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REPORT ON

HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
HEMPHILL STREET, RICHMOND
OTTAWA, ONTARIO

Submitted to:

Schouten Construction Ltd.
2740 Harbison Road
Richmond, Ontario
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1.0 INTRODUCTION

Morey Associates Ltd. was retained by Schouten Construction Ltd. to undertake a hydrogeological investigation at the site of the proposed residential subdivision located on the north side of Hemphill Street, Village of Richmond, within Part Lot 25, Concession 4, Geographic Township of Goulbourn, City of Ottawa, Ontario (see Key Plan, Figure 1).

The subject site for this assessment consists of about a 0.8 hectare 'L' shaped property. The proposed site development plan drawing prepared by H. A. Ken Shipman Surveying Ltd., Ref. No. GLB-467 for File 16-10896, indicates that the site will be subdivided into 7 lots for single family dwelling construction, with lot sizes of some 0.08 to 0.14 hectares (see Site Sketch Plan, Figure 3). The proposed dwellings will be serviced by individual on-site private wells. The dwellings will be serviced by a municipal sanitary sewer and accordingly a septic system impact assessment is not required.

For the purpose of this report Hemphill Street is considered to exist at the south side of the proposed subdivision (see Key Plan, Figure 1).

This investigation was carried out in general accordance with the Ministry of the Environment and Climate Change (MOECC) Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment (August 1996) and the applicable sections of the City of Ottawa Official Plan (2003) requiring that information be provided indicating the following:

- Sufficient quantity of groundwater exists on site to service the development.
- Water wells can be constructed on the proposed lots that will not be impacted by identified potential sources of groundwater contamination in the area.
- The quality of the groundwater meets or exceeds the Ontario Drinking Water Standards, Objectives and Guidelines.

The City of Ottawa provided us with a copy of a Hydrogeological Study Report previously carried out by Golder Associates Ltd. for a proposed residential development consisting of some 51 lots on the east side of Shea Road immediately opposite the site for this present report. That Golder Associates Ltd. Report is titled "Hydrogeological Study, Proposed Development, Part of Lot 26,

Concession 4, Geographic Township of Goulbourn, City of Ottawa (Richmond Village), Ontario", dated September 2017, Report Number 14118381-1000, Rev. 2, hereinafter collectively referred to as the "GAL report". The GAL report has not been relied upon for the conclusions presented in this present report, however the GAL report has been reviewed as one of several information sources with regards to the geological/hydrogeological setting in the general area of the present site.

1.1 SITE BACKGROUND

The site is bordered on the north and west by vacant agricultural fields, on the south by Hemphill Street with existing residential development beyond, and on the east by an existing single family dwelling with Shea Road and vacant agricultural fields beyond. The ground cover at the site consists of cultivated lands with some young to mature trees along the south property boundary. A tributary to Jock River exists some 130 metres east of the subject site. The regional groundwater flow is generally from southwest to northeast (MVC and RVCA, 2011).

A review of the surficial geology map for the site area indicates that the site is underlain by marine deposited clay, silt, and silty clay. The bedrock geology map indicates that the bedrock underlying the site consists of dolostone and sandstone of the Beekmantown Group (specifically the Oxford formation). The Oxford formation in the general area of the site is generally known (based on preparation and review of hydrogeological investigations carried out by the undersigned in the Ottawa area over the past some 30 years) as an adequate source of groundwater from a quality and quantity point of view for domestic use with localized occurrences of elevated iron, hardness, sodium, total dissolved solids and hydrogen sulphide.

2.0 PROCEDURES

2.1 GENERAL

The objectives of this investigation were:

- to investigate the potential quantity and quality of groundwater that would be expected from water supply wells drilled at the site to service the proposed residential development.

The test wells installed for this investigation will be used as water supply wells for the proposed development and constitute about 43 percent (3 out of 7) of the total number of water supply wells which will be required for the proposed 7 lot development.

2.2 TEST WELL CONSTRUCTION

To determine the quantity and quality of groundwater available for domestic water supply, three test wells, numbered TW1, TW2 and TW3 were pump tested and sampled. The approximate locations of the test wells are shown on the attached Site Sketch Plan, Figure 3. The test wells, TW1, TW2 and TW3 were drilled by Air Rock Drilling Co. Ltd., of Richmond, Ontario, on January 29, January 30 and February 6, 2018, respectively, for the purposes of this investigation. The water well records for the test wells are provided in Appendix A.

The water well records for the test wells supplied by the well driller indicate that nominal 16 centimetre inside diameter steel casings were installed through the overburden and were set well into the bedrock and grouted in place using cement slurry and bentonite. The well casings are indicated to extend some 15.8 to 16.5 metres (52 to 54 feet) below the ground surface at the test wells. The wells were drilled to final depths using a 15 centimetre diameter bit and completed as an open hole in the bedrock. TW1, TW2 and TW3 were drilled into the bedrock to final depths of some 48.8, 42.7 and 54.9 metres, respectively, below the existing ground surface.

The ground surface elevation at each test well location was surveyed using total station survey equipment in reference to a site benchmark, the Geodetic elevation of which was supplied by H. A. Ken Shipman Surveying Ltd. (see Site Sketch Plan, Figure 3). The ground surface elevations at TW1, TW2 and TW3 were 94.0, 94.0 and 93.7 metres and the stick-up of the well casing at each well is about 0.75, 1.2 and 0.75 metres, respectively.

2.3 WELL WATER QUALITY TESTING

2.3.1 TEST WELLS

Groundwater samples were collected from the test wells at about hours 3 and 6 of the pumping tests to characterize groundwater quality. The groundwater samples from the test wells were collected and prepared/preserved in the field using appropriate techniques and submitted to

Eurofins Environment Testing laboratory in Ottawa, Ontario for the chemical, physical and bacteriological analyses listed in the Ministry of the Environment and Climate Control (MOECC) guideline entitled Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment, August 1996. The temperature, conductivity, pH, total dissolved solids (TDS), turbidity and residual chlorine levels of the groundwater were measured at periodic intervals during the pumping tests.

2.3.2 NEIGHBOURING WELLS

An attempt was made to identify the MOECC well records associated with the 15 closest existing dwellings to the site located adjacent to the site, north of the site and south of Hemphill Street (see Appendix B). An attempt was also made to contact the residents of those 15 dwellings in order to carry out a well survey and/or collect samples of their well water. A well survey form was hand delivered to the residents of the 15 dwellings listed in the following table:

Table 2.1: Summary of Well Survey Form Distribution

Civic Address	*Survey Form Returned	Consented to Sampling for Laboratory Testing	Water Sample Obtained
3244 Shea Road	NO	NO	NO
3290 Shea Road	NO	NO	NO
4 Hemphill Street	NO	NO	NO
6 Hemphill Street	NO	NO	NO
39 Gamble Drive	YES	YES	YES
40 Gamble Drive	NO	NO	NO
41 Gamble Drive	NO	NO	NO
42 Gamble Drive	NO	NO	NO
43 Gamble Drive	NO	NO	NO
44 Gamble Drive	YES	YES	YES
22 Mary Hill Crescent	NO	NO	NO
24 Mary Hill Crescent	NO	NO	NO
26 Mary Hill Crescent	YES	YES	NO**
28 Mary Hill Crescent	NO	NO	NO
30 Mary Hill Crescent	NO	NO	NO

*At time of preparation of this report

**Several unsuccessful attempts to schedule a time for sampling were made between the time consent to sample was granted and time of preparation of this report. It is considered that the property owner became disinterested in a water sample being obtained from their well.

The completed well survey forms and consent to obtain a well water sample from the dwelling occupants from 39 Gamble Drive, 44 Gamble Drive and 26 Mary Hill Crescent had been provided to our office as of the date of this report. The completed well surveys are provided in Appendix B.

In addition to the above, the MOECC well records and the results of well surveys, conducted as part of the above mentioned GAL report, for the water wells associated with the dwellings located at 2 Hemphill Street and 3310, 3316 and 3326 Shea Road are provided in Appendix B.

2.4 WELL WATER QUANTITY TESTING

Pumping tests were conducted on TW1, TW2 and TW3 on January 7, January 12 and January 6, 2015, respectively. The testing consisted of six hour duration constant discharge rate pumping tests. During the pumping tests, water level measurements were made on a regular basis to monitor the drawdown of the water level in the wells in response to pumping. After the pumping period, the pump was shut off and the recovery of the water level in the test wells was monitored for a period of time. Water levels at adjacent test wells were monitored periodically during pumping tests to determine the potential interference effects between the wells. During the pump tests, the pump discharge outlet was located an adequate distance from the test wells to ensure the discharge did not interfere with the natural recharge to the wells in view of the relatively impermeable nature and thickness of the overburden (silty clay) at the site.

3.0 GROUNDWATER SUPPLY INVESTIGATION

3.1 SUPPLY AQUIFER

As mentioned above, the bedrock geology map for the site area indicates that dolomite of the Oxford formation underlies the site. The MOECC well records for the test wells indicate grey limestone was encountered during drilling. A review of the MOECC water well records for the test wells, attached in Appendix A, indicate that the test wells encountered water during drilling in the bedrock at depths of some 40.8 to 53.0 metres below the existing ground surface.

Table 3.1: Summary of Test Well Construction Details

Test Well	Total Depth of Well (m BGS)	Depth to Surface of Bedrock (m BGS)	Overburden Material Type	Bedrock Type	Depth of Well Casing (m BGS)	Depth Water Found (m BGS)
TW1	48.8	14.0	Clay	Limestone	15.8	46.9
TW2	42.7	14.3	Clay	Limestone	16.2	40.8
TW3	54.9	14.6	Clay	Limestone	16.5	33.8, 53.0

Note: m BGS = Metres Below Ground Surface

3.2 WATER QUALITY

The laboratory testing results of the chemical, physical and bacteriological analyses of water samples obtained from the test wells during the pumping tests are provided in the attached Appendix C and are summarized in the table below.

Table 3.2: Pumping Test Well Water Samples Laboratory Testing Results

				TW1			TW2			TW3	
Parameter	MRL	Units	[1]Guideline	3 hr	6 hr	Sample obtained 03/15/18	3 hr	6 hr	Sample obtained 03/15/18	3 hr	6 hr
Hardness as CaCO3	1	mg/L	OG-100, [4]500	***113***	***113***	-	***117***	***117***	-	***120***	***123***
Ion Balance	0.01			0.91	0.93	-	0.94	0.99	-	0.93	0.97
TDS (COND - CALC)	1	mg/L	AO-500	***555***	***552***	-	491	493	-	***530***	***536***
Alkalinity as CaCO3	5	mg/L	OG-30 - 500	241	228	-	243	232	-	234	223
Cl	1	mg/L	AO-250	101	104	-	80	80	-	100	100
Colour	2	TCU	AO-5, [2]T-7	4	3	-	***20***	***14***	3	<2	3
Conductivity	5	uS/cm		854	849	-	756	759	-	815	825
DOC	0.5	mg/L	AO-5, [2]T-10.0	1.3	<0.5	-	1.5	<0.5	-	<0.5	<0.5
F	0.10	mg/L	MAC-1.5	1.20	1.22	-	1.20	1.18	-	0.95	1.05
N-NO2	0.10	mg/L	MAC-1.0	<0.10	<0.10	-	<0.10	<0.10	-	<0.10	<0.10
N-NO3	0.10	mg/L	MAC-10.0	<0.10	<0.10	-	<0.10	<0.10	-	0.24	0.15
pH	1.00		OG-6.5 - 8.5	8.47	8.45	-	8.24	8.22	-	8.24	8.25
SO4	1	mg/L	AO-500	36	36	-	33	32	-	45	41
Ca	1	mg/L		22	22	-	22	22	-	25	26
Fe	0.03	mg/L	AO-0.3, [2]T-5.0	0.13	0.11	-	***0.41***	***0.39***	-	0.12	0.09
K	1	mg/L		8	8	-	7	7	-	7	7
Mg	1	mg/L		14	14	-	15	15	-	14	14
Mn	0.01	mg/L	AO-0.05, [2]T-1.0	<0.01	<0.01	-	0.05	0.04	-	<0.01	<0.01
Na	2	mg/L	AO-200, A-20	120	120	-	112	116	-	123	123
TKN	0.1	mg/L		0.5	0.5	-	0.4	0.4	-	0.2	0.3
Phenols	0.001	mg/L		<0.001	<0.001	-	<0.001	<0.001	-	<0.001	<0.001
N-NH3	0.01	mg/L		0.49	0.49	-	0.34	0.35	-	0.22	0.23
S2-	0.02	mg/L	AO-0.05	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02
Tannin & Lignin	0.1	mg/L		<0.1	<0.1	-	0.1	0.1	-	<0.1	<0.01
Turbidity	0.1	NTU	AO-5.0	1.1	1.2	-	***9.1***	***10.6***	-	2.5	2.3
Heterotrophic Plate Count	0	ct/1mL		202	361	-	4	1	-	24	18
E.Coli	0	ct/100mL	MAC-0	0	0	-	0	0	-	0	0
Faecal Coliforms	0	ct/100mL		0	0	-	0	0	-	0	0
Total Coliforms	0	ct/100mL	MAC-0	0	***4***	0	0	0	-	0	0
[5]Organic Nitrogen		mg/L	OG-0.15	0.01	0.01	-	0.06	0.05	-	0	0.07

[1] Guideline = Ontario Drinking Water Standards Objectives and Guidelines
[2] MOECC Maximum Concentration Considered Reasonably Treatable (See MOECC Guideline `D-5-5 Private Wells: Water Supply Assessment`)
[3] Table 2, Appendix, MOECC Guideline `D-5-5 Private Wells: Water Supply Assessment` document
[4] "Hardness in excess of 500mg/L in drinking water is unacceptable for most domestic purposes" - Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Revised June 2006, Province of Ontario.
[5] Organic Nitrogen = | Total Kjeldahl Nitrogen - N-NH3 | and should not exceed 0.15 mg/L

MRL = Method Reporting Limit
AO = MOECC Aesthetic Objective
OG = MOECC Operational Guideline
MAC = MOECC Maximum Acceptable Concentration
T = MOECC Treatability Limit (See Note 2)
A = MOECC Advisory Limit (See Note 3)
Bold Italic = AO, OG or MAC Guideline Exceedence

The results of the chemical, physical and bacteriological analyses of water samples obtained from the test wells are provided in the attached Appendix C and in Table I. The water quality as determined from the results of the analyses is relatively favourable. The water meets all the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) health and aesthetic parameters tested for at the test wells except for the following:

- hardness at all of the wells
- TDS at TW1 and TW3
- Iron at TW2

The water samples obtained from all of the test wells is considered to be hard by water treatment standards with a hardness level above the ODWSOG operational guideline of 100 milligrams per litre. The hardness at the test wells ranges from about 113 to 123 milligrams per litre. However, based on the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Revised June 2006, the hardness levels of the water samples are less than what is considered unacceptable (greater than 500 milligrams per litre) for most domestic purposes and is considered treatable. Water with hardness above 80 to 100 milligrams per litre as $CaC0_3$ is often softened for domestic use. Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water, which may contribute a significant percentage to the daily sodium intake for a consumer on a sodium restricted diet. Where ion exchange water softeners are used, a separate unsoftened water supply could be used for drinking and culinary purposes.

The levels of TDS measured at the laboratory for test wells TW1 and TW3 ranged from about 530 to 555 milligrams per litre and is above the ODWSOG aesthetic objective of 500 milligrams per litre. The in-situ measurements of TDS during the pumping tests, between hours 3 and 6, ranged from some 378 to 400 milligrams per litre for test well TW1 and from some 382 to 445 milligrams per litre for test well TW3, for an average TDS level of both laboratory measurement and in-situ measurements of about 381 milligrams per litre for test well TW1 and 473 milligrams per litre for test well TW3. TDS may result in corrosion or encrusting of plumbing/plumbing fixtures. Langelier Saturation Index (LSI) calculations (using the American Water Works Association spreadsheet) were carried out using the 3 hour and 6 hour water sample testing results for all of the test wells and gave LSI values ranging between 0.07 to 0.33 (see Table II). These LSI values are within the range (-0.5 to 0.5) considered to indicate an unlikely occurrence of encrusting/scale or corrosion on plumbing/plumbing fixtures.

The laboratory measured levels of iron for the water samples for test well TW2 ranged from 0.39 to 0.41 milligrams per litre and are above the ODWSOG aesthetic objective of 0.3 milligrams per litre. The above indicated iron levels are well within the MOECC maximum concentration considered reasonably treatable of 5.0 milligrams per litre. The levels of iron for the water samples are considered treatable using a water softener or manganese greensand filter.

The Total Coliform count at test well TW1 was 0 ct/100mL for the 3 hour sample and 4 ct/100mL for the 6 hour sample. On March 15, 2018 chlorination of test well TW1 was carried out and the well sampled after pumping and field testing confirmed that the free chlorine level for the well water was 0 milligrams per litre. The water sample was delivered to Eurofins Environment Testing for total coliform testing and gave a total coliform count of 0 ct/100mL. The total coliform count for the hour 6 sample at test well TW1 is considered typical of recently drilled wells.

The level of turbidity measured at the laboratory for test well TW2 was 9.1 NTU and 10.6 NTU for the 3 and 6 hour samples, respectively, which exceeds the ODWSOG aesthetic objective of 5 NTU. However, it is expected that the laboratory turbidity level reflects the precipitation of iron from the water sample during the time between when the water was sampled and then tested in the laboratory. Additional development of test well TW2 was carried out on March 15, 2018. Field measurements for turbidity were carried out at that time and gave values ranging from 12 NTU decreasing with time to 0.8 NTU.

The level of colour measured for the water samples at test well TW2 were 20 TCU and 14 TCU for the 3 and 6 hour samples, respectively, and are above the ODWSOG aesthetic objective of 5 TCU and the MOECC maximum concentration considered reasonably treatable of 7 TCU. As mentioned above the levels of iron measured for the water sample were above the ODWSOG aesthetic objective (but well within treatability limits) and as indicated in the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, Revised June 2006, “Sometimes colour may be contributed to by iron and manganese compounds produced by processes occurring in natural sediments or in aquifers”. As mentioned above additional development of test well TW2 was carried out on March 15, 2018. At that time a water sample was obtained from the well and delivered to Eurofins Environmental laboratory for colour testing. The results of that testing gave a value of 3 TCU which meets the ODWSOG aesthetic objective.

It is pointed out that the levels of sodium for the water samples for all three test wells were measured above 20 milligrams per litre (112 to 123 milligrams per litre) and accordingly may be of interest to persons on a sodium restricted diet. According to the MOECC, the local Medical Office of Health should be notified where sodium levels are above 20 milligrams per litre in order that this information may be relayed to local physicians. The sodium levels are well within the ODWSOG aesthetic objective of 200 milligrams per litre.

3.2.4 NEIGHBOURING WELLS

The following table provides available well construction information for the 15 residential water wells indicated in the above mentioned Table 2.1 (with the exception of 3244 and 3290 Shea Road and 28 Mary Hill Crescent for which the well records could not be located) as well as for the 4 previously mentioned water wells located at 2 Hemphill Street, 3310, 3316 and 3326 Shea Road (see report section 2.3.2).

Table 3.3: Summary of Neighbouring Well Construction Details

Well ID	Likely Well Location	Year of Well Construction	Total Depth of Well (m BGS)	Depth to Surface of Bedrock (m BGS)	Static Water Level (assumed m BGS)	Available Drawdown (m)
1509756	4 Hemphill St	1968	26.2	13.1	3.4	22.8
1528767	6 Hemphill St	1995	14.3	14.0	2.4	11.9
1509810	***39 Gamble Dr	1968	15.5	13.7	1.2	14.3
1509758	40 Gamble Dr	1968	15.2	13.7	1.8	13.4
1509748	41 Gamble Dr	1968	15.2	13.7	3.0	12.2
1509757	42 Gamble Dr	1968	14.3	13.7	1.5	12.8
1509791	43 Gamble Dr	1968	15.2	13.7	1.2	14.0
1509766	***44 Gamble Dr	1968	16.2	14.3	2.1	14.1
1531497	22 Mary Hill Cres	2000	73.2	14.9	4.1	69.1
1531410	24 Mary Hill Cres	2000	71.6	15.8	3.8	67.8
1531128	**26 Mary Hill Cres	2000	68.6	15.5	3.4	65.2
1530215	30 Mary Hill Cres	1998	22.9	15.8	4.5	18.4
1509773	**2 Hemphill St	1968	18.0	14.0	7.6	10.4
1509747	***3310 Shea Rd	1968	14.6	12.5	3.0	11.6
1509751	**3316 Shea Rd	1968	15.8	12.8	4.6	11.2
1509753	**3326 Shea Rd	1968	15.2	12.2	4.6	10.6

Note: m BGS = Metres Below Ground Surface
**Well survey results available as of the date of this present report
***Well survey and water sample testing results available as of the date of this present report

As indicated in the above Table 3.3, the results of seven well surveys for the wells located at 39 and 44 Gamble Drive, 26 Mary Hill Crescent, 2 Hemphill Street, and 3310, 3316 and 3326 Shea Road are available and provided in the attached Appendix B. Further, the results of laboratory testing of

water samples obtained from the wells located at 39 and 44 Gamble Drive and 3310 Shea Road are available and provided in the attached Appendix D.

The above mentioned seven residential wells are indicated to have been constructed in 1968 (some 50 years old), except for the well located at 26 Mary Hill Crescent which is indicated to have been constructed in 2000 (some 18 years old). No well grouting details are indicated on the well records for the above mentioned wells constructed in 1968. The well record for the well at 26 Mary Hill Crescent indicates that the annular space around the well casing from a depth of some 15.8 metres up to the ground surface was grouted/sealed with 1 bag of cement and 1 bag of QuickGrout (bentonite).

The well surveys for the above noted seven residential wells indicate that the groundwater is used for drinking water. Water treatment systems (water softeners) are used at all of the above mentioned locations, except for 39 and 44 Gamble Drive. The owner at 26 Mary Hill Crescent indicated that a filter and a water softener was used. The interviewees all indicated that their water was acceptable to excellent with regards to water quality and the interviewees did not indicate any problems with regards to water quantity.

The well water samples obtained from 39 Gamble Drive, 44 Gamble Drive and 3310 Shea Road were tested for the MOECC “subdivision package” list of bacteriological parameters. The results of that testing indicate all three water samples are of acceptable bacteriological quality.

The well water samples obtained from 44 Gamble Drive and 3310 Shea Road were also tested for the MOECC “subdivision package” list of chemical and physical parameters. The results of that testing indicated the two water samples meet all the ODWSOG health and aesthetic parameters tested for except for hardness, TDS, colour and sulphide for the sample obtained from 44 Gamble Drive and hardness, TDS and iron for the sample obtained from 3310 Shea Road.

The level of hardness measured for the above two samples (117 milligrams per litre) is less than what is considered unacceptable (greater than 500 milligrams per litre) for most domestic purposes and is considered treatable. The levels of TDS measured for the above two samples (515 and 536 milligrams per litre) is slightly above the aesthetic objective of 500 milligrams per litre and the interviewees at 44 Gamble Drive and 3310 Shea Road did not indicate any issues with encrusting/scale or corrosion on plumbing/plumbing fixtures.

The level of colour measured for the water sample obtained from 44 Gamble Drive was 6 TCU and is slightly above the ODWSOG aesthetic objective of 5 TCU, however is within the MOECC maximum concentration considered reasonably treatable of 7 TCU.

The level of iron measured for the water sample obtained from 3310 Shea Road was 0.31 milligrams per litre and is slightly above the ODWSOG aesthetic objective of 0.3 milligrams per litre, however is well within the MOECC maximum concentration considered reasonably treatable of 5.0 milligrams per litre.

The level of sulphide measured for the water sample obtained from 44 Gamble Drive was 0.06 milligrams per litre and is slightly above the ODWSOG aesthetic objective of 0.05 milligrams per litre. The interviewee at 44 Gamble Drive indicated that their water was acceptable to excellent with regards to quality and specifically did not indicate a poor odour or sulphur smell.

It is pointed out that the levels of sodium for the above two samples were measured above 20 milligrams per litre (124 and 134 milligrams per litre) and accordingly may be of interest to persons on a sodium restricted diet. According to the MOECC, the local Medical Office of Health should be notified where sodium levels are above 20 milligrams per litre in order that this information may be relayed to local physicians. The sodium levels are well within the ODWSOG aesthetic objective of 200 milligrams per litre.

The water quality at the sampled neighbouring wells is indicated to be comparable to the water quality at the test wells constructed for this investigation, with the exception of the slightly elevated level of sulphide measured for the water sample obtained from 44 Gamble Drive. Based on the results of the neighbouring well surveys and laboratory testing of neighbouring well water samples carried out for this investigation, the water quality and quantity in the water supply aquifer is indicated to be acceptable for typical domestic use.

3.3 WATER QUANTITY

The drawdown and recovery data and plots for TW1, TW2 and TW3 are shown in Appendices E, F and G, respectively. The drawdown and recovery data provided were measured with reference to the top of the well casing at each test well location.

The pumping test data for the test wells were analyzed using the method of Cooper and Jacob (1946). Although the assumptions on which these equations are based are not strictly met, this method provides a reasonable estimate of the aquifer transmissivity. The analysis of the data obtained during the pumping tests is summarized in the attached Table III. The water levels in adjacent wells were monitored during the pumping tests for the three test wells. The drawdown in the observation wells was plotted as a function of time during pumping (see attached Appendices E, F and G) and a resulting storativity estimate was calculated (see attached Table IV).

The following sections discuss the results of the analysis of the data obtained during the pumping tests with respect to test well yields.

3.3.1 TEST WELL TW1

The six hour duration pumping test was carried out at a discharge rate of 36 litres per minute (8 Igpm). The static water level prior to testing was about 3.28 metres below the top of the well casing and the water level after six hours of pumping was about 15.17 metres below the top of the well casing for a total drawdown at the end of pumping of 11.89 metres. The available drawdown in the well is about 45 metres. The specific capacity of the well at this pumping rate is approximately 4.4 cubic metres per day per metre of drawdown.

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be 34.2 m^2/day. Based on the pumping test recovery data the aquifer transmissivity is estimated to be 95.9 m^2/day. The average transmissivity of the bedrock aquifer in the area of TW1 is estimated to be 65.1 m^2/day. At the end of pumping, 120 minutes was required for 100 percent recovery of the total drawdown in the static water level created during pumping.

Based on the data obtained during the pumping test, it can be concluded that the well is capable of sustaining a short term yield of at least 36 litres per minute (8 Igpm) and that during the course of the six hour pumping period about 27 percent of the available drawdown in the test well was utilized.

3.3.2 TEST WELL TW2

The six hour duration pumping test was carried out at a discharge rate of 68 litres per minute (15 Igpm). The static water level prior to testing was about 2.51 metres below the top of the well casing and the water level after six hours of pumping was about 10.78 metres below the top of the well casing for a total drawdown at the end of pumping of 8.27 metres. The available drawdown in the well is about 40 metres. The specific capacity of the well at this pumping rate is approximately 11.9 cubic metres per day per metre of drawdown.

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be 74.9 m^2/day. Based on the pumping test recovery data the aquifer transmissivity is estimated to be 112.3 m^2/day. The average transmissivity of the bedrock aquifer in the area of TW2 is estimated to be 93.6 m^2/day. At the end of pumping, 50 minutes was required for 100 percent recovery of the total drawdown in the static water level created during pumping.

Based on the data obtained during the pumping test, it can be concluded that the well is capable of sustaining a short term yield of at least 68 litres per minute (15 Igpm) and that during the course of the six hour pumping period about 21 percent of the available drawdown in the test well was utilized.

3.3.3 TEST WELL TW3

The six hour duration pumping test was carried out at a discharge rate of 46 litres per minute (10 Igpm). The static water level prior to testing was about 2.14 metres below the top of the well casing and the water level after six hours of pumping was about 13.62 metres below the top of the well casing for a total drawdown at the end of pumping of 11.48 metres. The available drawdown in the well is about 52 metres. The specific capacity of the well at this pumping rate is approximately 5.7 cubic metres per day per metre of drawdown.

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be 54.5 m^2/day. Based on the pumping test recovery data the aquifer transmissivity is estimated to be 38.7 m^2/day. The average transmissivity of the bedrock aquifer in the area of TW3 is estimated to be 46.6 m^2/day. At the end of pumping, 70 minutes was required for 100 percent recovery of the total drawdown in the static water level created during pumping.

