

**REPORT ON**

**SCOPED HYDROGEOLOGICAL STUDY  
PROPOSED COACH HOUSE  
1717 LAKESHORE DRIVE, GREELY  
OSGOODE WARD  
CITY OF OTTAWA, ONTARIO**

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## 1.0 INTRODUCTION

Morey Associates Ltd. was retained by Lockwood Brothers Construction Ltd. to undertake a scoped hydrogeological study for a proposed coach house at the existing single family dwelling lot located at 1717 Lakeshore Drive, Greely, Osgoode Ward, City of Ottawa, Ontario (see Key Plan, Figure 1 and Site Sketch Plan, Figure 2).

For the purpose of this report Lakeshore Drive is considered to exist at the north side of the subject site.

The subject site for this scoped hydrogeological study consists of about a 1.6 hectare rectangular shaped property. It is understood that plans are being prepared for the construction of a one-storey, with two bedrooms, coach house (see Site Sketch Plan, Figure 2). An existing one-storey, three bedroom, single family dwelling exists at the site. The existing dwelling and proposed coach house will be serviced by an existing on site private well and on site private sewage system.

This scoped hydrogeological study was carried out in general accordance with the applicable sections of the Ministry of the Environment, Conservation and Parks (MOE) Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment (August 1996) and the MOE Procedure D-5-4 Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment, August 1996, and in general accordance with the applicable sections of the City of Ottawa document titled "Hydrogeological and Terrain Analysis Guidelines, Second Draft for Industry Circulation", dated March 2019, provided to us by the City of Ottawa.



## 2.0 SITE BACKGROUND

The site is bordered on the north by Lakeshore Drive with existing residential development beyond, on the east by existing single family dwelling development, on the south by existing single family dwelling development with woodland beyond, and on the west by existing single family dwelling development with Stagecoach Road and woodland beyond. The ground cover at the site consists mainly of grass and young to mature trees.

A review of the surficial geology map for the site area indicates that the site is underlain by fine to medium grained sand associated with glaciofluvial materials. The bedrock geology map indicates that the bedrock underlying the site consists of dolomite and limestone of 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.

The MOE water well record associated with the above mentioned existing on site well (provided to us by Lockwood Brothers Construction Ltd.) is attached as Appendix A and a summary of the well construction details is provided in Table 2.1 below.

**Table 2.1: Summary of On Site Well Construction Details**

Test Well	Thickness of Overburden Encountered (m)	Thickness of Rock Encountered [Limestone] (m)	Total Depth of Well (m BGS)	Inside Diameter of Well Casing (m)	Depth of Well Casing (m BGS)	Depth Water Found (m BGS)
On Site Well	16.1	4.3	20.4	0.16	16.1	19.8

Note: m BGS = Metres Below Ground Surface

The well driller indicates on the above mentioned well record that a nominal 16 centimetre inside diameter steel casing was installed through the overburden and grouted in place. The overburden material is indicated to consist of, in general, sand, clay and gravel. The well is indicated to be some 20.4 metres in depth from the ground surface, and advanced into a limestone aquifer.



### 3.0 WELL WATER QUANTITY

A pumping test was conducted on the existing on site well on April 30, 2019 by a member of our engineering staff and consisted of a six hour duration constant discharge rate pumping test. During the pumping test, water level measurements were made on a regular basis to monitor the drawdown of the water level in the well in response to pumping. After the pumping period, the pump was shut off and the recovery of the water level in the well was monitored for a period of time. During the pump test, the pump discharge outlet was located an adequate distance and downgradient from the well to ensure the discharge did not interfere with the natural recharge to the well.

The drawdown and recovery data and plots for the well pumping test is shown in Appendix B. The drawdown and recovery data provided were measured with reference to the top of the well casing.

The pumping test data for the well was 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 II.

The six hour duration pumping test was carried out at a discharge rate of about 91 litres per minute (20 lpm). The static water level prior to testing was about 3.54 metres below the top of the well casing and the water level after six hours of pumping was about 4.77 metres below the top of the well casing for a total drawdown at the end of pumping of 1.23 metres. The available drawdown in the well is about 16 metres. The specific capacity of the well at this pumping rate is approximately 106 cubic metres per day per metre of drawdown.

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be 67 m<sup>2</sup>/day. Based on the pumping test recovery data the aquifer transmissivity is estimated to be 120 m<sup>2</sup>/day. The average transmissivity of the aquifer in the area of the existing test well is estimated to be 94 m<sup>2</sup>/day. At the end of pumping, 120 minutes was required for 96 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 test well is capable of sustaining a short term yield of at least 91 litres per minute (20 lpm) and that during the



course of the six hour pumping period about 8 percent of the available drawdown in the test well was utilized.

### **3.1 SUMMARY OF ON SITE WELL YIELD**

The MOE 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 MOE guideline indicates that for a dwelling the likely number of persons per well (per dwelling) is considered to be the number of bedrooms in the dwelling plus one. The MOE 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 dwelling) shall not be less than 13.7 litres per minute.

The results of the pumping test carried out for this present hydrogeological study indicate that the existing well at the site is capable of more than meeting the MOE minimum demand rate of 13.7 litres per minute and that the existing test well at the site is capable of meeting the MOE peak demand rate for up to a twenty three (23) bedroom dwelling.

As mentioned above plans are being prepared for a proposed two bedroom coach house to be constructed at the site and that an existing 3 bedroom single family dwelling exists at the site. Based on the MOE Guideline D-5-5, the peak demand rate for the proposed coach house would be 13.7 litres per minute and the peak demand rate for the existing single family dwelling is 15.0 litres per minute, for a combined peak demand rate of 28.7 litres per minute. Based on the results of the pumping test the existing well at the site is capable of more than meeting the MOE peak demand rate for the above mentioned proposed coach house and existing single family dwelling.

### **3.2 SUMMARY OF TRANSMISSIVITY ANALYSIS**

The above mentioned transmissivity values based on the pumping test drawdown and recovery data are summarized in Table 3.1 and classified regarding magnitude, designation and groundwater supply potential based on Krasny (1993).



**Table 3.1: Classification of Transmissivity Values**

<sup>1</sup> Magnitude (m <sup>2</sup> /day)	<sup>1</sup> Class	<sup>1</sup> Designation	<sup>1</sup> Groundwater Supply Potential	Transmissivity Values Based on Test Well Pumping Test		
				Pump.	Rec.	Avg.
>1000	I	Very High	Regional Importance			
100 - 1000	II	High	Lesser Regional Importance		120	
10 - 100	III	Intermediate	Local Water Supply	67		94
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			

<sup>1</sup>Kransy (1993) "Classification of Transmissivity Magnitude and Variation", Vol.31, No.2 - Ground Water

Based on the above, the existing well at the site is indicated to be capable of providing an adequate quantity of water for local water supply. It is pointed out that a groundwater supply potential of "Private Consumption" would likely be associated with a water supply well adequate for the proposed site development.

## 4.0 WELL WATER QUALITY

In order to characterize the groundwater quality of the groundwater supply, two groundwater samples were collected from the test well by a member of our engineering staff at about hour 3 and hour 6 of the pumping test. Those groundwater samples 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 MOE guideline entitled Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment, August 1996 ("MOE Subdivision Package" list of parameters). The temperature, conductivity, pH, TDS, turbidity and residual chlorine levels of the groundwater were measured just prior to sampling and at other periodic intervals during the pumping test.

