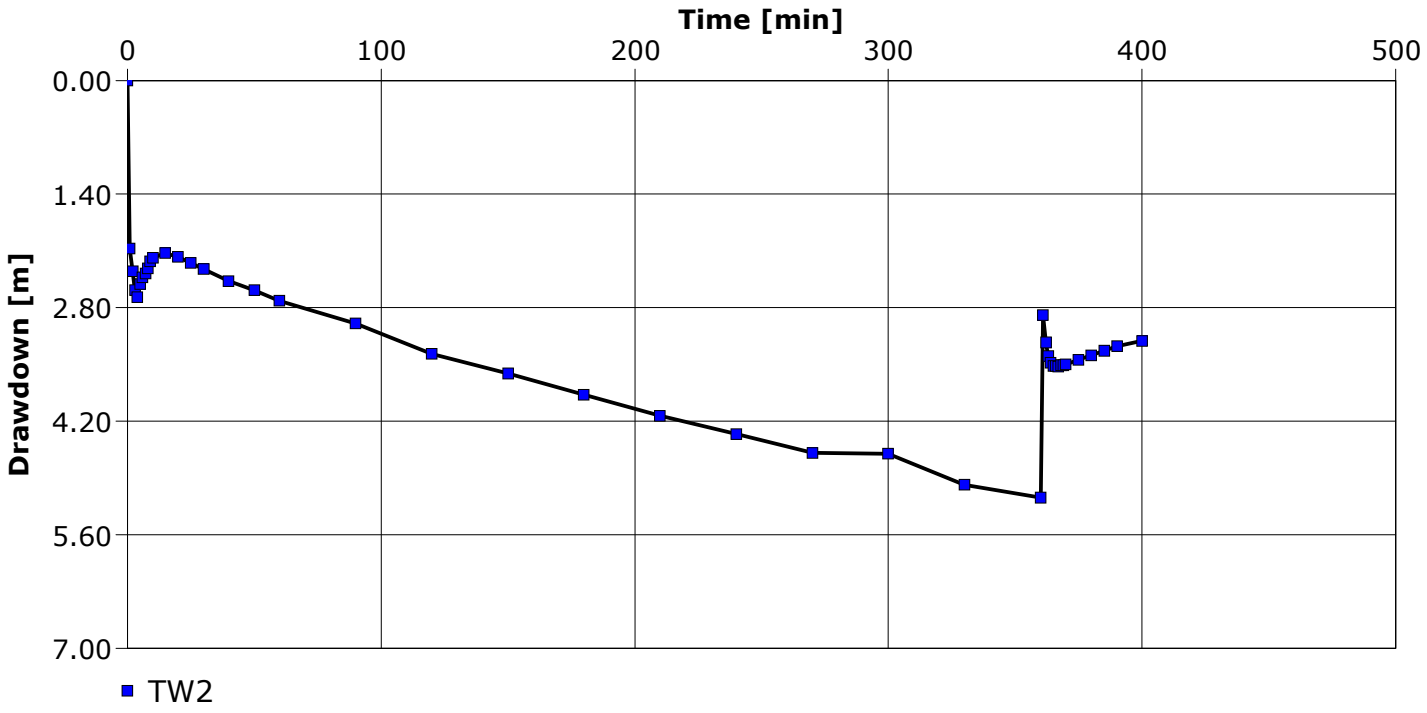


Calculation using Theis

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

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



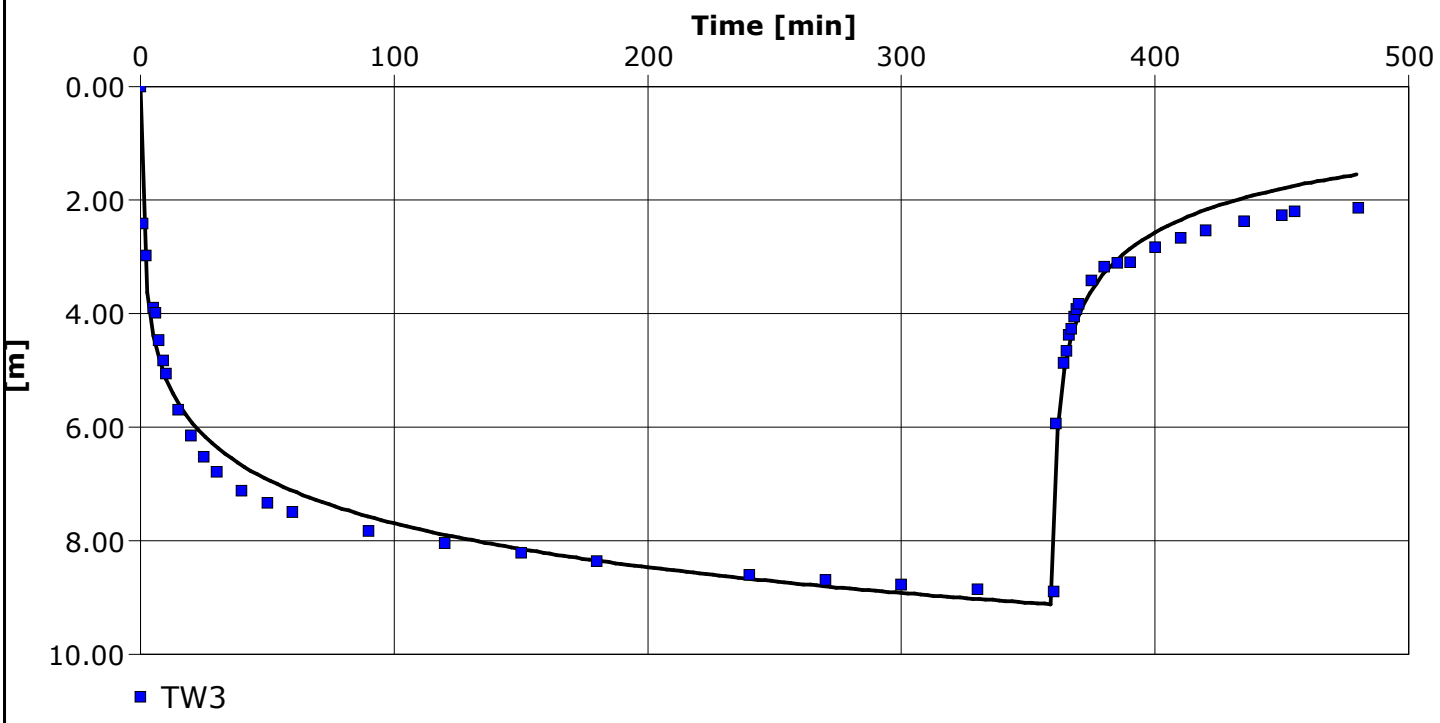
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: 1370 Wilhaven
	Number: PH1236
	Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW2	Pumping Well: TW2
Test Conducted by: RAP		Test Date: 01/02/2016
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^{0}	1.47×10^{-2}	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**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 (linear)	Analysis Date: 01/02/2016
Aquifer Thickness: 128.00 m	Discharge: variable, average rate 0.25 [l/s]	