Based on the data obtained during the pumping test, it can be concluded that the well is capable of sustaining a short term yield of at least 46 litres per minute (10 Igpm) and that during the course of the six hour pumping period about 22 percent of the available drawdown in the test well was utilized.

3.3.4 SUMMARY OF TEST WELL YIELDS

The MOECC Guideline D-5-5 Section 4.3.2 for water quantity requirement indicates that the per-person requirement shall be 450 litres per day and relates that quantity to an equivalent peak per person demand rate of 3.75 litres per minute. The MOECC guideline indicates that for a single family dwelling the likely number of persons per well (per dwelling) is considered to be the number of bedrooms in the dwelling plus one. The MOECC guidelines further requires that regardless of the demand rate determined using the above mentioned calculation, the demand rate (minimum pumping rate of a well servicing a single family dwelling) shall not be less than 13.7 litres per minute.

The results of the pumping tests indicate that all of the test wells are capable of more than meeting MOECC minimum demand rate of 13.7 litres per minute and that TW1, TW2 and TW3 are capable of meeting the MOECC demand rate for an eight, seventeen and eleven bedroom single family dwelling, respectively, (a typical single family dwelling is considered to be a four bedroom dwelling).

3.3.5 SUMMARY OF TRANSMISSIVITY ANALYSIS

The above mentioned transmissivity values based on the pumping test drawdown and recovery data are summarized in Table 3.4 and classified regarding magnitude, designation and groundwater supply potential based on Krasny (1993).

Table 3.4: Classification of Transmissivity Values

[1]Magnitude (m^2/day)	[1]Class	[1]Designation	[1]Groundwater Supply Potential	Transmissivity Values from Pumping Tests (m^2/day)					
				TW1		TW2		TW3	
				Pump.	Rec.	Pump.	Rec.	Pump.	Rec.
>1000	I	Very High	Regional Importance						
100 - 1000	II	High	Lesser Regional Importance				112.3		
10 - 100	III	Intermediate	Local Water Supply	34.2	95.9	74.9		54.5	38.7
1 - 10	IV	Low	Private Consumption						
0.1 - 1	V	Very Low	Limited Consumption						
<0.1	VI	Imperceptible	Very difficult to Utilize for Water Supply						

[1]Kransy (1993) 'Classification of Transmissivity Magnitude and Variation", Vol.31, No.2 - Ground Water

Based on the above, all of the test wells are indicated to be capable of providing an adequate quantity of water for local water supply.

4.0 IMPACT ASSESSMENT

4.1 HYDROGEOLOGICAL SENSITIVITY

No karstic areas, areas of fractured bedrock exposed at the surface, areas of thin soil cover or areas of highly permeable soils were identified for the site. Accordingly, the site is not considered hydrogeologically sensitive.

4.2 INTERFERENCE EFFECTS

During the pumping of TW1, periodic water level measurements were made at TW2 and TW3 located some 62 and 100 metres, respectively, from TW1. During the pumping of TW2, periodic water level measurements were made at TW1 and TW3 located some 62 and 40 metres, respectively, from TW2. During the pumping of TW3, periodic water level measurements were made at TW1 and TW2 located some 100 and 40 metres, respectively, from TW3. The graphs of observation wells drawdown versus time during the pumping tests at TW1, TW2 and TW3 are shown in the attached Appendices E, F and G.

In order to estimate the maximum interference between future wells at the site, calculations were carried out to predict the cumulative twenty year drawdown due to the proposed 7 domestic wells at a central well in the proposed subdivision (central well being TW2, located at Lot 4 – see attached Figure 3). The cumulative drawdown at the wells was calculated for a twenty year pumping rate of 2250 litres per day, which allows for a four bedroom household in accordance with Section 4.3.2 of MOECC Procedure D-5-5. The previously mentioned nineteen neighbouring dwellings discussed in section 2.3.2 of this report were also included in the cumulative twenty year drawdown calculation. The calculation was carried out using the following Cooper-Jacob formula:

$$s = \frac{2.3Q}{4\pi T}\log\left(\frac{2.25Tt}{r^2 S}\right)$$

Where, Q = 20 year pumping rate, 2250L/day
T = lowest transmissivity, 34.2 m^2/day
t = duration, 20 years
S = lowest storativity estimate, 4.5 x 10^{-5}
s = expected drawdown due to the 26 domestic wells

The results of the calculations indicate that the cumulative twenty year drawdown at the centrally located well (TW2), including the interference from the other six wells in the proposed residential development and from the other nineteen neighbouring wells, is about 2.0 metres (see attached Table V). It is pointed out that it is considered, in Morey Associates Ltd. professional opinion, that the actual cumulative twenty year drawdown at the centrally located well could be more accurately estimated by the use of the average transmissivity value determined from the pumping tests, the average estimated storativity value and the use of a more likely daily pumping rate given today's more efficient plumbing. However, for the purpose of this present report and for an exceedingly conservative approach the cumulative twenty year drawdown at the centrally located well was estimated using the lowest transmissivity value determined during the pumping tests, the lowest estimated storativity value and a daily pumping rate of 2250 litres.

In addition to the above twenty year drawdown calculation, and in order to estimate the maximum interference between future wells at the site during daily peak water usage, calculations were carried out to predict the cumulative drawdown at the centrally located well due to simultaneous peak demand use of the proposed seven domestic wells. A simultaneous peak demand pumping rate at each well of 2250 litres over a two hour period was used in the calculation and is equivalent to the peak demand rate indicated in Section 4.3.2 of MOECC Procedure D-5-5. The calculation was carried out using the following Cooper-Jacob formula:

$$s = \frac{2.3Q}{4\pi T}\log\left(\frac{2.25Tt}{r^2 S}\right)$$

Where, Q = peak demand pumping rate, 2250L/2hr
T = lowest transmissivity, 34.2 m^2/day
t = duration, 2 hours
S = lowest storativity estimate, 4.5 x 10^{-5}
s = expected drawdown due to the 7 subject site proposed domestic wells

The results of the calculations indicate that the cumulative peak demand drawdown at the centrally located well (TW2), including the interference from the other six wells in the proposed residential development is about 2.5 metres (see attached Table VI). It is pointed out that it is considered, in Morey Associates Ltd. professional opinion, that the actual cumulative peak demand drawdown at the centrally located well could be more accurately estimated by the use of the average transmissivity value determined from the pumping tests, the average estimated storativity value and the use of a more likely peak demand water usage pumping rate given today's more efficient plumbing and that the actual two hour peak demand is divided up into two separate one hour periods (a morning hour and an evening hour), allowing for well recovery in between the two peak demand periods. However, for the purpose of this present report and for an exceedingly conservative approach the cumulative peak demand drawdown at the centrally located well was estimated using the lowest transmissivity value determined during the pumping tests, the lowest estimated storativity value and a peak demand pumping rate of 2250 litres over a two hour period.

Based on the above mentioned exceedingly conservative 20 year drawdown calculation, the expected drawdown was found to be about 2.0 metres at the centrally located well. Applying this drawdown value to all sixteen existing neighbouring wells indicated on Table 3.3 for which available drawdown information is known (which is also a conservative approach as the drawdown at the site boundaries would be less than estimated at a central lot) would result in the reduction of available drawdown at those existing wells of between about 3% to 19%.

Based on the above mentioned exceedingly conservative peak demand drawdown calculation, the expected drawdown was found to be about 2.5 metres at the centrally located well. Applying this drawdown value to all sixteen existing neighbouring wells indicated on Table 3.3 for which available drawdown information is known (which is also a conservative approach as the drawdown at the site boundaries would be less than estimated at a central lot) would result in the reduction of available drawdown at those existing wells of between about 4% to 25%.

The above estimated drawdown values provide a fair assurance of adequate water supply for the proposed residential development. Further, as indicated above it is considered that the above estimated drawdown values are exceedingly conservative and the actual cumulative drawdown values should be much less and interference with existing neighbouring wells should not result in significant reduction of available well drawdown for the proposed residential development as well as the nearby neighbouring wells.

4.3 DEVELOPMENT IMPACTS AND NEIGHBOURING LAND USES

The land use south of the site is currently residential, the land use west and north of the site is currently agricultural fields, the land use east of the site is currently vacant fields and it is understood that plans are being prepared for a proposed residential development east of the site. The results of the water quality testing at the test wells indicate that there is no significant impact on the groundwater at the site due to the surrounding existing land use. The proposed residential development east of the site is not considered a significant potential for interference on water quality for the site. Further, a Phase One Environmental Site Assessment (Phase I ESA) for the proposed residential development east of the subject site was carried out by Golder Associates Limited in 2015. The GAL report indicates that the Phase I ESA did not identify any areas of potential environmental concern within the Phase I ESA study area. The subject site is within the study area of that Phase I ESA and based on observations carried out by members of our engineering staff during the fieldwork for this present report, no significant changes in use since 2015 or areas of potential environmental concern were identified within or in close proximity to the subject site.

Based on the above, potential adverse impacts to the water quality of the proposed residential development from possible sources of groundwater contamination due to the above described neighbouring land use is not anticipated.

4.4 POST DEVELOPMENT MONITORING PROGRAM

The results of this investigation indicate acceptable existing and expected impact on the groundwater quality at this site due to existing neighbouring land uses and the proposed development. The local hydrogeological conditions and existing water quantity and quality, all indicate that the impact of the proposed development will not significantly impact the overall groundwater quality and quantity at the site. Accordingly, based on the findings of this current investigation no post development monitoring program is considered to be required.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY AND CONCLUSIONS

Based on the groundwater supply investigation and impact assessment carried out for the proposed residential subdivision, the following summary and conclusions are provided by Morey Associates Ltd. and are based on our professional opinion and our interpretation of the relevant sections of the guideline MOECC Procedure D-5-5 and applicable sections of the City of Ottawa Official Plan:

1) There is a sufficient groundwater supply of acceptable drinking water quality in the bedrock aquifer system to satisfy the water requirements of the proposed residential subdivision. It is indicated that most wells will have to be drilled to depths of about 43 to 55 metres and that individual well yields of 36 to 68 litres per minute (8 to 15 Imperial gallons per minute) will be typical. However, because it is impossible to predict with certainty the depth at which water-producing fractures will be encountered during drilling, it may be necessary to drill to depths greater than 55 metres on some lots to produce a sufficient water supply. It is pointed out that water bearing zones were encountered in the bedrock between about 33 and 53 metres depth at the test wells and that water quality from water bearing zones below 53 metres depth have not been evaluated as part of this present investigation.

2) The groundwater quality in the bedrock aquifer system at the three test wells at the site meets all the ODWSOG concentrations for all health related chemical, physical and bacteriological parameters tested, except for hardness at all of the test wells, TDS at two of the test wells and iron at one of the test wells. The levels of hardness measured at the three test wells are well within the acceptable range that is considered treatable. Based on the results of LSI calculations the levels of TDS measured at the test wells are considered unlikely to result in encrusting/scale or corrosion on plumbing/plumbing fixtures. The levels of iron measured at TW2 are well within the MOECC maximum concentration considered reasonably treatable. Water softeners are indicated to be adequate to lower hardness to acceptable levels. Water softeners or manganese greensand filters are indicated to be adequate to lower iron to acceptable levels.

3) Interviewees from seven neighbouring residences all indicated that their water was acceptable to excellent with regards to water quality and the interviewees did not indicate any problems with regards to water quantity.

4) Mutual well interference calculations indicate a sufficient groundwater supply for the proposed residential subdivision and interference with existing neighbouring wells should not result in significant reduction of available well drawdown for the proposed residential development as well as the nearby neighbouring wells.

5) It is considered that the type of existing surrounding land use adjacent to the subject property should not significantly impact the subject site from a water supply or water quality point of view.

6) It is understood that test wells TW1, TW2 and TW3 are planned to be used as domestic supply wells for the proposed dwellings located at Lot 1, Lot 4 and Lot 6, respectively. As such, it is considered that provided the three test wells are used as domestic supply wells they do not require decommissioning in accordance with O.Reg 903.

7) It is considered that with regards to proposed domestic supply wells the proposed residential subdivision meets the above mentioned applicable sections of the City of Ottawa Official Plan.

5.2 RECOMMENDATIONS

Morey Associates Ltd. provides the following recommendations regarding groundwater supply wells at the site:

1) Future wells drilled on the site should be constructed with steel casing through the overburden materials and set well into the bedrock. The steel casings for the test wells for this investigation are indicated by the well driller on the MOECC Well Records to be set 1.8 metres into the bedrock. As such, for future wells drilled on the site, setting the steel casing 1.8 metres into the bedrock should be considered a minimum. The steel casing placed in the boreholes should be pressure grouted into place for the full length of the casing. The material used to seal the annular space could consist of either a cement grout or a commercially available bentonite grout product. Cement grout mixtures should be allowed

to set for a minimum two day period for normal cement or twelve hours for a high early strength cement prior to advancing the well further into bedrock. If a bentonite grout product is used, drilling need only be suspended for a few hours depending on the product used. Bentonite grout has the additional advantage of remaining flexible when set and therefore should not crack or shrink thereby ensuring as well as possible that surface water or shallow groundwater will not migrate along the annular space and into the well bore.

Once the casing has been sealed, the well should be advanced uncased in the bedrock until a water supply of sufficient quantity and quality is encountered. The completed well should then be developed to maximize the yield. The well casings should be completed at least 400 millimetres above the highest point on the finished ground surface within three metres radially from the well after surface drainage is directed away from the well. The casing should be fitted with a pitless adapter to facilitate below ground plumbing and electrical connections. Surface grading should be completed to direct surface water away from the well in order to ensure that water will not collect or pond in the vicinity of the well.

In addition to the above, future wells drilled on the site are to be constructed in accordance with O.Reg 903.

2) Future wells drilled on the site should be constructed by licensed well drillers in accordance with O.Reg 903.

3) The well casing installation for future wells drilled on the site should be inspected by qualified professional engineering or geoscientist consulting firms to ensure that the well casings are constructed in accordance with the requirements.

4) The existing test wells (understood to be used as domestic supply wells for the proposed subdivision) and future wells drilled at the site shall be located a minimum 15 metres from a source of contamination which includes sanitary/storm sewer mains and service laterals. Further, the existing test wells and futures wells drilled at the site shall be made “accessible” for future well maintenance, in accordance with O.Reg 903. It is understood that D.B. Gray Engineering Inc. (consulting civil engineers for the proposed subdivision) have taken into consideration the above 15 metre separation distance and well accessibility in their

preparation of the proposed subdivision site plan. Future homeowners at the site should be made aware of the above requirements, particularly the well accessibility requirement.

5) In order to encourage domestic supply well education and best management practices future homeowners at the site should be made aware of and refer to the MOECC publication titled “Water Supply Wells: Requirements and Best Management Practices”, revised April 2015.

6) Future homeowners at the site should be made aware that the use of water softeners for treatment of hardness and the use of water softeners or manganese greensand filters for treatment of iron may be desired based on the results of the water quality testing carried out for this investigation.

7) Future homeowners at the site should be made aware that the use of conventional sodium ion exchange water softeners may introduce relatively high concentrations of sodium into the drinking water, which may contribute a significant percentage to the daily sodium intake for a consumer on a sodium restricted diet. Where ion exchange water softeners are used, a separate unsoftened water supply could be used for drinking and culinary purposes.

8) Future homeowners at the site should be made aware that the levels of sodium for the water samples for all three test wells at the site were measured above 20 milligrams per litre (112 to 123 milligrams per litre) and accordingly may be of interest to persons on a sodium restricted diet. According to the MOECC, the local Medical Office of Health should be notified where sodium levels are above 20 milligrams per litre in order that this information may be relayed to local physicians. The sodium levels are well within the ODWSOG aesthetic objective of 200 milligrams per litre.

6.0 LIMITATIONS AND USE OF REPORT

This report was prepared for the exclusive use of Schouten Construction Ltd. This report may not be relied upon by any other person or entity without the express written consent of Schouten Construction Ltd. and Morey Associates Ltd.

This report documents work that was carried out with generally accepted professional standards at the time and location in which the services were provided and in a manner consistent with a level of care and skill normally exercised by other professional engineering and geoscientist firms practicing under similar conditions and subject to the time limits and financial and physical constraints applicable to the services.

Any third party use of this report, including reliance of this report and/or decisions made based on this report, is the sole responsibility of the third party. Morey Associates Ltd. accepts no responsibility for damages, whether direct or indirect, suffered by any third party as a result of any third party use of this report.

The conclusions provided herein represent an opinion of Morey Associates Ltd. as of the time of preparation of this report. It is recognized that the passage of time affects the information provided in this report. This report should not be construed as legal advice. If new information is discovered during future work, including excavations, borings or other studies, Morey Associates Ltd. should be requested to re-evaluate the conclusions presented in this report and provide amendments as required.

7.0 SIGNATURES

We trust that this report is sufficient for your present requirements. If you have any questions concerning this report, please do not hesitate to contact our office.

Yours truly,
Morey Associates Ltd.

D.G. Morey, B.A.Sc (Civil Eng.), P.Eng.
Director/Civil Engineer

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Senior Consulting Engineer

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Golder Associates Limited: Hydrogeological Study, Proposed Development, Part of Lot 26, Concession 4, Geographic Township of Goulbourn, City of Ottawa (Richmond Village), Ontario, report No. 1418381-1000, Rev.2, dated 2017 *[provided to Morey Associates Ltd. by the City of Ottawa]*

Map 1492A – Surficial Geology Map – Kemptville Ontario: Energy, Mines and Resources, Ottawa, Geological Survey of Canada, published 1982

Map 2544 – Bedrock Geology of Ontario Map – Southern Sheet: Province of Ontario, Ministry of Northern Development and Mines, dated 1991

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Province of Ontario: Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, revised June 2006

TABLE I
RESULTS OF THE FIELD WATER QUALITY MEASUREMENTS
FOR TEST WELLS

Test Well	Hours Since Pumping Started	Temp. (°C)	Conductivity (uS/cm)	pH (pH units)	TDS (ppm)	Turbidity (NTU)	Free Chlorine (mg/L)	Sample
TW1	1	8.7	771	8.4	391	17	-	-
	2	9.1	795	8.4	400	5.3	-	-
	3	9.5	774	8.3	389	2.0	0.00	3hr sample
	4	10.1	760	8.2	378	2.2	-	-
	5	11.1	778	8.2	386	1.2	-	-
	6	11.2	796	8.2	396	0.9	0.00	6hr sample
TW2	1	9.5	667	8.2	335	29	-	-
	2	8.0	588	8.2	289	26	-	-
	3	7.7	639	8.2	318	24	0.00	3hr sample
	4	10.3	721	8.1	351	17	-	-
	5	10.5	728	8.2	361	13	-	-
	6	10.9	659	8.0	280	11	0.00	6hr sample
TW3	1	9.6	893	8.4	445	11.0	-	-
	2	11.0	778	8.3	390	4.3	-	-
	3	10.6	769	8.4	383	3.7	0.00	3hr sample
	4	10.9	777	8.4	387	2.3	-	-
	5	11.1	781	8.4	389	1.3	-	-
	6	10.6	767	8.4	382	0.9	0.00	6hr sample
TW1 (Pumping for additional sampling and laboratory testing, 03/15/18)	1	-	-	-	-	-	0.03	-
	2	-	-	-	-	-	0.00	-
	2.75	-	-	-	-	-	0.00	Sample
TW2 (Additional pumping for in-situ turbidity testing and additional sampling and laboratory testing, 03/15/18)	0.75	-	-	-	-	12	-	-
	1.75	-	-	-	-	7.8	-	-
	2.75	-	-	-	-	3.6	-	-
	3.75	-	-	-	-	1.4	-	-
	5	-	-	-	-	1.1	-	-
	6	-	-	-	-	0.8	-	Sample

TABLE II

LANGELIER SATURATION INDEX CALCULATIONS

Sample	pH	TDS (mg/L)	Temp. (°C)	Ca (mg/L)	Ca as CaCO3 (mg/L)	Alkalinity as CaCO3 (mg/L)	A	B	C	D	pHs	Langelier Saturation Index (pH - pHs)	*Comment
TW1 - 3hr	8.47	555	9.5	22	55	241	0.1744293	2.3926379	1.3403627	2.3820170	8.1447	0.33	Acceptable
TW1 - 6hr	8.45	552	11.2	22	55	228	0.1741939	2.3584522	1.3403627	2.3579348	8.1343	0.32	Acceptable
TW2 - 3hr	8.24	491	7.7	22	55	243	0.1691081	2.4290595	1.3403627	2.3856063	8.1722	0.07	Acceptable
TW2 - 6hr	8.22	493	10.9	22	55	232.0	0.1692847	2.3644701	1.3403627	2.3654880	8.1279	0.09	Acceptable
TW3 - 3hr	8.24	530	10.6	25	62.5	234	0.1724276	2.3704943	1.3958800	2.3692159	8.0778	0.16	Acceptable
TW3 - 6hr	8.25	536	10.6	26	65	223	0.1729165	2.3704943	1.4129134	2.3483049	8.0822	0.17	Acceptable

*An acceptable range is considered a value between -0.5 and 0.5

Notes:

Ca as CaCO3 = Ca / 0.4

A = $(Log_{10}[TDS] -1)/10$

B = $-13.12[(Log_{10}(Temp. + 273)]+34.55$

C = $Log_{10}[Ca\ as\ CaCO3]-0.4$

D = $Log_{10}[alkalinity\ as\ CaCO3]$

pHs = (9.3+A+B)-(C+D)

Langelier Saturation Index = pH-pHs

TABLE III
SUMMARY OF PUMPING TEST RESULTS AND WELL PARAMETERS

Well	Tp (m^2/day)	Tr (m^2/day)	Tav (m^2/day)	Q (m^3/day)	SC (m^3/day/m)	ho m	hf m	Td m	TD m	CS m	AD m
TW1	34.2	95.9	65.1	52.4	4.4	3.28	15.17	11.89	48.77	0.75	45
TW2	74.9	112.3	93.6	98.2	11.9	2.51	10.78	8.27	42.67	1.20	40
TW3	54.5	38.7	46.6	65.5	5.7	2.14	13.63	11.49	54.86	0.75	52

Well	% Available Drawdown Used
TW1	27%
TW2	21%
TW3	22%

Overall Average Transmissivity

T 68.4 m^2/day

Note:
- Tp: Transmissivity as calculated from pumping data (m^2/day)
- Tr: Transmissivity as calculated from recovery data (m^2/day)
- Tav: Average transmissivity (average of pumping and recovery) (m^2/day)
- Q: Test pumping rate (m^3/day)
- SC: Specific Capacity (m^3/day/m)
- ho: Static water level (below top of casing) at beginning of pumping test (metres)
- hf: Water level (below top of casing) at end of 6 hour pumping test (metres)
- Td: Total drawdown (metres)
- TD: Total depth of well (below ground surface) (metres)
- CS: Casing stickup above ground surface, as measured at time of pumping test (metres)
- AD: Approximate available drawdown (metres)

TABLE IV
ESTIMATE OF STORATIVITY BY COOPER-JACOB METHOD

$$S = \frac{2.25Tt_0}{r^2}$$

(A curve of drawdown versus time was generated for an observation well as an adjacent well was pumped)

Pumping Well	Observation Well	r (m)	Q (m^3/day)	t_o (s)	T (m^2/s)	S
TW1	TW2	61	52.4	36	3.7E-03	8.1E-05
	TW3	100		684	3.7E-03	5.7E-04
TW2	TW1	61	98.2	82	5.2E-03	2.6E-04
	TW3	40		88	3.5E-03	4.3E-04
TW3	TW1	100	98.2	29	6.9E-03	4.5E-05
	TW2	40		73	6.9E-03	7.1E-04
					Average Storativity	3.5E-04

TABLE V

MUTUTAL WELL INTERFERENCE AT CENTRAL WELL

20 YEAR ASSESSMENT

Centre Lot:	Lot 4	
S =	4.5E-05	
T =	34.2	m^2/day
T =	4.0E-04	m^2/s
Q =	2250	L/day
Q =	2.6E-05	m^3/s
Duration =	20	years
Duration =	6.3E+08	seconds

Calculated by Cooper-Jacob Method using:

Lowest Transmissivity value determined from pumping tests (conservsative)

Lowest Storativity value calculated from pumping tests (conservative)

Flow/pump rate (Q) using section 4.3.2 of MOECC Procedure D-5-5 for a four bedroom dwelling, [4 + 1] * 450 L/day = 2250 L/d

Lot	Distance (m)	20 year Drawdown (m)
1	62	0.08
2	44	0.08
3	28	0.09
4	0	0.13
5	20	0.09
6	40	0.08
7	60	0.08
3244 Shea	235	0.06
3290 Shea	87	0.07
4 Hemphill	79	0.07
6 Hemphill	61	0.08
39 Gamble	119	0.07
40 Gamble	97	0.07
41 Gamble	89	0.07
42 Gamble	70	0.08
43 Gamble	58	0.08
44 Gamble	59	0.08
22 Mary Hill	153	0.07
24 Mary Hill	135	0.07
26 Mary Hill	126	0.07
28 Mary Hill	124	0.07
30 Mary Hill	134	0.07
2 Hemphill	99	0.07
3310 Shea	145	0.07
3316 Shea	162	0.07
3326 Shea	211	0.06
Cumulative aquifer drawdown at Lot 4 =		1.97

TABLE VI

MUTUTAL WELL INTERFERENCE AT CENTRAL WELL

PEAK WATER DEMAND ASSESSMENT

Centre Lot:	Lot 4	
S =	4.5E-05	
T =	34.2	m^2/day
T =	4.0E-04	m^2/s
Q =	2250	L/2hr
Q =	3.1E-04	m^3/s
Duration =	0.0002282	years
Duration =	7.2E+03	seconds

Calculated by Cooper-Jacob Method using:

Lowest Transmissivity value determined from pumping tests (conservsative)

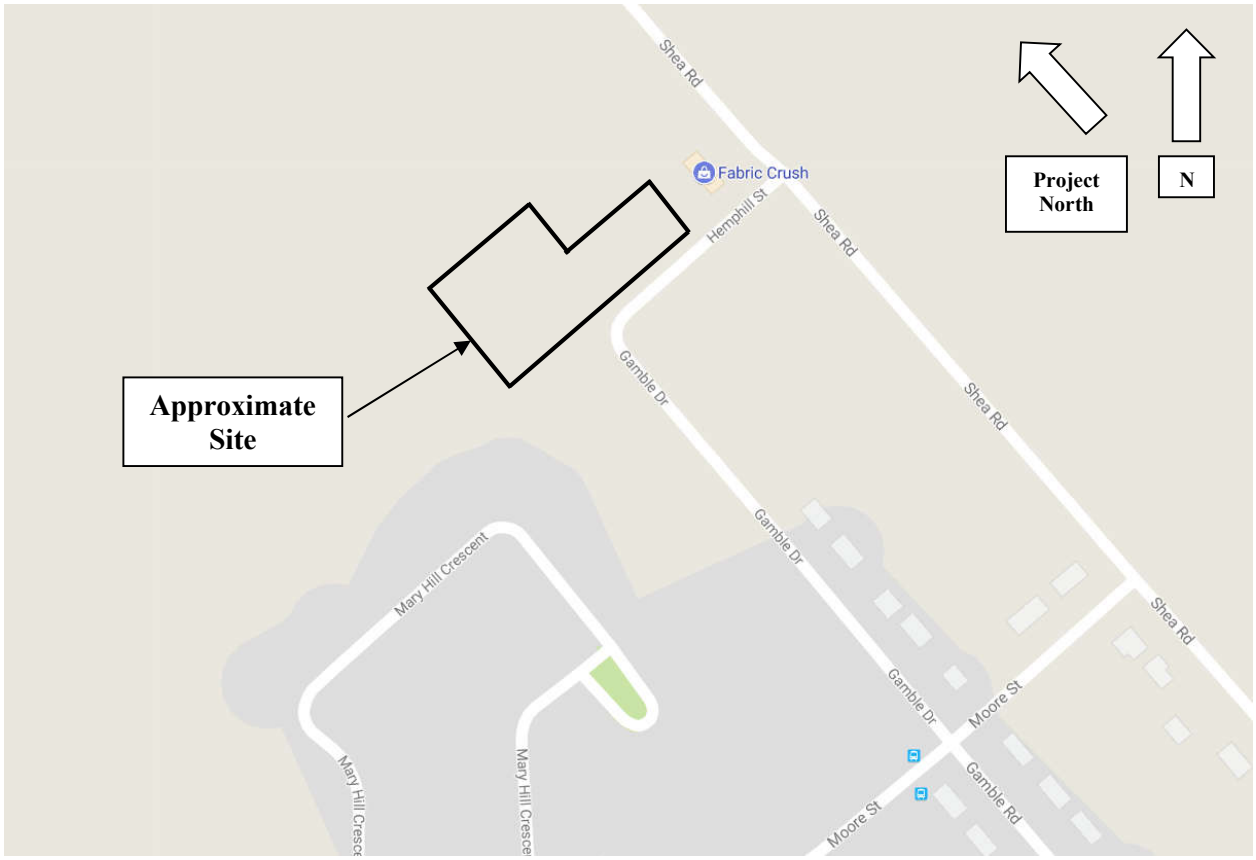
Lowest Storativity value calculated from pumping tests (conservative)