The results of the above mentioned laboratory testing and field testing are provided in Table 4.1 below and in the attached Table I, respectively.



**Table 4.1: Pumping Test Well Water Samples Laboratory Testing Results**

Parameter	MRL	Units	<sup>1</sup> Guideline	On Site Well		
				3 hr Pumping Test Sample (Apr.30/19)	6 hr Pumping Test Sample (Apr.30/19)	Interior Faucet Sample (Jul.25/19)
Hardness as CaCO <sub>3</sub>	1	mg/L	OG-100, <sup>4</sup> 500	<b>303</b>	<b>301</b>	-
Ion Balance	0.01			1.01	1.00	-
TDS (COND - CALC)	1	mg/L	AO-500	<b>501</b>	495	-
Alkalinity as CaCO <sub>3</sub>	5	mg/L	OG-30 - 500	208	208	-
Cl	1	mg/L	AO-250	107	104	-
Colour	2	TCU	AO-5, <sup>2</sup> T-7	<b>16</b>	<b>15</b>	<2
Conductivity	5	uS/cm		771	762	-
DOC	0.5	mg/L	AO-5, <sup>2</sup> T-10.0	2.5	2.5	-
F	0.10	mg/L	MAC-1.5	0.41	0.41	-
N-NO <sub>2</sub>	0.10	mg/L	MAC-1.0	<0.10	<0.10	-
N-NO <sub>3</sub>	0.10	mg/L	MAC-10.0	<0.10	<0.10	-
pH	1.00		OG-6.5 - 8.5	7.96	7.96	-
SO <sub>4</sub>	1	mg/L	AO-500	41	41	-
Ca	1	mg/L		67	66	-
Fe	0.03	mg/L	AO-0.3, <sup>2</sup> T-5.0	<b>0.40</b>	<b>0.36</b>	0.11
K	1	mg/L		3	3	-
Mg	1	mg/L		33	33	-
Mn	0.01	mg/L	AO-0.05, <sup>2</sup> T-1.0	0.01	0.01	-
Na	2	mg/L	AO-200, A-20	45	44	-
TKN	0.1	mg/L		0.2	0.1	-
Phenols	0.001	mg/L		<0.001	<0.001	-
N-NH <sub>3</sub>	0.01	mg/L		0.15	0.14	-
S <sub>2</sub> -	0.02	mg/L	AO-0.05	<0.01	<0.01	-
Tannin & Lignin	0.1	mg/L		<0.1	<0.1	-
Turbidity	0.1	NTU	AO-5.0	2.2	1.9	-
Heterotrophic Plate Count	0	ct/1mL		1	3	-
E. Coli	0	ct/100mL	MAC-0	0	0	-
Faecal Coliforms	0	ct/100mL		0	0	-
Total Coliforms	0	ct/100mL	MAC-0	0	0	-
<sup>5</sup> Organic Nitrogen		mg/L	OG-0.15	0.05	0	-

<sup>1</sup> Guideline = Ontario Drinking Water Standards Objectives and Guidelines

<sup>2</sup> MOE Maximum Concentration Considered Reasonably Treatable (See MOE Guideline 'D-5-5 Private Wells: Water Supply Assessment')

<sup>3</sup> Table 2, Appendix, MOECC Guideline 'D-5-5 Private Wells: Water Supply Assessment' document

<sup>4</sup> "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.

<sup>5</sup> Organic Nitrogen = | Total Kjeldahl Nitrogen - N-NH<sub>3</sub> | and should not exceed 0.15 mg/L

MRL = Method Reporting Limit

AO = MOE Aesthetic Objective

OG = MOE Operational Guideline

MAC = MOE Maximum Acceptable Concentration

T = MOE Treatability Limit (See Note 2)

A = MOE Advisory Limit (See Note 3)

**Bold Italic** = AO, OG or MAC Guideline Exceedence

The water quality as determined from the results of the analyses is favourable. The well water samples meet all the Ontario Drinking Water Standards, Objectives and Guidelines (ODWSOG) health and aesthetic parameters tested for except for the following:





- Hardness
- Total Dissolved Solids (TDS) for the 3 hour sample
- Colour
- Iron

The water samples obtained from the test well are considered to be hard by water treatment standards with a hardness level above the ODWSOG operational guideline of 80 to 100 mg/L. The hardness at the well was measured at 303 and 301 mg/L for the 3 hour and 6 hour samples, respectively. 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 mg/L) for most domestic purposes and is considered treatable. Water with hardness above 80 to 100 mg/L as  $\text{CaCO}_3$  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 TDS level of the 3 hour water sample obtained from the well was measured at 501 mg/L and is slightly above the ODWSOG aesthetic objective of 500 mg/L. The results of Ryznar Stability Index (RSI) calculations for the samples obtained from the well gave an RSI value of about 7.1 and can be interpreted to indicate potential for the groundwater to cause light corrosion of plumbing/plumbing fixtures. The results of Langelier Saturation Index (LSI) calculations (see attached Table III) for each of the samples obtained from the test well gave LSI values of about 0.28 and can be interpreted (based on Carrier 1965) to indicate potential for the groundwater to cause slight scale-forming and slight corrosion possible (LSI >0 to 0.5).

The level of colour measured for the 3 hour and 6 hour water samples were 16 TCU and 15 TCU, respectively, and are above the ODWSOG aesthetic objective of 5 TCU and the MOE maximum concentration considered reasonably treatable of 7 TCU. As mentioned above the levels of iron measured for the water samples were above the ODWSOG aesthetic objective 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". The current owner of the subject site indicated that the existing well water is treated using a water softener treatment system



(see Appendix D, Water Well System & Septic Survey Questionnaire). A sample of the treated well water was obtained from an interior faucet from the existing single family dwelling at the site by a member of our engineering staff on July 25, 2019 and submitted to Eurofins Environment Testing laboratory in Ottawa, Ontario for colour testing. The level of colour measured for the above mentioned treated well water sample was less than 2 TCU and meets the ODWSOG aesthetic objective of 5 TCU.

The laboratory measured levels of iron for the 3 hour and 6 hour water samples were 0.40 to 0.36 mg/L, respectively, and are above the ODWSOG aesthetic objective of 0.3 mg/L. The above indicated iron levels are well within the MOE maximum concentration considered reasonably treatable of 5.0 mg/L. The levels of iron for the water samples are considered treatable using a water softener or manganese greensand filter. As mentioned above the existing well water is treated using a water softener treatment system. A sample of the treated well water was obtained from an interior faucet from the existing single family dwelling at the site by a member of our engineering staff on July 25, 2019 and submitted to Eurofins Environment Testing laboratory in Ottawa, Ontario for iron testing. The level of iron measured for the above mentioned treated well water sample was 0.11 mg/L and meets the ODWSOG aesthetic objective.

It is pointed out that the levels of sodium for the water samples obtained from the well were measured at 45 and 44 mg/L which is below the ODWSOG aesthetic objective of 200 mg/L, however, according to the MOE the local Medical Office of Health should be notified where sodium levels are above 20 mg/L in order that this information may be relayed to local physicians. Accordingly, the levels of sodium for the water samples obtained from the existing on site well may be of interest to persons on a sodium restricted diet.