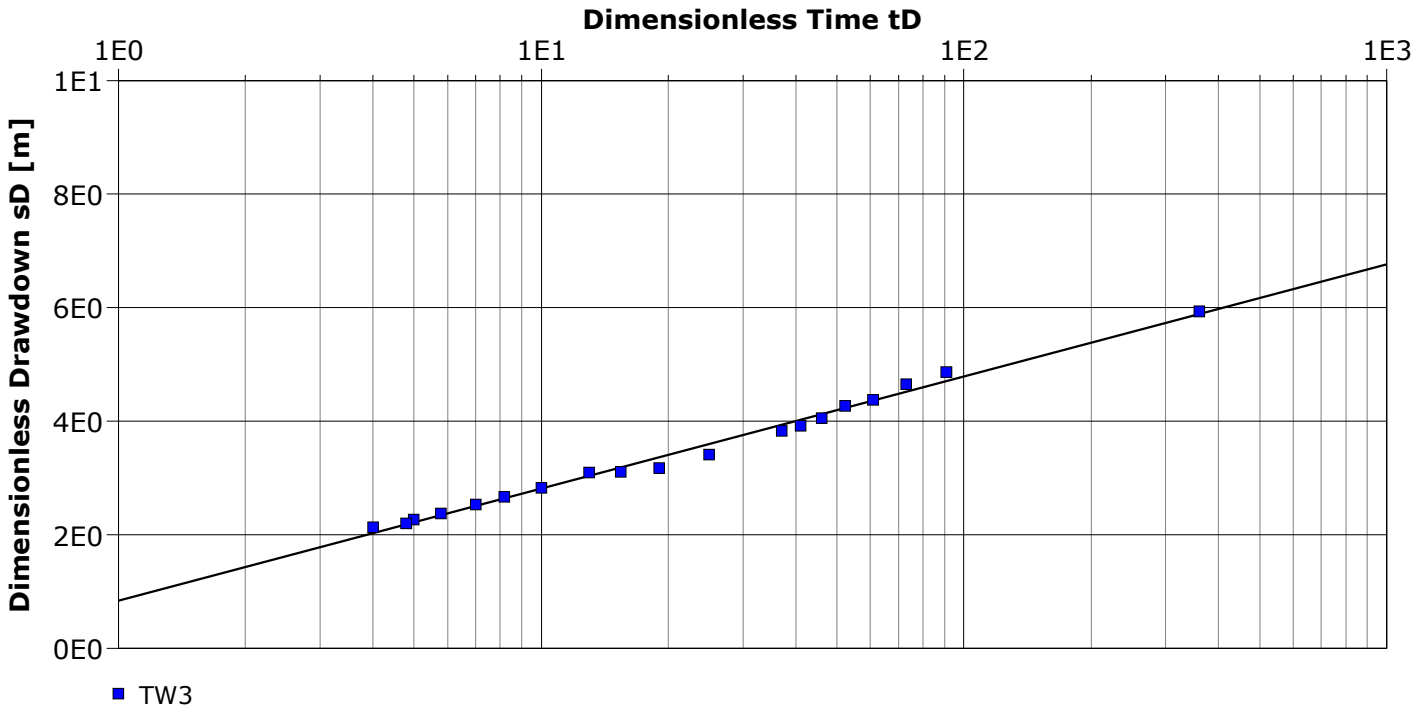


Calculation using Theis

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

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

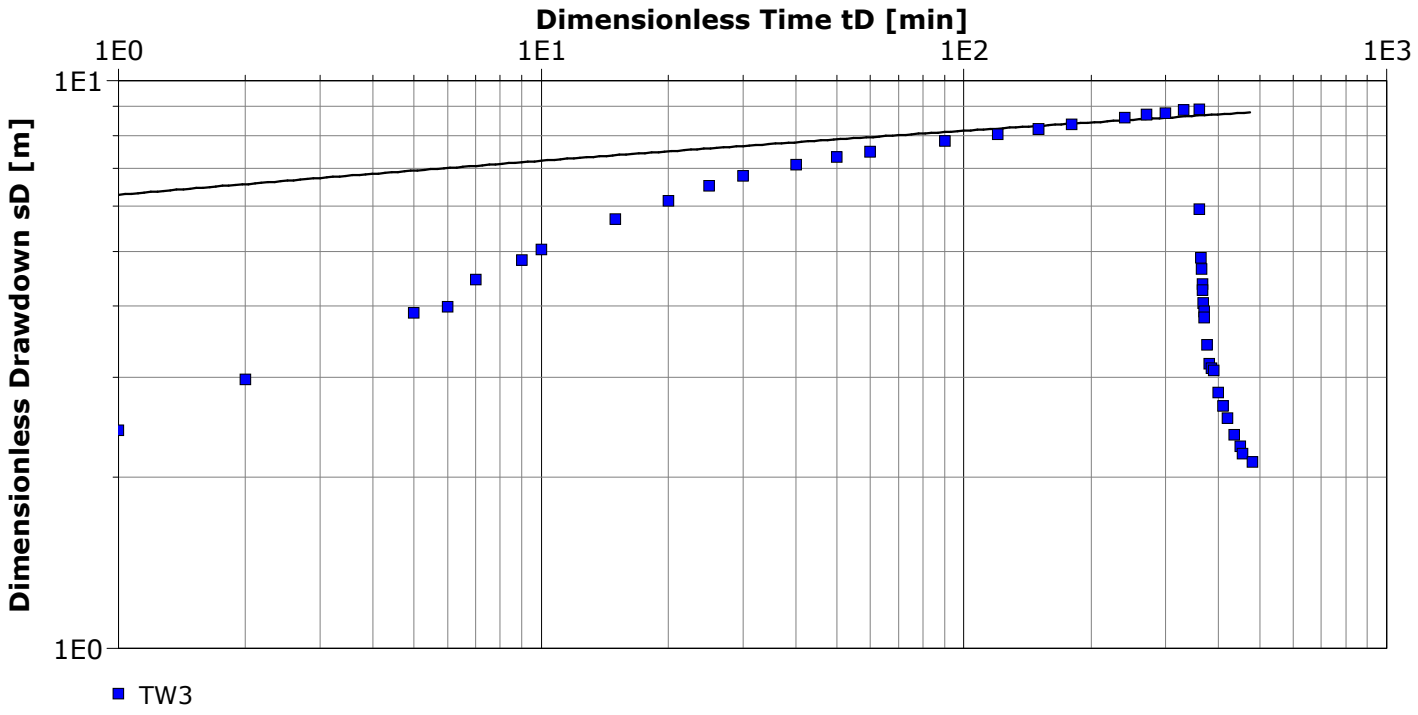


Calculation using THEIS & JACOB

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

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



Calculation using Theis

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

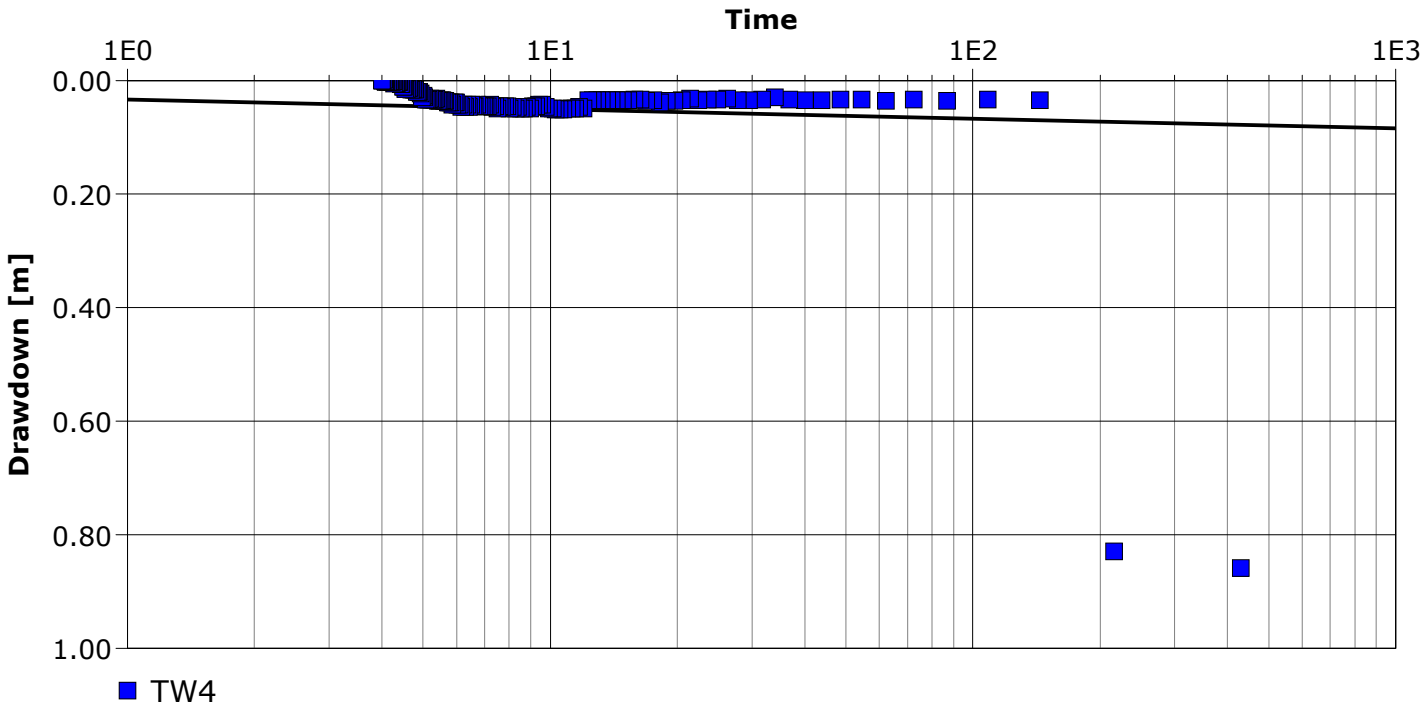
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: 1730 Wilhaven
	Number: PH1236
	Client: F. Farsi

Location: Cumberland, ON	Pumping Test: Pumping Test of TW3	Pumping Well: TW3
Test Conducted by: RAP		Test Date: 01/02/2016
Aquifer Thickness: 128.00 m	Discharge: variable, 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^{0}	1.20×10^{-2}	
2	Theis RECOVERY		01/02/2016	Theis Recovery	TW3	2.00×10^{0}	1.56×10^{-2}	
3	Theis (log-log)		19/07/2016	Theis	TW3	1.53×10^{0}	1.19×10^{-2}	
					Average	1.69×10^{0}	1.32×10^{-2}	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven
	Number: 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]	

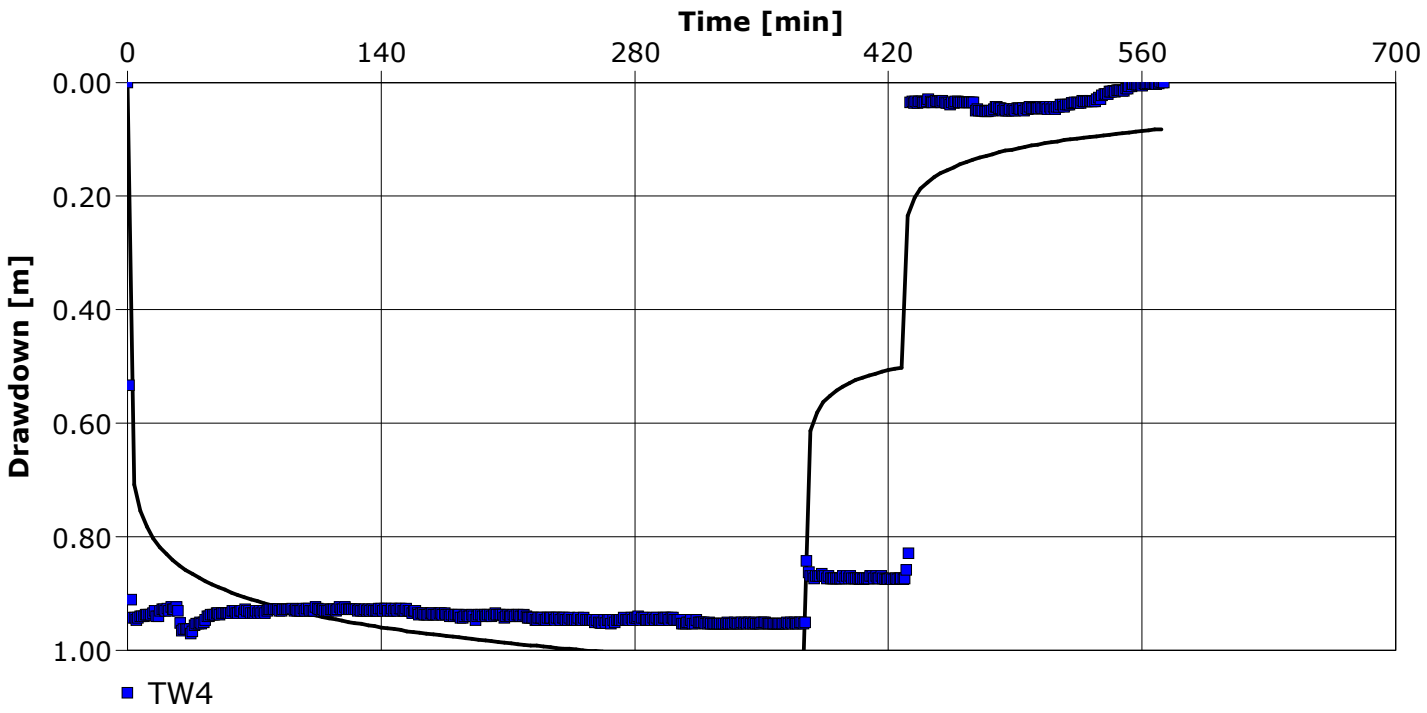


Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]	
TW4	1.62×10^{3}	6.48×10^{2}	0.25	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven
	Number: 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 (linear)	Analysis Date: 19/07/2016
Aquifer Thickness: 2.50 m	Discharge: variable, average rate 1.7451 [l/s]	

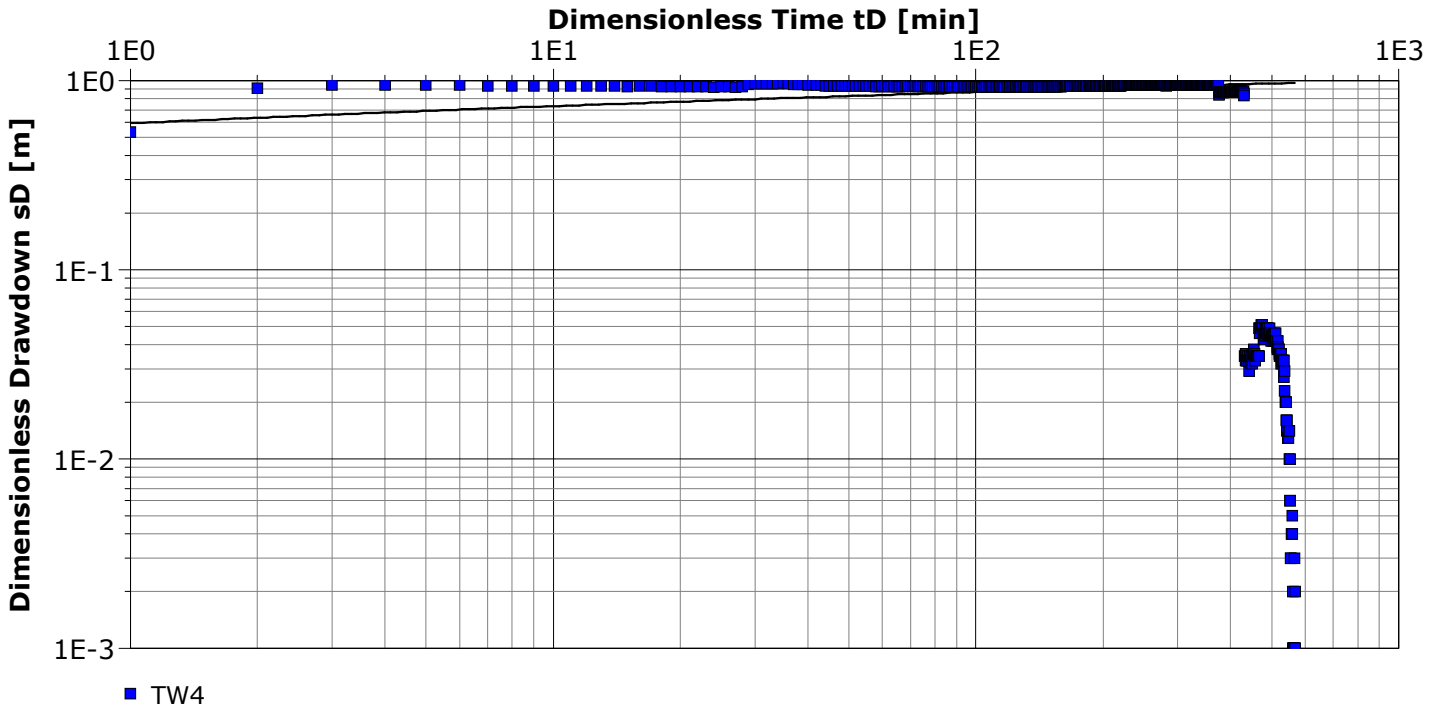


Calculation using Theis

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW4	1.89×10^{2}	7.56×10^{1}		0.25	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven
	Number: 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 (log-log)	Analysis Date: 19/07/2016
Aquifer Thickness: 2.50 m	Discharge: variable, average rate 1.7451 [l/s]	



Calculation using Theis

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

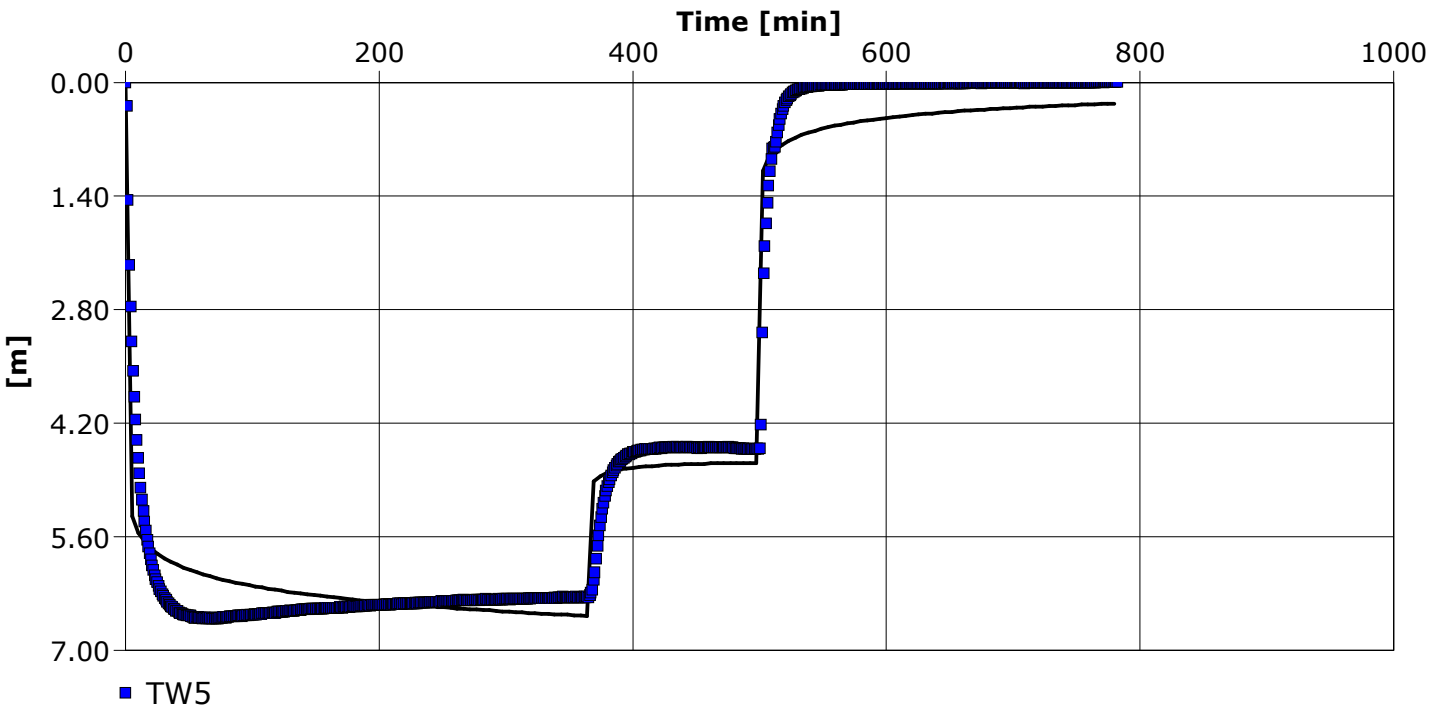
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven
	Number: PH1236
	Client: Fred Farsi

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

	Analysis Name	Analysis Performed by	Analysis Date	Method name	Well	T [m²/d]	K [m/d]	S
1	Theis RECOVERY		02/11/2015	Theis Recovery	TW4	1.62×10^{3}	6.48×10^{2}	
2	Theis (linear)		19/07/2016	Theis	TW4	1.89×10^{2}	7.56×10^{1}	
3	Theis (log-log)		19/07/2016	Theis	TW4	8.64×10^{1}	3.46×10^{1}	
					Average	6.32×10^{2}	2.53×10^{2}	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**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 (linear)	Analysis Date: 12/05/2016
Aquifer Thickness: 15.24 m	Discharge: variable, average rate 0.32046 [l/s]	