Flow/pump rate (Q) = 2250 L over a continuous 2 hour period simultaneously at all wells (conservative)

Lot	Distance (m)	Peak Drawdown (m)
1	62	0.22
2	44	0.27
3	28	0.32
4	0	0.84
5	20	0.36
6	40	0.28
7	60	0.23
Cumulative aquifer drawdown at Lot 4 =		2.52

KEY PLAN

FIGURE 1



0 250m

APPROXIMATE SCALE

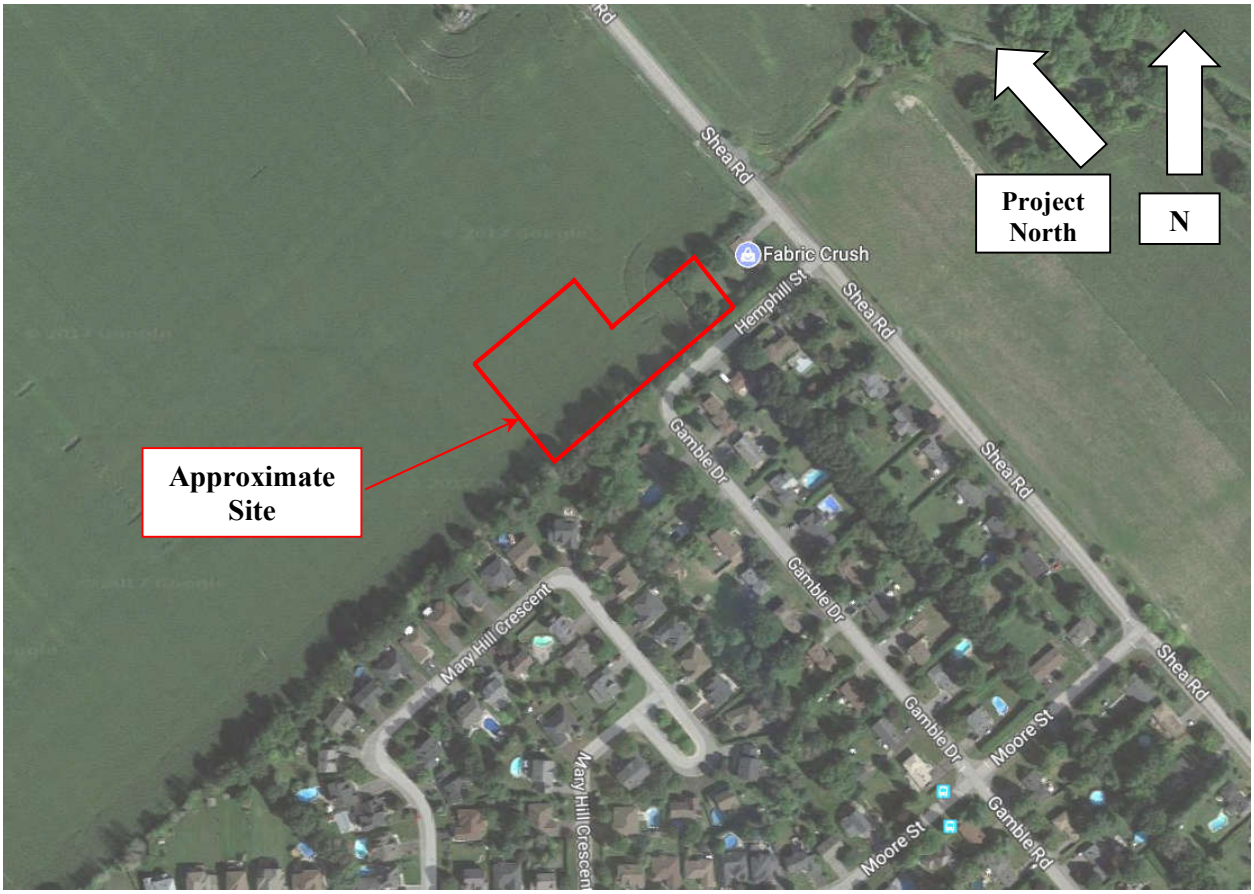
MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

Project No. 017630

Date May 2018

AERIAL PHOTOGRAPH

FIGURE 2

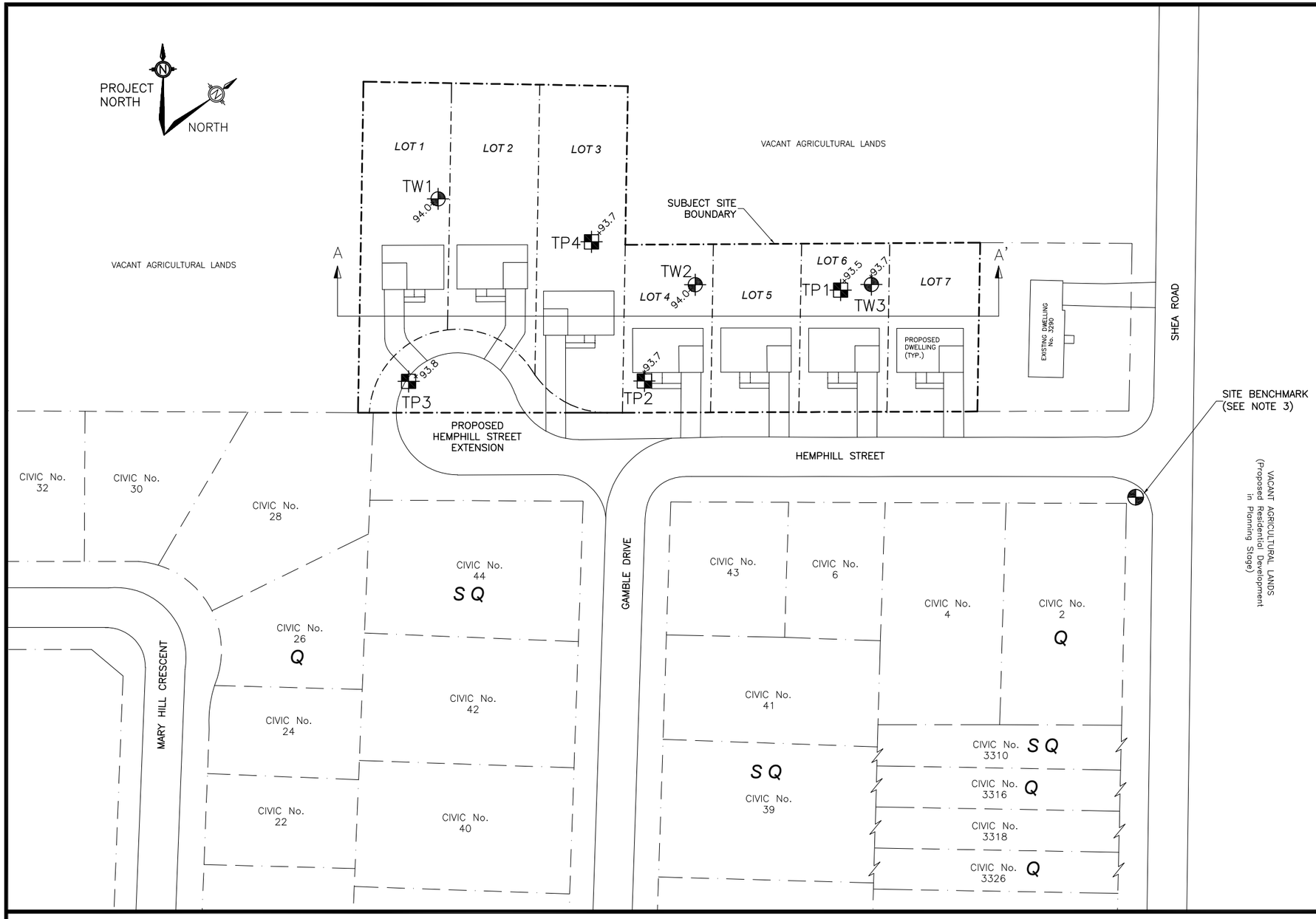


NOT TO SCALE

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

Project No. 017630

Date May 2018



NOTES:

1. All dimensions are in metres. Do not scale drawing.

2. This drawing is to be read in conjunction with the accompanying report.

3. Site benchmark = Existing nail in utility pole, located as shown on drawing. Geodetic elevation 94.21m as per H.A.Ken Shipman Surveying Ltd. drawing Ref. No. GLB.-478 for File No. 16-10896D.

4. Lot numbers shown on subject site have been arbitrarily selected.

5. Any changes made to this plan must be verified and approved by Morey Associates Ltd.

LEGEND

TW1 — APPROXIMATE MOREY ASSOCIATES LTD. TEST WELL

TP1 — APPROXIMATE MOREY ASSOCIATES LTD. TEST PIT

+99.9 — APPROXIMATE EXISTING SPOT ELEVATION

S — NEIGHBOURING WELL WATER SAMPLE LABORATORY TESTING INFORMATION OBTAINED

Q — NEIGHBOURING WATER WELL SYSTEM SURVEY QUESTIONNAIRE INFORMATION OBTAINED

A A' — APPROXIAMATE CROSS-SECTION LOCATION (See Figure 6)

REFERENCE:

Base plan information referenced from D. B. Gray Engineering Inc., Site Servicing Plan, Drawing C-1, dated Feb-XX-12 for Job No. 17037, Proposed 7-lot Residential Development Hemphill Street Richmond Ontario, Revision 01 dated Nov 29-17.

DRAWING: SITE SKETCH PLAN - FIGURE 3

LOCATION: HEMPHILL STREET, RICHMOND OTTAWA, ONTARIO

PROJECT: PROPOSED RESIDENTIAL DEVELOPMENT HYDROGEOLOGICAL INVESTIGATION

CLIENT: SCHOUTEN CONSTRUCTION LTD.

DATE	DRAWING No.	DRAWN BY	APPROX. SCALE	FILE NO.
May 2018	1 of 1	DGM	1:1000	017630

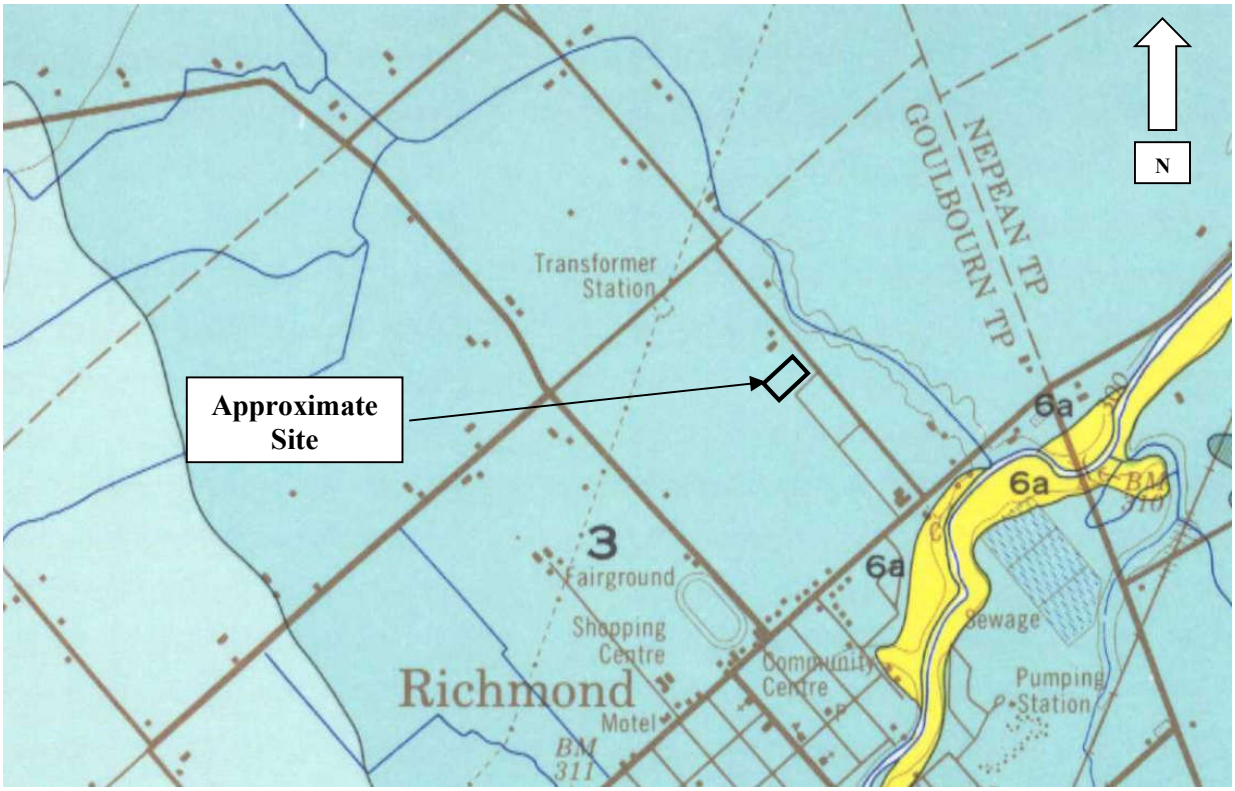
MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

2672 HWY.43, PO BOX 184
KEMPTVILLE, ONTARIO
K0G 1J0

T:613.215.0605
F:613.258.0605
info@moreyassociates.com

SURFICIAL GEOLOGY MAP

FIGURE 4



NOT TO SCALE

3 — *OFFSHORE MARINE DEPOSITS: massive blue-grey clay, silty clay and silt; calcareous and fossiliferous; locally overlain by thin sands*

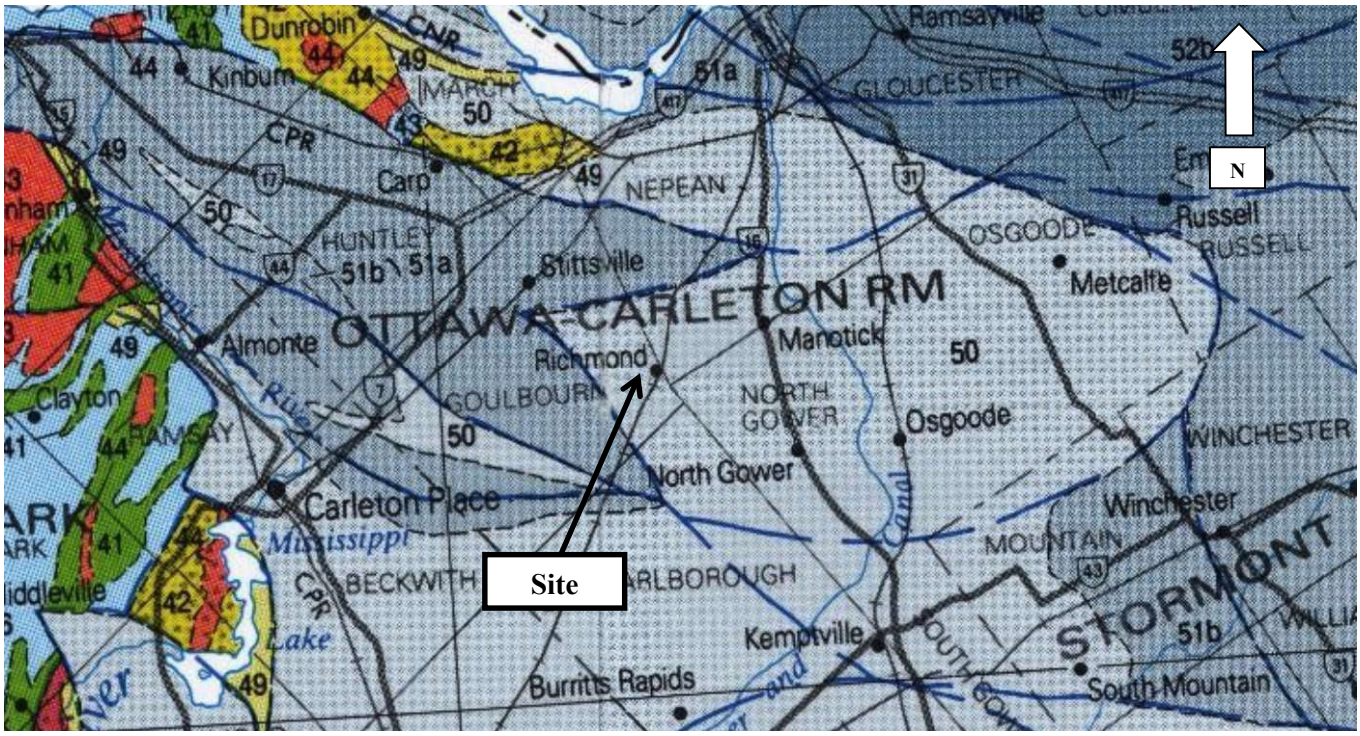
MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

Project No. 017630

Date May 2018

BEDROCK GEOLOGY MAP

FIGURE 5



NOT TO SCALE

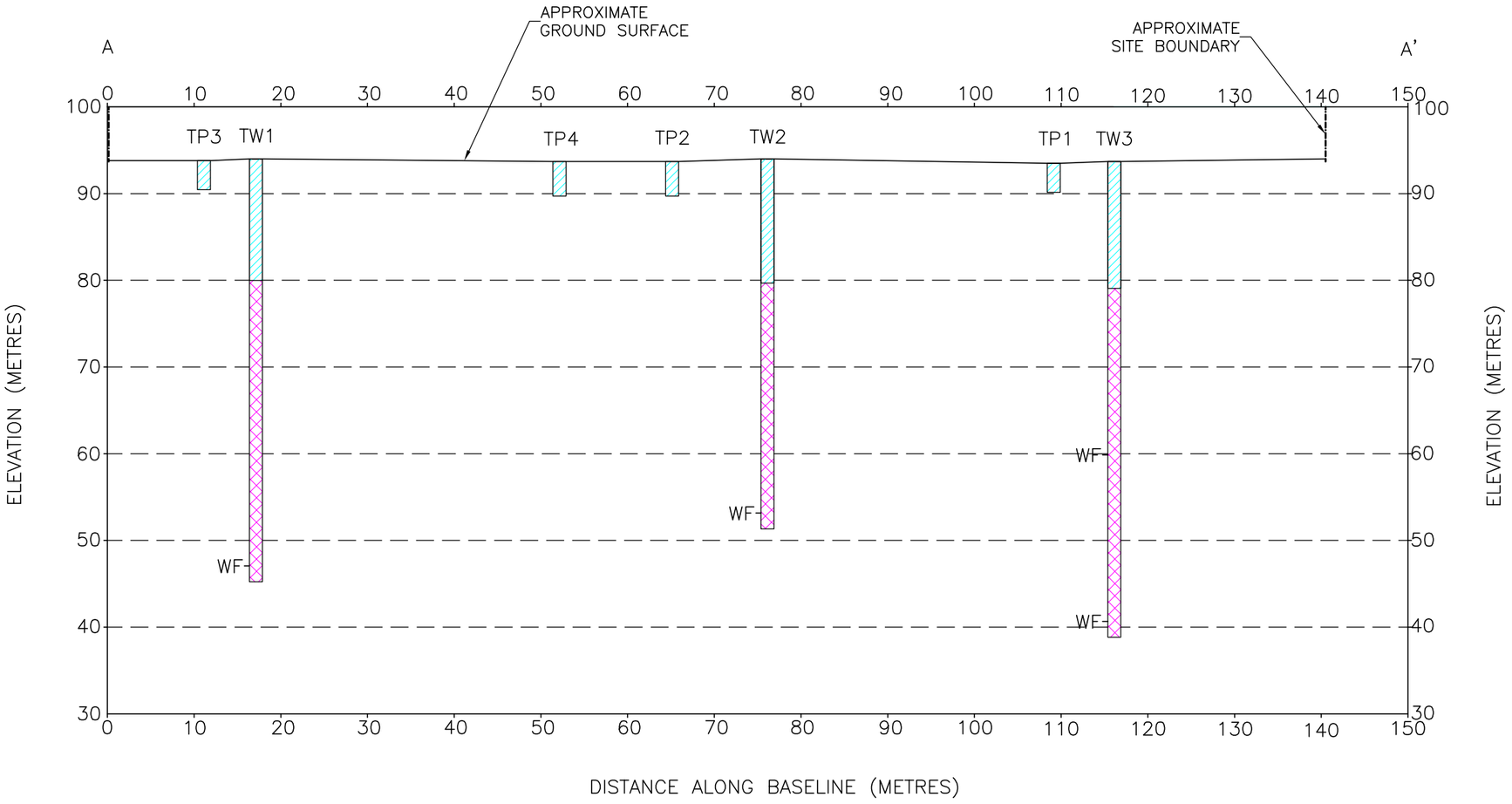
LOWER ORDOVICIAN

50 **Dolostone, sandstone:** Beekmantown Gp.

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

Project No. 017630

Date May 2018



NOTES:

1. All dimensions are in metres. Do not scale drawing.
2. This drawing is to be read in conjunction with the accompanying report.
3. See Site Sketch Plan, Figure 3 for cross-section location.
4. About a 0.3m thickness of topsoil was encountered from the surface at each of the test pits. For clarity purposes that topsoil layer is not shown on this cross-section drawing. For detailed soil stratigraphy and or groundwater conditions at test pits, refer to Record of Test Pit Logs.
5. Any changes made to this plan must be verified and approved by Morey Associates Ltd.

LEGEND

- SILTY CLAY or CLAY (as indicated by well driller)
- GREY LIMESTONE (as indicated by well driller)
- WF — Water Found (as indicated by well driller)

DRAWING

STRATIGRAPHIC CROSS-SECTION A-A' - FIGURE 6

LOCATION

HEMPHILL STREET, RICHMOND
OTTAWA, ONTARIO

PROJECT

PROPOSED RESIDENTIAL DEVELOPMENT
HYDROGEOLOGICAL INVESTIGATION

CLIENT

SCHOUTEN CONSTRUCTION LTD.

DATE	DRAWING No.	DRAWN BY	APPROX. SCALE	FILE NO.
May 2018	1 of 1	DGM	1:600	017630

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

2672 HWY.43, PO BOX 184
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APPENDIX A

MOECC WELL RECORDS FOR TEST WELLS

TW1

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag#: A240713 (below) A240713

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
1230381	Ontario Inc	Adrian Schouten	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
2740 Horbison Road	Richmond Ont		K0A 2Z0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
(NO CIVIC) HEMPHILL STREET	GOULBOURN PL	25	4

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARLETON	RICHMOND	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	434309	5006032	PART # 4	

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
	Clay			0'	46'
	Grey limestone			46'	160
	TW #1 OF 3				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
52'	42'	Neat Cement Slurry	12.48
42'	0'	Bentonite Grout	29.40

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	52'
6"	Open Hole		52'	160'

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 - Screen

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
154 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0'	52'	9 3/4"
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	52'	160'	6"
(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: X

Pump intake set at (m/ft): 140'

Pumping rate (l/min / GPM): 10

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 129'7"

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

Recommended pump depth (m/ft): 140'

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

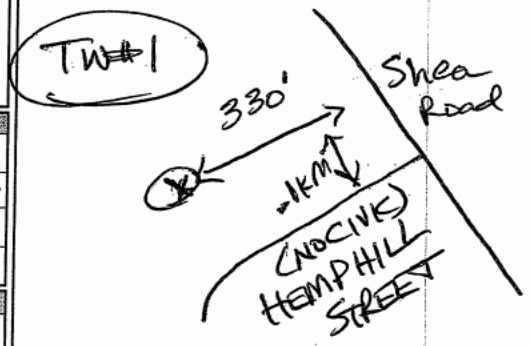
Well production (l/min / GPM): 10

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	10'2"		129'7"
1	21.4	1	97.3
2	27.2	2	90.2
3	33.	3	85.
4	39.4	4	80.7
5	41.3	5	76.
10	56.6	10	53.7
15	725	15	40.4
20	86.4	20	25.1
25	94.8	25	16.1
30	107.6	30	10.2
40	115.4	40	10.2
50	121.6	50	10.2
60	129.7	60	10.2

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

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

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

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

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	Hanna Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
13632		2018/02/28

Comments: 1/2HP-10GPM@140 FT

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2018/02/01	2018/01/29

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Audit No. Z237032

Received

0506E (2014/11)

Ministry's Copy

TW2

Ontario — Ministry of the Environment and Climate Change

Well Tag#: A 240714 (bow)

A240714

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
1230381	Ontario Inc.	(Adrian Schouten)	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
2740 Harbison Road	Richmond	Ont	K0A2Z0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
(NOCIVIC) HEMPHILL STREET	GOULBOURN PL	25	4

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA-CARLETON	RICHMOND	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	434371	5006052	PART	#6

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			0'	47'
	Grey Limestone			47'	140'
	* BROKEN ROCK - DO NOT SET PUMP BELOW 100 FT *				
	TW#2 OF 3				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/imp gal)
53'	43'	Neat Cement Slurry	10.92
43'	0'	Bentonite Slurry	8.40.

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	53'
6"	Open Hole		53'	140'

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested	☐ Gas ☐ Other, specify
134		
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'	53'	9 3/4"
53'	140'	6"

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 100'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 51'4"

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min / GPM): 20

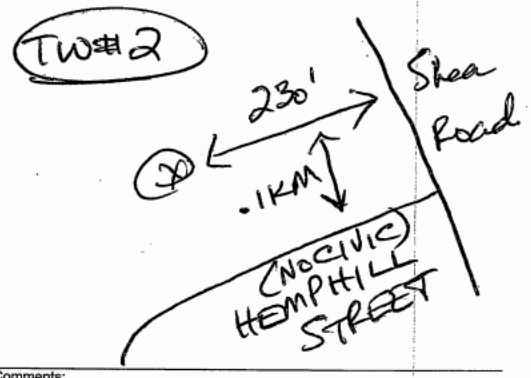
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	9'6"		51'4"
1	18.8	1	37.7
2	26.	2	28.8
3	32.	3	21.9
4	35.8	4	20.4
5	38.6	5	18.6
10	46.8	10	11.3
15	49.6	15	9.6
20	50.2	20	9.6
25	50.6	25	
30	50.9	30	
40	51.2	40	
50	51.3	50	
60	51.4	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1/2HP-10GPM @100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
A&R Rock DRILLING Co LTD	1119

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

Province	Postal Code	Business E-mail Address
ONT	K0A2Z0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	HANNA JEREMY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
13632		2018 02 28

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2018 02 28	Audit No. Z237047
	Date Work Completed	Received
	2018 02 28	

0506E (2014/11)

Ministry's Copy

TW3

Ontario Ministry of the Environment

Well Tag#: A240721 v)

A240721

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
1230381	Ontario Inc	(AdrianSchouten)	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
2740 Harbison Road	Richmond	Ont	K0A 2Z0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
(NO CIVIC) HEMPHILL STREET	GOULBOURN	P/L 25	4

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA CARLETON	RICHMOND	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	434385	5006065	PART # 8/9	

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			0'	48'
	Grey Limestone			48'	180'

TW#3 OF 3

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
54'	44'	Neat Cement Slurry	10.92
44'	0'	Bentonite Grout	16.80

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	54'
5 7/8"	Open Hole		54'	180'

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 - 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	Water found at Depth (m/ft)	Kind of Water
111 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	174 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify		

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	54'	9 3/4"
54'	180'	5 7/8"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
A1R Rock DRILLING Co LTD	1119

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

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

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	HANNA JEREMY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
13632		2018/02/08

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 160'

Pumping rate (l/min / GPM): 15

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 104' 7"

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

Recommended pump depth (m/ft): 140'

Recommended pump rate (l/min / GPM): 15

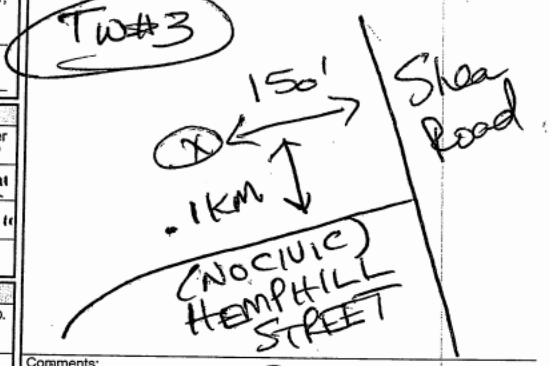
Well production (l/min / GPM): 15

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	8'4"		104.7
1	16.1	1	81.4
2	24.3	2	62.2
3	32.5	3	55.1
4	40.7	4	46.4
5	47.8	5	38.7
10	63.8	10	23.9
15	70.8	15	12.3
20	76.4	20	8.4
25	81.7	25	8.4
30	93.4	30	
40	98.6	40	
50	101.4	50	
60	104.7	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1/2HP-10GPM @ 140 FT

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2018/02/07	2018/02/06

Ministry Use Only

Audit No. Z 202848

Received

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Ministry's Copy

APPENDIX B

MOECC WELL RECORDS AND SURVEY QUESTIONNAIRE FOR NEIGHBOURING WELLS

(w) A 18 434 4 0 5 CODED
14 50015 8 10
14 03 04
2 5 1

1509756

3 9

The Ontario Water Resources Commission Act

LIKELY 4 HEMPHILL STREET

B

WATER WELL RECORD

County or District: Carleton
Township, Village, Town or City: Richmond
Con.: — 1V Lot: —
Date completed: 14 (day) Aug (month) 1968 (year)
Owner: Julia Construction Ltd. (print in block letters)
Address: Richmond Ont.