## **5.0 SEWAGE SYSTEM IMPACT ASSESSMENT**

No karstic areas, areas of fractured bedrock exposed at the surface or areas of highly permeable soils were identified for the site. As mentioned above the MOE water well record associated with the existing well at the site indicates that the well driller encountered about a 16.1 metre thickness of overburden material above the bedrock consisting of, in general, sand, clay and gravel. Accordingly, the site is not considered hydrogeologically sensitive.



As per the Section 6.2 of the above mentioned City of Ottawa guideline document if the lot (subject site) is one hectare or larger no additional sewage system impact assessment needs to be provided. As mentioned above the subject site is some 1.6 hectares in plan area and as such, in accordance with the City of Ottawa requirements for scoped hydrogeological studies for coach houses, no additional sewage system impact assessment is required.

## **6.0 CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 SUMMARY AND CONCLUSIONS**

Based on the groundwater supply investigation and impact assessment carried out for the subject site, 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 MOE Procedure D-5-5 and Procedure D-5-4 guidelines and the applicable sections of the above mentioned City of Ottawa guideline document:

- 1) Based on the results of the laboratory testing of the raw water sample obtained from the existing well at the site, the raw water meets the following City of Ottawa required aesthetic limits:
  - Chloride: 250 mg/L
  - Dissolved Organic Carbon: 10 mg/L
  - Iron: 10 mg/L
  - Manganese: 1.0 mg/L
  - Sodium: 200 mg/L
  - Sulphate: 500 mg/L
- 2) The groundwater quality in the bedrock aquifer system at the existing well at the site meets all the ODWSOG concentrations for all health related chemical, physical and bacteriological parameters tested, except for hardness, TDS, colour and iron. The levels of hardness measured at the existing well is well within the acceptable range that is considered treatable. The results of RSI and LSI calculations for the levels of TDS measured at the existing well indicate potential for the groundwater to cause light corrosion of plumbing/plumbing fixtures and to cause slight scale-forming and slight corrosion, respectively. Water softeners are indicated to be adequate to lower hardness to acceptable levels. The levels of colour and iron measured for the treated water samples obtained from an interior faucet within the existing single family dwelling at the site are well below the ODWSOG aesthetic objective.



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) There is a sufficient/sustainable groundwater supply of acceptable drinking water quality in the bedrock aquifer system to satisfy the MOE water requirements of the proposed coach house and existing single family dwelling.

## **6.2 RECOMMENDATIONS**

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

- 1) In order to encourage domestic supply well education and best management practices future/existing homeowners at the site should be made aware of and refer to the MOE publication titled "Water Supply Wells: Requirements and Best Management Practices", revised April 2015.
- 2) Future/existing 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 and color may be desired based on the results of the water quality testing carried out for this investigation.
- 3) Future/existing 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.
- 4) Future/existing homeowners at the site should be made aware of the potential for elevated TDS levels in the well water at the site and that the results of Ryznar Stability Index (RSI) and Langelier Saturation Index (LSI) calculations for samples obtained from the existing well at the site can be interpreted to indicate potential for the groundwater to cause light corrosion of plumbing/plumbing fixtures and potential for the groundwater to cause slight scale-forming and slight corrosion possible, respectively.



- 5) Future/existing homeowners at the site should be made aware that the levels of sodium for the water sample obtained from the existing well at the site was measured above 20 mg/L (45 and 44 mg/L) and accordingly may be of interest to persons on a sodium restricted diet. According to the MOE, the local Medical Office of Health should be notified where sodium levels are above 20 mg/L in order that this information may be relayed to local physicians. The sodium levels are well within the ODWSOG aesthetic objective of 200 mg/L.

## **7.0 LIMITATIONS AND USE OF REPORT**

This report was prepared for the exclusive use of Lockwood Brothers Construction Ltd. This report may not be relied upon by any other person or entity without the express written consent of Lockwood Brothers 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, nothing in this report is intended to provide a legal opinion. 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.



## 8.0 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.  
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Revised December 10, 2019 as per City of Ottawa comment



## 9.0 REFERENCES

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*Map 1508A – Generalized Bedrock Geology – Ottawa-Hull:* Geological Survey of Canada, Department of Energy, Mines and Resources, dated 1979

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*Kransy:* Classification of Transmissivity Magnitude and Variation, Vol.31, No.2 - Ground Water, dated 1993

*Ontario Ministry of the Environment, Conservation and Parks:* Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment, August 1996

*Ontario Ministry of the Environment, Conservation and Parks:* Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment, August 1996

*City of Ottawa:* Second Draft for Industry Circulation, Hydrogeological and Terrain Analysis Guidelines, Section 6.0, Coach Houses: Terms of Reference: Scoped Hydrogeological Studies for Coach Houses, (Approved by City Council on October 11, 2017), dated March 2019

*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 WELL**

Test Well	Hours Since Pumping Started	Temp. (°C)	Conductivity (uS/cm)	pH (pH units)	TDS (ppm)	Turbidity (NTU)	Free Chlorine (mg/L)	Sample
On Site Well	1	9.8	1150	7.97	570	3.8	-	-
	2	11.3	1020	7.92	510	0.8	-	-
	3	11.4	980	7.93	480	0.6	0.00	3hr sample
	4	11.6	970	7.94	480	0.6	-	-
	5	11.8	950	7.96	480	0.5	-	-
	6	11.7	970	8.04	480	0.4	0.00	6hr sample





**TABLE II**  
**SUMMARY OF PUMPING TEST RESULTS AND WELL PARAMETERS**

Test Well	Tp (m <sup>2</sup> /day)	Tr (m <sup>2</sup> /day)	Tav (m <sup>2</sup> /day)	Q (m <sup>3</sup> /day)	SC (m <sup>3</sup> /day/m)	ho m	hf m	Td m	TD m	CS m	AD m
On Site Well	67.0	120.0	94	130.9	106.4	3.54	4.77	1.23	20.40	0.4	16.26

Well	% Available Drawdown Used
On Site Well	8%

**Overall Average Transmissivity**

T	93.5	m <sup>2</sup> /day
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Note:	Tp:	Transmissivity as calculated from pumping data (m <sup>2</sup> /day)
	Tr:	Transmissivity as calculated from recovery data (m <sup>2</sup> /day)
	Tav:	Average transmissivity (average of pumping and recovery) (m <sup>2</sup> /day)
	Q:	Test pumping rate (m <sup>3</sup> /day)
	SC:	Specific Capacity (m <sup>3</sup> /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 III  
LANGELIER SATURATION INDEX CALCULATIONS

Test Well Sample	pH	TDS (mg/L)	Temp. (°C)	Ca (mg/L)	Ca as CaCO <sub>3</sub> (mg/L)	Alkalinity as CaCO <sub>3</sub> (mg/L)	A	B	C	D	pHs	Langelier Saturation Index (pH - pHs)	*Comment
3hr	7.96	501	11.4	67	168	208	0.170	2.354	1.824	2.318	7.682	0.28	Slight scale-forming, and slight corrosion possible
6hr	7.96	495	11.7	66	165	208	0.169	2.348	1.817	2.318	7.682	0.28	Slight scale-forming, and slight corrosion possible

\*Based on (Carrier 1965) -2 to -0.5 indicates serious corrosion

\*Based on (Carrier 1965) -0.5 to <0 indicates slight corrosion, non scale-forming

Notes:

Ca as CaCO<sub>3</sub> = Ca / 0.4

A = (Log<sub>10</sub>[TDS] -1)/10

B = -13.12[(Log<sub>10</sub>(Temp. + 273))+34.55

C = Log<sub>10</sub>[Ca as CaCO<sub>3</sub>]-0.4

D = Log<sub>10</sub>[alkalinity as CaCO<sub>3</sub>]

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

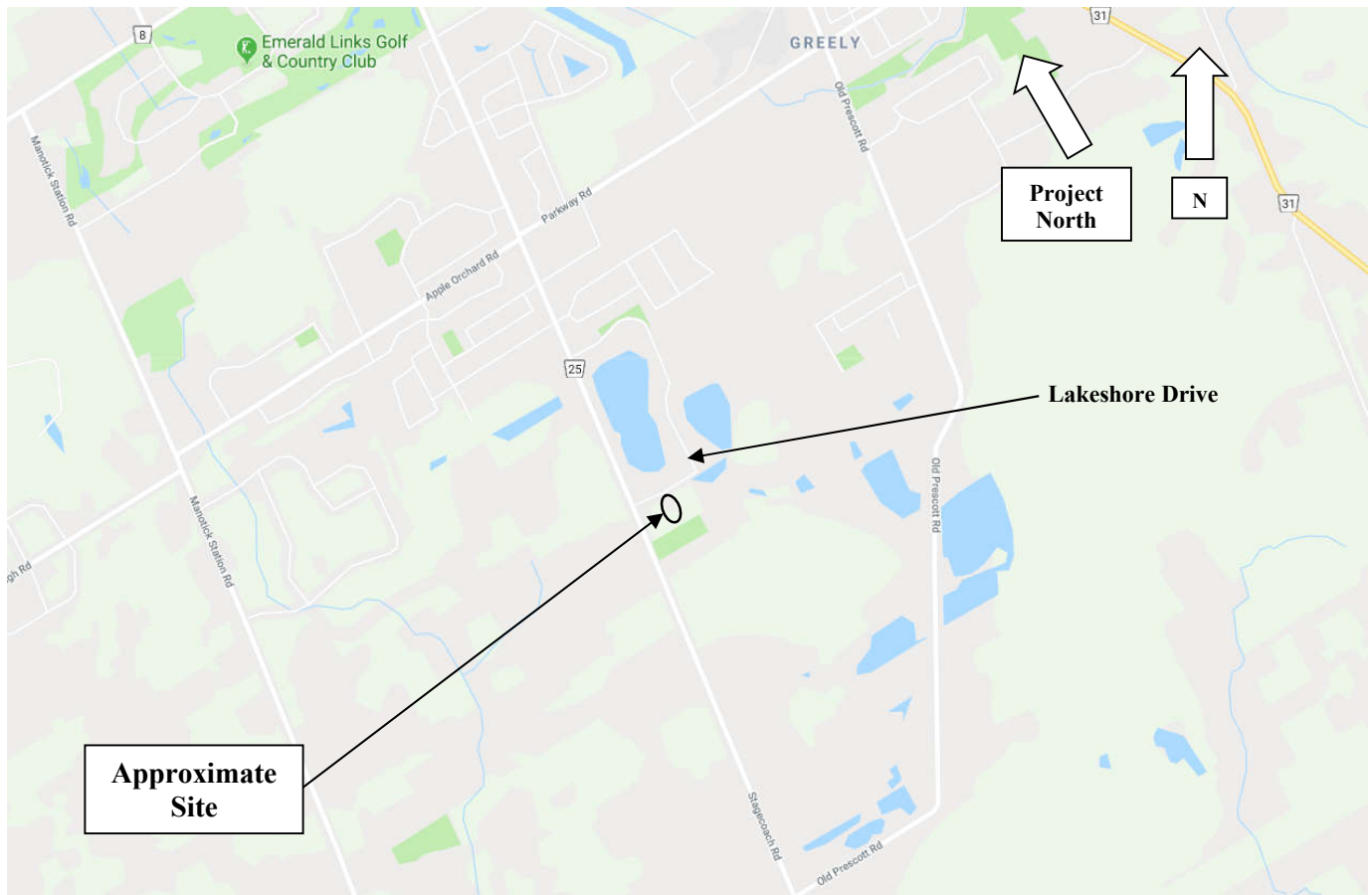
Langelier Saturation Index = pH-pHs

\*Based on (Carrier 1965) >0 to 0.5 indicates slight scale-forming, and slight corrosion possible

\*Based on (Carrier 1965) 0.5 to 2.0 indicates scale-forming, non corrosive

## KEY PLAN

FIGURE 1



NOT TO SCALE

## SITE SKETCH PLAN

FIGURE 2



0 50m

APPROXIMATE SCALE



## **APPENDIX A**

### **MOE WELL RECORD FOR ON SITE WELL**





## Environment

## The Ontario Water Resources Act

# WATER WELL RECORD

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK TRACT SURVEY ETC	LOT
Albion Carleton	Osgood	4 Lakeland Estate	10
OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED	
Spill Green	1717 Lakeland Road, Bldg 4, Osgood	DAY 1 MAY YR 90	

## LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

[illegible]

## WATER RECORD

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

## CASING &amp; OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET	
			FROM	TO
6 1/4	<input checked="" type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC	188	0	53
	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC			
	<input type="checkbox"/> STEEL <input type="checkbox"/> GALVANIZED <input type="checkbox"/> CONCRETE <input type="checkbox"/> OPEN HOLE <input type="checkbox"/> PLASTIC			

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

## PLUGGING &amp; SEALING RECORD

DEPTH SET AT FEET		MATERIAL AND TYPE	CEMENT GROUT LEAD PACKER, ETC.
FROM	TO		
2	53	grout	

## PUMPING TEST

PUMPING TEST	PUMPING TEST METHOD		PUMPING RATE		DURATION OF PUMPING	
	<input checked="" type="checkbox"/> PUMP	<input type="checkbox"/> BAILER	50 GPM		1 HOUR	
	STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING		<input type="checkbox"/> PUMPING <input type="checkbox"/> RECOVERY	
	FEET	48 FEET	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
			35 FEET	40 FEET	45 FEET	48 FEET
IF FLOWING GIVE RATE		PUMP INTAKE SET AT		WATER AT END OF TEST		
GPM		67 FEET		<input type="checkbox"/> CLEAR <input type="checkbox"/> CLOUDY		
RECOMMENDED PUMP TYPE		RECOMMENDED PUMP SETTING		RECOMMENDED PUMPING RATE		
<input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP		45 FEET		20 GPM		