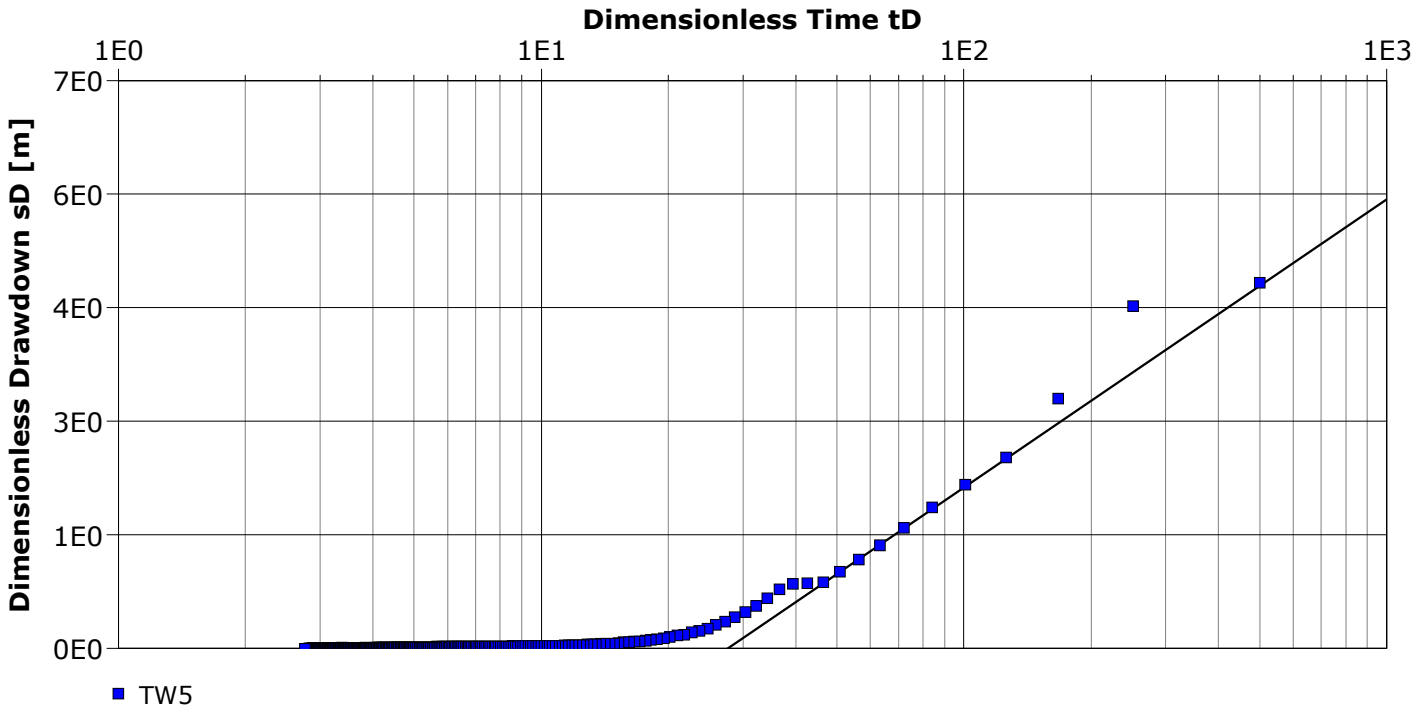


Calculation using Theis

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

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**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 RECOVERY	Analysis Date: 25/05/2016
Aquifer Thickness: 15.24 m	Discharge: variable, average rate 0.32046 [l/s]	

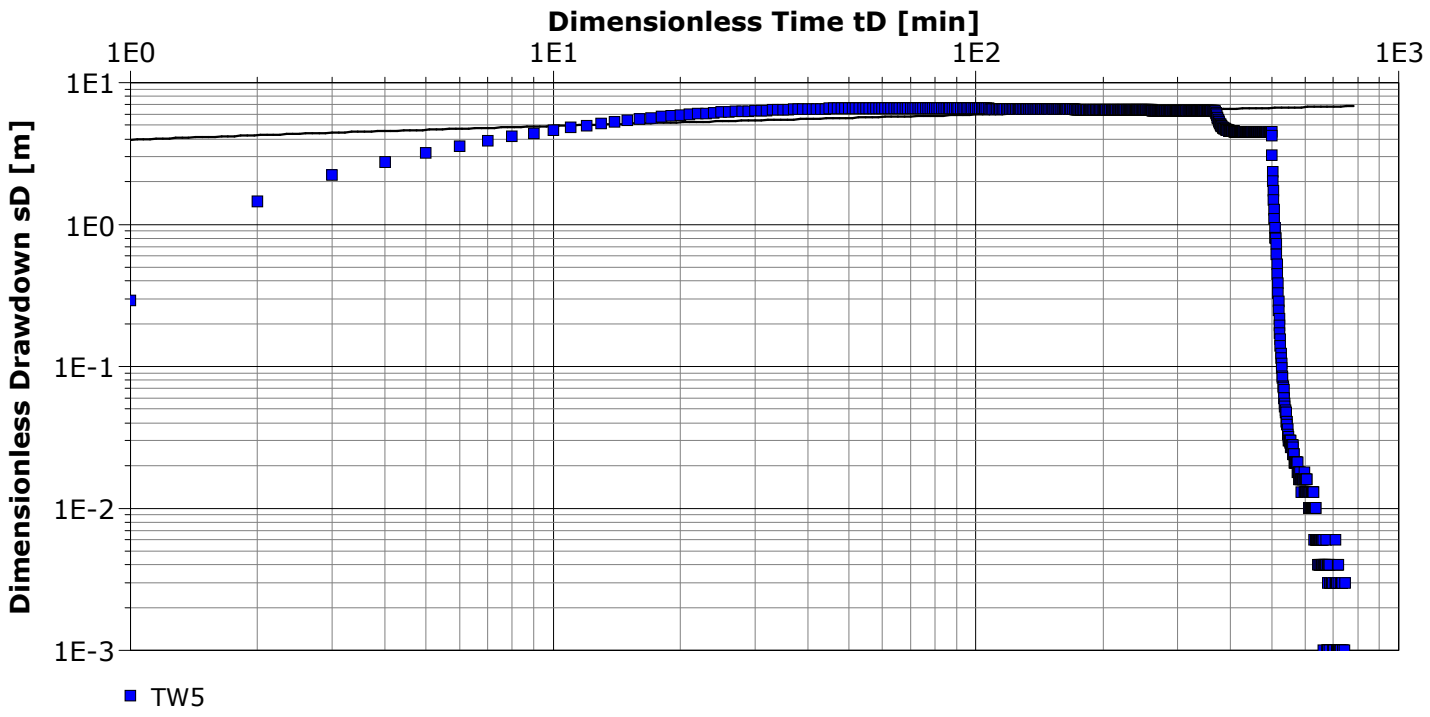


Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]	
TW5	1.43×10^{0}	9.36×10^{-2}	0.07	

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



Calculation using Theis

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

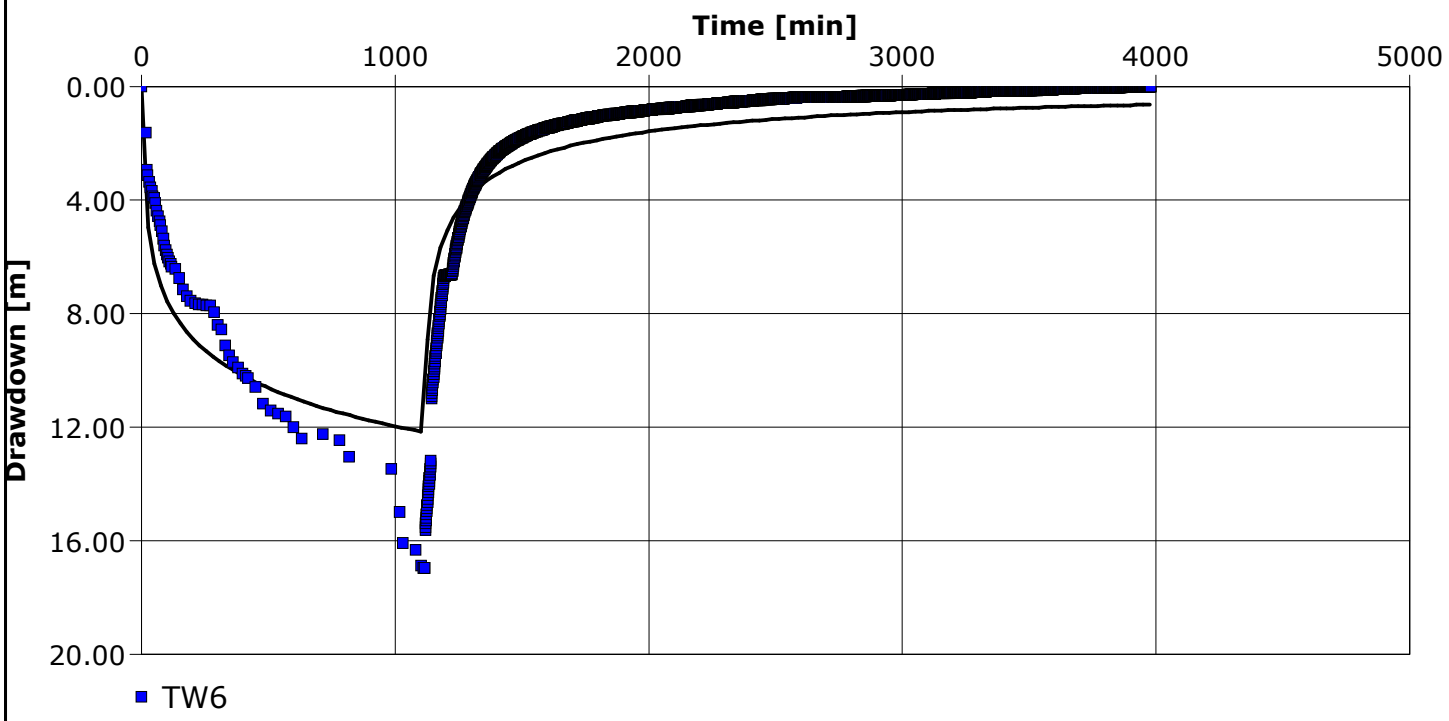
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven - pumping test TW5
	Number: PH1236
	Client: Fred Farsi

Location: 1730 Wilhaven Drive	Pumping Test: Pumping Test 1	Pumping Well: TW5
Test Conducted by: MM		Test Date: 11/05/2016
Aquifer 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^{0}	5.49×10^{-1}	
2	Theis RECOVERY		25/05/2016	Theis Recovery	TW5	1.43×10^{0}	9.36×10^{-2}	
3	Theis (log-log)		19/07/2016	Theis	TW5	2.56×10^{0}	1.68×10^{-1}	
					Average	4.11×10^{0}	2.70×10^{-1}	

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping 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]	

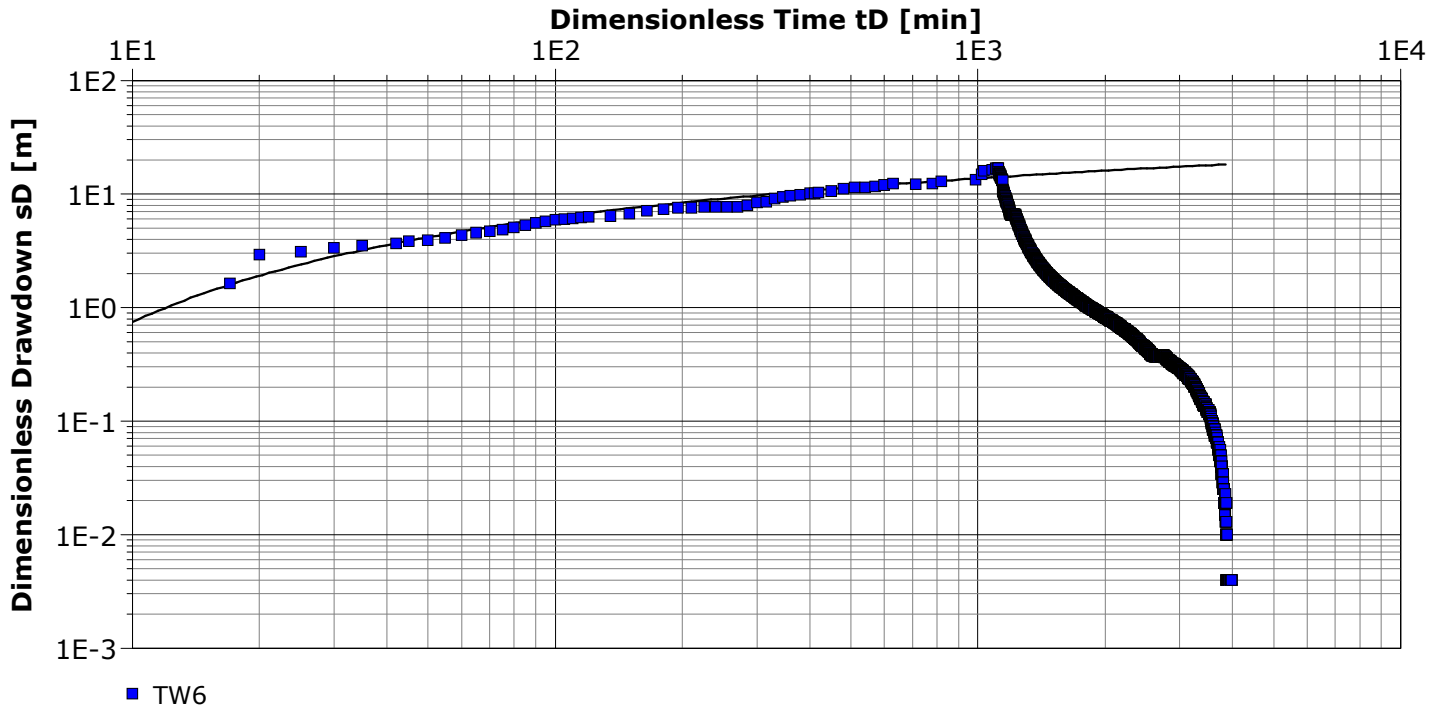


Calculation using Theis

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

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	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	Discharge: variable, average rate 0.046 [l/s]	