Casing and Screen Record

Inside diameter of casing: 5"
Total length of casing: 47'
Type of screen:
Length of screen:
Depth to top of screen:
Diameter of finished hole: 5"

Pumping Test

Static level: 11'
Test-pumping rate: 10 G.P.M.
Pumping level: 50
Duration of test pumping: 1 hr
Water clear or cloudy at end of test: clear
Recommended pumping rate: 5 G.P.M.
with pump setting of 60 feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
clay	0	43	85	fresh
limestone	43	86		

For what purpose(s) is the water to be used? new house
Is well on upland, in valley, or on hillside?
Drilling or Boring Firm: Capital Well Drilling
Address: 14 Ashford Dr
Licence Number: 2857
Name of Driller or Borer: H Mains
Address:
Date: Aug 14 1968
Walter Kavanagh
(Signature of Licensed Drilling or Boring Contractor)

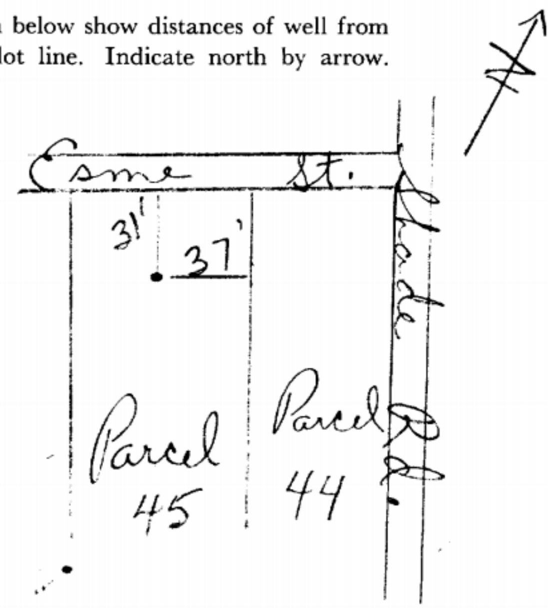
Form 7 15M-60-4138

OWRC COPY

Lot 45

Location of Well

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



Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

LIKELY 6 HEMPHILL STREET

1528767 15704 CON

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

11

/Hemphill St. Richmond

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON	BLOCK	TRACT, SURVEY, ETC.	LOT	DATE COMPLETED
[redacted]	Nepean (Richmond)	Con 4			25	DAY 5 MO 9 YR 95

ex 639, Richmond K0A 2Z0

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			0	46
grey	broken rock			46	47

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
47	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS — Not tested
	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	DEPTH - FEET TO
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	N/A	0	46
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		46	47
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

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.)
10-13	14-17	cement grouted
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE GPM	DURATION OF PUMPING HOURS	MINS
1 ☒ PUMP 2 ☐ BAILER	15	1	0

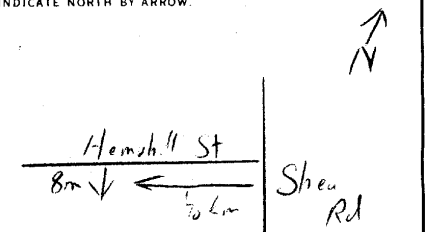
STATIC LEVEL FEET	WATER LEVEL END OF PUMPING FEET	WATER LEVELS DURING 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES FEET	30 MINUTES FEET	45 MINUTES FEET	60 MINUTES FEET
8	30		8	8	8	8

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

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING FEET	RECOMMENDED PUMPING RATE GPM
☒ SHALLOW ☐ DEEP	30	10

LOCATION OF WELL

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



DRILLERS REMARKS

137565

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 ☐ DEWATERING
WATER USE	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 CONSTRUCTION	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Kenny Mains Well Drilling
WELL CONTRACTOR'S LICENCE NUMBER: 3644
ADDRESS: Box 326 Richmond Ont
NAME OF WELL TECHNICIAN:
WELL TECHNICIAN'S LICENCE NUMBER: 7-0064
SIGNATURE OF TECHNICIAN/CONTRACTOR:
SUBMISSION DATE: DAY 7 MO 9 YR 95

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 3644 | DATE RECEIVED OCT 10 1995
DATE OF INSPECTION | INSPECTOR
REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

PARK LOTS 1, 2 & 3
NORTH PERTH PLO CODED
14 50105 7 20
4 KP0305
25

1509810

LIKELY 39 GAMBLE DRIVE

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District CARLETON
Township, Village, Town or City RICHMOND
Con. DELLA ST. IV Lot PARCEL 21
Date completed 2 (day) 7 month 68 year)
[redacted] ress 10 Cedar View RD. Bells Corners

Casing and Screen Record

Inside diameter of casing 5"
Total length of casing 45'
Type of screen —
Length of screen —
Depth to top of screen —
Diameter of finished hole 5"

Pumping Test

Static level 4'
Test-pumping rate 10 G.P.M.
Pumping level 15'
Duration of test pumping 2 hrs.
Water clear or cloudy at end of test Clear
Recommended pumping rate 8 G.P.M.
with pump setting of 25 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)
Blue Clay	0	43		
Gravel	43	45		
Limestone	45	51	50	Fresh

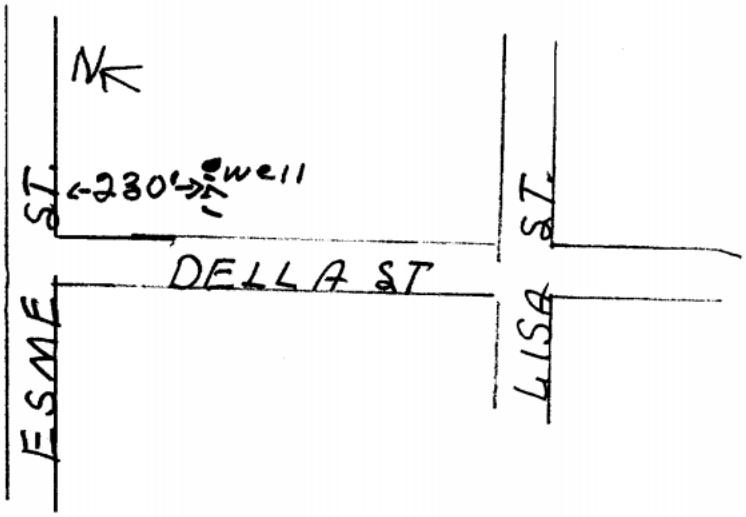
For what purpose(s) is the water to be used?
House
Is well on upland, in valley, or on hillside? upland
Drilling or Boring Firm McLean Water Supply LTD.
Address 1532 RAVEN AVE OTTAWA 3, ONT
Licence Number 2879
Name of Driller or Borer H. SALLY
Address
Date JULY 27 1968
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138
OWRC COPY

Lot 21

Location of Well

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



Ca

1 1 8 4 3 4 3 8 0 CODED

1 4 5 0 0 5 7 0 0

1 4 0 3 0 5

2 5

1509758

B

The Ontario Water Resources Commission Act

LIKELY 40 GAMBLE DRIVE

WATER WELL RECORD

County or District Carleton — Township, Village, Town or City Richmond

Con. 14 Lot — Date completed 16 (day) Aug (month) 1968 (year)

Owner Julia Construction Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 46'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 6'

Test-pumping rate 10 G.P.M.

Pumping level 10'

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30' 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	0'	45'	49'	fresh
limestone	45'	50'		

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

new house

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

Drilling or Boring Firm Capital Well Drilling

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer H Mains

Address

Date Aug 16 1968

Walter Kavanagh

(Signature of Licensed Drilling or Boring Contractor)

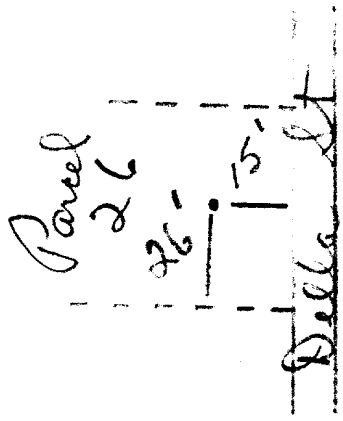
Form 7 15M-60-4138

OWRC COPY

Lot 26

Location of Well

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



CODED

1509748

B

The Ontario Water Resources Commission Act

LIKELY 41 GAMBLE DRIVE

WATER WELL RECORD

County or District Carleton — Township, Village, Town or City Richmond

Con. IV — Lot — Date completed 24 (day) Sept (month) 1968 (year)

Owner Julia Construction Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 46'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 10'

Test-pumping rate 10 G.P.M.

Pumping level 10'

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30 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	0	45	49	fresh
limestone	45	50		

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

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

Drilling or Boring Firm Capital Water Supply Ltd

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer M Kavanagh

Address

Date Sept 24 1968

Walter Kavanagh

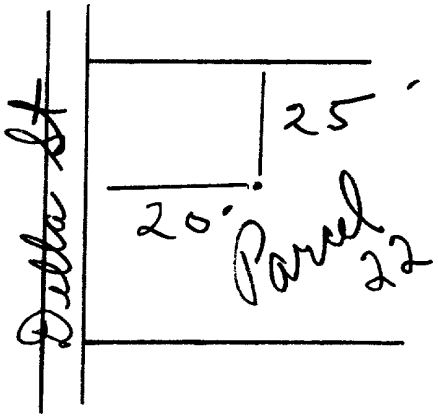
(Signature of Licensed Drilling or Boring Contractor)

Form 7 5M 60-20912

OWRC COPY

Location of Well

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



Lot 22

CODED 6 14 3 & 3 6 0 CODED

14 5 0 0 5 7 2 0

14 0 3 0 5

25T

1509757

3 9

The Ontario Water Resources Commission Act

LIKELY 42 GAMBLE DRIVE

WATER WELL RECORD

County or District Carleton — Township, Village, Town or City Richmond

Con. IV Lot — Date completed 14 (day) Aug (month) 1968 (year)

Owner Julia Construction Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 46'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 5'

Test-pumping rate 10 G.P.M.

Pumping level 8'

Duration of test pumping 1 hr

Water clear or cloudy at end of test cloudy

Recommended pumping rate 5 G.P.M.

with pump setting of 30 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	0	45	47'	fresh
limestone	45	47		

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

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

Drilling or Boring Firm Capital Well Drilling

Address 14 Ashford Dr

Licence Number 2857

Name of Driller or Borer A Mains

Address

Date Aug 14 1968

Walter Kavanagh

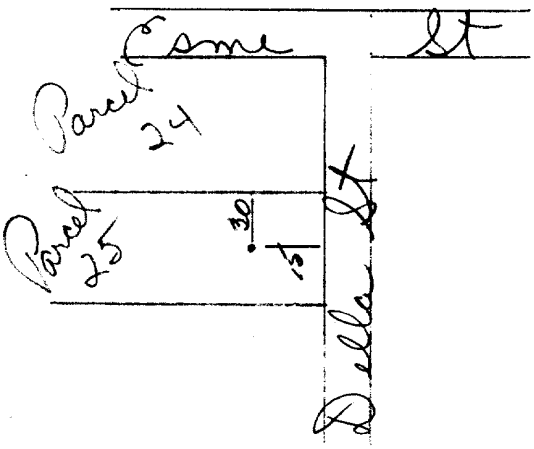
(Signature of Licensed Drilling or Boring Contractor)

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.



Lot 25

PARK LOTS 1, 8, 14, 4, 3.6 0 ... NORTH, PERTH 4 ... 5.7 6 1 5 ... 10 305 25T

CODE

1509791

(B)

WATER RE... AUG 2 2 1968

The Ontario Water Resources Commission Act

WATER WELL RECORD

LIKELY 43 GAMBLE DRIVE

County or District CARLETON ~~Township~~, Village, ~~Town or City~~ RICHMOND, ONT.

~~Con.~~ ~~DELLA ST~~ IV ~~PARCEL~~ Lot 23 Date completed 27 (day) 6 month 1968 year)

[redacted] ...dress 10 Cedarview Rd. BELLS CORNERS, ONT

Casing and Screen Record		Pumping Test	
Inside diameter of casing	5"	Static level	4'
Total length of casing	45'	Test-pumping rate	8 G.P.M.
Type of screen	—	Pumping level	15'
Length of screen	—	Duration of test pumping	1 1/2 hrs.
Depth to top of screen	—	Water clear or cloudy at end of test	Clear
Diameter of finished hole	5"	Recommended pumping rate	8 G.P.M.
		with pump setting of	25' feet below ground surface

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
BLUE Clay	0	42		
Coarse Gravel	42	45		
Limestone	45	50	48'	fresh

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

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

Drilling or Boring Firm McLean Water Supply LTD.

Address 1532 Raven Ave. OTTAWA, ONT

Licence Number 2879

Name of Driller or Borer H. SALLY

Address

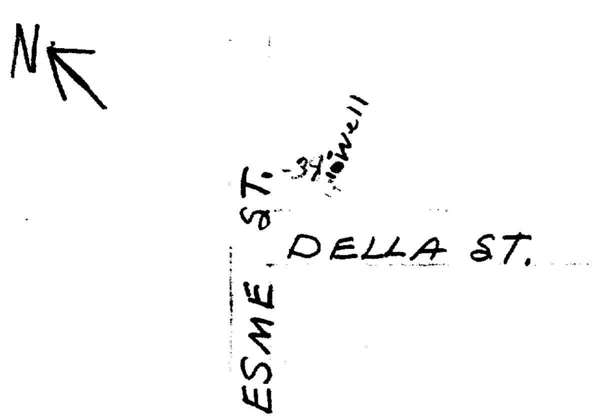
Date JULY 2, 1968

[signature]

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

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



Form 7 15M-60-4138

Lot 23

OWRC COPY

18 43434 0 CODED

14 50057 40

14 03051

25T

1509766

LIKELY 44 GAMBLE DRIVE

B

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton — ~~Township~~, Village, ~~Town or City~~ Richmond

Con. IV Lot — Date completed 27 (day) Aug (month) 1968 (year)

Owner Julia Constr. Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 48'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 7'

Test-pumping rate 10 G.P.M.

Pumping level 10

Duration of test pumping 48 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30' 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	0	47'	52	fresh
limestone	47'	53'		

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

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

Drilling or Boring Firm Capital Valley Drilling

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer H Mains

Address

Date Aug 28, 1968

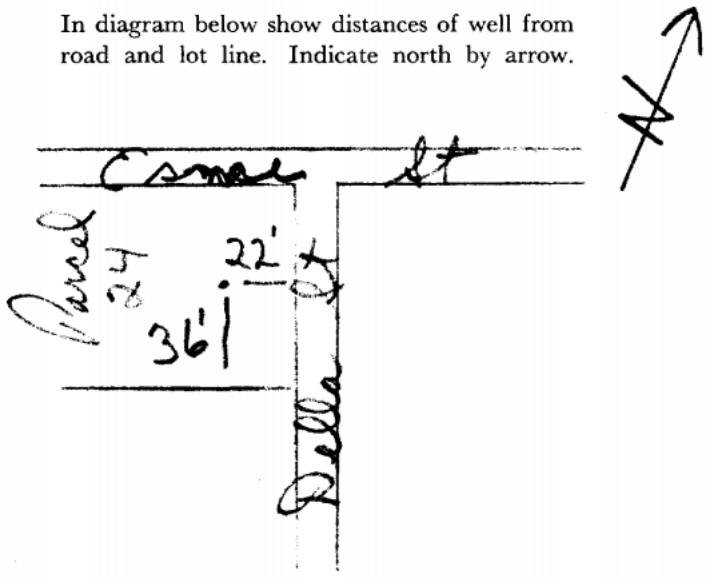
Walter Kavanagh
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138 Lot 24

OWRC COPY

Location of Well

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



Ontario Ministry of the Environment

LIKELY 22 MARY HILL CRESCENT

The Ontario Water Resources Act
WATER WELL RECORD

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

11 1531497 Municipality 15003 Con. CON 04

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	Goulbourn	4				25

Owner's surname	First Name	Address	Date completed
Cedarstone Homes		Box 1297 Richmond, Ontario K0A 2Z0	23 day 10 month 00 year

21 UTM Zone Easting 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
Brown	Clay			0	12
Gray	Clay			12	49
Gray	Limestone			49	165
Gray & White	Sandstone			165	240

31

32

41 WATER RECORD

Water found at - feet	Kind of water
240	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas — NOT TESTED
	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	Depth - feet To
6 1/4	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	51.5
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic		51.5	240
	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.)
50	0	Grouted - Bentonite Mix(3)

71 PUMPING TEST

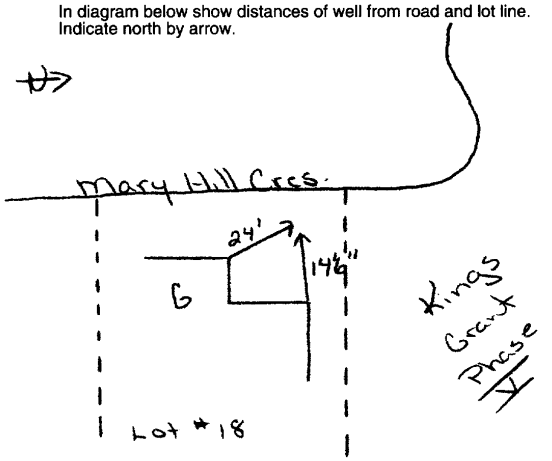
Pumping test method: 1 ☒ Pump 2 ☐ Bailer
Pumping rate: 100 GPM
Duration of pumping: 1 Hours Mins

Static level	Water level end of pumping	Water levels during: 1 ☒ Pumping 2 ☐ Recovery	15 minutes	30 minutes	45 minutes	60 minutes
13'6" feet	50 feet		235 feet	150 feet	100 feet	50 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: 75 feet
Recommended pump rate: 5 GPM

LOCATION OF WELL

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



224684

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	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Address: P.O. Box 490 Stittsville, Ontario K2S 1A6

Name of Well Technician	Well Technician's Licence No.
S. Miller	T0097

Signature of Technician/Contractor: [signature] Submission date: day 24 mo 10 yr 00

MINISTRY USE ONLY

Data source | Contractor 1558 | Date received NOV 16 2000
Date of inspection | Inspector
Remarks: CSS.ES0

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

LIKELY 24 MARY HILL CRESCENT

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

11 1531410

Municipality 15003 Con. CON 04

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Ottawa Carleton	Goulbourn	4	25

Owner's surname	First Name	Address	Date completed
Cedarstone Homes		P.O. Box 1297 Richmond, Ontario K0A 2Z0	23 day 9 month 00 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	Depth - feet To
Brown	Clay			0	12
Gray	Clay			12	52
Gray	Limestone			52	160
Gray & White	Sandstone			160	235

31

32

41 WATER RECORD

Water found at - feet	Kind of water
231	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas — NOT TESTED
	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	Depth - feet To
6 1/4	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	55
6 1/16	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic		55	235
	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.)
54	0	Grouted - Cement (5)

71 PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
1 ☒ Pump 2 ☐ Bailer	15 GPM	1 Hours Mins

Static level	Water level end of pumping	Water levels during 1 ☒ Pumping 2 ☐ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
12'6"	75 feet	230 feet	150 feet	100 feet	75 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	100 feet	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

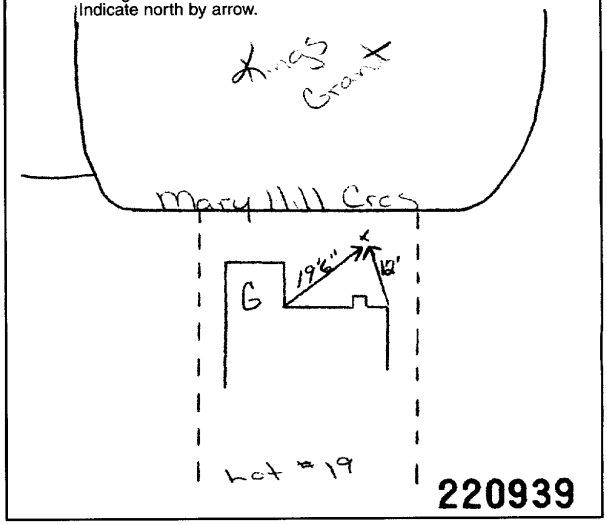
1 ☒ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

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.



220939

Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Address: P.O. Box 490 Stittsville, Ontario K2S 1A6

Name of Well Technician	Well Technician's Licence No.
S. Miller	T0097

Signature of Technician/Contractor: Kelly Greene

Submission date: day 25 mo 9 yr 00

MINISTRY USE ONLY

Data source	Contractor	Date received
	1558	OCT 18 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

LIKELY 26 MARY HILL CRESCENT

The Ontario Water Resources Act

WATER WELL RECORD

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

11 **1531128** Municipality 15003 Con. CON 04

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Ottawa Carleton	Goulbourn	4	25

Owner's surname	First Name	Address	Date completed
Cedarstone Homes		P.O. Box 1297 Richmond,Ontario K0A 2Z0	day 5 month 00 year 19

21 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	Depth - feet To
Brown	Clay			0	12
Gray	Clay			12	49
Gray	Clay	Stones		49	51
Gray	Limestone			51	170
Gray & White	Sandstone			170	225

31

32

41 WATER RECORD

Water found at - feet	Kind of water
	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
6 1/4	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	53.5
5 7/8	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic		53.5	225
	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.)
52	0	Grouted-Cement (1)
		-QuickGrout (1)

71 PUMPING TEST

Pumping test method: 1 ☒ Pump 2 ☐ Bailer

Pumping rate: 4 GPM

Duration of pumping: 1 Hours ..... Mins

Static level: 11'0"

Water level end of pumping: 125 feet

Water levels during: 1 ☒ Pumping 2 ☐ Recovery

15 minutes	30 minutes	45 minutes	60 minutes
220 feet	150 feet	150 feet	125 feet

If flowing give rate: GPM

Pump intake set at: feet

Water at end of test: ☐ Clear ☒ Cloudy

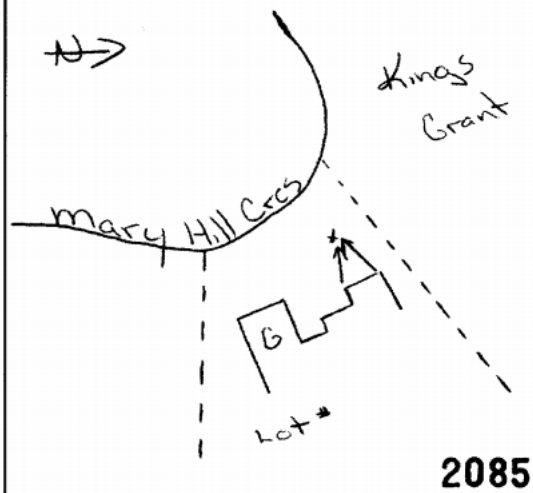
Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: 150 feet

Recommended pump rate: 5 GPM

LOCATION OF WELL

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



208587

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	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558
Address: P.O. Box 490 Stittsville,Ontario K2S 1A6	
Name of Well Technician: S. Miller	Well Technician's Licence No.: T0097
Signature of Technician/Contractor	Submission date: day 23 mo 5 yr 00

MINISTRY USE ONLY

Data source | Contractor: 1558 | Date received: JUN 20 2000

Date of inspection | Inspector

Remarks: CSS.ES0

0506 (11/98) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ministry of Environment and Energy
Ontario

LIKELY 30 MARY HILL CRESCENT

The Ontario Water Resources Act
WATER WELL RECORD

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

11 (1 2)

1530215

Municipality 15003 (10 14) Con. CON (15 22 23 24)

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
Ottawa Carleton	Goulbourn	4	25

Owner's surname (26-47) / First name: Cedarstone Homes
Address: P.O. Box 1297 Richmond, Ontario K0A 2Z0
Date completed (48-53): 8 day 9 month 98 year

21 (1 2) UTM Zone (10) Easting (12 17) Northing (18 24) RC (25) Elevation (26) RC (30) Basin Code (31) i ii iii iv (47)

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	Stones	Packed	0	12
Gray	Clay		Loose	12	51
Gray	Sandy Clay	Stones		51	52
Gray	Limestone		Medium	52	75

31 (10 14 15 21 32 43 54 65 75 80)
32 (10 14 15 21 32 43 54 65 75 80)

41 WATER RECORD

Water found at – feet	Kind of water
56	1 Fresh 2 Salty 3 Sulphur 4 Minerals 6 Gas
NOT TESTED	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	Depth – feet To
6 1/4	1 Steel 2 Galvanized 3 Concrete 4 Open hole 5 Plastic	.188	0	53.5
6	1 Steel 2 Galvanized 3 Concrete 4 Open hole 5 Plastic		53.5	75
	1 Steel 2 Galvanized 3 Concrete 4 Open hole 5 Plastic			

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38) inches	Length (39-40) feet
Material and type	Depth at top of screen (41-44) feet	(30)

61 PLUGGING & SEALING RECORD

X Annular space ☐ Abandonment

Depth set at – feet From	To	Material and type (Cement grout, bentonite, etc.)
52	0	Grouted Cement (8)

71 PUMPING TEST

Pumping test method (10): 1 ☐ Pump 2 ☐ Bailer — X
Pumping rate (11-14): 12 GPM
Duration of pumping (15-18): 1 Hours ..... Mins

Static level (19-21)	Water level end of pumping (22-24)	Water levels during (25): 1 ☐ Pumping 2 ☐ Recovery — X			
14'10"	60 feet	15 minutes (26-28): 15'2" feet	30 minutes (29-31): 15 feet	45 minutes (32-34): 14'11"	60 minutes (35-37): 14'10"

If flowing give rate (38-41)	Pump intake set at	Water at end of test
GPM	feet	☐ Clear X Cloudy

Recommended pump type	Recommended pump setting (43-45)	Recommended pump rate (46-49)
☐ Shallow X Deep	60 feet	5 GPM

(50-53)

LOCATION OF WELL

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

194716

FINAL STATUS OF WELL (54)

1 ☐ Water supply
2 X 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 (55-56)

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

METHOD OF CONSTRUCTION (57)

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

Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Address: P.O. Box 490 Stittsville, Ontario K2S 1A6

Name of Well Technician	Well Technician's Licence No.
S. Miller	T0097

Signature of Technician/Contractor: Scott Kavanagh
Submission date: day 10 mo 9 yr 98

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	1558	OCT 15 1998

Date of inspection | Inspector

Remarks

CSS. ES9

0506 (07/94) Front Form 9

2 - MINISTER OF ENVIRONMENT & ENERGY COPY

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3

B

LIKELY 2 HEMPHILL STREET

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton — Township, Village, ~~Town or City~~ Richmond

Con. 11 Lot — Date completed 24 (day) Oct (month) 1968 (year)

Owner Julia Constr. Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 46'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 25

Test-pumping rate 10 G.P.M.

Pumping level 25

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 35 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	0'	44'	58	fresh
hardpan	44'	46'		
limestone	46'	59'		

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

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

Drilling or Boring Firm Capital Water Supply Ltd.