## LOCATION OF WELL

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

712

# LAKE shore

<b>FINAL STATUS OF WELL</b>	<input checked="" type="checkbox"/> WATER SUPPLY <input type="checkbox"/> OBSERVATION WELL <input type="checkbox"/> TEST HOLE <input type="checkbox"/> RECHARGE WELL	<input type="checkbox"/> ABANDONED INSUFFICIENT SUPPLY <input type="checkbox"/> ABANDONED POOR QUALITY <input type="checkbox"/> UNFINISHED <input type="checkbox"/> DEWATERING
<b>WATER USE</b>	<input checked="" type="checkbox"/> DOMESTIC <input type="checkbox"/> STOCK <input type="checkbox"/> IRRIGATION <input type="checkbox"/> INDUSTRIAL <input type="checkbox"/> OTHER _____	<input type="checkbox"/> COMMERCIAL <input type="checkbox"/> MUNICIPAL <input type="checkbox"/> PUBLIC SUPPLY <input type="checkbox"/> COOLING OR AIR CONDITIONING <input type="checkbox"/> NOT USED
<b>METHOD OF CONSTRUCTION</b>	<input type="checkbox"/> CABLE TOOL <input type="checkbox"/> ROTARY (CONVENTIONAL) <input type="checkbox"/> ROTARY (REVERSE) <input checked="" type="checkbox"/> ROTARY (AIR)	<input type="checkbox"/> BORING <input type="checkbox"/> DIAMOND <input type="checkbox"/> JETTING <input type="checkbox"/> DRIVING

Regional ES

House      garage

$\odot 10'$   
 $\rightarrow \bullet \rightarrow \text{well}$   
 $15'$

66793

FORM NO. 0506 (11/86) FORM 9





## **APPENDIX B**

### **PUMPING TEST DATA FOR ON SITE WELL**





## DRAWDOWN DATA TEST WELL

File: 019210

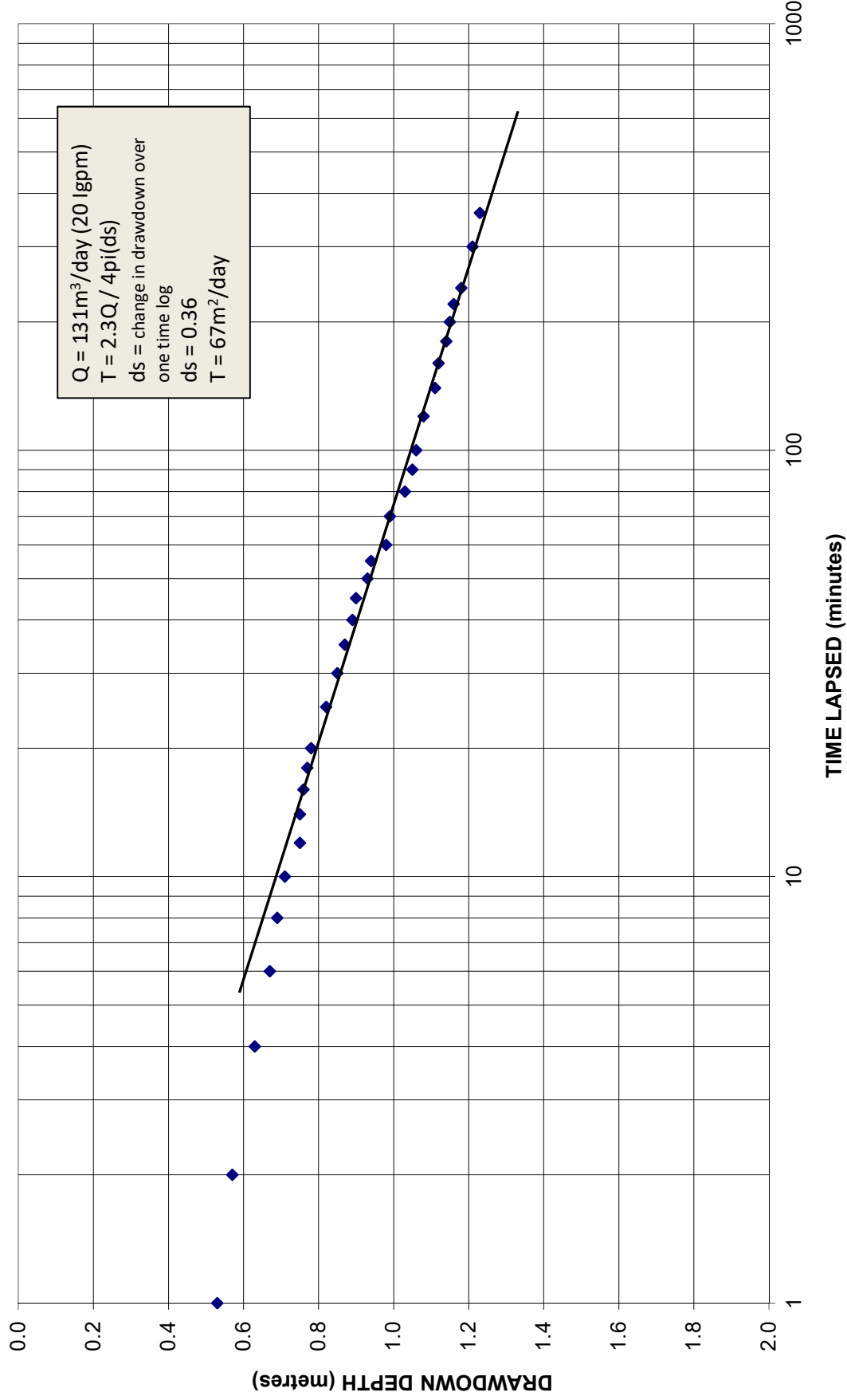
Pump Test Date: April 30/19

Pump Rate: 20 l/gpm

Time of Day	Time Lapsed (minutes)	Depth (metres)	h-ho (metres)
7:54	0	3.54	0.00
7:55	1	4.07	0.53
7:56	2	4.11	0.57
7:58	4	4.17	0.63
8:00	6	4.21	0.67
8:02	8	4.23	0.69
8:04	10	4.25	0.71
8:06	12	4.29	0.75
8:08	14	4.29	0.75
8:10	16	4.30	0.76
8:12	18	4.31	0.77
8:14	20	4.32	0.78
8:19	25	4.36	0.82
8:24	30	4.39	0.85
8:29	35	4.41	0.87
8:34	40	4.43	0.89
8:39	45	4.44	0.90
8:44	50	4.47	0.93
8:49	55	4.48	0.94
8:54	60	4.52	0.98
9:04	70	4.53	0.99
9:14	80	4.57	1.03
9:24	90	4.59	1.05
9:34	100	4.60	1.06
9:44	120	4.62	1.08
9:54	140	4.65	1.11
10:04	160	4.66	1.12
10:14	180	4.68	1.14
10:24	200	4.69	1.15
10:34	220	4.70	1.16
10:44	240	4.72	1.18
10:54	300	4.75	1.21
11:04	360	4.77	1.23



## TEST WELL DRAWDOWN VS. TIME





## RECOVERY DATA TEST WELL

File: 019210

Pump Test Date: April 30/19

Recovery Time t' (minutes)	t / t' (ratio)	Depth (metres)	h-ho (metres)
0		4.77	1.23
1	361	4.10	0.56
2	181	4.03	0.49
4	91	4.00	0.46
6	61	3.96	0.42
8	46	3.94	0.40
10	37	3.92	0.38
12	31	3.90	0.36
14	27	3.88	0.34
16	24	3.87	0.33
18	21	3.86	0.32
20	19	3.84	0.30
25	15	3.81	0.27
30	13	3.79	0.25
35	11	3.77	0.23
40	10	3.75	0.21
45	9	3.74	0.20
50	8	3.72	0.18
55	8	3.71	0.17
60	7	3.70	0.16
70	6	3.67	0.13
80	6	3.64	0.10
90	5	3.63	0.09
100	5	3.61	0.07
120	4	3.59	0.05