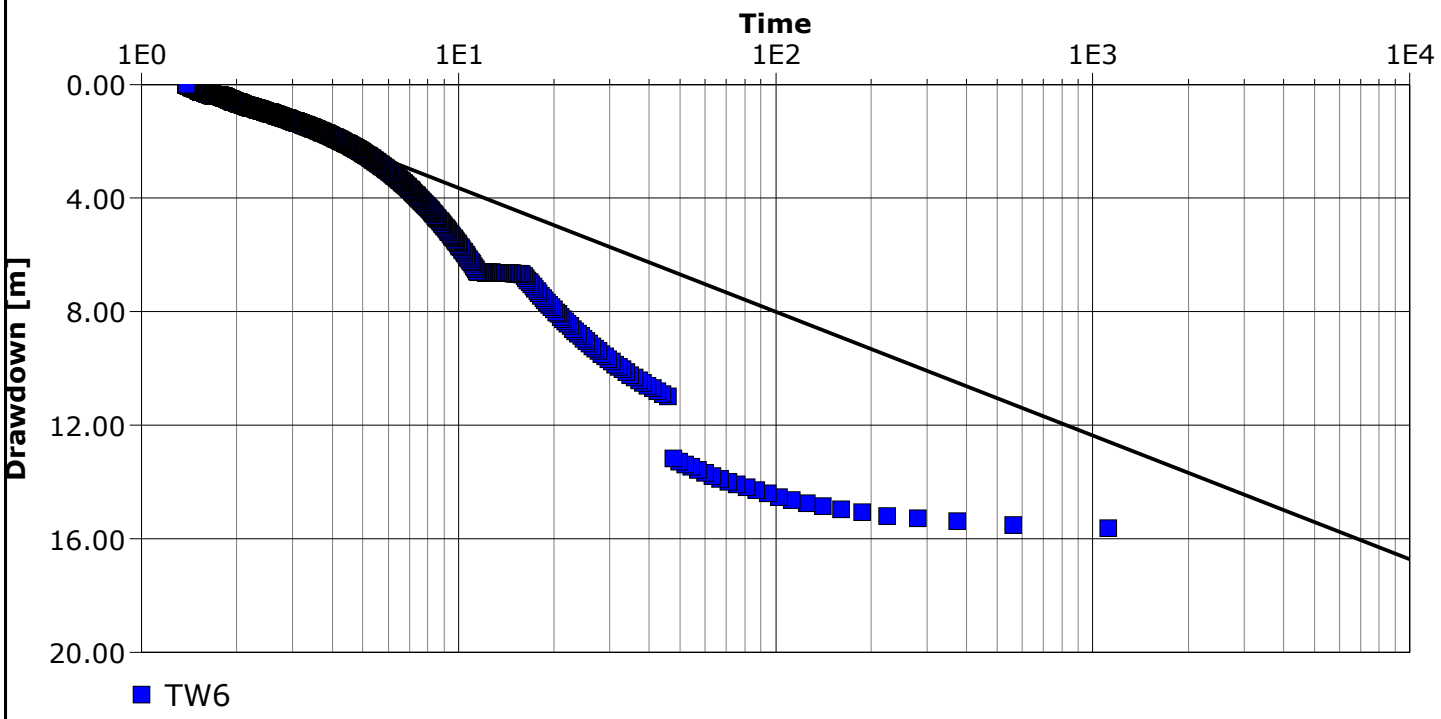


Calculation using Theis

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

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	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 [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]	
TW6	1.67×10^{-1}	2.65×10^{-3}	0.07	

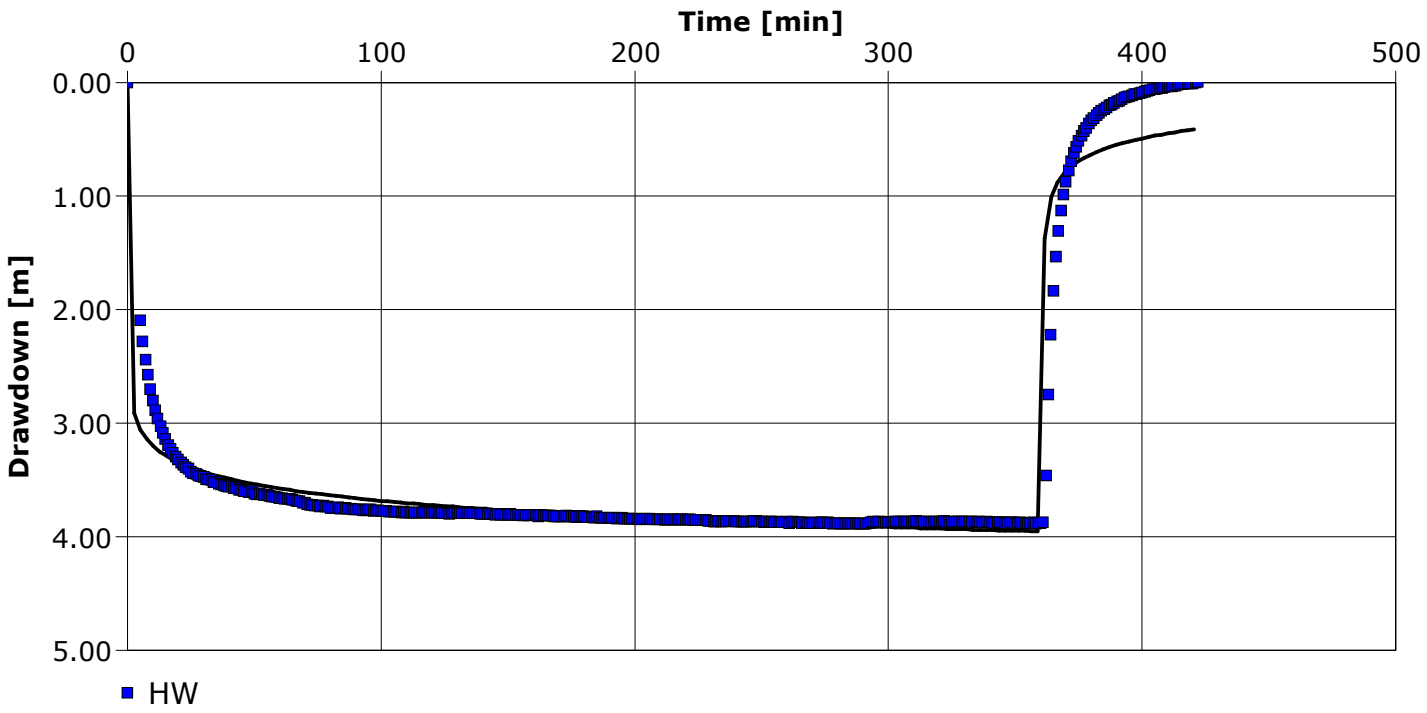
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report** Project: Wilhaven Number: PH1236 Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping 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 [m²/d]	K [m/d]	S
1	Theis (linear)		19/07/2016	Theis	TW6	1.63×10^{-1}	2.59×10^{-3}	
2	Theis (log-log)		19/07/2016	Theis	TW6	1.04×10^{-2}	1.65×10^{-4}	
3	Theis RECOVERY		19/07/2016	Theis Recovery	TW6	1.67×10^{-1}	2.65×10^{-3}	
					Average	1.13×10^{-1}	1.80×10^{-3}	

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven - p-test HW on 24may16 by MM
	Number: PH1236
	Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, ON	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
Aquifer Thickness: 22.00 m	Discharge: variable, average rate 0.35 [l/s]	

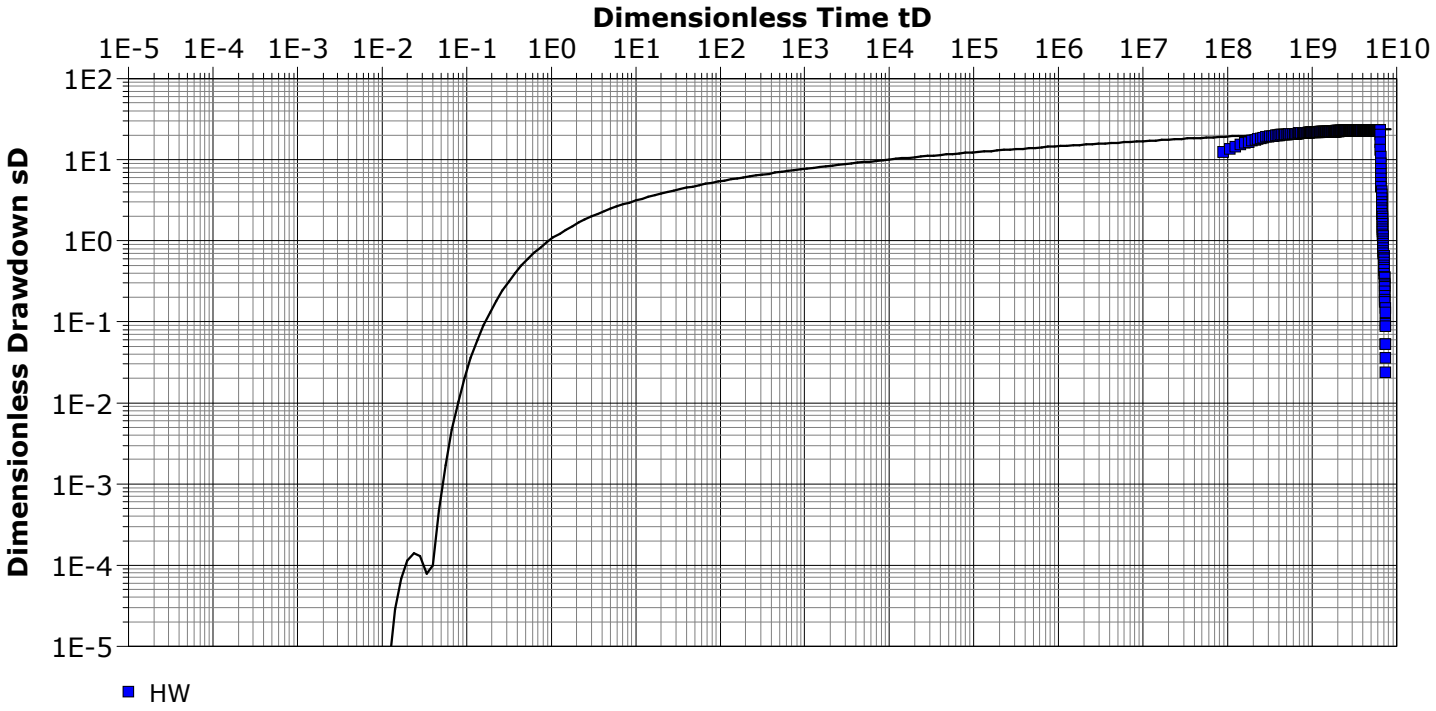


Calculation using Theis

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

Paterson Group **Hydrogeology** **154 Colonnade Road South** **Ottawa, ON, K2E 7J5**	**Pumping Test Analysis Report** Project: Wilhaven - p-test HW on 24may16 by MM Number: PH1236 Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping 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]	

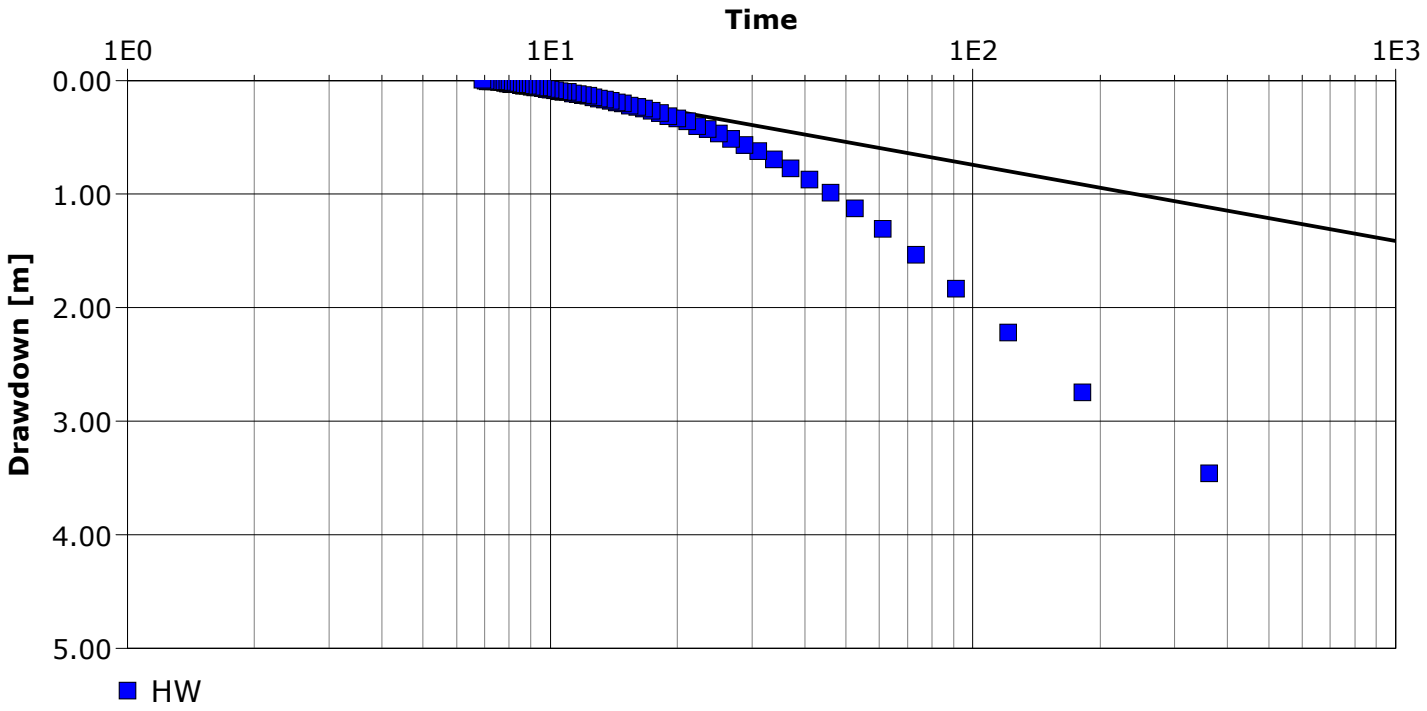


Calculation using Theis

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

Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven - p-test HW on 24may16 by MM
	Number: PH1236
	Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, ON	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 [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]	
HW	8.25×10^{0}	3.75×10^{-1}	0.07	