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer M Kavanagh

Address

Date Oct 24 1968

Walter Kavanagh

(Signature of Licensed Drilling or Boring Contractor)

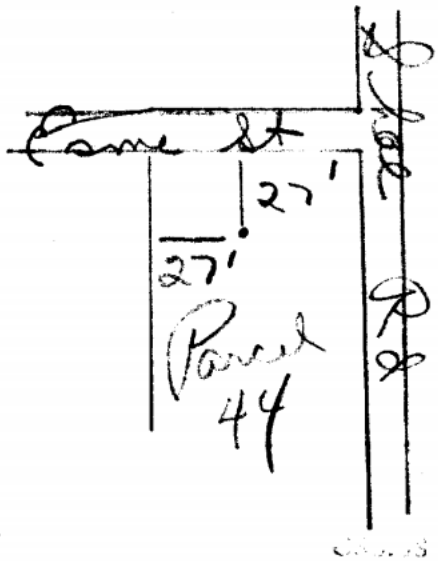
Form 7 5M 60-20912

OWRC COPY

Lot 11

Location of Well

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



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1509747

B

WATER RESOURCES DIVISION OCT 1 1968 ONTARIO WATER RESOURCES COMMISSION

LIKELY 3310 SHEA ROAD

1 1 8 4 3 4 4 7 0

4 5 0 0 5 7 8

4 0 3 0 4

2 5

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton — Township, Village, Town or City Richmond

Con. 1K Lot — Date completed 24 (day) Sept (month) 1968 (year)

Owner Julia Construction Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 42'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 10

Test-pumping rate 10 G.P.M.

Pumping level 12

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30 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	0'	41'	47	fresh
limestone	41'	48'		

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

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

Drilling or Boring Firm Capital Water Supply Ltd.

Address 14 Ashford Dr Ottawa 6

Licence Number 285

Name of Driller or Borer M Kavanagh

Address

Date 24 Sept 1968

Walter Kavanagh (Signature of Licensed Drilling or Boring Contractor)

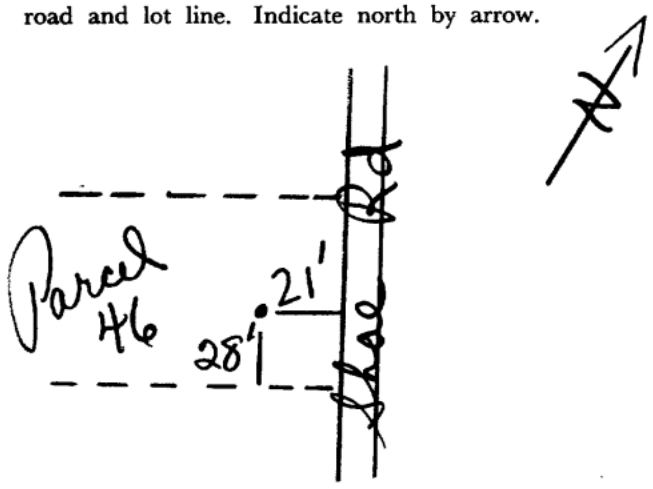
Form 7 5M 60-20912

OWRC COPY

lot 46

Location of Well

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



18 434490
5005760
4 0304
25 Carleton

CODED

1509751

WATER RESOURCES DIVISION
OCT 15 1968
ONTARIO WATER RESOURCES COMMISSION

B

The Ontario Water Resources Commission Act

WATER WELL RECORD

LIKELY 3316 SHEA ROAD

County or District Carleton — ~~Township~~, Village, ~~Town or City~~ Richmond

Con. IV — Lot — Date completed 25 (day) Sept (month) 1968 (year)

Owner Julia Constr. Ltd. (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 44'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole

Pumping Test

Static level 15

Test-pumping rate 10 G.P.M.

Pumping level 16

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30 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	0'	40'	51	fresh
gravel	40'	42'		
limestone	42	52		

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

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

Drilling or Boring Firm Capital Water Supply Ltd.

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer B Acres

Address

Date Sept 25 1968

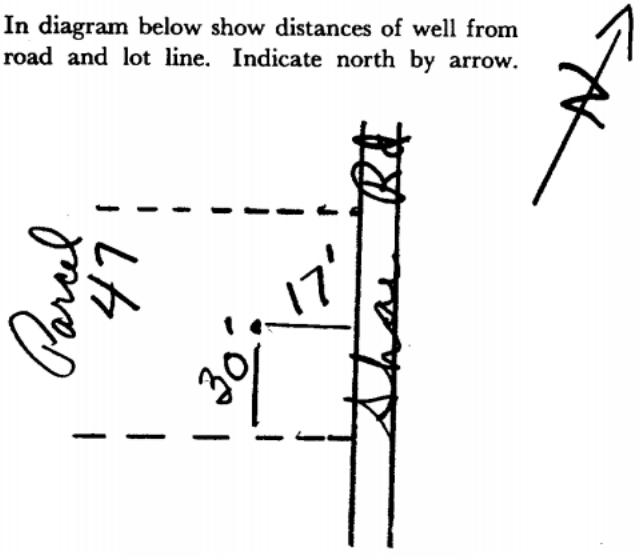
Walter Kavanagh
(Signature of Licensed Drilling or Boring Contractor)

Form 7 5M 60-20912

OWRC COPY

Location of Well

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



Lot 47

CSS.S3

yl 18 4 3 4 5 2 5 CODED
14 5 0 0 5 7 2 0
14 9 3 0 4
2 5

1509753

WATER RESOURCES DIVISION OCT 1 1968 ONTARIO WATER RESOURCES COMMISSION

B

LIKELY 3326 SHEA ROAD

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Carleton — Township, Village, ~~Town or City~~ Richmond

Con. 1/4 Lot — Date completed 24 (day) Sept (month) 1968 (year)

Owner Julia Construction Ltd (print in block letters) — Address Richmond Ont.

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 42'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 5"

Pumping Test

Static level 15'

Test-pumping rate 10 G.P.M.

Pumping level 17'

Duration of test pumping 1 hr

Water clear or cloudy at end of test

Recommended pumping rate 5 G.P.M.

with pump setting of 30 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	0	40	49	fresh
limestone	40	50		

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

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

Drilling or Boring Firm Capital Water Supply Ltd.

Address 14 Ashford Dr Ottawa 6

Licence Number 2857

Name of Driller or Borer B Acres

Address

Date Sept 24 1968

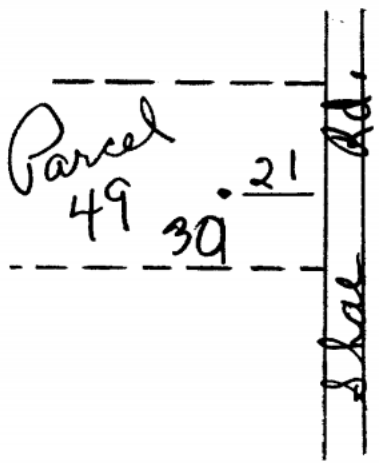
Walter Kavanagh
(Signature of Licensed Drilling or Boring Contractor)

Form 7 5M 60-20912

OWRC COPY

Location of Well

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



Lot 49

WATER WELL SYSTEM SURVEY QUESTIONNAIRE

Our File No.:	017630

SECTION A: PROPERTY INFORMATION	
Address of Property:	26 MARY HILL CRES
* Name of Property Owner:	[redacted]
* Telephone Number (Home):	
Number of Occupants:	2
Number of Bedrooms:	3
How Long at Present Address:	3 YRS

*This information will NOT be included in any reporting

SECTION B: WELL CONSTRUCTION DETAILS				
Date or year well constructed:	2001 ?			
~~Do you have a copy of the MOE Well Record?~~		☑ YES	☐ NO	
Well record number (if known):				
Type of well:		☑ Drilled	☐ Dug	
Well casing diameter (inches):				
Location of well (e.g. front yard, back yard, etc.):	FRONT			
Present well depth:	200FT	Original well depth:		☐ Same as present
Is the well accessible?		☑ YES	☐ NO	
Is it vented and how?	?			

SECTION C: WATER SUPPLY			
Do you have a water treatment system?		☑ YES	☐ NO
If yes, what kind of treatment?:			
Chlorination:	☐ YES	☐ NO	
Softener:	☑ YES	☐ NO	
Filter:	☑ YES	☐ NO	
Other:			

SECTION D: WATER QUALITY & QUANTITY			
Do you drink the water?	☑ YES	☐ NO	
If no, since when and why?			
Have you ever run out of water?	☐ YES	☑ NO	
Has your well ever been deepened or a new well constructed?	☐ YES	☑ NO	
If yes, why?			
Have you ever experienced any problems with your well?	NO		
What was the cause of the problem?		☐ Drought	☐ Pump Failure
☐ Increased Usage	☐ Interference	☐ Other (Please Specify)	

SECTION D CONTINUED: WATER QUALITY & QUANTITY			
Quality: Taste	☑ Excellent	☐ Acceptable	☐ Poor
Odour	☑ Excellent	☐ Acceptable	☐ Poor
Colour	☑ Excellent	☐ Acceptable	☐ Poor
Hardness	☐ Excellent	☑ Acceptable	☐ Poor
Iron	☐ Excellent	☑ Acceptable	☐ Poor
Sulphur Smell	☑ Excellent	☐ Acceptable	☐ Poor
Has your water quality been tested previously?		☑ YES	☐ NO
If yes, for what?	☑ Bacteriological	☐ Chemical analysis	☐ Other
Does your well supply enough water for your use?		☑ YES	☐ NO
If no, is this the case?:	☐ Some of the time	☐ Seasonally	☐ Other
Do you use your well for?:	☑ Lawn watering	☐ Pool filling	☑ Gardening
Number of persons using water from your well?		2	

SECTION E: WATER SAMPLING		
Would you be interested in having a water sample collected?	☑ YES	☐ NO

Please return this questionaire in the included pre-addressed, stamped envelope.

WATER WELL SYSTEM SURVEY QUESTIONNAIRE

Our File No.:	017630

SECTION A: PROPERTY INFORMATION	
Address of Property:	44 GAMBLES DR
* Name of Property Owner:	[redacted]
* Telephone Number (Home):	
Number of Occupants:	2
Number of Bedrooms:	4
How Long at Present Address:	35 YRS

*This information will NOT be included in any reporting

SECTION B: WELL CONSTRUCTION DETAILS			
Date or year well constructed:	OVER 47 APPROX (YRS)		
Do you have a copy of the MOE Well Record?		☐ YES	☒ NO
Well record number (if known):			
Type of well:		☒ Drilled	☐ Dug
Well casing diameter (inches):	NOT SURE		
Location of well (e.g. front yard, back yard, etc.):	FRONT YARD		
Present well depth:	36 FT	Original well depth: YES	☐ Same as present
Is the well accessible?		☒ YES	☐ NO
Is it vented and how?	YES TOP		

SECTION C: WATER SUPPLY			
Do you have a water treatment system?		☐ YES	☒ NO
If yes, what kind of treatment?:			
Chlorination:	☐ YES	☐ NO	
Softener:	☐ YES	☐ NO	
Filter:	☐ YES	☐ NO	
Other:			

SECTION D: WATER QUALITY & QUANTITY			
Do you drink the water?	☒ YES	☐ NO	
If no, since when and why?			
Have you ever run out of water?	☐ YES	☒ NO	
Has your well ever been deepened or a new well constructed?	☐ YES	☒ NO	
If yes, why?			
Have you ever experienced any problems with your well?	NO		
What was the cause of the problem?	☐ Drought	☐ Pump Failure	
☐ Increased Usage	☐ Interference	☐ Other (Please Specify)	

SECTION D CONTINUED: WATER QUALITY & QUANTITY			
Quality: Taste	☐ Excellent	☒ Acceptable	☐ Poor
Odour	☐ Excellent	☒ Acceptable	☐ Poor
Colour	☒ Excellent	☐ Acceptable	☐ Poor
Hardness	☐ Excellent	☒ Acceptable	☐ Poor
Iron	☐ Excellent	☒ Acceptable	☐ Poor
Sulphur Smell	☐ Excellent	☒ Acceptable	☐ Poor
Has your water quality been tested previously?		☐ YES	☒ NO
If yes, for what?	☐ Bacteriological	☐ Chemical analysis	☐ Other
Does your well supply enough water for your use?		☒ YES	☐ NO
If no, is this the case?:	☐ Some of the time	☐ Seasonally	☐ Other
Do you use your well for?:	☒ Lawn watering	☒ Pool filling	☒ Gardening
Number of persons using water from your well?		UP TO 5 PEOPLE	

SECTION E: WATER SAMPLING		
Would you be interested in having a water sample collected?	☒ YES	☐ NO

Please return this questionaire in the included pre-addressed, stamped envelope.

WATER WELL SYSTEM SURVEY QUESTIONNAIRE

Our File No.:	017630

SECTION A: PROPERTY INFORMATION	
Address of Property:	39 GAMBLE DR., RICHMOND, ON.
* Name of Property Owner:	[redacted]
* Telephone Number (Home):	
Number of Occupants:	2
Number of Bedrooms:	4
How Long at Present Address:	31

*This information will NOT be included in any reporting

SECTION B: WELL CONSTRUCTION DETAILS				
Date or year well constructed:	JULY 2, 1968			
~~Do you have a copy of the MOE Well Record?~~		☑ YES		☐ ~~NO~~
Well record number (if known):	1509810			
Type of well:		☑ Drilled		☐ Dug
Well casing diameter (inches):	5"			
Location of well (e.g. front yard, back yard, etc.):	FRONT YARD			
Present well depth:	51'	Original well depth:	51'	☑ Same as present
Is the well accessible?		☑ YES		☐ NO
Is it vented and how?	IN HOUSE			

SECTION C: WATER SUPPLY		
Do you have a water treatment system?	☐ YES	☑ NO
If yes, what kind of treatment?:		
Chlorination:	☐ YES	☑ NO
Softener:	☐ YES	☑ NO
Filter:	☐ YES	☑ NO
Other:		

SECTION D: WATER QUALITY & QUANTITY			
Do you drink the water?	☑ YES	☐ NO	
If no, since when and why?			
Have you ever run out of water?	☐ YES	☑ NO	
Has your well ever been deepened or a new well constructed?	☐ YES	☑ NO	
If yes, why?			
Have you ever experienced any problems with your well?	NO		
What was the cause of the problem?	☐ Drought	☑ Pump Failure	
☐ Increased Usage	☐ Interference	☐ Other (Please Specify)	

SECTION D CONTINUED: WATER QUALITY & QUANTITY			
Quality: Taste	☑ Excellent	☐ Acceptable	☐ Poor
Odour	☑ Excellent	☐ Acceptable	☐ Poor
Colour	☑ Excellent	☐ Acceptable	☐ Poor
Hardness	☐ Excellent	☑ Acceptable	☐ Poor
Iron	☐ Excellent	☑ Acceptable	☐ Poor
Sulphur Smell	☐ Excellent	☑ Acceptable	☐ Poor
Has your water quality been tested previously?		☑ YES	☐ NO
If yes, for what?	☑ Bacteriological	☐ Chemical analysis	☐ Other
Does your well supply enough water for your use?		☑ YES	☐ NO
If no, is this the case?:	☐ Some of the time	☐ Seasonally	☐ Other
Do you use your well for?:	☑ Lawn watering	☑ Pool filling	☑ Gardening
Number of persons using water from your well?		2	

SECTION E: WATER SAMPLING		
Would you be interested in having a water sample collected?	☑ YES	☐ NO

Please return this questionaire in the included pre-addressed, stamped envelope.

* WATER WELL SYSTEM SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☐ Residential ☐ Commercial ☐ Institutional ☐ Other

I. OWNER/OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER/OCCUPANT:

Name: [redacted] Telephone No. (business) .....

Address: 2 Hemphill Street Telephone No. (home) [redacted]

Number of Bedrooms 3 Number of Occupants 2

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 43 years

Is well water used for drinking water supply? Yes ☒ No ☐

If no, why not?.....

If no, how long has it been since well water was used for drinking?.....

If no, what is the origin of drinking water?.....

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Date or year constructed 1960 Contractor .....

Well record number (if known) .....

Type of well: Drilled ☒ Dug ☐ Well diameter (inches) 8 inch (?)

Location of well (e.g. front yard, back yard, etc.) Front yard

Present well depth 30 ft Original well depth ..... ☑ Same as present

Is the well accessible? Yes ☐ No ☐ By digging

Is well vented and how? [redacted]e Yes - 1 inch plastic hose runs parallel with supply line

* *Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

B. WATER QUANTITY

Does your well supply enough water for your use? Yes ☒ No ☐

If no, is this is the case: all the time ☐ some of the time ☐ seasonally ☐ other .....

Use: Domestic: No ☐ Yes ☐ No. of persons using water from well .....

Lawn Watering: No ☐ Yes ☐ Other Uses .....

Have you ever experienced any problems with your well? ....1 once.....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☒ Other (Please Specify) 90° elbow at well head broke (rusted)

Did you ever have your well deepened or cleaned, or a new well constructed? ....No.....

If so, why?.....

C. WATER QUALITY

Water Treatment equipment in use (if any).....softner.....

Has your well recently been chlorinated and, if so, when? ....No.....

How would you describe quality of your water? ☐Poor ☐Good ☒Excellent

Has your water quality previously been tested? No ☐ Yes ☒

If yes, for what and how often? (bacteriological, chemical analyses, etc.) .....

.....Probably once a year.....

D. WATER SAMPLING INFORMATION

Would you be interested in having a water sample collected? ☐No ☐Yes

Please return this questionnaire in the included pre- addressed, stamped envelope.

* *Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

September 2015 1418381

* WATER WELL SYSTEM SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other

I. OWNER/OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER/OCCUPANT:

Name: [redacted] Telephone No. (business) [redacted]

Address: 3317 Shea Rd Telephone No. (home) [redacted]

Number of Bedrooms 3 Number of Occupants 4

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 32 years

Is well water used for drinking water supply? Yes ☑ No ☐

If no, why not?

If no, how long has it been since well water was used for drinking?

If no, what is the origin of drinking water?

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Date or year constructed Late 60's Contractor don't know

Well record number (if known)

Type of well: Drilled ☑ Dug ☐ Well diameter (inches) 6"

Location of well (e.g. front yard, back yard, etc.) Front yard

Present well depth 45 ft Original well depth ☑ Same as present

Is the well accessible? Yes ☐ No ☑

Is well vented and how? yes 1" plastic pipe

* *Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

B. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this is the case: all the time ☐ some of the time ☐ seasonally ☐ other .....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....4....

Lawn Watering: No ☐ Yes ☑ Other Uses .....

Have you ever experienced any problems with your well? ....No....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) .....

Did you ever have your well deepened or cleaned, or a new well constructed? ....No....

If so, why? .....

C. WATER QUALITY

Water Treatment equipment in use (if any)....Softner....

Has your well recently been chlorinated and, if so, when? ....No....

How would you describe quality of your water? ☐ Poor ☑ Good ☐ Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) .....

.....E Coli..... every.....couple of months.....

D. WATER SAMPLING INFORMATION

Would you be interested in having a water sample collected? ☐ No ☑ Yes

Please return this questionnaire in the included pre- addressed, stamped envelope.

** Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

September 2015 1418381

* WATER WELL SYSTEM SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☒ Residential ☐ Commercial ☐ Institutional ☐ Other

I. OWNER/OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER/OCCUPANT:

Name: [redacted] Telephone No. (business)

Address: 3316 SHEA A Telephone No. (home) [redacted]

Number of Bedrooms 3 Number of Occupants 2

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 44 years

Is well water used for drinking water supply? Yes ☒ No ☐

If no, why not?

If no, how long has it been since well water was used for drinking?

If no, what is the origin of drinking water?

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Date or year constructed Approx 1967-68 Contractor N/A

Well record number (if known) unknown

Type of well: Drilled ☒ Dug ☐ Well diameter (inches) unknown

Location of well (e.g. front yard, back yard, etc.) FRONT YARD

Present well depth Approx 40 ft Original well depth ☒ Same as present

Is the well accessible? Yes ☐ No ☒

Is well vented and how? Vented thru basement wall

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B. WATER QUANTITY

Does your well supply enough water for your use? Yes ☒ No ☐

If no, is this is the case: all the time ☐ some of the time ☐ seasonally ☐ other .....

Use: Domestic: No ☐ Yes ☒ No. of persons using water from well ....3....

Lawn Watering: No ☐ Yes ☒ Other Uses .....

Have you ever experienced any problems with your well? ....No....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) .....

Did you ever have your well deepened or cleaned, or a new well constructed? .....

If so, why? ....Foot Valve ~~repaired~~ replaced....

C. WATER QUALITY

Water Treatment equipment in use (if any)..WATER SOFTENER....

Has your well recently been chlorinated and, if so, when? ....No....

How would you describe quality of your water? ☐Poor ☒Good ☐Excellent

Has your water quality previously been tested? No ☐ Yes ☒

If yes, for what and how often? (bacteriological, chemical analyses, etc.) .....

....Bacteriological....

D. WATER SAMPLING INFORMATION

Would you be interested in having a water sample collected? ☒No ☐Yes

Please return this questionnaire in the included pre- addressed, stamped envelope.

* *Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

* WATER WELL SYSTEM SURVEY QUESTIONNAIRE

TYPE OF DWELLING: ☑ Residential ☐ Commercial ☐ Institutional ☐ Other

I. OWNER/OCCUPANT INFORMATION AND GENERAL QUESTIONS:

OWNER/OCCUPANT:

Name: [redacted] Telephone No. (business) .....

Address: 3326 Shea Rd Telephone No. (home) [redacted]

Number of Bedrooms 3 Number of Occupants 3

GENERAL QUESTIONS

How long have you owned/occupied this dwelling? 1 1/2 years

Is well water used for drinking water supply? Yes ☐ No ☐

If no, why not? It is drinkable, but we have a filter system

If no, how long has it been since well water was used for drinking?

If no, what is the origin of drinking water?

II. WATER WELL

A. WELL CONSTRUCTION DETAILS:

Date or year constructed ..... Contractor .....

Well record number (if known) .....

Type of well: Drilled ☐ Dug ☐ Well diameter (inches) .....

Location of well (e.g. front yard, back yard, etc.) front yard

Present well depth ..... Original well depth ..... ☑ Same as present

Is the well accessible? Yes ☐ No ☑

Is well vented and how? No

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B. WATER QUANTITY

Does your well supply enough water for your use? Yes ☑ No ☐

If no, is this is the case: all the time ☐ some of the time ☐ seasonally ☐ other .....

Use: Domestic: No ☐ Yes ☑ No. of persons using water from well ....3.....

Lawn Watering: No ☒ Yes ☐ Other Uses .....

Have you ever experienced any problems with your well? ..no.....

What was the cause of the problem? ☐ Drought ☐ Pump Failure ☐ Plugging

☐ Increased Usage ☐ Interference ☐ Other (Please Specify) .....

Did you ever have your well deepened or cleaned, or a new well constructed? .....

If so, why? ..N.a.....

C. WATER QUALITY

Water Treatment equipment in use (if any)..Water Softener.....

Has your well recently been chlorinated and, if so, when? ....no.....

How would you describe quality of your water? ☐Poor ☑Good ☐Excellent

Has your water quality previously been tested? No ☐ Yes ☑

If yes, for what and how often? (bacteriological, chemical analyses, etc.) .When we bought the house, test came back good.....

D. WATER SAMPLING INFORMATION

Would you be interested in having a water sample collected? ☒No ☐Yes

Please return this questionnaire in the included pre- addressed, stamped envelope.

* *Water Well Survey Questionnaire from Golder Associates Ltd. Hydrogeological Study, dated September 2017, Report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa*

APPENDIX C

RESULTS OF LABORATORY TESTING OF TEST WELL WATER SAMPLES

Certificate of Analysis

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802379
Date Submitted:	2018-02-17
Date Reported:	2018-02-20
Project:	017630
COC #:	192756

Dear Dan Morey:

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, Team Leader

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

Eurofins 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.

Eurofins (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.

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. Eurofins recommends consulting the official provincial or federal guideline as required.

Certificate of Analysis

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802379
Date Submitted: 2018-02-17
Date Reported: 2018-02-20
Project: 017630
COC #: 192756

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1345671 / Water / / 2018-02-16 / TWI 3hr
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Heterotrophic Plate Count	0	ct/1mL		202
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802377
Date Submitted:	2018-02-17
Date Reported:	2018-02-27
Project:	017630
COC #:	192756

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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

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Certificate of Analysis

eurofins | Environment Testing

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Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802377
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192756

				Lab I.D.	1345669
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-16
				Sample I.D.	TWI 3hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG 100	113*
	Ion Balance	0.01			0.91
	TDS (COND - CALC)	1	mg/L	AO 500	555*
General Chemistry	Alkalinity as CaCO3	10	mg/L	OG 500	241
	Cl	1	mg/L	AO 250	101
	Colour	2	TCU	AO 5	4
	Conductivity	5	uS/cm		854
	F	0.10	mg/L	MAC 1.5	1.20
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	pH	1.00		6.5-8.5	8.47
	SO4	1	mg/L	AO 500	36
	Turbidity	0.1	NTU	AO 5.0	1.1
Metals	Ca	1	mg/L		22
	Fe	0.03	mg/L	AO 0.3	0.13
	K	1	mg/L		8
	Mg	1	mg/L		14
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	120
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.5
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	1.3
	N-NH3	0.01	mg/L		0.49
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		<0.1

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802377
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192756

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 340887 **Analysis/Extraction Date** 2018-02-20 **Analyst** C_F			
Method C SM2130B			
Turbidity	0.1 NTU	101	70-130
Run No 340888 **Analysis/Extraction Date** 2018-02-21 **Analyst** H_F			
Method SM 4110			
Chloride	<1 mg/L	110	90-110
SO4	<1 mg/L	111	90-110
Run No 340893 **Analysis/Extraction Date** 2018-02-20 **Analyst** SKH			
Method EPA 200.8			
Iron	<0.03 mg/L	96	91-109
Manganese	<0.01 mg/L	100	92.9-107
Run No 340924 **Analysis/Extraction Date** 2018-02-23 **Analyst** R_E			
Method C SM2120C			
Colour	<2 TCU	98	90-110
Run No 340947 **Analysis/Extraction Date** 2018-02-21 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	92	90-110
Potassium	<1 mg/L	107	87-113

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802377
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192756

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Magnesium	<1 mg/L	92	76-124
Sodium	<2 mg/L	104	82-118
Run No 341060 **Analysis/Extraction Date** 2018-02-22 **Analyst** R_E			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	93	80-120
Run No 341062 **Analysis/Extraction Date** 2018-02-23 **Analyst** H_D			
Method SM 2320B			
Alkalinity (CaCO3)	<10 mg/L	102	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	102	90-110
Method SM 4500-H+B			
pH		145	90-110
Run No 341108 **Analysis/Extraction Date** 2018-02-23 **Analyst** H_D			
Method SM 4500-FC			
F	<0.10 mg/L	101	90-110
Run No 341152 **Analysis/Extraction Date** 2018-02-23 **Analyst** AET			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	90	

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802377
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192756

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NH3	<0.01 mg/L	104	
Phenols	<0.001 mg/L	92	69-132
S2-	<0.02 mg/L	104	
Tannin & Lignin	<0.1 mg/L	90	
Total Kjeldahl Nitrogen	<0.1 mg/L	91	81-126
Run No 341162 **Analysis/Extraction Date** 2018-02-26 **Analyst** AET			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802377
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192756

Sample Comment Summary

Sample ID: 1345669 TWI 3hr Holding time for turbidity analysis was exceeded.

Guideline = ODWSOG *** = Guideline Exceedence**

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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802380
Date Submitted:	2018-02-17
Date Reported:	2018-02-20
Project:	017630
COC #:	192755

Dear Dan Morey:

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, Team Leader

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

Eurofins 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.

Eurofins (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.