**96%**

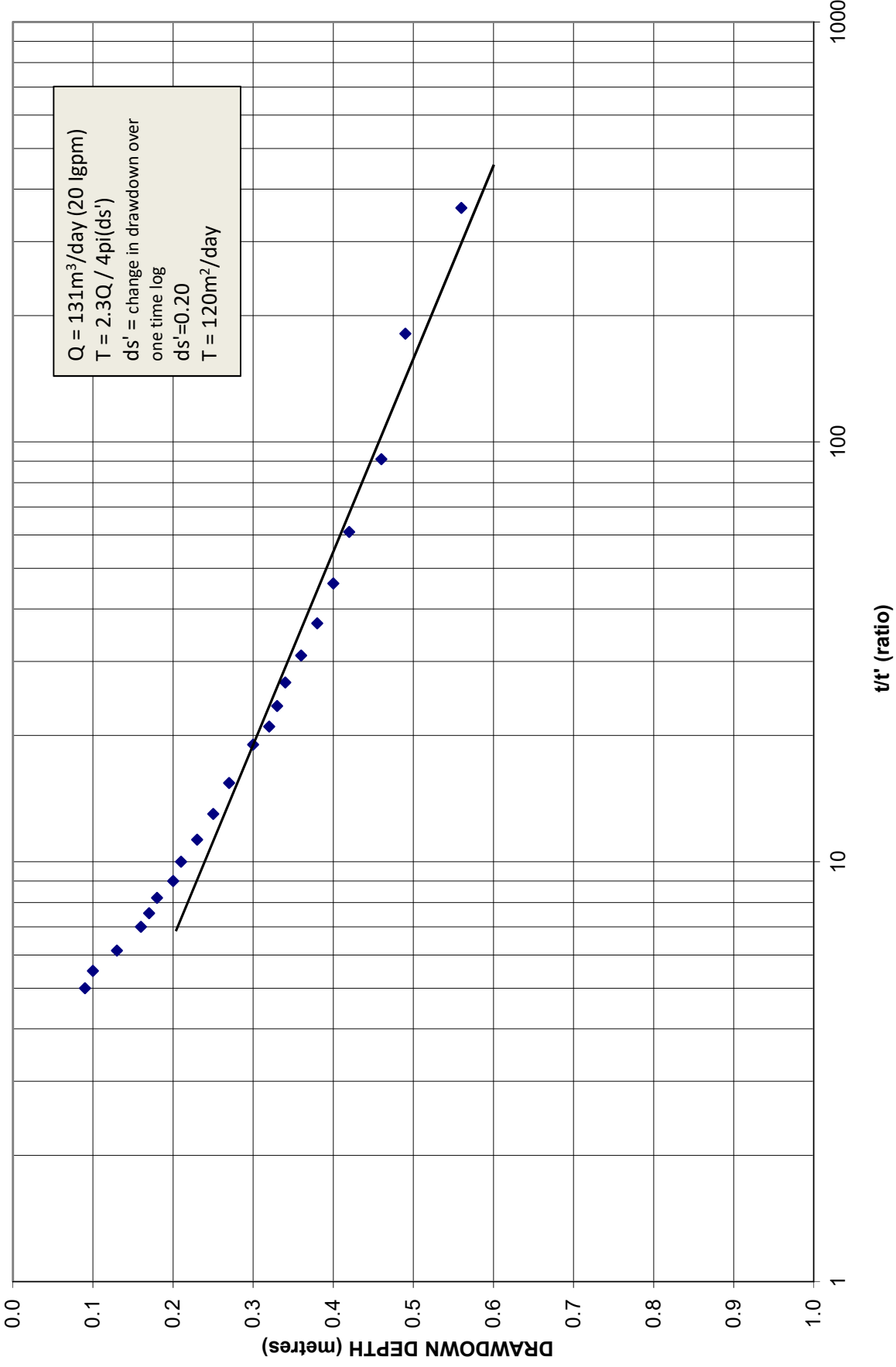
**RECOVERY AFTER**

**120**

**MINUTES**



## TEST WELL RECOVERY DATA





## **APPENDIX C**

### **RESULTS OF LABORATORY TESTING OF ON SITE WELL WATER SAMPLES**



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

Report Number: 1906414  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-08  
Project: 019210  
COC #: 203505

Page 1 of 5

**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:

Addressine  
Thomas  
2019.05.08  
15:47:07 -04'00'

APPROVAL: \_\_\_\_\_  
Addressine Thomas, Inorganics Supervisor

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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: 1906414  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-08  
Project: 019210  
COC #: 203505

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Anions	Cl	1	mg/L	AO 250	1423565 Water
	F	0.10	mg/L	MAC 1.5	107
	N-NO2	0.10	mg/L	MAC 1.0	0.41
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	SO4	1	mg/L	AO 500	<0.10
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	41
	Colour	2	TCU	AO 5	208
	Conductivity	5	uS/cm		16*
	pH	1.00		6.5-8.5	771
	S2-	0.01	mg/L	AO 0.05	7.96
Hardness	TDS (COND - CALC)	1	mg/L	AO 500	<0.01
	Turbidity	0.1	NTU	AO 5.0	501*
	Hardness as CaCO3	1	mg/L	OG 100	2.2
	Ion Balance	0.01			303*
	Ca	1	mg/L		1.01
Indices/Calc Metals	Fe	0.03	mg/L	AO 0.3	67
	K	1	mg/L		0.40*
	Mg	1	mg/L		3
	Mn	0.01	mg/L	AO 0.05	33
	Na	2	mg/L	AO 200	0.01
Subcontract-Ihorg	DOC	0.5	mg/L	AO 5	45
	N-NH3	0.01	mg/L		2.5
	Phenols	0.001	mg/L		0.15
	Tannin & Lignin	0.1	mg/L		<0.001
	Total Kjeldahl Nitrogen	0.1	mg/L		<0.1
					0.2

Guideline = Obwsog

\* = 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



## 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: 1906414  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-08  
Project: 019210  
COC #: 203505

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
<b>Run No 364714</b> <b>Method C SM2130B</b>	<b>Analysis/Extraction Date 2019-05-01</b>	<b>Analyst R K</b>	
Turbidity	0.2 NTU	102	70-130
<b>Run No 364917</b> <b>Method SM 4110</b>	<b>Analysis/Extraction Date 2019-05-02</b>	<b>Analyst AA</b>	
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	105	90-110
SO4	<1 mg/L	105	90-110
<b>Run No 364967</b> <b>Method SM2320,2510,4500H/F</b>	<b>Analysis/Extraction Date 2019-05-05</b>	<b>Analyst K J</b>	
Alkalinity (CaCO3)	<5 mg/L	97	90-110
Conductivity	<5 uS/cm	100	90-110
F	<0.10 mg/L	100	90-110
pH		100	90-110
<b>Run No 364975</b> <b>Method SM 4110</b>	<b>Analysis/Extraction Date 2019-05-03</b>	<b>Analyst AA</b>	
Chloride	<1 mg/L	100	90-110
<b>Run No 364985</b> <b>Method C SM2120C</b>	<b>Analysis/Extraction Date 2019-05-06</b>	<b>Analyst AA</b>	

**Guideline = OBWSOG**

**\* = Guideline Exceedence**

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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: 1906414  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-08  
Project: 019210  
COC #: 203505