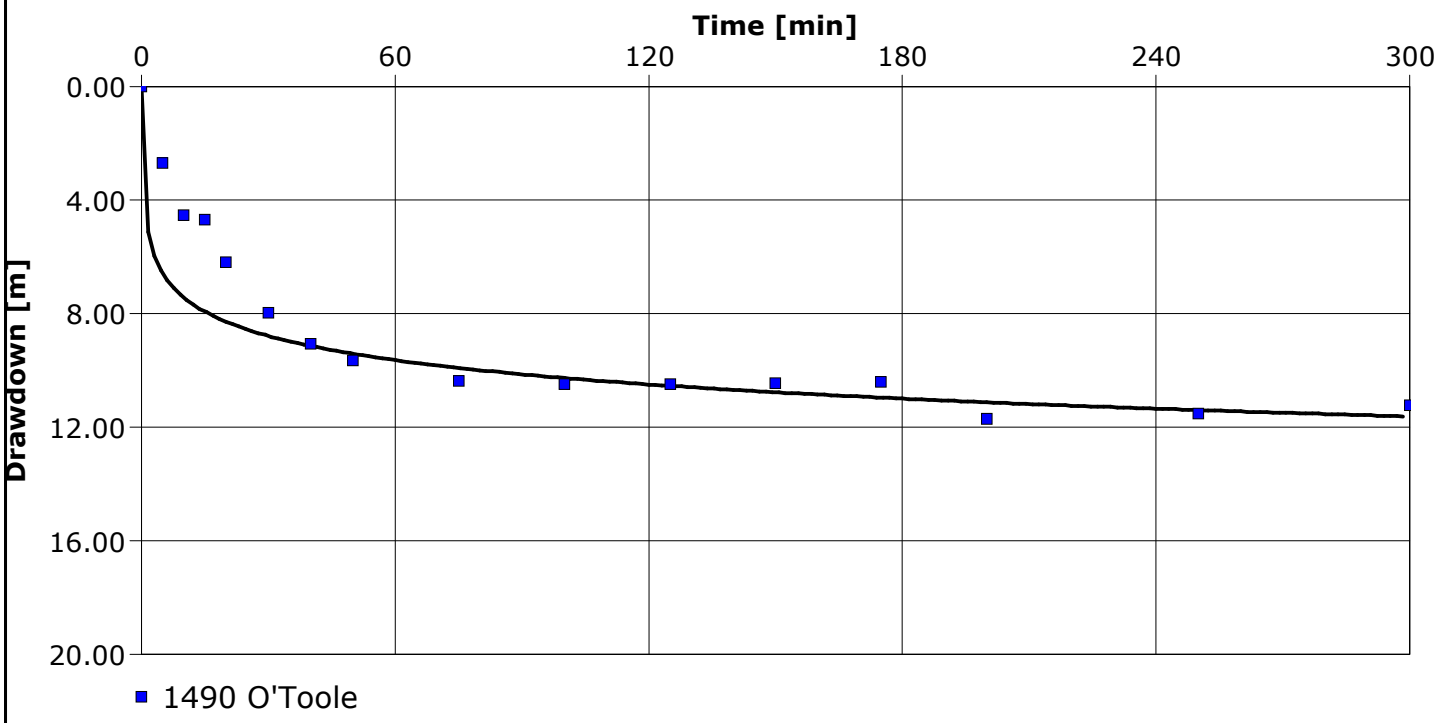
Paterson Group Hydrogeology 154 Colonnade Road South Ottawa, ON, K2E 7J5	**Pumping Test Analysis Report**
	Project: Wilhaven - p-test HW on 24may16 by MM
	Number: PH1236
	Client: Fred Farsi

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	Pumping Well: HW
Test Conducted by: MM		Test Date: 24/05/2016
Aquifer 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^{1}	5.19×10^{-1}	
2	Thies (log-log)		25/05/2016	Theis	HW	1.43×10^{1}	6.49×10^{-1}	
3	Theis RECOVERY		25/05/2016	Theis Recovery	HW	8.25×10^{0}	3.75×10^{-1}	
					Average	1.13×10^{1}	5.14×10^{-1}	

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	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
Aquifer Thickness: 91.00 m	Discharge Rate: 24 [l/s]	

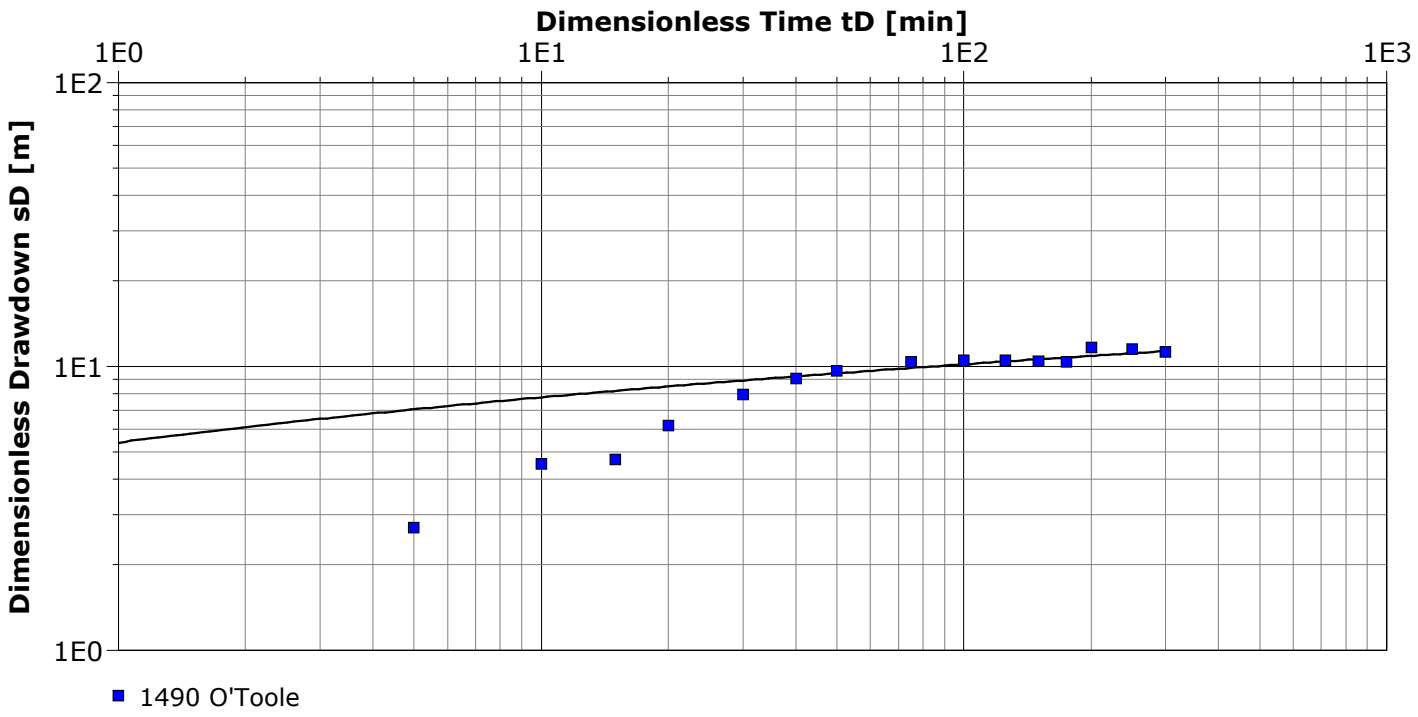


Calculation using Theis

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

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	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 Theis

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
1490 O'Toole	1.59×10^{2}	1.75×10^{0}		0.07	

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

Location: 1730 Wilhaven Drive, Cumberland, ON	Pumping Test: Pumping Test 1	Pumping Well: 1490 O'Toole
Test Conducted by: Kollard Associates Inc.		Test Date: 16/03/2016
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'Toole	1.34×10^{2}	1.47×10^{0}	
2	Theis (log-log)		19/07/2016	Theis	1490 O'Toole	1.59×10^{2}	1.75×10^{0}	
					Average	1.46×10^{2}	1.61×10^{0}	

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Wilhaven

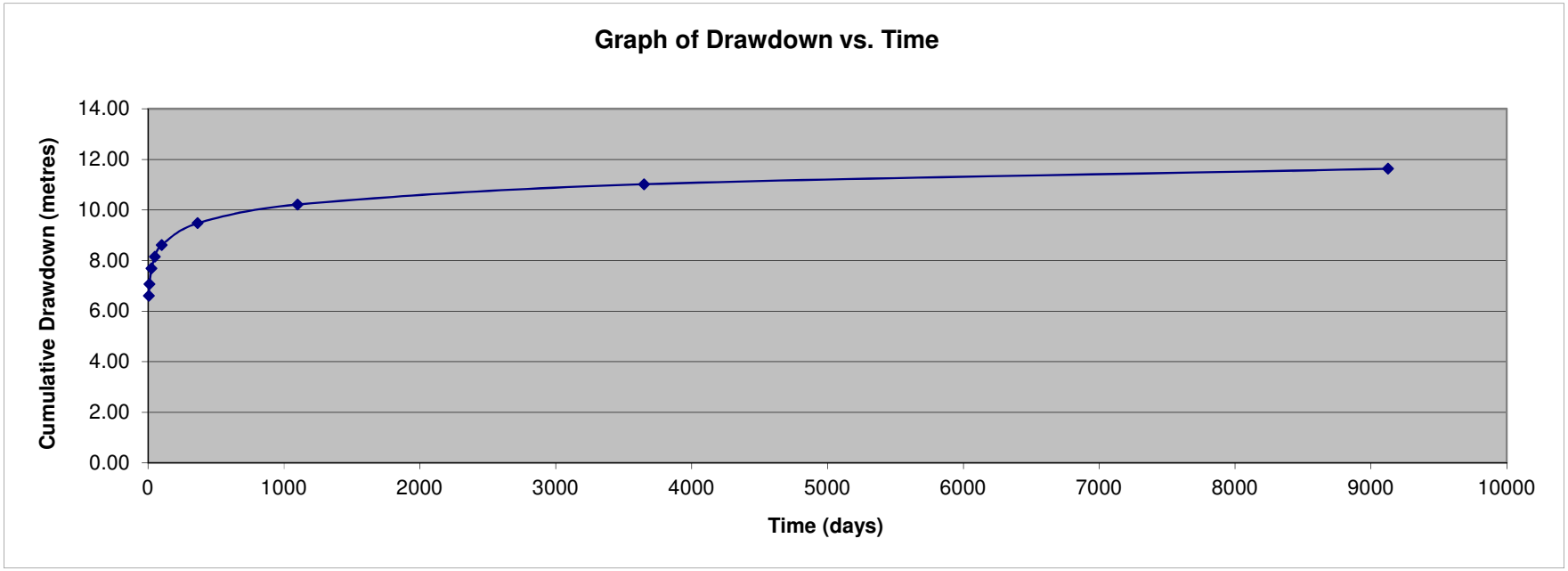
Determination of Potential Well Interference

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	50	
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		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



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Wilhaven
PH1236
Langlier Saturation Index (LSI) Calculation

(Langlier, 1936)

LSI = pH - pHs
pHs = (9.3 + A + B) - (C + D)
Where:

A = (Log10 [TDS] - 1) / 10
B = -13.12 x Log10 (oC + 273) + 34.55
C = Log10 [Ca2+ as CaCO3] - 0.4
D = Log10 [alkalinity as CaCO3]

TW6	inputs		
pH	8.27	A	0.18
TDS	597	B	2.32
Hardness	98	C	1.59
Alkalinity	296	D	2.47
Temp.	13		
		pHs =	7.74
		LSI =	**0.5**

LSI	Effect
0.5 to 2	**Water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive)**
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

RSI =	**7.2**

RSI	Effect
<5.5	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

Predictive Nitrate Impact Assessment

PRE DEVELOPMENT CONDITIONS			POST DEVELOPMENT CONDITIONS		
Groundwater Flow Through	NOT USED		**Groundwater Flow Through**	NOT USED	
~~Background Nitrate Concentration (C_b) =~~	~~0~~	~~mg/L~~	~~Background Nitrate Concentration (C_b) =~~	~~0~~	~~mg/L~~
~~Hydraulic Conductivity (k) =~~	~~0~~	~~m/s~~	~~Hydraulic Conductivity (k) =~~	~~0~~	~~m/s~~
~~Horizontal Gradient (i) =~~	~~0~~		~~Horizontal Gradient (i) =~~	~~0~~	
~~Length (L) =~~	~~0~~	~~m~~	~~Length (L) =~~	~~0~~	~~m~~
~~Aquifer Thickness (t) =~~	~~0~~	~~m~~	~~Aquifer Thickness (t) =~~	~~0~~	~~m~~
~~Groundwater Flow (Q_b) =~~	~~0~~	~~m^3/day~~	~~Groundwater Flow (Q_b) =~~	~~0~~	~~m^3/day~~
Infiltration Factors			**Infiltration Factors**		
Topography	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^2	Area of Site :	199,161	m^2
			Area of each roof:	525	m^2
			Total of roof areas:	11,025	m^2
			Area of each driveway:	200	m^2
			Total of driveway areas:	4200	m^2
			Length of roadways:	753	m
			Width of roadways:	8	m
			Total area of roadways:	6024	
			Impervious Area	21,249	m^2
			Percent Impervious Area =	10.67	%
Infiltration Area =	199,161	m^2	Infiltration Area =	177,912	m^2
Septic Effluent			**Septic Effluent**		
Concentration of Effluent (Cs) =	0	mg/L	Concentration of Effluent (Cs) =	40	mg/L
Daily Sewage Flow (Qs)=	0	m^3	Daily Sewage Flow (Qs)=	21	m^3
Infiltration Calculation			**Infiltration Calculation**		
Nitrate concentration in precipitation (C_i) =	0	mg/L	Nitrate concentration in precipitation (C_i) =	0	mg/L
Preciptation (from Environment Canada climate normals)	943.4	mm/yr	Preciptation (from Environment Canada climate normals)	943.4	mm/yr
Surplus Water (Environment Canada)	300	mm/yr	Surplus Water (Environment Canada)	384	mm/yr
Factored Water Surplus =	200	mm/yr	Factored Water Surplus =	261	mm/yr
Total volume of Infiltration	39,785	m^3	Infiltraion % due to stormwater management measures	78%	
			Runoff volume (all water running off impervious areas)	20,046	m^3
			Minimum 'storminf' volume (25mm event, Stantec, 2016)	15,550	m^3/year
				43	m^3/day
Infiltration flow entering the system (Q_i) =	109	m^3/day	Infiltration Flow Entering the System (Q_i) =	127	m^3/day
			Infiltration Flow Entering the System (Q_i with 'storminf') =	170	m^3/day
Mass Balance Model (MOEE, 1995)			**Mass Balance Model (MOEE, 1995)**		
$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration			$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration		
Q_b = flow entering the system across the upgradient area	0	m^3/day	Q_b = flow entering the system across the upgradient area	0	m^3/day
C_b = background nitrate concentration	0	mg/L	C_b = background nitrate concentration	0	mg/L
Q_e = flow entering the system from the septic drainfield	0	m^3/day	Q_e = flow entering the system from the septic drainfield	21	m^3/day
C_e = concentration of nitrates in the septic effluent	0	mg/L	C_e = concentration of nitrates in the septic effluent	40	mg/L
Q_i = flow entering the system from infiltration	109	m^3/day	Q_i = flow entering the system from infiltration (with 'storminf')	170	m^3/day
C_i = Concentration of nitrates in the infiltrate	0	mg/L	C_i = Concentration of nitrates in the infiltrate	0	mg/L
C_T =	**0.0**	**mg/L**	**C_T =**	**4.399**	**mg/L**
Estimate Number of Lots	**1**	**big lot**	Estimate Number of Lots	**21**	**lots**

* = see separate weighted infiltration factor calculations

patersongroup **Water Well / Septic System Inspection Log**

Address: 1865 Wilhaven Cres Project Number: PH1236

Name of Property Owner: CLAude Mathieu 613 833 0321

Date of Inspection: July 7, 2016 Owner telephone No:

Paterson Rep: MM

Well Details

Is well casing exposed above ground surface ? (pitless) Y / (N) Length of stickup: —

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 ? ~1979 In what year was the house built ? ~1979

Depth of well ? 1101 Depth of well casing ? —

Who drilled the well ? — check well cap for driller ID

Water Quality

Taste ? good

Odour ? good

Colour ? yes

Hardness ? NO

History of bacteria testing ? No

Any other water quality related comments or issues ?