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. Eurofins recommends consulting the official provincial or federal guideline as required.

eurofins | Environment Testing

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802380
Date Submitted: 2018-02-17
Date Reported: 2018-02-20
Project: 017630
COC #: 192755

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1345672 Water 2018-02-16 TWI 6hr
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Heterotrophic Plate Count	0	ct/1mL		361
	Total Coliforms	0	ct/100mL	MAC 0	4*

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802378
Date Submitted:	2018-02-17
Date Reported:	2018-02-27
Project:	017630
COC #:	192755

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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

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Certificate of Analysis

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802378
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192755

				Lab I.D.	1345670
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-16
				Sample I.D.	Tw1 6hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG 100	113*
	Ion Balance	0.01			0.93
	TDS (COND - CALC)	1	mg/L	AO 500	552*
General Chemistry	Alkalinity as CaCO3	10	mg/L	OG 500	228
	Cl	1	mg/L	AO 250	104
	Colour	2	TCU	AO 5	3
	Conductivity	5	uS/cm		849
	F	0.10	mg/L	MAC 1.5	1.22
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	pH	1.00		6.5-8.5	8.45
	SO4	1	mg/L	AO 500	36
	Turbidity	0.1	NTU	AO 5.0	1.2
Metals	Ca	1	mg/L		22
	Fe	0.03	mg/L	AO 0.3	0.11
	K	1	mg/L		8
	Mg	1	mg/L		14
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	120
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.5
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	<0.5
	N-NH3	0.01	mg/L		0.49
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		<0.1

Guideline = ODWSOG *** = Guideline Exceedence**

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

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2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
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Report Number: 1802378
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192755

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 340887 **Analysis/Extraction Date** 2018-02-20 **Analyst** C_F			
Method C SM2130B			
Turbidity	0.1 NTU	101	70-130
Run No 340888 **Analysis/Extraction Date** 2018-02-21 **Analyst** H_F			
Method SM 4110			
Chloride	<1 mg/L	110	90-110
SO4	<1 mg/L	111	90-110
Run No 340893 **Analysis/Extraction Date** 2018-02-20 **Analyst** SKH			
Method EPA 200.8			
Iron	<0.03 mg/L	96	91-109
Manganese	<0.01 mg/L	100	92.9-107
Run No 340924 **Analysis/Extraction Date** 2018-02-23 **Analyst** R_E			
Method C SM2120C			
Colour	<2 TCU	98	90-110
Run No 340947 **Analysis/Extraction Date** 2018-02-21 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	92	90-110
Potassium	<1 mg/L	107	87-113

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

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2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802378
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192755

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Magnesium	<1 mg/L	92	76-124
Sodium	<2 mg/L	104	82-118
Run No 341060 **Analysis/Extraction Date** 2018-02-22 **Analyst** R_E			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	93	80-120
Run No 341062 **Analysis/Extraction Date** 2018-02-23 **Analyst** H_D			
Method SM 2320B			
Alkalinity (CaCO3)	<10 mg/L	102	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	102	90-110
Method SM 4500-H+B			
pH		145	90-110
Run No 341108 **Analysis/Extraction Date** 2018-02-23 **Analyst** H_D			
Method SM 4500-FC			
F	<0.10 mg/L	101	90-110
Run No 341153 **Analysis/Extraction Date** 2018-02-23 **Analyst** AET			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	90	

Guideline = ODWSOG *** = Guideline Exceedence**

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Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802378
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192755

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NH3	<0.01 mg/L	104	
Phenols	<0.001 mg/L	92	69-132
S2-	<0.02 mg/L	104	
Tannin & Lignin	<0.1 mg/L	90	
Total Kjeldahl Nitrogen	<0.1 mg/L	91	81-126
Run No 341162 **Analysis/Extraction Date** 2018-02-26 **Analyst** AET			
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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Attention: Mr. Dan Morey
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Invoice to: Morey Associates

Report Number: 1802378
Date Submitted: 2018-02-17
Date Reported: 2018-02-27
Project: 017630
COC #: 192755

Sample Comment Summary

Sample ID: 1345670 Tw1 6hr Holding time for turbidity analysis was exceeded.

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

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Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802616
Date Submitted:	2018-02-23
Date Reported:	2018-02-25
Project:	017630
COC #:	192915

Dear Dan Morey:

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, Team Leader

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

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Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802616
Date Submitted: 2018-02-23
Date Reported: 2018-02-25
Project: 017630
COC #: 192915

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1346273 Water - 2018-02-22 TW2 3hr
Microbiology	Heterotrophic Plate Count	0	ct/1mL		4
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.

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Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802607
Date Submitted:	2018-02-23
Date Reported:	2018-03-02
Project:	017630
COC #:	192915

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802607
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192915

				Lab I.D.	1346241
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-22
				Sample I.D.	TW2 3hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG 100	117*
	Ion Balance	0.01			0.94
	TDS (COND - CALC)	1	mg/L	AO 500	491
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	243
	Cl	1	mg/L	AO 250	80
	Colour	2	TCU	AO 5	20*
	Conductivity	5	uS/cm		756
	F	0.10	mg/L	MAC 1.5	1.20
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	pH	1.00		6.5-8.5	8.24
	SO4	1	mg/L	AO 500	33
	Turbidity	0.1	NTU	AO 5.0	9.1*
Metals	Ca	1	mg/L		22
	Fe	0.03	mg/L	AO 0.3	0.41*
	K	1	mg/L		7
	Mg	1	mg/L		15
	Mn	0.01	mg/L	AO 0.05	0.05
	Na	2	mg/L	AO 200	112
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.4
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	1.5
	N-NH3	0.01	mg/L		0.34
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		0.1

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

Client: Morey Associates
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Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802607
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192915

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341078 **Analysis/Extraction Date** 2018-02-23 **Analyst** SKH			
Method EPA 200.8			
Manganese	<0.01 mg/L	100	92.9-107
Run No 341092 **Analysis/Extraction Date** 2018-02-23 **Analyst** C F			
Method C SM2130B			
Turbidity	<0.1 NTU	99	70-130
Run No 341096 **Analysis/Extraction Date** 2018-02-26 **Analyst** R E			
Method C SM2120C			
Colour	<2 TCU	90	90-110
Run No 341108 **Analysis/Extraction Date** 2018-02-23 **Analyst** H D			
Method SM 2320B			
Alkalinity (CaCO3)	<5 mg/L	101	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	100	90-110
Method SM 4500-FC			
F	<0.10 mg/L	101	90-110
Method SM 4500-H+B			
pH		100	90-110

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Report Number: 1802607
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192915

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341175 **Analysis/Extraction Date** 2018-02-26 **Analyst** SKH			
Method EPA 200.8			
Iron	<0.03 mg/L	95	91-109
Run No 341182 **Analysis/Extraction Date** 2018-02-27 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	97	90-110
Potassium	<1 mg/L	102	87-113
Magnesium	<1 mg/L	96	76-124
Sodium	<2 mg/L	99	82-118
Run No 341251 **Analysis/Extraction Date** 2018-02-28 **Analyst** H_F			
Method SM 4110			
Chloride	<1 mg/L	104	90-110
SO4	<1 mg/L	105	90-110
Run No 341353 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	90	80-120
Run No 341372 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			

Guideline = ODWSOG *** = Guideline Exceedence**

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Report Number: 1802607
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192915

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Method C Ion Balance			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Run No 341392 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	95	
N-NH3	<0.01 mg/L	108	
Phenols	<0.001 mg/L	84	69-132
S2-	<0.02 mg/L	102	
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	97	81-126

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

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Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802618
Date Submitted:	2018-02-23
Date Reported:	2018-02-25
Project:	017630
COC #:	192916

Dear Dan Morey:

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, Team Leader

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Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802618
Date Submitted: 2018-02-23
Date Reported: 2018-02-25
Project: 017630
COC #: 192916

				Lab I.D.	1346275
				Sample Matrix	Water
				Sample Type	-
				Sampling Date	2018-02-22
				Sample I.D.	TW2 6hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Microbiology	Heterotrophic Plate Count	0	ct/1mL		1
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802609
Date Submitted:	2018-02-23
Date Reported:	2018-03-02
Project:	017630
COC #:	192916

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

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Client: Morey Associates
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Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802609
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192916

				Lab I.D.	1346242
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-22
				Sample I.D.	TW2 6hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG 100	117*
	Ion Balance	0.01			0.99
	TDS (COND - CALC)	1	mg/L	AO 500	493
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	232
	Cl	1	mg/L	AO 250	80
	Colour	2	TCU	AO 5	14*
	Conductivity	5	uS/cm		759
	F	0.10	mg/L	MAC 1.5	1.18
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	pH	1.00		6.5-8.5	8.22
	SO4	1	mg/L	AO 500	32
	Turbidity	0.1	NTU	AO 5.0	10.6*
Metals	Ca	1	mg/L		22
	Fe	0.03	mg/L	AO 0.3	0.39*
	K	1	mg/L		7
	Mg	1	mg/L		15
	Mn	0.01	mg/L	AO 0.05	0.04
	Na	2	mg/L	AO 200	116
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.4
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	<0.5
	N-NH3	0.01	mg/L		0.35
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		0.1

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802609
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192916

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341078 **Analysis/Extraction Date** 2018-02-23 **Analyst** SKH			
Method EPA 200.8			
Iron	<0.03 mg/L	94	91-109
Manganese	<0.01 mg/L	100	92.9-107
Run No 341092 **Analysis/Extraction Date** 2018-02-23 **Analyst** C_F			
Method C SM2130B			
Turbidity	<0.1 NTU	99	70-130
Run No 341096 **Analysis/Extraction Date** 2018-02-26 **Analyst** R_E			
Method C SM2120C			
Colour	<2 TCU	90	90-110
Run No 341108 **Analysis/Extraction Date** 2018-02-23 **Analyst** H_D			
Method SM 2320B			
Alkalinity (CaCO3)	<5 mg/L	101	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	100	90-110
Method SM 4500-FC			
F	<0.10 mg/L	101	90-110
Method SM 4500-H+B			
pH		100	90-110

Guideline = ODWSOG *** = Guideline Exceedence**

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

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Attention: Mr. Dan Morey
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Report Number: 1802609
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192916

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341182 **Analysis/Extraction Date** 2018-02-27 **Analyst** H F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	97	90-110
Potassium	<1 mg/L	102	87-113
Magnesium	<1 mg/L	96	76-124
Sodium	<2 mg/L	99	82-118
Run No 341251 **Analysis/Extraction Date** 2018-02-28 **Analyst** H F			
Method SM 4110			
Chloride	<1 mg/L	104	90-110
SO4	<1 mg/L	105	90-110
Run No 341353 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	90	80-120
Run No 341372 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

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Attention: Mr. Dan Morey
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Report Number: 1802609
Date Submitted: 2018-02-23
Date Reported: 2018-03-02
Project: 017630
COC #: 192916

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Run No 341389 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	102	
N-NH3	<0.01 mg/L	108	
Phenols	<0.001 mg/L	84	69-132
S2-	<0.02 mg/L	102	
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	97	81-126

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

Certificate of Analysis

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Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802939
Date Submitted: 2018-03-01
Date Reported: 2018-03-04
Project: 017630
COC #: 192757

Dear Dan Morey:

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, Team Leader

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

Eurofins 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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802939
Date Submitted: 2018-03-01
Date Reported: 2018-03-04
Project: 017630
COC #: 192757

				Lab I.D.	1347081
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-28
				Sample I.D.	TW3 3Hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Microbiology	Heterotrophic Plate Count	0	ct/1mL		24
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802929
Date Submitted:	2018-03-01
Date Reported:	2018-03-07
Project:	017630
COC #:	192757

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

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Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
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Report Number: 1802929
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192757

				Lab I.D.	1347060
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-28
				Sample I.D.	TW3 3Hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG 100	120*
	Ion Balance	0.01			0.93
	TDS (COND - CALC)	1	mg/L	AO 500	530*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	234
	Cl	1	mg/L	AO 250	100
	Colour	2	TCU	AO 5	<2
	Conductivity	5	uS/cm		815
	F	0.10	mg/L	MAC 1.5	0.95
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	0.24
	pH	1.00		6.5-8.5	8.24
	SO4	1	mg/L	AO 500	45
	Turbidity	0.1	NTU	AO 5.0	2.5
Metals	Ca	1	mg/L		25
	Fe	0.03	mg/L	AO 0.3	0.12
	K	1	mg/L		7
	Mg	1	mg/L		14
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	123
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.2
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	<0.5
	N-NH3	0.01	mg/L		0.22
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		<0.1

Guideline = ODWSOG *** = Guideline Exceedence**

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Report Number: 1802929
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192757

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341345 **Analysis/Extraction Date** 2018-03-01 **Analyst** C_F			
Method C SM2130B			
Turbidity	<0.1 NTU	99	70-130
Run No 341355 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method C SM2120C			
Colour	<2 TCU	105	90-110
Run No 341401 **Analysis/Extraction Date** 2018-03-02 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	99	90-110
Potassium	<1 mg/L	107	87-113
Magnesium	<1 mg/L	97	76-124
Sodium	<2 mg/L	97	82-118
Run No 341414 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method EPA 200.8			
Iron	<0.03 mg/L	97	91-109
Manganese	<0.01 mg/L	103	92.9-107
Run No 341456 **Analysis/Extraction Date** 2018-03-05 **Analyst** H_F			
Method SM 4110			

Guideline = ODWSOG *** = Guideline Exceedence**

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Report Number: 1802929
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192757

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Chloride	<1 mg/L	102	90-110
SO4	<1 mg/L	105	90-110
Run No 341457 **Analysis/Extraction Date** 2018-03-02 **Analyst** AET			
Method SM 2320B			
Alkalinity (CaCO3)	<5 mg/L	102	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	101	90-110
Method SM 4500-FC			
F	<0.10 mg/L	103	90-110
Method SM 4500-H+B			
pH		100	90-110
Run No 341496 **Analysis/Extraction Date** 2018-03-05 **Analyst** AET			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	100	80-120
N-NO3	<0.10 mg/L	87	80-120
Run No 341647 **Analysis/Extraction Date** 2018-03-06 **Analyst** SDC			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	100	
N-NH3	<0.01 mg/L	101	

Guideline = ODWSOG *** = Guideline Exceedence**

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Report Number: 1802929
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192757

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Phenols	<0.001 mg/L	108	69-132
S2-	<0.02 mg/L	104	
Tannin & Lignin			
Total Kjeldahl Nitrogen	<0.1 mg/L	94	81-126
Run No 341656 **Analysis/Extraction Date** 2018-03-07 **Analyst** AET			
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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Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802938
Date Submitted:	2018-03-01
Date Reported:	2018-03-04
Project:	017630
COC #:	192917

Dear Dan Morey:

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, Team Leader

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Report Number: 1802938
Date Submitted: 2018-03-01
Date Reported: 2018-03-04
Project: 017630
COC #: 192917

				Lab I.D.	1347080
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-02-28
				Sample I.D.	TW3 6Hr
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Microbiology	Heterotrophic Plate Count	0	ct/1mL		18
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.

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Report Number:	1802930
Date Submitted:	2018-03-01
Date Reported:	2018-03-07
Project:	017630
COC #:	192917

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Report Comments:

APPROVAL: _____
Addrine Thomas, Inorganics Supervisor

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Report Number: 1802930
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192917

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1347061 Water 2018-02-28 TW 3 6Hr
Calculations	Hardness as CaCO3	1	mg/L	OG 100	123*
	Ion Balance	0.01			0.97
	TDS (COND - CALC)	1	mg/L	AO 500	536*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	223
	Cl	1	mg/L	AO 250	100
	Colour	2	TCU	AO 5	3
	Conductivity	5	uS/cm		825
	F	0.10	mg/L	MAC 1.5	1.05
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	0.15
	pH	1.00		6.5-8.5	8.25
	SO4	1	mg/L	AO 500	41
	Turbidity	0.1	NTU	AO 5.0	2.3
Metals	Ca	1	mg/L		26
	Fe	0.03	mg/L	AO 0.3	0.09
	K	1	mg/L		7
	Mg	1	mg/L		14
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	123
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.3
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	<0.5
	N-NH3	0.01	mg/L		0.23
	S2-	0.02	mg/L	AO 0.05	<0.02
	Tannin & Lignin	0.1	mg/L		<0.1

Guideline = ODWSOG *** = Guideline Exceedence**

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

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Report Number: 1802930
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192917

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 341345 **Analysis/Extraction Date** 2018-03-01 **Analyst** C_F			
Method C SM2130B			
Turbidity	<0.1 NTU	99	70-130
Run No 341355 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method C SM2120C			
Colour	<2 TCU	105	90-110
Run No 341401 **Analysis/Extraction Date** 2018-03-02 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	99	90-110
Potassium	<1 mg/L	107	87-113
Magnesium	<1 mg/L	97	76-124
Sodium	<2 mg/L	97	82-118
Run No 341414 **Analysis/Extraction Date** 2018-03-01 **Analyst** AET			
Method EPA 200.8			
Iron	<0.03 mg/L	97	91-109
Manganese	<0.01 mg/L	103	92.9-107
Run No 341456 **Analysis/Extraction Date** 2018-03-05 **Analyst** H_F			
Method SM 4110			

Guideline = ODWSOG *** = Guideline Exceedence**

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Certificate of Analysis

Client: Morey Associates
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K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802930
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192917

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Chloride	<1 mg/L	102	90-110
SO4	<1 mg/L	105	90-110
Run No 341457 **Analysis/Extraction Date** 2018-03-02 **Analyst** AET			
Method SM 2320B			
Alkalinity (CaCO3)	<5 mg/L	102	90-110
Method SM 2510B			
Conductivity	<5 uS/cm	101	90-110
Method SM 4500-FC			
F	<0.10 mg/L	103	90-110
Method SM 4500-H+B			
pH		100	90-110
Run No 341496 **Analysis/Extraction Date** 2018-03-05 **Analyst** AET			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	103	80-120
N-NO3	<0.10 mg/L	93	80-120
Run No 341636 **Analysis/Extraction Date** 2018-03-07 **Analyst** AET			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
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Report Number: 1802930
Date Submitted: 2018-03-01
Date Reported: 2018-03-07
Project: 017630
COC #: 192917

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Run No 341648 **Analysis/Extraction Date** 2018-03-06 **Analyst** SDC			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	100	
N-NH3	<0.01 mg/L	101	
Phenols	<0.001 mg/L	108	69-132
S2-	<0.02 mg/L	104	
Tannin & Lignin			
Total Kjeldahl Nitrogen	<0.1 mg/L	94	81-126

Guideline = ODWSOG *** = Guideline Exceedence**

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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1803745
Date Submitted:	2018-03-15
Date Reported:	2018-03-19
Project:	017630
COC #:	192918

Dear Dan Morey:

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, Microbiology Supervisor

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

Eurofins 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.

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

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eurofins | Environment Testing

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1803745
Date Submitted: 2018-03-15
Date Reported: 2018-03-19
Project: 017630
COC #: 192918

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1349267 / Water / / 2018-03-15 / TW1
Others	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1803746
Date Submitted:	2018-03-15
Date Reported:	2018-03-19
Project:	017630
COC #:	194176

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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

Eurofins 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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1803746
Date Submitted: 2018-03-15
Date Reported: 2018-03-19
Project: 017630
COC #: 194176

				Lab I.D.	1349268
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2018-03-15
				Sample I.D.	TW2
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
General Chemistry	Colour	2	TCU	AO 5	3

Guideline = ODWSOG *** = Guideline Exceedence**

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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1803746
Date Submitted: 2018-03-15
Date Reported: 2018-03-19
Project: 017630
COC #: 194176

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 342108 **Analysis/Extraction Date** 2018-03-16 **Analyst** A_V			
Method C SM2120C			
Colour	<2 TCU	75	90-110

Guideline = ODWSOG *** = Guideline Exceedence**

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

APPENDIX D

RESULTS OF LABORATORY TESTING OF NEIGHBOURING WELL WATER SAMPLES

Certificate of Analysis

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802063
Date Submitted:	2018-02-13
Date Reported:	2018-02-15
Project:	017630
COC #:	190259

Dear Dan Morey:

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, Microbiology Supervisor

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

Eurofins 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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eurofins | Environment Testing

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802063
Date Submitted: 2018-02-13
Date Reported: 2018-02-15
Project: 017630
COC #: 190259

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
					1344809 Water 2018-02-12 44 Gamble Dr.
Microbiology	Heterotrophic Plate Count	0	ct/1mL		0
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1802076
Date Submitted:	2018-02-13
Date Reported:	2018-02-21
Project:	017630
COC #:	190259

Dear Dan Morey:

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: _____
Addrine Thomas, Inorganics Supervisor

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

Eurofins 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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802076
Date Submitted: 2018-02-13
Date Reported: 2018-02-21
Project: 017630
COC #: 190259

Group	Analyte	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sampling Date / Sample I.D.
					1344862 / Water / / 2018-02-12 / 44 Gamble Dr
Calculations	Hardness as CaCO3	1	mg/L	OG 100	117*
	Ion Balance	0.01			1.01
	TDS (COND - CALC)	1	mg/L	AO 500	515*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	232
	Cl	1	mg/L	AO 250	91
	Colour	2	TCU	AO 5	6*
	Conductivity	5	uS/cm		792
	F	0.10	mg/L	MAC 1.5	1.15
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	pH	1.00		6.5-8.5	8.19
	SO4	1	mg/L	AO 500	30
	Turbidity	0.1	NTU	AO 5.0	0.4
Metals	Ca	1	mg/L		19
	Fe	0.03	mg/L	AO 0.3	0.14
	K	1	mg/L		7
	Mg	1	mg/L		17
	Mn	0.01	mg/L	AO 0.05	<0.01
	Na	2	mg/L	AO 200	124
Nutrients	Total Kjeldahl Nitrogen	0.1	mg/L		0.6
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO 5	1.4
	N-NH3	0.02	mg/L		0.51
	S2-	0.02	mg/L	AO 0.05	0.06*
	Tannin & Lignin	0.1	mg/L		0.2

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802076
Date Submitted: 2018-02-13
Date Reported: 2018-02-21
Project: 017630
COC #: 190259

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 340672 **Analysis/Extraction Date** 2000-00-18 **Analyst** C_F			
Method C SM2130B			
Turbidity	<0.1 NTU	100	70-130
Run No 340694 **Analysis/Extraction Date** 2018-02-14 **Analyst** H_F			
Method SM 4110			
Chloride	<1 mg/L	110	90-110
SO4	<1 mg/L	111	90-110
Run No 340696 **Analysis/Extraction Date** 2018-02-13 **Analyst** R_E			
Method C SM4500-NO3-F			
N-NO2	<0.10 mg/L	103	80-120
N-NO3	<0.10 mg/L	87	80-120
Run No 340745 **Analysis/Extraction Date** 2018-02-14 **Analyst** SKH			
Method EPA 200.8			
Iron	<0.03 mg/L	93	91-109
Manganese	<0.01 mg/L	97	92.9-107
Run No 340748 **Analysis/Extraction Date** 2018-02-15 **Analyst** H_F			
Method M SM3120B-3500C			
Calcium	<1 mg/L	97	90-110

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802076
Date Submitted: 2018-02-13
Date Reported: 2018-02-21
Project: 017630
COC #: 190259

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Potassium	<1 mg/L	97	87-113
Magnesium	<1 mg/L	97	76-124
Sodium	<2 mg/L	97	82-118
Run No 340833 **Analysis/Extraction Date** 2018-02-16 **Analyst** H D			
Method SM 2320B			
Alkalinity (CaCO3)	<5 mg/L	96	90-110
Method SM 2510B			
Conductivity	5 uS/cm	101	90-110
Method SM 4500-FC			
F	<0.10 mg/L	94	90-110
Method SM 4500-H+B			
pH		100	90-110
Run No 340922 **Analysis/Extraction Date** 2018-02-15 **Analyst** AET			
Method SUBCONTRACT P-INORG			
DOC	<0.5 mg/L	105	
N-NH3	<0.01 mg/L	98	
Phenols	<0.001 mg/L	124	69-132
S2-	<0.02 mg/L	104	
Tannin & Lignin	<0.1 mg/L	100	

Guideline = ODWSOG *** = Guideline Exceedence**

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: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1802076
Date Submitted: 2018-02-13
Date Reported: 2018-02-21
Project: 017630
COC #: 190259

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Total Kjeldahl Nitrogen	<0.1 mg/L	92	81-126
Run No 340924 **Analysis/Extraction Date** 2018-02-21 **Analyst** R_E			
Method C SM2120C			
Colour	<2 TCU	98	90-110
Run No 340938 **Analysis/Extraction Date** 2018-02-21 **Analyst** AET			
Method C Ion Balance			
Ion Balance			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			

Guideline = ODWSOG *** = Guideline Exceedence**

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

eurofins | Environment Testing

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number:	1804402
Date Submitted:	2018-03-28
Date Reported:	2018-04-02
Project:	017630
COC #:	194197

Dear Dan Morey:

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, Microbiology Supervisor

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

Eurofins 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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eurofins | Environment Testing

Certificate of Analysis

Client: Morey Associates
2672 Highway 43
Kemptville, ON
K0G 1J0
Attention: Mr. Dan Morey
PO#:
Invoice to: Morey Associates

Report Number: 1804402
Date Submitted: 2018-03-28
Date Reported: 2018-04-02
Project: 017630
COC #: 194197

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D. 1350999 Water 2018-03-27 39 Gamble Dr.
Microbiology	Heterotrophic Plate Count	0	ct/1mL		1
Others	Escherichia Coli	0	ct/100mL	MAC 0	0
	Faecal Coliforms	0	ct/100mL		0
	Total Coliforms	0	ct/100mL	MAC 0	0

Guideline = ODWSOG *** = Guideline Exceedence**

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: Golder Associates Ltd. (Ottawa)
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms. Caitlin Cooke
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1521146
Date Submitted: 2015-10-23
Date Reported: 2015-10-25
Project: 1418381
COC #: 180449

Dear Caitlin Cooke:

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 2015.10.25 13:47:27 -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.

Water well sample laboratory testing results from Golder Associates Ltd. Hydrogeological Study, dated September 2017, report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa

EXOVA ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Golder Associates Ltd. (Ottawa)
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms. Caitlin Cooke
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1521146
Date Submitted: 2015-10-23
Date Reported: 2015-10-25
Project: 1418381
COC #: 180449

				Lab I.D.	1209515
				Sample Matrix	Water
				Sample Type	-
				Sampling Date	2015-10-23
				Sample I.D.	3310 Shea
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Microbiology	Escherichia Coli	0	ct/100mL	MAC-0	0
	Total Coliforms	0	ct/100mL	MAC-0	0

Water well sample laboratory testing results from Golder Associates Ltd. Hydrogeological Study, dated September 2017, report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa

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 ENVIRONMENTAL ONTARIO

Certificate of Analysis

Client: Golder Associates Ltd.
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms. Caitlin Cooke
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1521181
Date Submitted: 2015-10-23
Date Reported: 2015-11-02
Project: 1418381
COC #: 180449

Dear Caitlin Cooke:

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 2015.11.02 13:42:24 -05'00'

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.

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

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*Water well sample laboratory testing results from Golder Associates Ltd. Hydrogeological Study, dated September 2017, report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa

Client: Golder Associates Ltd.
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms. Caitlin Cooke
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1521181
Date Submitted: 2015-10-23
Date Reported: 2015-11-02
Project: 1418381
COC #: 180449

				Lab I.D.	1209571
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2015-10-23
				Sample I.D.	3310 Shea
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Calculations	Hardness as CaCO3	1	mg/L	OG-100	117*
	TDS (COND - CALC)	1	mg/L	AO-500	536*
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG-500	238
	Cl	1	mg/L	AO-250	100
	Colour	2	TCU	AO-5	3
	Conductivity	5	uS/cm		825
	F	0.10	mg/L	MAC-1.5	1.11
	N-NO2	0.10	mg/L	MAC-1.0	<0.10
	N-NO3	0.10	mg/L	MAC-10.0	<0.10
	pH	1.00		6.5-8.5	8.33
	SO4	1	mg/L	AO-500	38
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	0.52
	Ba	0.01	mg/L	MAC-1.0	0.08
	Be	0.0005	mg/L		<0.0005
	Ca	1	mg/L		19
	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	0.31*
	K	1	mg/L		6
	Mg	1	mg/L		17
	Mn	0.01	mg/L	AO-0.05	<0.01

*Water well sample laboratory testing results from Golder Associates Ltd. Hydrogoelogical Study, dated September 2017, report No. 1418381-1000, Rev.2, provided to us by the City of Ottawa

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Client: Golder Associates Ltd.
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms. Caitlin Cooke
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1521181
Date Submitted: 2015-10-23
Date Reported: 2015-11-02
Project: 1418381
COC #: 180449

				Lab I.D.	1209571
				Sample Matrix	Water
				Sample Type	
				Sampling Date	2015-10-23
				Sample I.D.	3310 Shea
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Metals	Mo	0.005	mg/L		<0.005
	Na	2	mg/L	AO-200	134
	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		2.86
	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		0.4
Phenols	Phenols	0.001	mg/L		<0.001
Subcontract	DOC	0.5	mg/L	AO-5	1.3
	N-NH3	0.01	mg/L		0.41
	PO4 as P	0.2	mg/L		<0.2
	Tannin & Lignin	0.1	mg/L		<0.1

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 297423 **Analysis/Extraction Date** 2015-10-27 **Analyst** SKH			
Method M SM3120B-3500C			
Calcium	<1 mg/L	103	90-110
Potassium	<1 mg/L	99	87-113
Magnesium	<1 mg/L	102	76-124
Sodium	<2 mg/L	99	82-118
Run No 297446 **Analysis/Extraction Date** 2015-10-27 **Analyst** AET			
Method C SM4500-H+B			
Alkalinity (CaCO3)	<5 mg/L	101	90-110
Conductivity	<5 uS/cm	101	90-110
F	<0.10 mg/L	98	90-110
pH	5.64	100	90-110
Run No 297487 **Analysis/Extraction Date** 2015-10-28 **Analyst** NP			
Method SM 4110C			
Chloride	<1 mg/L	102	90-112
SO4	<1 mg/L	104	90-110
Run No 297496 **Analysis/Extraction Date** 2015-10-28 **Analyst** K A			
Method EPA 200.8			

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Date Submitted: 2015-10-23
Date Reported: 2015-11-02
Project: 1418381
COC #: 180449

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Silver	<0.0001 mg/L	98	94-106
Aluminum	<0.01 mg/L	98	89-111
Arsenic	<0.001 mg/L	97	93-106
Boron (total)	<0.01 mg/L	101	88-112
Barium	<0.01 mg/L	103	91-109
Beryllium	<0.0005 mg/L	96	93-107
Cadmium	<0.0001 mg/L	96	93-107
Chromium Total	<0.001 mg/L	97	94-106
Copper	<0.001 mg/L	97	93-106
Iron	<0.03 mg/L	97	92-107
Manganese	<0.01 mg/L	99	94-106
Molybdenum	<0.005 mg/L	100	94-106
Nickel	<0.005 mg/L	97	94-106
Lead	<0.001 mg/L	100	70-130
Antimony	<0.0005 mg/L	108	80-120
Selenium	<0.001 mg/L	102	91-108
Strontium	<0.001 mg/L	103	89-110
Thallium	<0.0001 mg/L	97	95-105

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Uranium	<0.001 mg/L	99	94-106
Zinc	<0.01 mg/L	101	94-106
Run No 297545 **Analysis/Extraction Date** 2015-10-29 **Analyst** AET			
Method C SM2120C			
Colour	<2 TCU	104	90-110
Run No 297568 **Analysis/Extraction Date** 2015-10-28 **Analyst** JDT			
Method M SM3112B-3500B			
Mercury	<0.0001 mg/L	95	76-123
Run No 297648 **Analysis/Extraction Date** 2015-10-29 **Analyst** NP			
Method C SM4500-NO3-I			
N-NO2	<0.10 mg/L	107	80-120
N-NO3	<0.10 mg/L	95	80-120
Run No 297749 **Analysis/Extraction Date** 2015-10-28 **Analyst** SDC			
Method SUBCONTRACT P			
DOC	<0.5 mg/L	109	
N-NH3	<0.01 mg/L	96	
Phenols	<0.001 mg/L	112	
PO4 as P	<0.2 mg/L	118	
Tannin & Lignin	<0.1 mg/L	90	

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QC Summary

Analyte	Blank	QC % Rec	QC Limits
Total Kjeldahl Nitrogen	<0.1 mg/L	98	
Run No 297785 **Analysis/Extraction Date** 2015-11-02 **Analyst** SCM			
Method C SM2340B			
Hardness as CaCO3			
Method C SM2540			
TDS (COND - CALC)			
Run No 297787 **Analysis/Extraction Date** 2015-11-02 **Analyst** SCM			
Method C SM4500-Norg-C			
Organic Nitrogen			

Guideline = ODWSOG *** = Guideline Exceedence**
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APPENDIX E

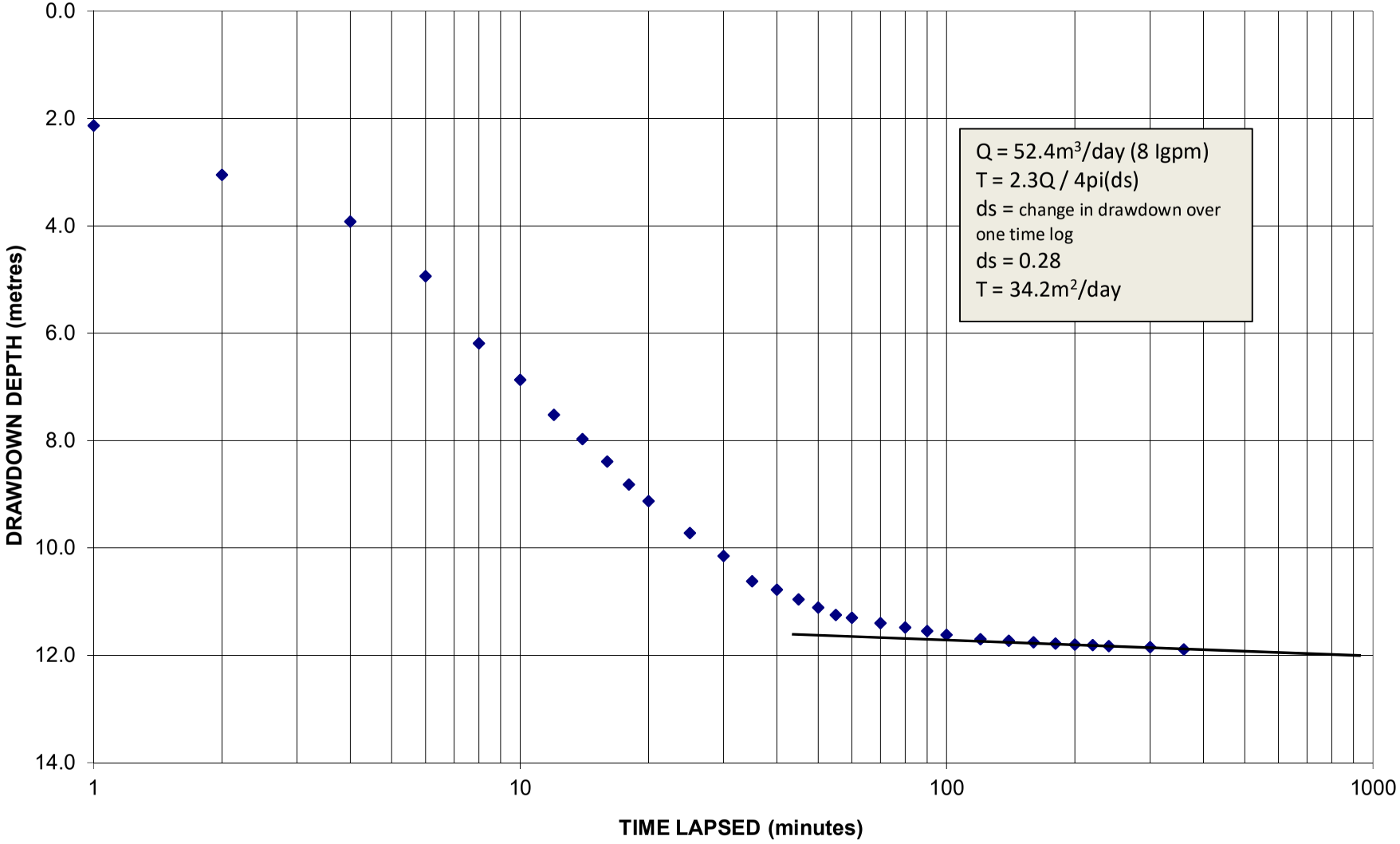
PUMPING TEST DATA FOR TEST WELL TW1

DRAWDOWN DATA TW1

File: 017630
Pump Test Date: Feb.16/18
Pump Rate: 8 lgpm

Time of Day	Time Lapsed (minutes)	Depth (metres)	h-ho (metres)
8:40	0	3.28	0.00
8:41	1	5.41	2.13
8:42	2	6.33	3.05
8:44	4	7.20	3.92
8:46	6	8.22	4.94
8:48	8	9.47	6.19
8:50	10	10.15	6.87
8:52	12	10.80	7.52
8:54	14	11.25	7.97
8:56	16	11.67	8.39
8:58	18	12.10	8.82
9:00	20	12.41	9.13
9:05	25	13.00	9.72
9:10	30	13.43	10.15
9:15	35	13.90	10.62
9:20	40	14.06	10.78
9:25	45	14.24	10.96
9:30	50	14.39	11.11
9:35	55	14.53	11.25
9:40	60	14.58	11.30
9:50	70	14.68	11.40
10:00	80	14.76	11.48
10:10	90	14.83	11.55
10:20	100	14.90	11.62
10:40	120	14.98	11.70
11:00	140	15.01	11.73
11:20	160	15.04	11.76
11:40	180	15.06	11.78
12:00	200	15.08	11.80
12:20	220	15.09	11.81
12:40	240	15.11	11.83
13:40	300	15.13	11.85
14:40	360	15.17	11.89

TW1 WELL DRAWDOWN VS. TIME



File: 017630

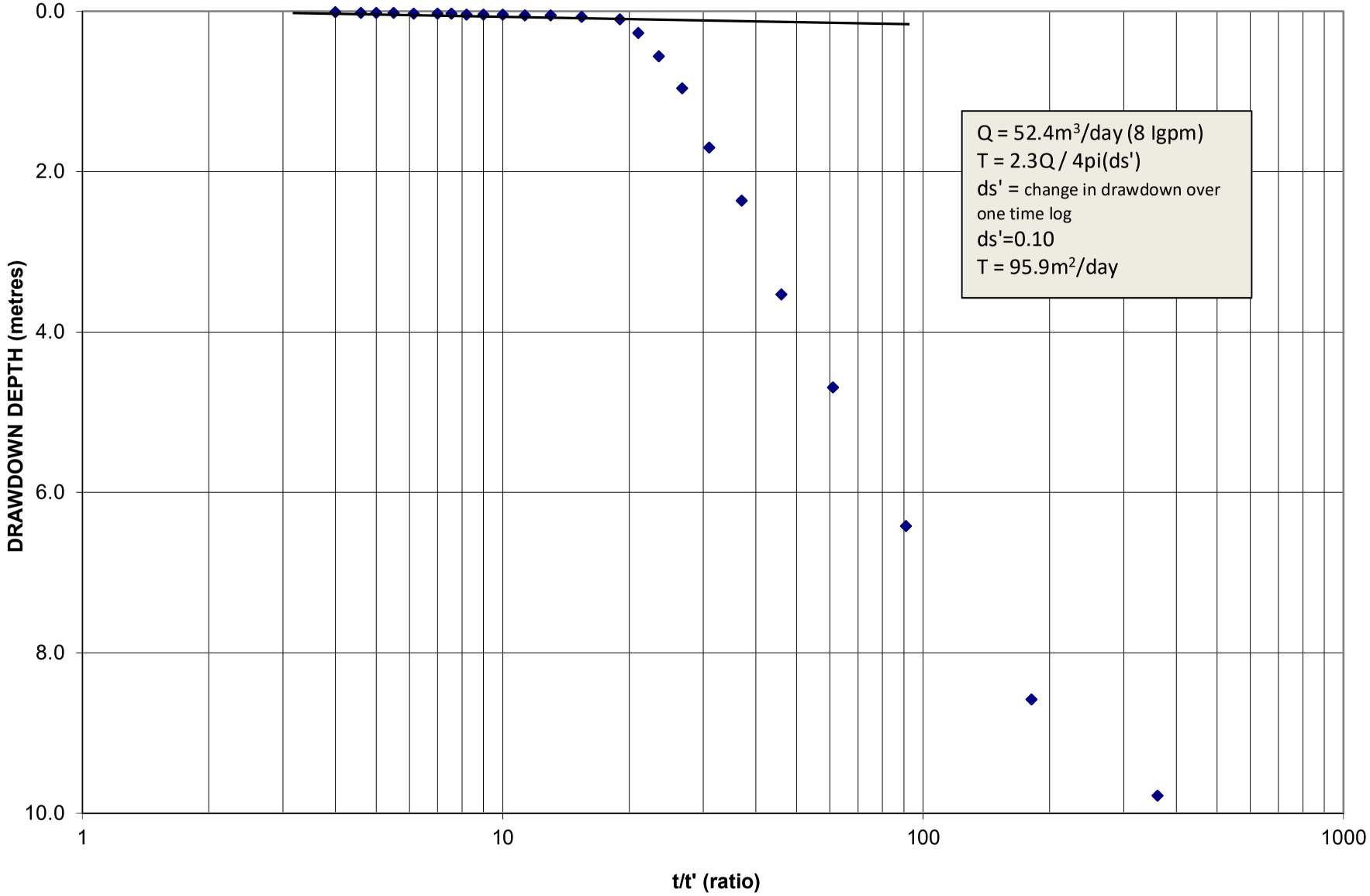
RECOVERY DATA TW1

Pump Test Date: Feb.16/18

Recovery Time t' (minutes)	t / t' (ratio)	Depth (metres)	h-ho (metres)
0		15.17	11.89
1	361	13.06	9.78
2	181	11.86	8.58
4	91	9.70	6.42
6	61	7.97	4.69
8	46	6.81	3.53
10	37	5.64	2.36
12	31	4.98	1.70
14	27	4.24	0.96
16	24	3.84	0.56
18	21	3.55	0.27
20	19	3.38	0.10
25	15	3.35	0.07
30	13	3.33	0.05
35	11	3.33	0.05
40	10	3.32	0.04
45	9	3.32	0.04
50	8	3.32	0.04
55	8	3.31	0.03
60	7	3.31	0.03
70	6	3.31	0.03
80	6	3.30	0.02
90	5	3.30	0.02
100	5	3.30	0.02
120	4	3.29	0.01

99.9% **RECOVERY AFTER** **120** **MINUTES**

TW1 RECOVERY DATA

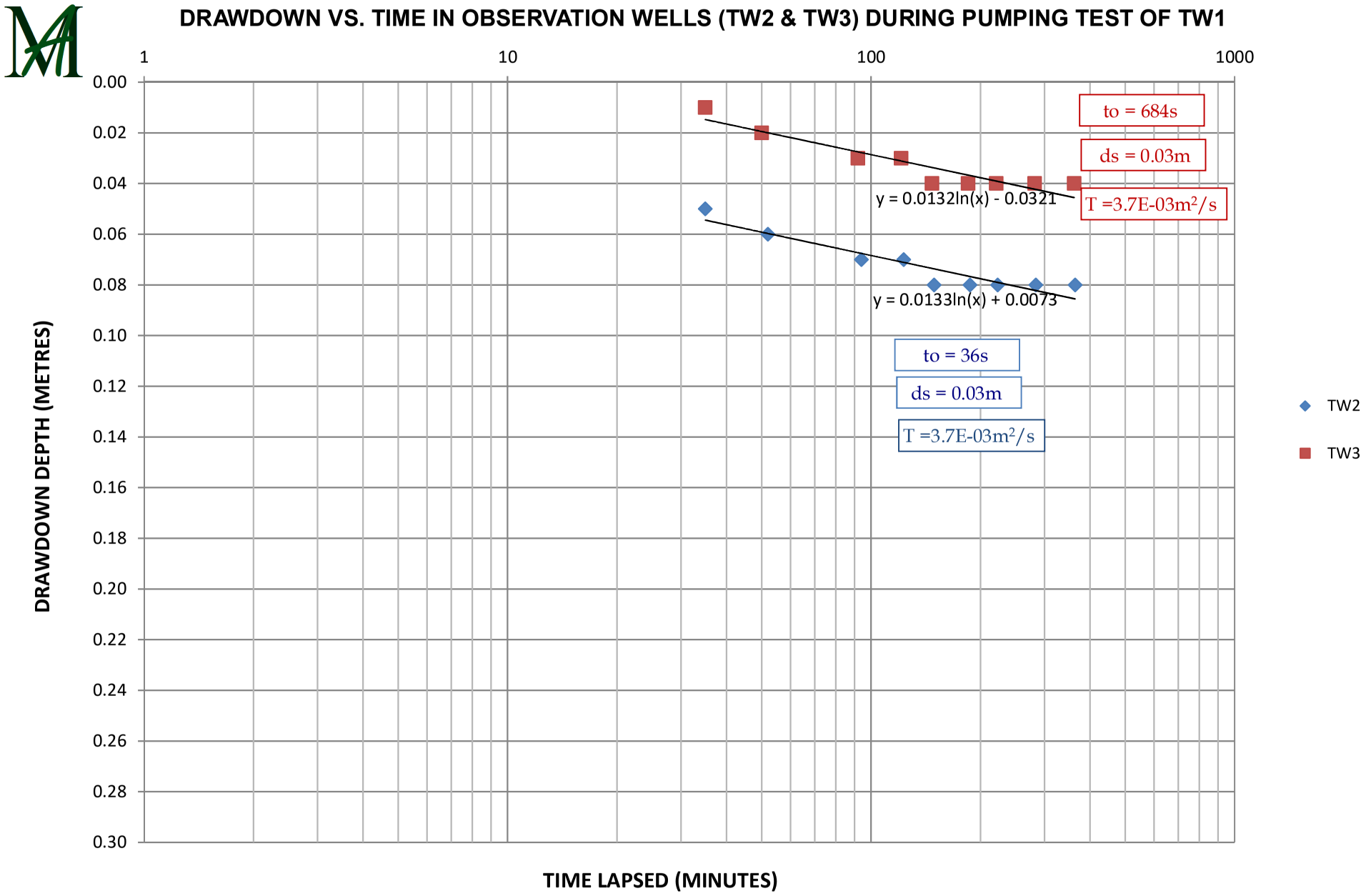


File: 017630
Pump Test Date: Feb.16/18

OBSERVATION WELLS DRAWDOWN DURING TW1 PUMPING TEST

Approximate Time of Day	Time Lapsed (minutes)	TW2	
		Depth (m)	h-ho (m)
8:20	0	2.82	
8:55	35	2.87	0.05
9:12	52	2.88	0.06
9:54	94	2.89	0.07
10:23	123	2.89	0.07
10:49	149	2.90	0.08
11:27	187	2.90	0.08
12:03	223	2.90	0.08
13:04	284	2.90	0.08
14:24	364	2.90	0.08

Approximate Time of Day	Time Lapsed (minutes)	TW3	
		Depth (m)	h-ho (m)
8:24	0	2.59	
8:59	35	2.60	0.01
9:14	50	2.61	0.02
9:56	92	2.62	0.03
10:25	121	2.62	0.03
10:51	147	2.63	0.04
11:29	185	2.63	0.04
12:05	221	2.63	0.04
13:06	282	2.63	0.04
14:26	362	2.63	0.04


DRAWDOWN VS. TIME IN OBSERVATION WELLS (TW2 & TW3) DURING PUMPING TEST OF TW1
1
10
100
1000
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
DRAWDOWN DEPTH (METRES)
TIME LAPSED (MINUTES)
to = 684s
ds = 0.03m
y = 0.0132ln(x) - 0.0321
T =3.7E-03m²/s
y = 0.0133ln(x) + 0.0073
to = 36s
ds = 0.03m
T =3.7E-03m²/s
TW2
TW3

APPENDIX F

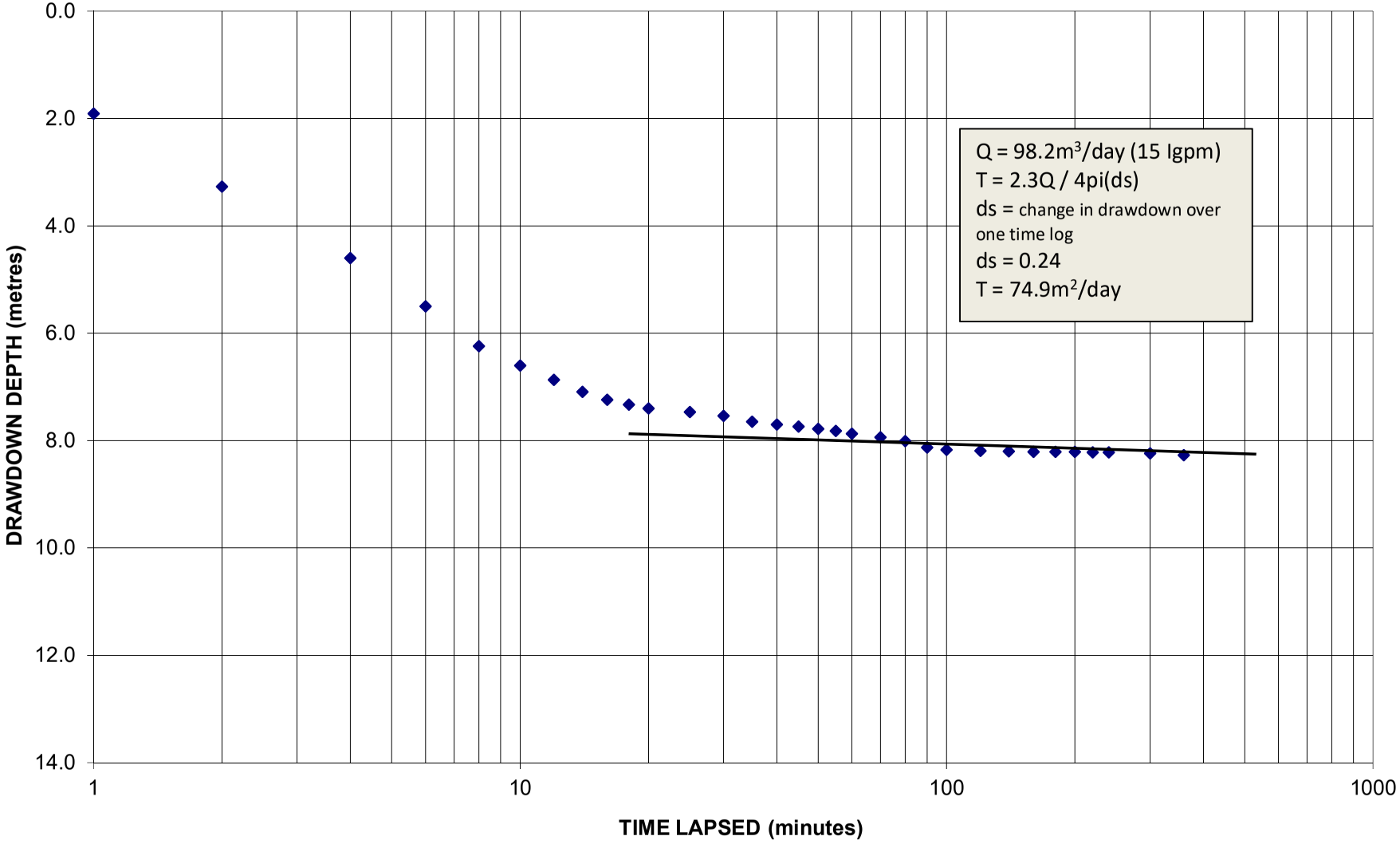
PUMPING TEST DATA FOR TEST WELL TW2

DRAWDOWN DATA TW2

File: 017630
Pump Test Date: Feb.22/18
Pump Rate: 15 lgpm

Time of Day	Time Lapsed (minutes)	Depth (metres)	h-ho (metres)
9:10	0	2.51	0.00
9:11	1	4.42	1.91
9:12	2	5.78	3.27
9:14	4	7.11	4.60
9:16	6	8.01	5.50
9:18	8	8.75	6.24
9:20	10	9.11	6.60
9:22	12	9.38	6.87
9:24	14	9.60	7.09
9:26	16	9.75	7.24
9:28	18	9.84	7.33
9:30	20	9.91	7.40
9:35	25	9.98	7.47
9:40	30	10.05	7.54
9:45	35	10.16	7.65
9:50	40	10.21	7.70
9:55	45	10.25	7.74
10:00	50	10.29	7.78
10:05	55	10.33	7.82
10:10	60	10.38	7.87
10:20	70	10.45	7.94
10:30	80	10.52	8.01
10:40	90	10.64	8.13
10:50	100	10.68	8.17
11:10	120	10.70	8.19
11:30	140	10.71	8.20
11:50	160	10.72	8.21
12:10	180	10.72	8.21
12:30	200	10.72	8.21
12:50	220	10.73	8.22
13:10	240	10.73	8.22
14:10	300	10.75	8.24
15:10	360	10.78	8.27

TW2 WELL DRAWDOWN VS. TIME



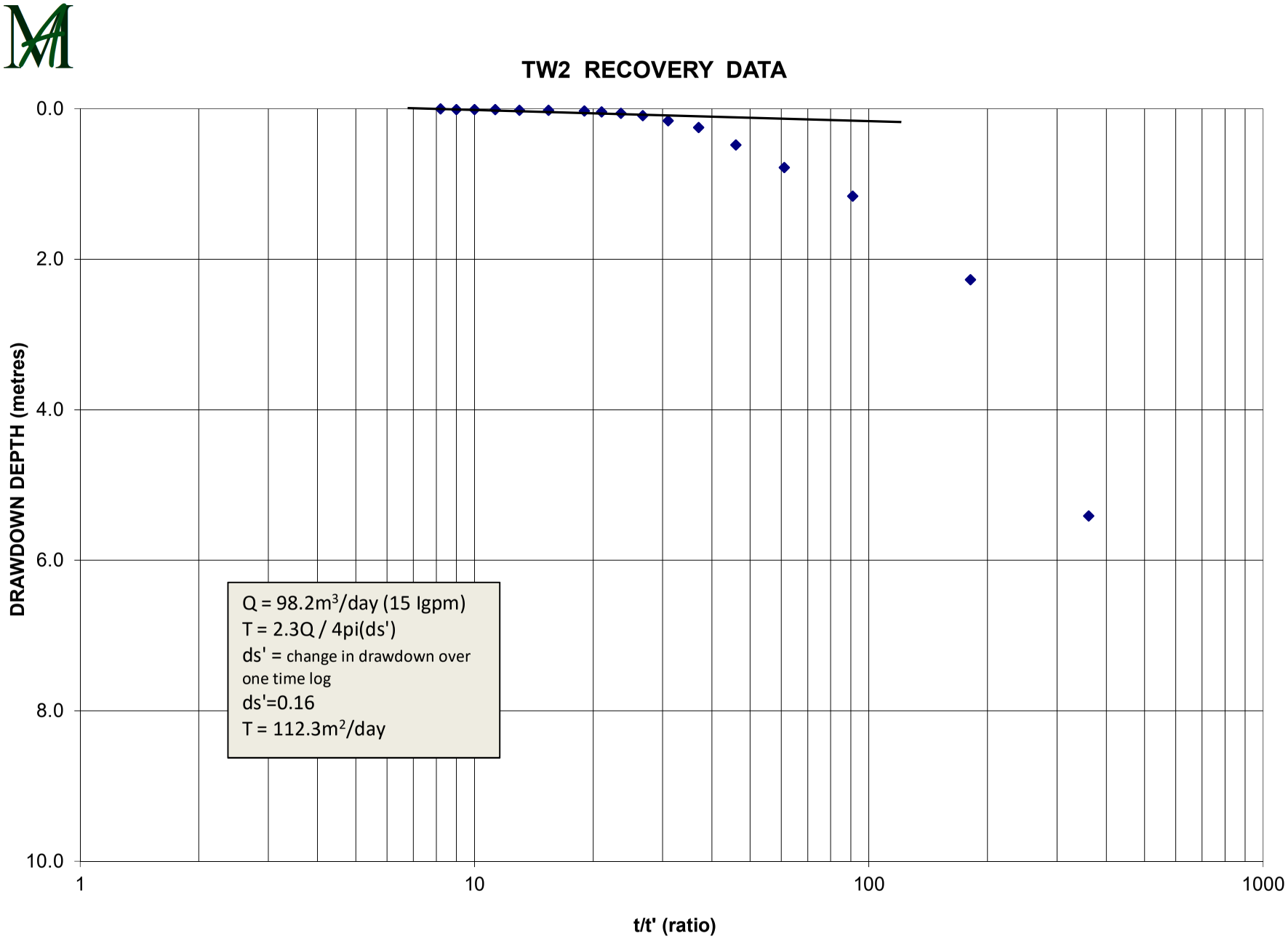
File: 017630

RECOVERY DATA TW2

Pump Test Date: Feb.22/18

Recovery Time t' (minutes)	t / t' (ratio)	Depth (metres)	h-ho (metres)
0		10.78	8.27
1	361	7.92	5.41
2	181	4.78	2.27
4	91	3.67	1.16
6	61	3.29	0.78
8	46	2.99	0.48
10	37	2.76	0.25
12	31	2.67	0.16
14	27	2.60	0.09
16	24	2.57	0.06
18	21	2.55	0.04
20	19	2.54	0.03
25	15	2.53	0.02
30	13	2.53	0.02
35	11	2.52	0.01
40	10	2.52	0.01
45	9	2.52	0.01
50	8	2.51	0.00

100% **RECOVERY AFTER** **50** **MINUTES**

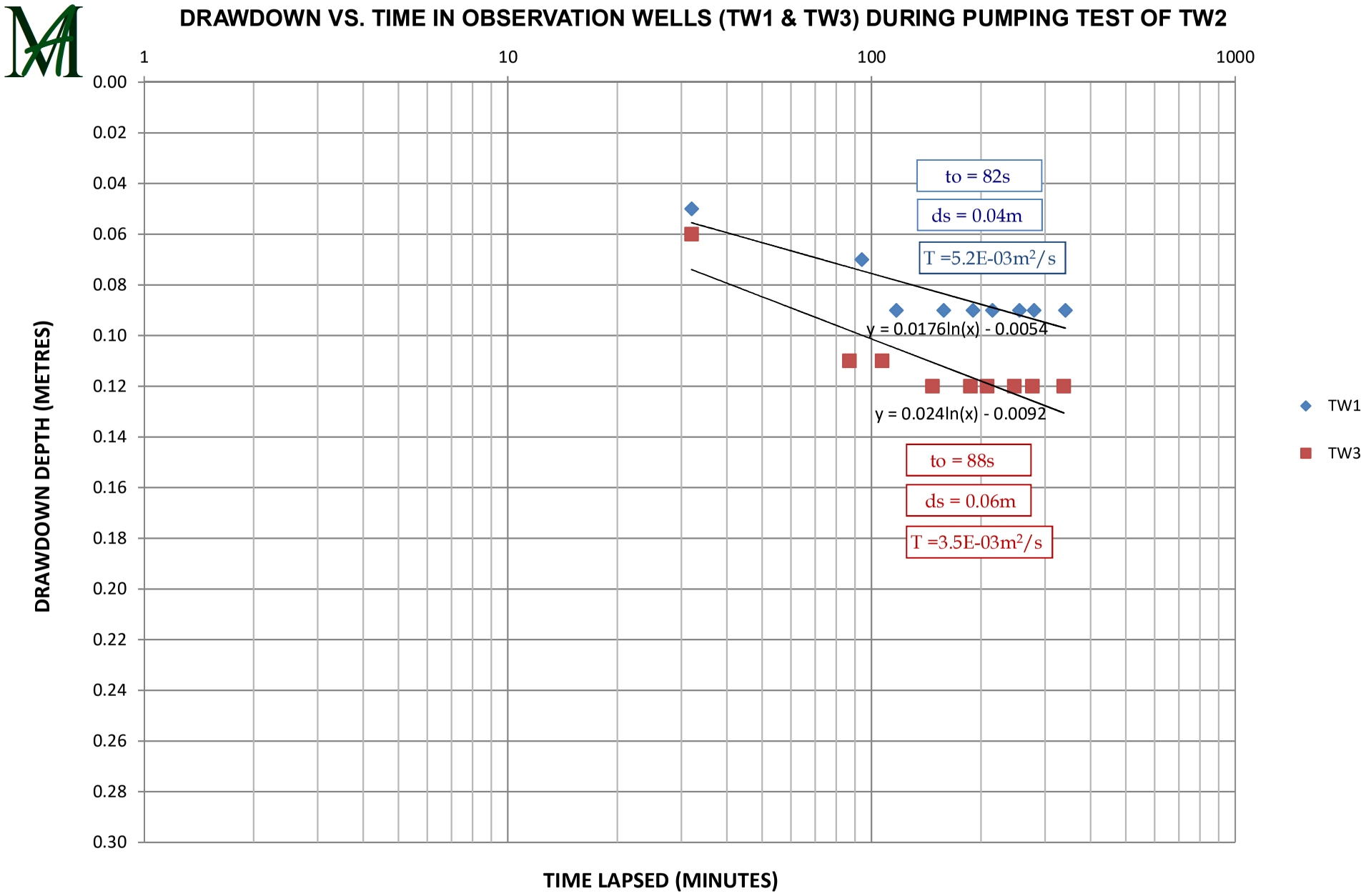

TW2 RECOVERY DATA
DRAWDOWN DEPTH (metres)
0.0
2.0
4.0
6.0
8.0
10.0
1
10
100
1000
t/t' (ratio)
Q = 98.2m3/day (15 Igpm)
T = 2.3Q / 4pi(ds')
ds' = change in drawdown over one time log
ds'=0.16
T = 112.3m2/day

File: 017630
Pump Test Date: Feb.22/18

OBSERVATION WELLS DRAWDOWN DURING TW2 PUMPING TEST

Approximate Time of Day	Time Lapsed (minutes)	TW1	
		Depth (m)	h-ho (m)
9:00	0	2.96	
9:32	32	3.01	0.05
10:34	94	3.03	0.07
10:57	117	3.05	0.09
11:38	158	3.05	0.09
12:10	190	3.05	0.09
12:35	215	3.05	0.09
13:15	255	3.05	0.09
13:40	280	3.05	0.09
14:41	341	3.05	0.09

Approximate Time of Day	Time Lapsed (minutes)	TW3	
		Depth (m)	h-ho (m)
9:05	0	2.26	
9:37	32	2.32	0.06
10:32	87	2.37	0.11
10:52	107	2.37	0.11
11:32	147	2.38	0.12
12:12	187	2.38	0.12
12:33	208	2.38	0.12
13:12	247	2.38	0.12
13:42	277	2.38	0.12
14:43	338	2.38	0.12


DRAWDOWN VS. TIME IN OBSERVATION WELLS (TW1 & TW3) DURING PUMPING TEST OF TW2
1
10
100
1000
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
DRAWDOWN DEPTH (METRES)
TIME LAPSED (MINUTES)
to = 82s
ds = 0.04m
T =5.2E-03m²/s
y = 0.0176ln(x) - 0.0054
y = 0.024ln(x) - 0.0092
to = 88s
ds = 0.06m
T =3.5E-03m²/s
TW1
TW3

APPENDIX G

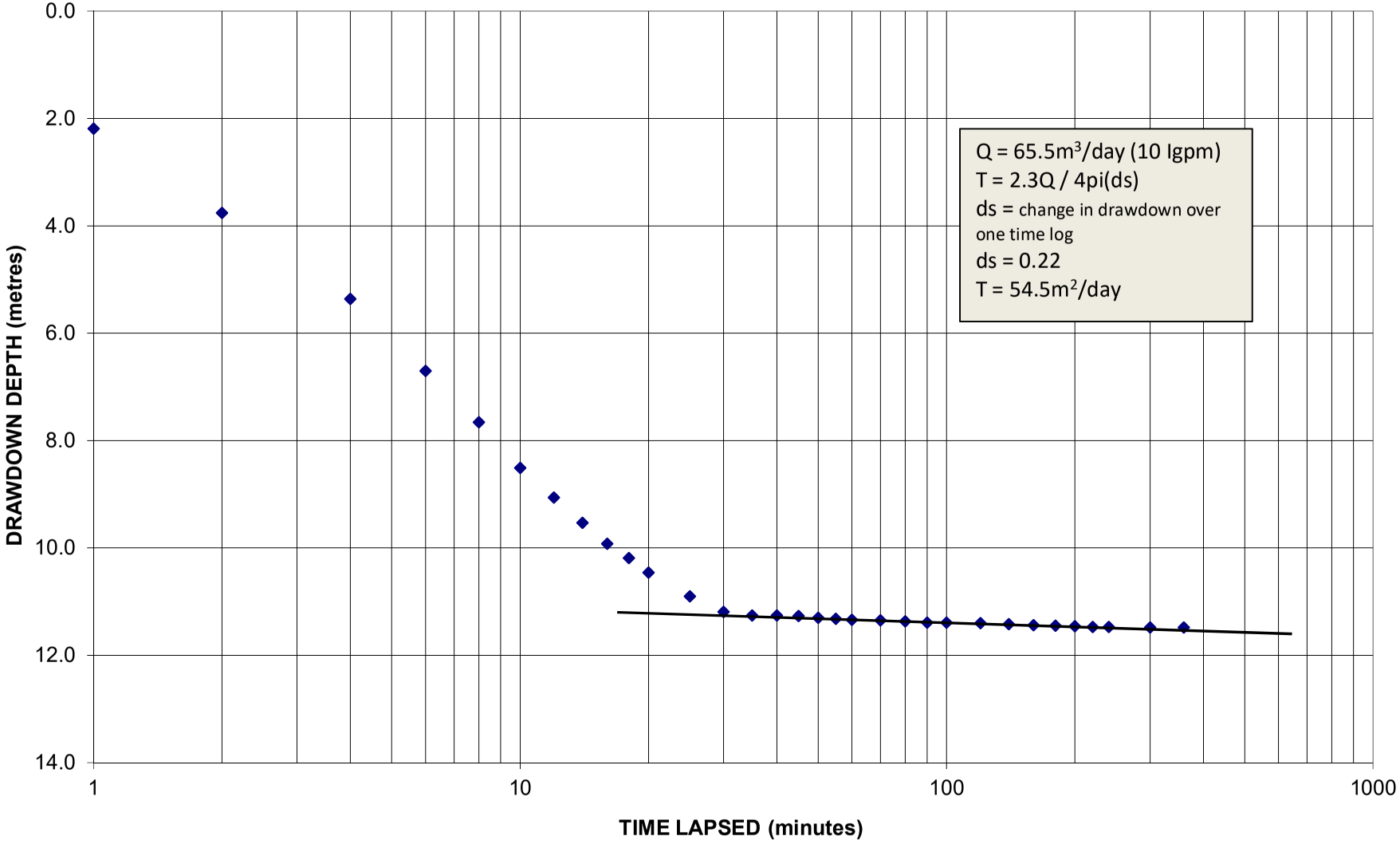
PUMPING TEST DATA FOR TEST WELL TW3

DRAWDOWN DATA TW3

File: 017630
Pump Test Date: Feb.28/18
Pump Rate: 10 lgpm

Time of Day	Time Lapsed (minutes)	Depth (metres)	h-ho (metres)
9:00	0	2.14	0.00
9:01	1	4.33	2.19
9:02	2	5.90	3.76
9:04	4	7.50	5.36
9:06	6	8.84	6.70
9:08	8	9.80	7.66
9:10	10	10.65	8.51
9:12	12	11.20	9.06
9:14	14	11.67	9.53
9:16	16	12.06	9.92
9:18	18	12.33	10.19
9:20	20	12.60	10.46
9:25	25	13.04	10.90
9:30	30	13.33	11.19
9:35	35	13.40	11.26
9:40	40	13.40	11.26
9:45	45	13.41	11.27
9:50	50	13.44	11.30
9:55	55	13.46	11.32
10:00	60	13.48	11.34
10:10	70	13.49	11.35
10:20	80	13.51	11.37
10:30	90	13.53	11.39
10:40	100	13.53	11.39
11:00	120	13.54	11.40
11:20	140	13.56	11.42
11:40	160	13.58	11.44
12:00	180	13.59	11.45
12:20	200	13.60	11.46
12:40	220	13.61	11.47
13:00	240	13.61	11.47
14:00	300	13.62	11.48
15:00	360	13.62	11.48

TW3 WELL DRAWDOWN VS. TIME



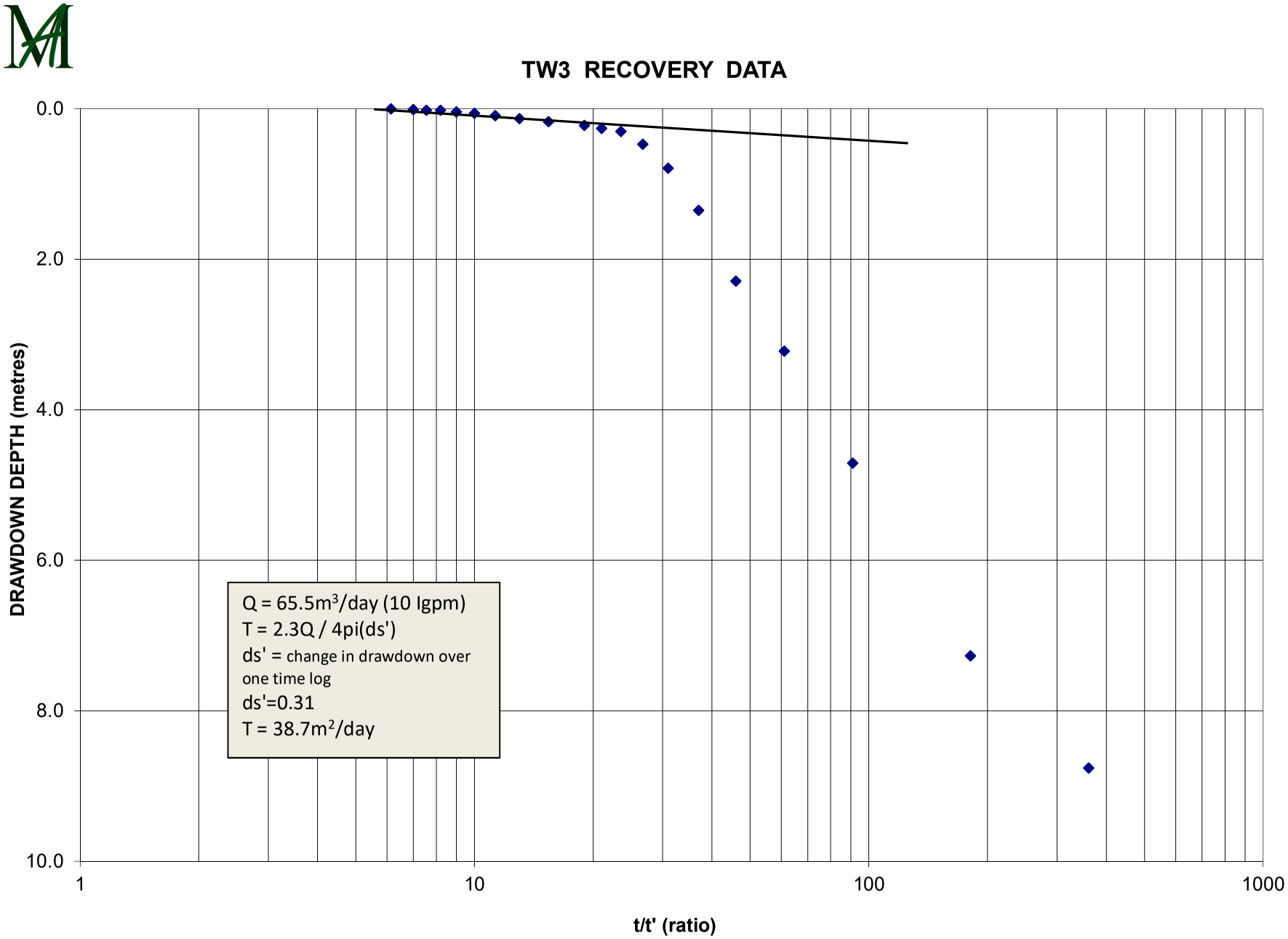
File: 017630

RECOVERY DATA TW3

Pump Test Date: Feb.28/18

Recovery Time t' (minutes)	t / t' (ratio)	Depth (metres)	h-ho (metres)
0		13.62	11.48
1	361	10.90	8.76
2	181	9.41	7.27
4	91	6.85	4.71
6	61	5.36	3.22
8	46	4.43	2.29
10	37	3.49	1.35
12	31	2.93	0.79
14	27	2.61	0.47
16	24	2.44	0.30
18	21	2.40	0.26
20	19	2.36	0.22
25	15	2.31	0.17
30	13	2.27	0.13
35	11	2.23	0.09
40	10	2.20	0.06
45	9	2.18	0.04
50	8	2.16	0.02
55	8	2.16	0.02
60	7	2.15	0.01
70	6	2.14	0.00

100% **RECOVERY AFTER** **70** **MINUTES**

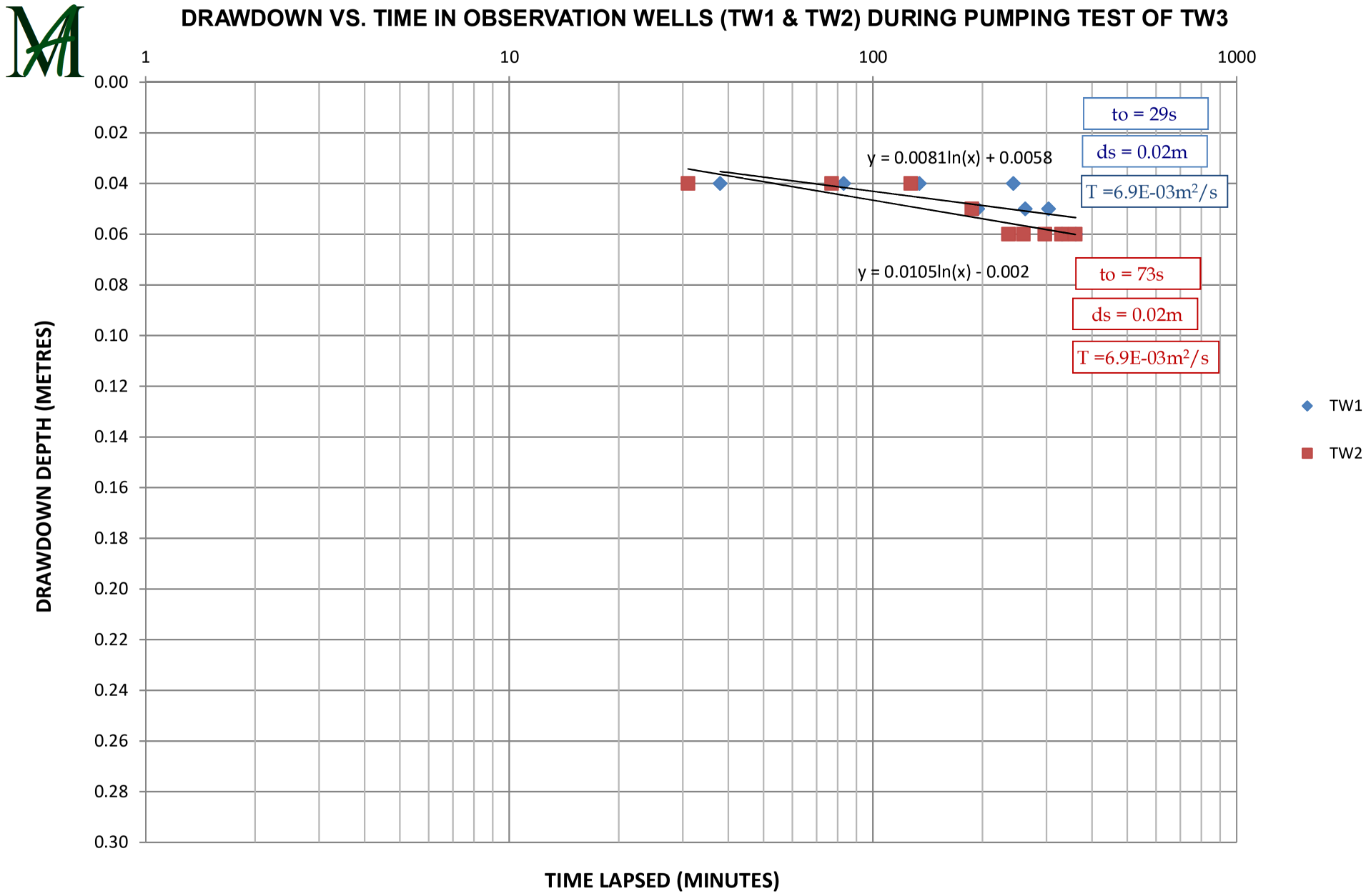

TW3 RECOVERY DATA
DRAWDOWN DEPTH (metres)
0.0
2.0
4.0
6.0
8.0
10.0
1
10
100
1000
t/t' (ratio)
Q = 65.5m3/day (10 Igpm)
T = 2.3Q / 4pi(ds')
ds' = change in drawdown over one time log
ds'=0.31
T = 38.7m2/day

File: 017630
Pump Test Date: Feb.28/18

OBSERVATION WELLS DRAWDOWN DURING TW3 PUMPING TEST

Approximate Time of Day	Time Lapsed (minutes)	TW1	
		Depth (m)	h-ho (m)
8:50	0	2.80	
9:28	38	2.84	0.04
10:13	83	2.84	0.04
11:04	134	2.84	0.04
12:04	194	2.85	0.05
12:53	243	2.84	0.04
13:12	262	2.85	0.05
13:54	304	2.85	0.05
14:21	331	2.86	0.06
14:51	361	2.86	0.06

Approximate Time of Day	Time Lapsed (minutes)	TW2	
		Depth (m)	h-ho (m)
8:55	0	2.39	
9:26	31	2.43	0.04
10:12	77	2.43	0.04
11:02	127	2.43	0.04
12:02	187	2.44	0.05
12:51	236	2.45	0.06
13:14	259	2.45	0.06
13:52	297	2.45	0.06
14:25	330	2.45	0.06
14:55	360	2.45	0.06


DRAWDOWN VS. TIME IN OBSERVATION WELLS (TW1 & TW2) DURING PUMPING TEST OF TW3
1
10
100
1000
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
0.30
DRAWDOWN DEPTH (METRES)
TIME LAPSED (MINUTES)
y = 0.0081ln(x) + 0.0058
y = 0.0105ln(x) - 0.002
to = 29s
ds = 0.02m
T =6.9E-03m²/s
to = 73s
ds = 0.02m
T =6.9E-03m²/s
TW1
TW2

APPENDIX H

TEST PIT LOGS FROM PREVIOUS MOREY ASSOCIATES LTD. GEOTECHNICAL INVESTIGATION

TABLE I

RECORD OF TEST PITS
PROPOSED RESIDENTIAL DEVELOPMENT
HEMPHILL STREET
OTTAWA, ONTARIO

TEST PIT NUMBER/ ELEVATION	DEPTH (METRES)	DESCRIPTION
TP1 ELEV. 93.5m	0.00 – 0.30	TOPSOIL
	0.30 – 3.35	Stiff to very stiff, grey brown SILTY CLAY
	3.35	End of test pit

Depth (m)	Strength, Cu (kPa)
0.3	>130
0.6	>130
0.9	>130
1.2	>130
1.5	>130
1.8	>130
2.1	120
2.4	105
2.7	89
3.0	65
3.3	62

Groundwater flow observed in test pit at about 2.3 metres below existing ground surface, November 22, 2017.
Water measured in standpipe at about 1.1 metres below existing ground surface, December 6, 2017.

TABLE I (CONTINUED)

TEST PIT NUMBER/ ELEVATION	DEPTH (METRES)	DESCRIPTION
TP2 ELEV. 93.7m	0.00 – 0.30	TOPSOIL
	0.30 – 4.00	Stiff to very stiff, grey brown SILTY CLAY
	4.00	End of test pit

Depth (m)	Strength, Cu (kPa)
0.3	>130
0.6	>130
0.9	>130
1.2	>130
1.5	>130
1.8	>130
2.1	120
2.4	110
2.7	90
3.0	71
3.3	67
3.6	78
3.9	84

Groundwater seepage observed in test pit at about 1.8 metres below existing ground surface, November 22, 2017. Water measured in standpipe at about 1.2 metres below existing ground surface, December 6, 2017.

TABLE I (CONTINUED)

TEST PIT NUMBER/ ELEVATION	DEPTH (METRES)	DESCRIPTION
TP3 ELEV. 93.8m	0.00 – 0.30	TOPSOIL
	0.30 – 4.00	Stiff to very stiff, grey brown SILTY CLAY
	4.00	End of test pit

Depth (m)	Strength, Cu (kPa)
0.3	>130
0.6	>130
0.9	>130
1.2	>130
1.5	>130
1.8	110
2.1	95
2.4	83
2.7	67
3.0	72
3.3	80
3.6	92

Groundwater flow observed in test pit at about 2.1 metres below existing ground surface, November 22, 2017.
Water measured in standpipe at about 1.2 metres below existing ground surface, December 6, 2017.

TABLE I (CONTINUED)

TEST PIT NUMBER/ ELEVATION	DEPTH (METRES)	DESCRIPTION
TP4 ELEV. 93.7m	0.00 – 0.30	TOPSOIL
	0.30 – 4.00	Stiff to very stiff, grey brown SILTY CLAY
	4.00	End of test pit

Depth (m)	Strength, Cu (kPa)
0.3	>130
0.6	>130
0.9	>130
1.2	>130
1.5	>130
1.8	125
2.1	100
2.4	96
2.7	90
3.0	74
3.3	80
3.6	96

Groundwater flow observed in test pit at about 2.1 metres below existing ground surface, November 22, 2017.
Water measured in standpipe at about 1.2 metres below existing ground surface, December 6, 2017.

APPENDIX I

CURRICULA VITAE

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

D.G. MOREY, P.Eng.

LANGUAGE: English

EDUCATION: Bachelor of Applied Science, Civil Engineering
University of Ottawa, 2009

PROFESSIONAL AFFILIATIONS: Registered Professional Engineer Ontario

EXPERIENCE:

2012 – Present — **Morey Associates Ltd.**
Director/Senior Engineer

Responsible for the managerial and technical aspects of the operation of the firm carrying out geotechnical and hydrogeological investigations, environmental site assessments, and construction inspection and testing.

2010 – 2012 — **Levac Robichaud Leclerc Associates Ltd.**
Junior Engineer

Analysis, preparation and field work for geotechnical investigations, hydrogeological impact assessments and environmental assessments. Also carry out quality control testing (i.e. compaction, subgrade, concrete testing)

2009 – 2010 — **Kollaard Associates Inc.**
Junior Engineer

Analysis and preparation of geotechnical and slope stability evaluation reports. Responsible for field work and drafting (using AutoCAD) for geotechnical investigations, slope stability evaluations, environmental site assessments, hydrogeological investigations, site grading plans, roadway designs, and structural designs. Also carry out quality control testing (i.e. compaction, subgrade, concrete testing).

2005 – 2008 (Summers) — **Kollaard Associates Inc.**
Civil Engineering Student

Responsible for field work and drafting for geotechnical investigations, site grading plans, septic system designs, roadway designs, and structural designs.

2004 — **Morey Houle Chevrier Engineering Ltd.**
Technician

Carried out surveying and drafting for site grading plans and septic system designs. Also carried out well grouting inspections and well pump tests.

MOREY ASSOCIATES LTD.
CONSULTING ENGINEERS

C.R. MOREY, P.Eng

LANGUAGE: English

EDUCATION:
B.Sc., Geological Engineering, Queen's University, Kingston, Ontario, 1973.
M.Sc.,(Eng.), Civil Engineering, Queen's University, Kingston, Ontario, 1977.
Graduate courses in Civil and Geotechnical Engineering, Windsor and Carleton Universities, 1980 and 1982.

PROFESSIONAL AFFILIATIONS:
Registered Professional Engineer Ontario
Designated Consulting Engineer

EXPERIENCE:

2012 – PRESENT **Morey Associates (Kemptville, Ontario)**
Senior Engineer

Responsible for supervision of all technical aspects of projects carried out by the firm.

2010 - 2012 **Levac Robichaud Leclerc Associates Ltd. (Rockland & Kemptville, Ontario)**
Director of Geotechnical Department

Responsible for senior level supervision of geotechnical investigations, hydrogeological impact assessments and environmental site assessments and providing QA/QC for the related project letters, memos, reports and drawings.

2005 – 2010 **Kollaard Associates Inc. (Kemptville, Ontario)**
Principal

Responsible for mentoring of professional staff, project letter and report reviews, senior level project supervision, business development, and assisting in office administration.

1994 – 2005 **Morey Houle Chevrier Engineering Ltd. (Kemptville, Ontario)**
President

Responsible for the managerial and technical aspects of the operation of the firm carrying out geotechnical and hydrogeological investigations, environmental site assessments, and construction inspection and testing. Geotechnical and hydrogeological expert witness for Ontario Municipal Board hearings and Ontario Court Provincial Division trials.

1980 - 1994 **Golder Associates Ltd. (Windsor & Ottawa, Ontario)**
Geotechnical Engineer then Associate

Responsible for subsurface investigations and design of roadways, retaining walls, airport runways, residential and commercial developments, buried services, septic systems, wharves, building foundations, dams, municipal drains, stormwater management facilities, building flood proofing.

PUBLICATIONS: Co-author of two papers regarding retrogressive landslides in sensitive marine deposited silty clay of the Ottawa Valley area, published by the Geological Survey of Canada.