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Colour	<2 TCU	100	90-110
Run No 364989 Method C SM4500-S2-D	Analysis/Extraction Date 2019-05-03	Analyst AET	
S2-	<0.01 mg/L	95	80-120
Run No 365091 Method M SM3120B-3500C	Analysis/Extraction Date 2019-05-06	Analyst H D	
Calcium	<1 mg/L	102	90-110
Potassium	<1 mg/L	101	87-113
Magnesium	<1 mg/L	98	76-124
Sodium	<2 mg/L	109	82-118
Run No 365097 Method EPA 200.8	Analysis/Extraction Date 2019-05-07	Analyst H D	
Iron	<0.03 mg/L	93	91-109
Manganese	<0.01 mg/L	98	92.9-107
Run No 365116 Method SUBCONTRACT P-INORG	Analysis/Extraction Date 2019-05-06	Analyst REE	
DOC	<0.5 mg/L	87	
N-NH3	<0.01 mg/L	90	
Phenols	<0.001 mg/L	76	69-132

**Guideline = OBWSOG**

**\* = Guideline Exceedence**

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

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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: 1906414  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-08  
Project: 019210  
COC #: 203505

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	103	81-126
Run No 365147 Method C SM2340B	Analysis/Extraction Date 2019-05-08	Analyst AET	
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			

**Guideline = OBWSOG**

**\* = 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



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

Report Number: 1906415  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-02  
Project: 019210  
COC #: 203505

Page 1 of 2

**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:

Steven  
Tosh  
2019.05.02  
16:48:41  
-04'00'

APPROVAL:

Steven Tosh, Operations Manager

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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: 1906415  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-02  
Project: 019210  
COC #: 203505

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	1423566 Water  2019-04-20 3hr 1717 Lakeshore Dr - Bacti
	Faecal Coliforms	0	ct/100mL		
	Heterotrophic Plate Count	0	ct/1mL		
	Total Coliforms	0	ct/100mL	MAC 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



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

Report Number: 1906416  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-22  
Project: 019210  
COC #: 202427

Page 1 of 5

**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:

  
Addrine Thomas  
2019.05.22  
15:22:10 -04'00'

APPROVAL:

Addrine Thomas, Inorganics Supervisor

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

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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: 1906416  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-22  
Project: 019210  
COC #: 202427

Group	Analyte	MRL	Units	Guideline	1423567 Water  2019-04-30 6hr 1717 Lakeshore Dr.
Anions	Cl	1	mg/L	AO 250	104
	F	0.10	mg/L	MAC 1.5	0.41
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	SO4	1	mg/L	AO 500	41
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	208
	Colour	2	TCU	AO 5	15*
	Conductivity	5	uS/cm		762
	pH	1.00		6.5-8.5	7.96
	S2-	0.01	mg/L	AO 0.05	<0.01
Hardness	TDS (COND - CALC)	1	mg/L	AO 500	495
	Turbidity	0.1	NTU	AO 5.0	1.9
	Hardness as CaCO3	1	mg/L	OG 100	301*
	Ion Balance	0.01			1.00
	Ca	1	mg/L		66
Indices/Calc Metals	Fe	0.03	mg/L	AO 0.3	0.36*
	K	1	mg/L		3
	Mg	1	mg/L		33
	Mn	0.01	mg/L	AO 0.05	0.01
	Na	2	mg/L	AO 200	44
Subcontract-Ihorg	DOC	0.5	mg/L	AO 5	2.5
	N-NH3	0.01	mg/L		0.14
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		<0.1
	Total Kjeldahl Nitrogen	0.1	mg/L		0.1

Guideline = Obwsog

\* = Guideline Exceedence

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



## 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: 1906416  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-22  
Project: 019210  
COC #: 202427

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
<b>Run No 364714</b> <b>Method C SM2130B</b>	<b>Analysis/Extraction Date 2019-05-01 Analyst R K</b>		
Turbidity	0.2 NTU	102	70-130
<b>Run No 364917</b> <b>Method SM 4110</b>	<b>Analysis/Extraction Date 2019-05-02 Analyst AA</b>		
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	105	90-110
SO4	<1 mg/L	105	90-110
<b>Run No 364967</b> <b>Method SM2320,2510,4500H/F</b>	<b>Analysis/Extraction Date 2019-05-05 Analyst K J</b>		
Alkalinity (CaCO3)	<5 mg/L	97	90-110
Conductivity	<5 uS/cm	100	90-110
F	<0.10 mg/L	100	90-110
pH		100	90-110
<b>Run No 364975</b> <b>Method SM 4110</b>	<b>Analysis/Extraction Date 2019-05-03 Analyst AA</b>		
Chloride	<1 mg/L	100	90-110
<b>Run No 364985</b> <b>Method C SM2120C</b>	<b>Analysis/Extraction Date 2019-05-06 Analyst AA</b>		

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#### \* = 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: 1906416  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-22  
Project: 019210  
COC #: 202427

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Colour	<2 TCU	100	90-110
Run No 364989 Analysis/Extraction Date 2019-05-03 Analyst AET Method C SM4500-S2-D			
S2-	<0.01 mg/L	95	80-120
Run No 365026 Analysis/Extraction Date 2019-05-06 Analyst H D Method EPA 200.8			
Iron	<0.03 mg/L	97	91-109
Manganese	<0.01 mg/L	100	92.9-107
Run No 365091 Analysis/Extraction Date 2019-05-06 Analyst H D Method M SM3120B-3500C			
Calcium	<1 mg/L	102	90-110
Potassium	<1 mg/L	101	87-113
Magnesium	<1 mg/L	98	76-124
Sodium	<2 mg/L	109	82-118
Run No 365147 Analysis/Extraction Date 2019-05-08 Analyst AET Method C SM2340B			
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			

**Guideline = ODWSOG**

**\* = Guideline Exceedence**

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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: 1906416  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-22  
Project: 019210  
COC #: 202427

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 365951 Method SUBCONTRACT P-INORG	Analysis/Extraction Date 2019-05-06 Analyst REE		
DOC	<0.5 mg/L	87	
N-NH3	<0.01 mg/L	90	
Phenols	<0.001 mg/L	76	69-132
Tannin & Lignin	<0.1 mg/L	100	
Total Kjeldahl Nitrogen	<0.1 mg/L	121	81-126

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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: 1906417  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-02  
Project: 019210  
COC #: 202427

Page 1 of 2

**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:

Steven Tosh  
2019.05.02  
16:49:19  
-04'00'

APPROVAL:

Steven Tosh, Operations Manager

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

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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: 1906417  
Date Submitted: 2019-04-30  
Date Reported: 2019-05-02  
Project: 019210  
COC #: 202427

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	1423569 Water  2019-04-30 6Hr 1717 Lakeshore Dr
	Faecal Coliforms	0	ct/100mL		
	Faecal Streptococcus	0	ct/100mL		
	Heterotrophic Plate Count	0	ct/1mL		
	Total Coliforms	0	ct/100mL	MAC 0	

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Analytical Method: AMBCOLM1  
additional QA/QC information available on request.