Water treatment details: softener

SAMPLING DETAILS:

Copy of results to well owner ? (get contact details / email address) Klomath@Gmail.com

Temp pH Cond TDS

Water Quantity

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 related comments or issues ? yes, when filling pool

Has the well ever run dry ? yes

Septic System draw location on sketch

Class 4 ? Tertiary treatment ?

Have there been any problems with the septic system ? Y / (N)

Environmental Concerns

Surface water ? pooling in the spring

Septic System ? No

Land use ? forested around, farmland to the S

Neighbouring properties ? forested

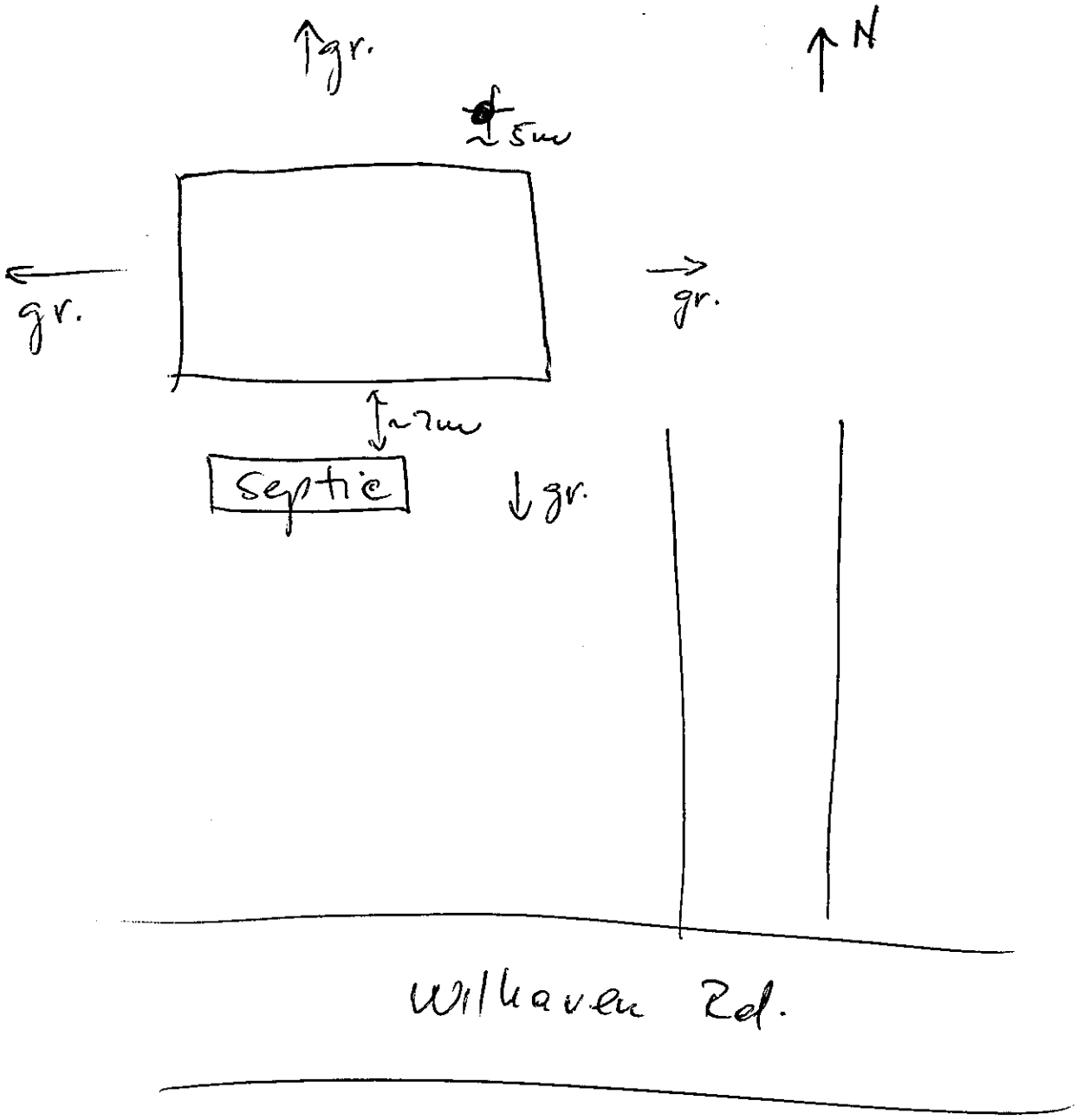
Potential sources of contamination (onsite and offsite) ? None (road salt)

Please sketch the site layout showing well location and location of septic system - on reverse side of this sheet

All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

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



All dimensions in metres (m) unless otherwise noted

1753

patersongroup **Water Well / Septic System Inspection Log**

Address: 1753 Wilhaven Dr. Project Number: PH

Name of Property Owner: David Leach - Chelsey Labrecque

Date of Inspection: July 7, 2016 Owner telephone No: 613 827 5004

Paterson Rep: MM

Well Details

Is well casing exposed above ground surface ? (Y) / N Length of stickup: 0.8m

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 ? ~1980 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 ?

Odour ? Good, no odour

Colour ? clear

Hardness ? No

History of bacteria testing ? No

Any other water quality related comments or issues ? No

Water treatment details: softener

SAMPLING DETAILS:

Copy of results to well owner ? (get contact details / email address)

Temp pH Cond TDS

Water Quantity

Size of pump in well ? — Type of pump ? —

Pumping rate ? —

Depth of pump in well ? — has owner ever seen it layed out on surface ? No

Any water quantity related comments or issues ? No

Has the well ever run dry ? No

Septic System draw location on sketch

Class 4 ? Tertiary treatment ?

Have there been any problems with the septic system ? Y / (N) in front of laundry

Environmental Concerns

Surface water ? standing water in spring

Septic System ? - upgradient from a well

Land use ? forested area

Neighbouring properties ? " + farm land to the south

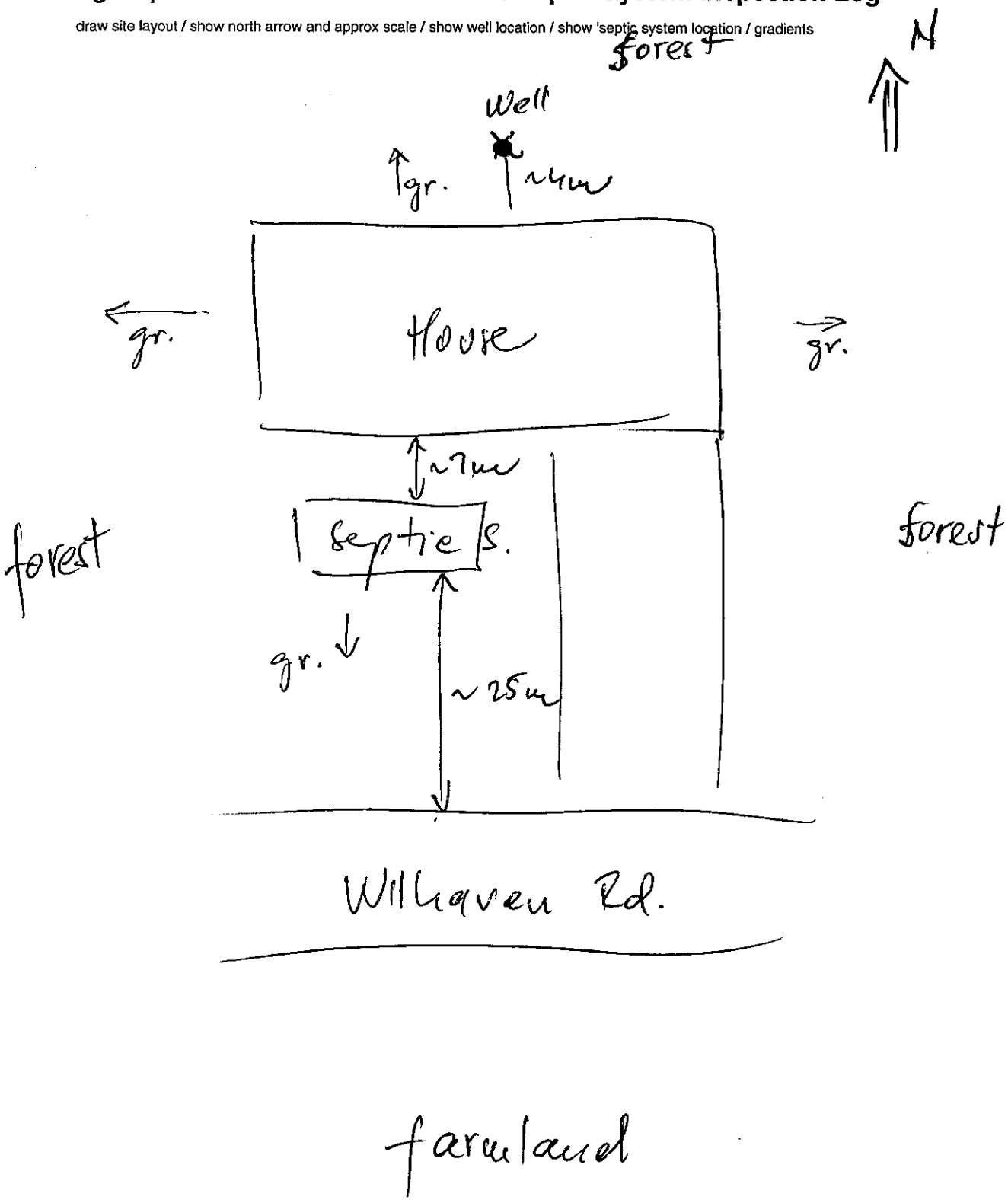
Potential sources of contamination (onsite and offsite) ? None (road salt)

Please sketch the site layout showing well location and location of septic system - on reverse side of this sheet

All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

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



All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

Address: 1649 Willowen Drive

Name of Property Owner: –

Date of Inspection: July 7, 2016 Project Number: PH 1236

Paterson Rep: MM No one at home

Well Details Well not observed

Is well casing exposed above ground surface ? Y / N Length of stickup:

Does owner have a copy of the 'water well record' ? Y / N Try to obtain a copy or get details (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 comments or issues ?

Water Quantity

Size of pump in well ? Type of pump ?

Pumping rate ?

Depth of pump in well ?

Any water quantity related comments or issues ?

Environmental Concerns

Surface water ?

Septic System ?

Land use ? resid.

Neighbouring properties ? Farmland - N, W, S, forested - E

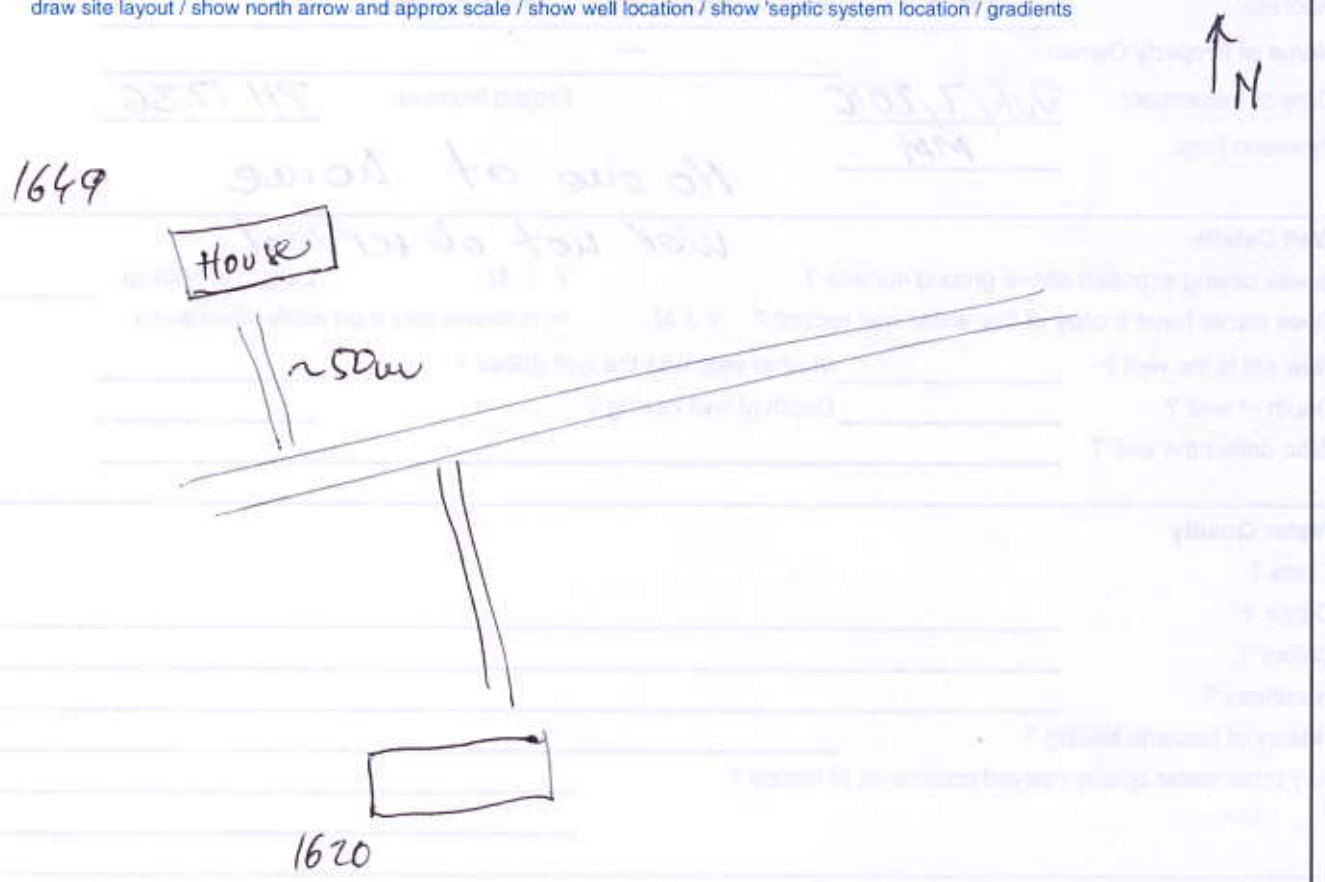
Potential sources of contamination (onsite and offsite) ?

Please sketch the site layout showing well location and location of septic system - on reverse side of this sheet

All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

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



-area flat

~ 400 m to TW6

• TW6

All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

Address: 1620 Wilhaven Drive

Name of Property Owner:

Date of Inspection: July 7, 2016 Project Number: PH1236

Paterson Rep: MM

No one at home

Well Details Well not observed

Is well casing exposed above ground surface ? Y / N Length of stickup:

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 comments or issues ?

Water Quantity

Size of pump in well ? Type of pump ?

Pumping rate ?

Depth of pump in well ?

Any water quantity related comments or issues ?

Environmental Concerns

Surface water ?

Septic System ?

Land use ? residential

Neighbouring properties ? resid. to the N, farmland E, S, W

Potential sources of contamination (onsite and offsite) ?

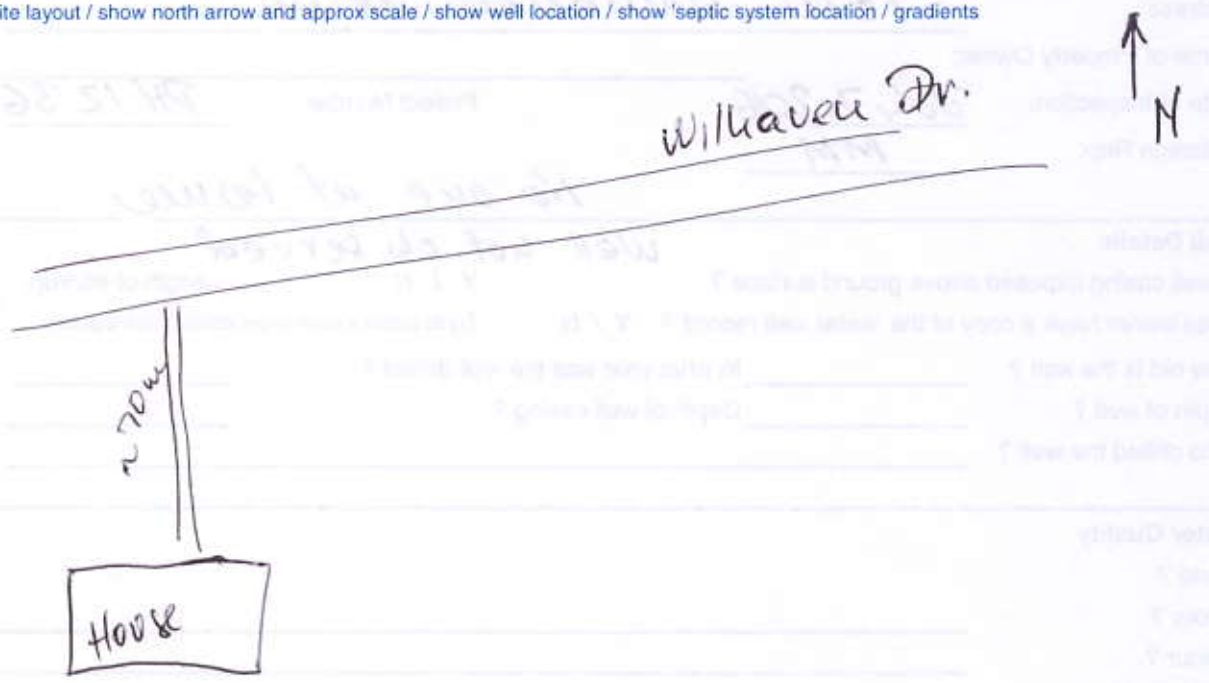
- livestock at the property (llamas)

Please sketch the site layout showing well location and location of septic system - on reverse side of this sheet

All dimensions in metres (m) unless otherwise noted

patersongroup **Water Well / Septic System Inspection Log**

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



- area flat

~150m to TWB

• TWB

All dimensions in metres (m) unless otherwise noted

paterson group

Water Well / Septic System Inspection Log

Address: 1675 Project Number: PH1236

Name of Property Owner: –

Date of Inspection: July 7, 2016 Owner telephone No:

Paterson Rep: MM Nanny at home only - doesn't know about well

Well Details

Is well casing exposed above ground surface ? Y / N Length of stickup:

Does owner have a copy of the 'water well record' ? Y / N Try to obtain a copy or get details (take a photo)

How old is the well ? In what year was the house built ?

Depth of well ? Depth of well casing ?

Who drilled the well ? check well cap for driller ID

Water Quality

Taste ?

Odour ?

Colour ?

Hardness ?

History of bacteria testing ?

Any other water quality related comments or issues ?

Water treatment details:

SAMPLING DETAILS:

Copy of results to well owner ? (get contact details / email address)

Temp pH Cond TDS

Water Quantity

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 related comments or issues ?

Has the well ever run dry ?

Septic System draw location on sketch

Class 4 ? Tertiary treatment ?

Have there been any problems with the septic system ? Y / N

Environmental Concerns

Surface water ?

Septic System ?

Land use ? rural.

Neighbouring properties ? Forested - E, N ; rural / farmland - S, W

Potential sources of contamination (onsite and offsite) ?

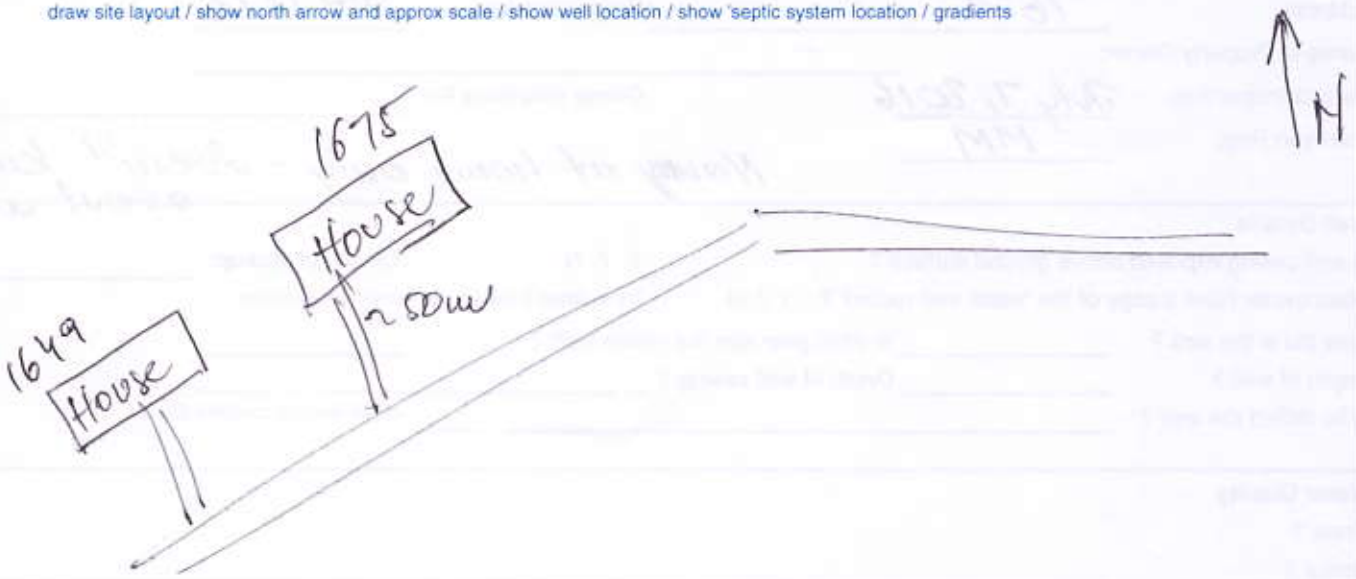
Please sketch the site layout showing well location and location of septic system - on reverse side of this sheet

All dimensions in metres (m) unless otherwise noted

paterson group

Water Well / Septic System Inspection Log

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



~ 400m to T.W6

- area flat

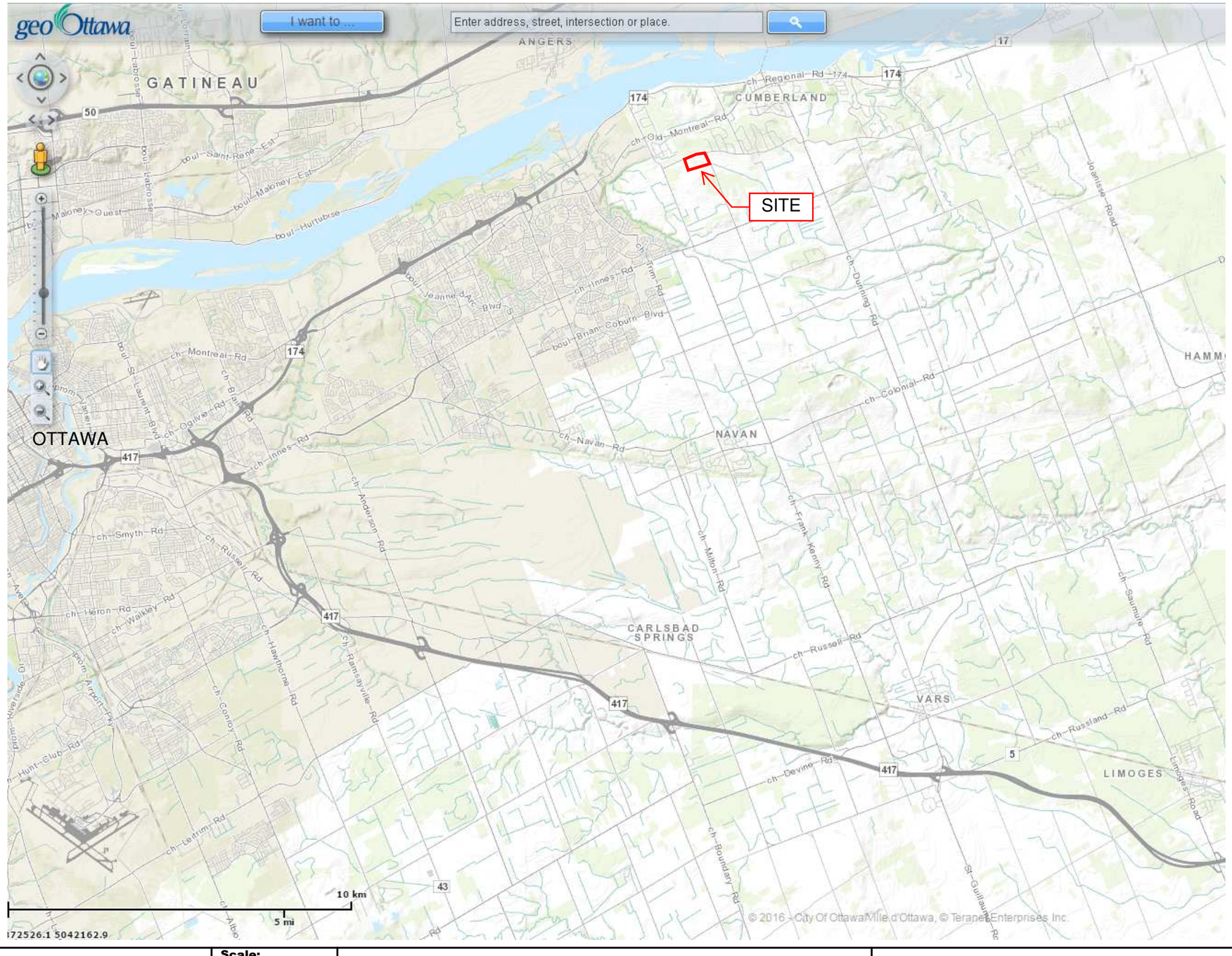
TW6

All dimensions in metres (m) unless otherwise noted

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**

N



REF: http://maps.ottawa.ca/geoottawa/

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

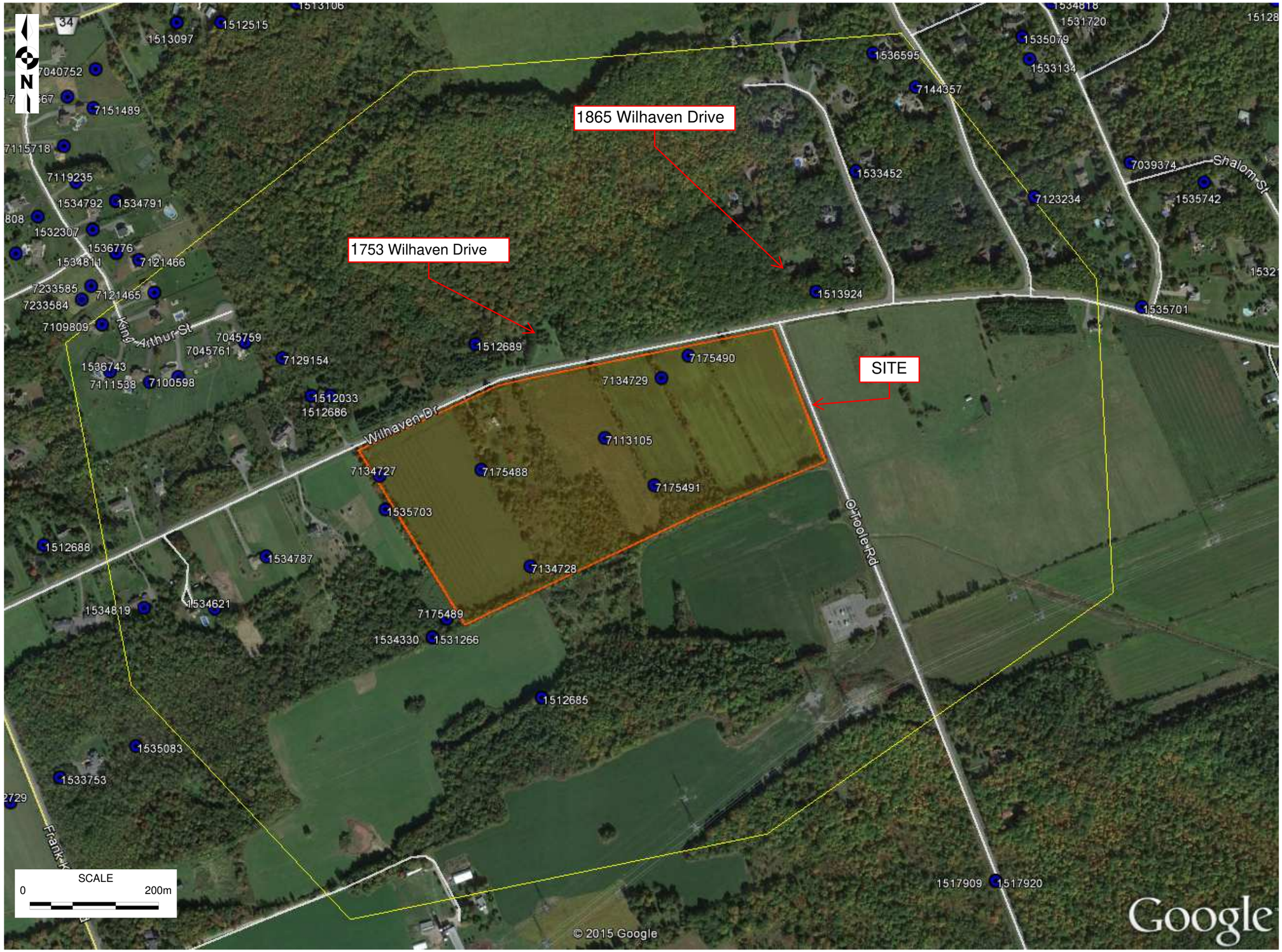
Scale:	
Des.:	
Dwn:	
Chkd:	

2183144 ONTARIO LTD.

1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO

SITE LOCATION PLAN

Dwg. No.	FIGURE 1
Report No.:	
Date:	



DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

2183144 ONTARIO LTD.

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

REF:The Ontario Geological Survey. 2003. Surficial Geology of Southern Ontario.

patersongroup consulting engineers 154 Colonnade Road South, Ottawa, Ontario K2E 7J5	Scale: Des.: Dwn: Chkd:	FRED FARSI HYDROGEOLOGICAL AND TERRAIN ANALYSIS 1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO	OVERBURDEN GEOLOGY	Dwg. No. **FIGURE 3** Report No.: Date:

Ministry of Northern Development, Mines and Forestry, - Ontario Geological Survey, OGS Earth website: (http://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth).

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

Scale scale not specified
Des.: RLC
Dwn: RLC
Chkd: .

2183144 ONTARIO LTD.
HYDROGEOLOGICAL AND TERRAIN ANALYSIS
1730 WILHAVEN DRIVE, CUMBERLAND, ONTARIO

BEDROCK MAPPING

FIGURE 4
Report No.: PH1236-REP.03
Date: 2-NOV-2015

LEGEND

- TW6 — TEST WELL
- TP6 — TEST PIT (PATERSON, 209)
- EXISTING BUILDING
- PROPERTY BOUNDRY

REFERENCE

- GEO-OTTAWA IMAGERY

DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

2183144 ONTARIO LTD.

Project:

1730 WILHAVEN DRIVE CUMBERLAND, ONTARIO

Drawing:

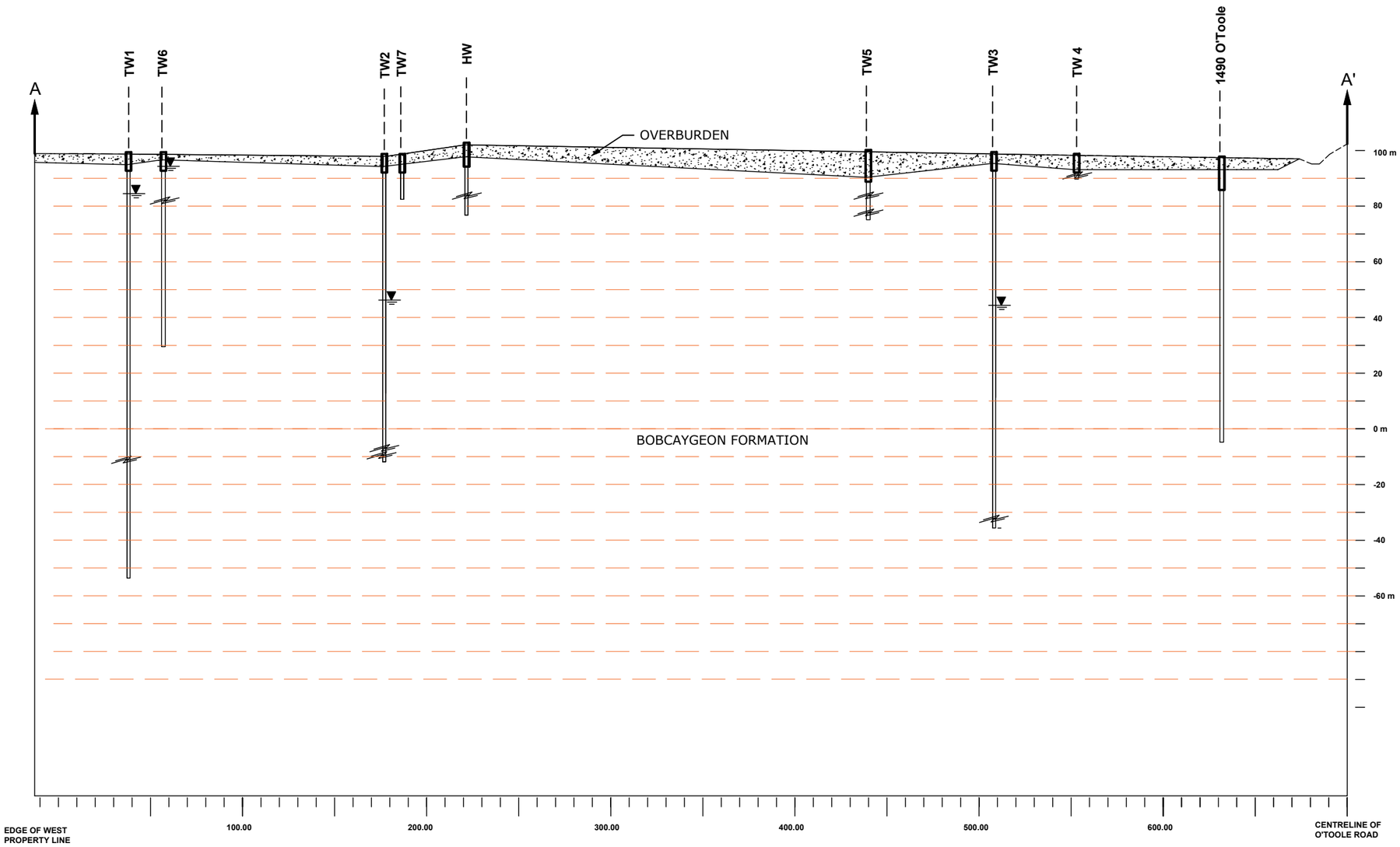
TEST HOLE LOCATION PLAN

Scale:	Drawn by:
1:2500	RLC
File: PH1236	Checked by: SW

Drawing No.:

FIGURE 5

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



DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

2183144 ONTARIO LTD.

Project:

1730 WILAVEN DRIVE CUMBERLAND, ONTARIO

Drawing:

CROSS SECTION

Scale:	Drawn by:
1:2500	RLC
File: PH1236	Checked by: SW

Drawing No.:

FIGURE 6

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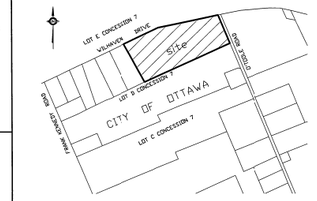
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED _____.

THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT. THIS ____ DAY OF _____.

_____
MIKE WILDMAN, MANAGER
DEVELOPMENT APPROVALS, SUBURBAN SERVICES
PLANNING AND GROWTH MANAGEMENT
INFRASTRUCTURE SERVICES AND COMMUNITY SUSTAINABILITY
CITY OF OTTAWA



DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 'D' AND 'E' CONCESSION 7 AND PART OF LOT 21 CONCESSION 7 (OLD SURVEY)
Geographic Township of Cumberland
CITY OF OTTAWA
Prepared by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1000
40 30 20 10 0 20 40 Metres

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :
The boundaries of the lands to be subdivided and their relationship to adjoining lands have been accurately and correctly shown.

December 8, 2009 Edward M. Lancaster
Date
Edward M.Lancaster
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

This is to certify that we are the owners of the lands to be subdivided and that this plan was prepared in accordance with our instructions.

(SEE SIGNED APPLICATION)

_____ _____
Date 2183144 Ontario Limited

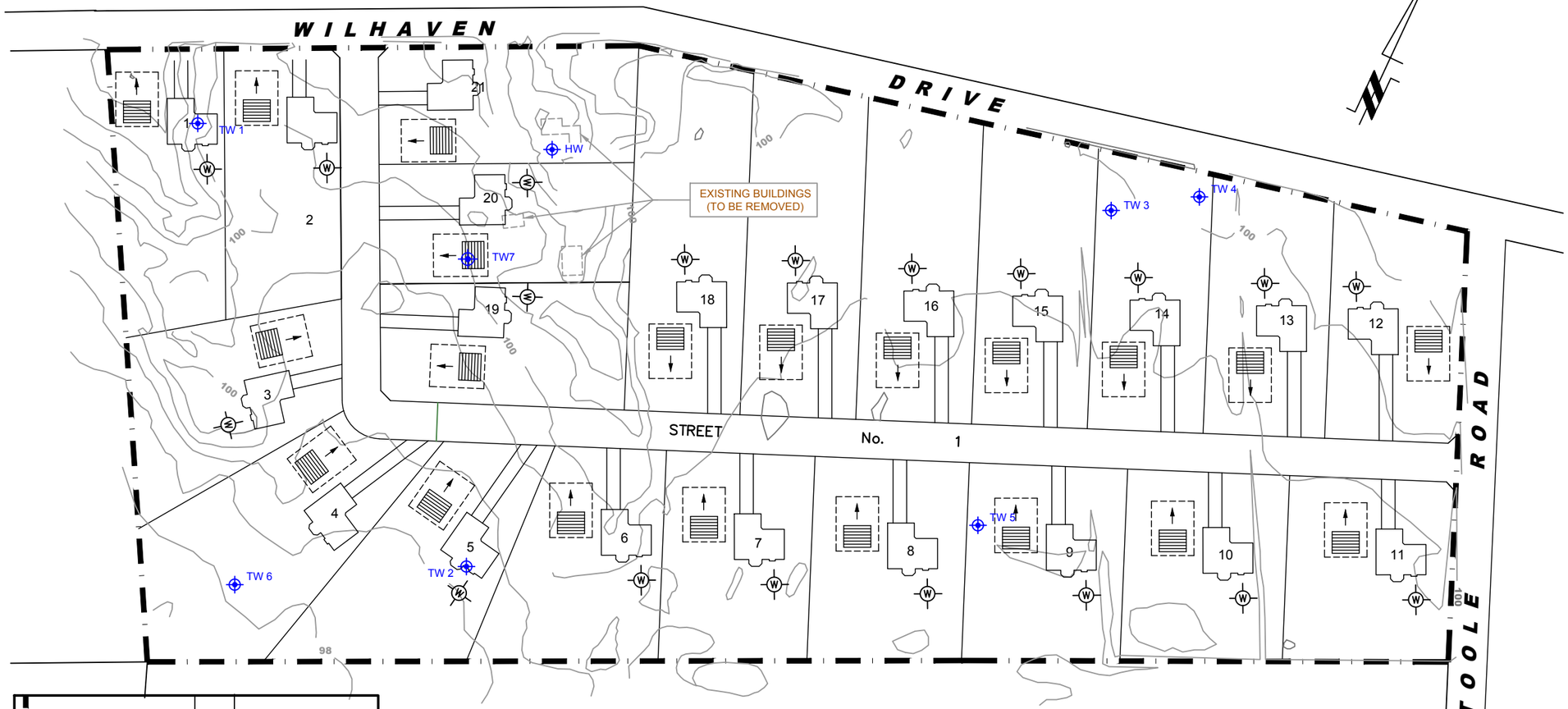
ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 OF THE PLANNING ACT

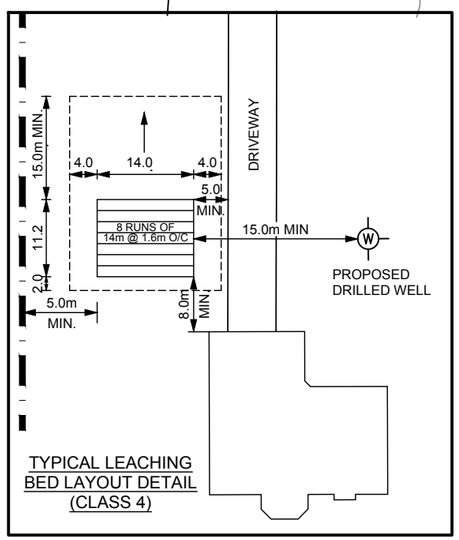
(a) see plan
(b) see plan
(c) see plan
(d) residential housing
(e) see plan
(f) see plan
(g) see plan
(h) individual well and septic systems
(i) see soils report
(j) see plan
(k) hydro, cable and bell
(l) see plan

Site Area = 19.9161 Hectares (49.21 Acres)
All Lots Are Larger Than The Minimium Area of 8000 Square Metres

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: ltopen@annisoll.com
Ontario Land Surveyors
Job No. 10499-09-PLOSE C7 OJ DPS 95

FIGURE 7
DRAFT PLAN OF SURVEY





TYPICAL LEACHING BED LAYOUT DETAIL (CLASS 4)

DD/MM/YY	DESCRIPTION	REV.

Consultant:

patersongroup
consulting engineers

Client:

2183144 ONTARIO LTD.

Project:

HYDROGEOLOGICAL INVESTIGATION & TERRAIN ANALYSIS

1730 WILHAVEN DRIVE CUMBERLAND, ONTARIO

Drawing:

LOT DEVELOPMENT PLAN

Scale:	Drawn by:
1:2500	RLC
File: PH1236	Checked by: SW

Drawing No.:

FIGURE 8

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