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Client: Morey Associates  
2672 Highway 43  
Kemptville, ON  
K0G 1J0  
Attention: Mr. Dan Morey  
PO#: 120481  
Invoice to: Morey Associates

Report Number: 1913228  
Date Submitted: 2019-07-25  
Date Reported: 2019-07-29  
Project: 019210  
COC #: 190179

Page 1 of 3

**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:

Addrine Thomas

2019.07.29

14:01:13 -04'00'

APPROVAL:

Addrine Thomas, Inorganics Supervisor

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Environment Testing

Certificate of Analysis

Client: Morey Associates  
2672 Highway 43  
Kemptville, ON  
K0G 1J0  
Attention: Mr. Dan Morey  
PO#: 120481  
Invoice to: Morey Associates

Report Number: 1913228  
Date Submitted: 2019-07-25  
Date Reported: 2019-07-29  
Project: 019210  
COC #: 190179

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
General Chemistry	Colour	2	TCU	AO 5	1443554 Water 2019-07-25 1717 Lakeshore Drive
					<2

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Client: Morey Associates  
2672 Highway 43  
Kemptville, ON  
K0G 1J0  
Attention: Mr. Dan Morey  
PO#: 120481  
Invoice to: Morey Associates

Report Number: 1913228  
Date Submitted: 2019-07-25  
Date Reported: 2019-07-29  
Project: 019210  
COC #: 190179

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 369730 Method C SM2120C	Analysis/Extraction Date 2019-07-26 Analyst K J		
Colour	<2 TCU	105	90-110

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Client: Morey Associates  
2672 Highway 43  
Kemptville, ON  
K0G 1J0  
Attention: Mr. Dan Morey  
PO#: 120481  
Invoice to: Morey Associates

Report Number: 1913226  
Date Submitted: 2019-07-25  
Date Reported: 2019-07-29  
Project: 019210  
COC #: 190178

Page 1 of 3

**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:

Addrine Thomas  
2019.07.29  
13:59:55 -04'00'

APPROVAL:

\_\_\_\_\_  
Addrine Thomas, Inorganics Supervisor

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Environment Testing

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Client: Morey Associates  
2672 Highway 43  
Kemptville, ON  
K0G 1J0  
Attention: Mr. Dan Morey  
PO#: 120481  
Invoice to: Morey Associates

Report Number: 1913226  
Date Submitted: 2019-07-25  
Date Reported: 2019-07-29  
Project: 019210  
COC #: 190178

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Metals	Fe	0.03	mg/L	AO 0.3	1443552 Water 2019-07-25 1717 Lakeshore Drive
					0.11

Guideline = OBWSOG

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Environment Testing

## Certificate of Analysis

Client: Morey Associates

2672 Highway 43

Kemptville, ON

K0G 1J0

Attention: Mr. Dan Morey

PO#: 120481

Invoice to: Morey Associates

Report Number: 1913226

Date Submitted: 2019-07-25

Date Reported: 2019-07-29

Project: 019210

COC #: 190178

### QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 369767 Method EPA 200.8	Analysis/Extraction Date 2019-07-26	Analyst H D	
Iron	<0.03 mg/L	96	91-109

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## **APPENDIX D**

### **ON SITE WATER WELL SYSTEM & SEPTIC SURVEY QUESTIONNAIRE**

# WATER WELL SYSTEM & SEPTIC SURVEY QUESTIONNAIRE

Our File No.: 019210

## SECTION A: PROPERTY INFORMATION

Address of Property:	1717 Lakeshore Drive, Greely, ON.
* Name of Property Owner:	Gerrie Kautz
* Telephone Number (Home):	n/a
Number of Occupants:	1
Number of Bedrooms:	3
How Long at Present Address:	Since 1998

\*This information will NOT be included in any reporting

## SECTION B: WELL CONSTRUCTION DETAILS

Date or year well constructed:		~1990	
Do you have a copy of the MOE Well Record?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Well record number (if known):		unknown	
Type of well:		<input checked="" type="checkbox"/> Drilled	<input type="checkbox"/> Dug
Well casing diameter (inches):		6"	
Location of well (e.g. front yard, back yard, etc.):		Side Yard	
Present well depth:	±67'	Original well depth:	±67' <input checked="" type="checkbox"/> Same as present
Is the well accessible?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Is it vented and how?		unknown	

## SECTION C: WATER SUPPLY

Do you have a water treatment system?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
If yes, what kind of treatment?:			
Chlorination:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Softener:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
Filter:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Other:			

## SECTION D: WATER QUALITY & QUANTITY

Do you drink the water?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	
If no, since when and why?			
Have you ever run out of water?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
Has your well ever been deepened or a new well constructed?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO	
If yes, why?			
Have you ever experienced any problems with your well?		No, except 1 pump failure.	
What was the cause of the problem?		<input type="checkbox"/> Drought	<input checked="" type="checkbox"/> Pump Failure
<input type="checkbox"/> Increased Usage	<input type="checkbox"/> Interference	<input type="checkbox"/> Other (Please Specify) ↑	

at about 14 years of use.

SECTION D CONTINUED: WATER QUALITY & QUANTITY			
Quality: Taste	<input type="checkbox"/> Excellent	<input checked="" type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Odour	<input type="checkbox"/> Excellent	<input checked="" type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Colour	<input checked="" type="checkbox"/> Excellent	<input type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Hardness	<input type="checkbox"/> Excellent	<input checked="" type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Iron	<input type="checkbox"/> Excellent	<input checked="" type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Sulphur Smell	<input type="checkbox"/> Excellent	<input checked="" type="checkbox"/> Acceptable	<input type="checkbox"/> Poor
Has your water quality been tested previously?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
If yes, for what?	<input checked="" type="checkbox"/> Bacteriological	<input type="checkbox"/> Chemical analysis	<input type="checkbox"/> Other
Does your well supply enough water for your use?		<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
If no, is this the case?:	<input type="checkbox"/> Some of the time	<input type="checkbox"/> Seasonally	<input type="checkbox"/> Other
Do you use your well for?:	<input checked="" type="checkbox"/> Lawn watering	<input checked="" type="checkbox"/> Pool filling	<input checked="" type="checkbox"/> Gardening
Number of persons using water from your well?		1	

SECTION E: WATER SAMPLING		
Water sample obtained?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**SECTION F: SEWAGE SYSTEM**What type of sewage system are you using? ☒ Conventional: ☐ Tertiary:

If tertiary, what type?

Leaching bed/area bed type? ☒ Raised ☐ Partially Raised ☐ BuriedType of Septic Tank? ☒ Concrete ☐ Plastic ☐ Other

What is the age of the sewage system? ~ 1991

Have there been any problems with the system? ☐ YES ☒ NO

If yes, please comment:

Other General Comments:

**SECTION G: INTERVIEWER WELL AND SEWAGE SYSTEM OBSERVATIONS**Approximate Well Location: ☐ Front yard ☐ Rear yard ☒ Side yardSewage System Location: ☐ Front yard ☒ Rear yard ☐ Side yardApproximate distance between the well and sewage system:  $\pm 30$  mMOE well record tag # on well? ☐ YES ☒ NO

If yes, what is the tag #?

Septic tank lids visible/accessible at grade? ☐ YES ☒ NOTertiary unit lid visible/accessible at grade? ☐ YES ☐ NO ☒ N/AAny visible evidence of distress to the at ground surface components of the sewage system? ☐ YES ☒ NO

If yes, describe:

Any visible evidence of effluent "breakout" at ground surface at the sewage system? ☐ YES ☒ NO

If yes, describe:

Other General Comments: