HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



Project No.: CCO-20-0203

Prepared for:

1384341 Ontario Limited 9094 Cavanagh Road Ashton, Ontario K0A 1B0

Prepared by:

McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Road Carp, Ontario K0A 1L0

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MCINTOSH PERRY

EXECUTIVE SUMMARY

McIntosh Perry (MP) was retained by 1384341 Ontario Limited (Cavanagh Construction) to conduct a Hydrogeological Assessment and Terrain Analysis at Gardiner's Shore in the Township of Beckwith, Ontario (the Site) (Figure 1). The site is bounded by 9th Line Road and 10th Line Road, east of Gardiner's Shore Road and is located within the community development zone of Blacks Corners in Beckwith Township. An outline of the Site, showing the neighbouring portions of Beckwith is presented on Figure 2. At the present time, the Site consists primarily of agricultural fields.

The Site is relatively flat, with the land generally sloping downward to the north side of the property. The elevation ranges between 136 and 148.5 metres above sea level (m asl), with the majority of the site at an elevation between 140 and 144 metres above sea level (m asl).

McIntosh Perry supervised the installation of seven on-site water wells, as well as ten on-site test pits. Wells were used for groundwater quality and quantity testing, and all test well locations were slotted for eventual domestic use when the Site is developed. Test pit data were collected for purposes of soil classification and overburden thickness. A summary of the test wells and test pit locations is illustrated on Figure 2.

All test wells were pumped for at least six hours and were sampled twice during this time, per Ministry of Environment, Conservation and Parks (MECP) Procedure D-5-5. Analytical data and pumping test results from all test wells suggests that on-site water supply aquifer is of high yield and good quality.

Test pit excavations revealed on-site shallow overburden to consist of either a thin continuous layer of silty sand to sand with gravel, or shallow bedrock overlain by topsoil. Bedrock was found at a maximum depth of approximately 2.4 metres below ground surface (m bgs) and generally consists of dolostone and sandstone based on Ontario Geological Survey (OGS) and MECP Water Well Information System (WWIS) records (2020).

The site appears to be suitable for the proposed development, from a hydrogeological perspective.

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1.0 INTRODUCTION

McIntosh Perry (MP) was retained by 1384341 Ontario Limited (Cavanagh Construction) to conduct a Hydrogeological Assessment and Terrain Analysis at a property located immediately east of Gardiner Shore Road, between 9th Line Road and 10th Line Road in the Township of Beckwith, Ontario (the Site) (Figure 1). This study has been prepared in support of an application for the approval of a proposed 118-lot subdivision at the Site, which currently consists primarily of agricultural fields.

This work was conducted in general accordance with Ministry of Environment, Conservation and Parks (MECP) guidance as follows:

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

This work was initiated by McIntosh Perry in late 2020 with a Site reconnaissance to observe surface conditions and select drilling locations. The work presented herein involved the following:

- Topographic survey (completed by Cavanagh Construction);
- Hydrogeological assessment (for evaluating water supply); and
- Terrain Analysis (for evaluating existing conditions for private sewage treatment).

The property is owned by Cavanagh Construction and is legally described as follows:

LT 7 CON 9 BECKWITH; NE1/2 LT 8 CON 9 BECKWITH; SW1/2 LT 8 CON 9 BECKWITH EXCEPT PT 1, 27R2704, PT 1, 27R7971, PARTS 1 TO 4, 27R221, RS83491, RS111170, PART 1 ON 27R9778 AND PART 1 ON 27R10784 BECKWITH TOWNSHIP.

A full Preliminary Concept Plan is included as Appendix A.

This report considers the development potential of the entire land holding, which includes a total of 118 lots over a total area of approximately 84 hectares. The Hydrogeological Assessment and Terrain Analysis address the following:

- General Site setting information;
- Geological and hydrogeological background;
- Site-specific conditions;
- Soils evaluation; and
- Contaminant attenuation.

2.0 INVESTIGATION

2.1 Site Setting

The Site is located within the Township of Beckwith in central Eastern Ontario, south of the Town of Carleton Place (Figure 1).

While the Site is currently primarily used for agricultural purposes, a rural-residential severance with a single detached residence, as well as associated garages, sheds, and agricultural structures exists on the southern portion of the Site, along 9th Line Road. There are residentially developed lands immediately west of the Site, along Mississippi Lake, otherwise the surrounding land use is predominately rural agriculture or vacant/forested.

This region is characterized by thin overburden overlying Paleozoic bedrock (OGS, 2020; MECP, 2020). The climate is humid continental with cool winters and warm summers. The 1981-2010 mean annual precipitation is approximately 943.4 mm with 223.5 cm as snow, and the mean daily temperature is 6.4 °C (Environment Canada Climate Normals for Ottawa MacDonald-Cartier Int'l Airport, ON).

The Site currently consists of agricultural fields and has likely never been contemporarily developed. On-site elevation ranges between 136 and 148.5 metres above sea level (m asl), with the majority of the site at an elevation between 140 and 144 metres above sea level (m asl). The topography of the Site is generally flat and slopes downwards slightly to the west.

2.2 Neighbouring Properties and Land Uses

The property is bounded to the north by 10th Line Road, undeveloped forest and rural residential to the east, 9th Line Road to the south, and Gardiner Shore Road and residential properties to the west.

Based on a review of MECP Well Record Information System (WWIS) records, it appears that all residences in the area are privately serviced with wells and septic systems.

The surrounding properties are designated as rural areas in the Township of Beckwith's Official Plan. The Township's Official Plan – Schedule A is included as Appendix H.

2.3 Hydrology

The Site is relatively flat and appears to be well-drained. McGibbon Bay (part of the Mississippi River system) is the closest permanent waterbody to the Site and is located approximately 150 m west of the Site at its closest point. On a local scale, shallow groundwater flow is interpreted to reflect local topography and flow to the west.

2.4 Background Geology and Hydrology

2.4.1 Surficial and Bedrock Geology

According to Ontario Geological Survey (OGS) regional mapping, surficial overburden at the Site is thin, and is characterized by Paleozoic bedrock (OGS, 2020). This classification is consistent with on-site observations made by McIntosh Perry. Based on OGS 2020 data, the underlying bedrock is classified as quartz sandstone of the Nepean Formation and crystalline dolostone of the Oxford Formation, which is consistent with MECP WWIS Records (MECP 2020).

Well records for on-site test wells indicate an average overburden thickness of approximately 1.3 m (median 0.6 m), with only one record indicating an overburden depth greater than 1.8 m. A review of the MECP Water Well Information System (WWIS) well records within 500 m of the Site showed that the depth to bedrock ranges from 0 - 8.2 m bgs, with an average depth of approximately 1.1 m bgs. Where noted in the well records, bedrock is typically referred to as either "sandstone" or "limestone" by the driller (Appendix H).

2.4.2 Recharge and Discharge Areas

A review of topographic data, geological maps, and Site visits show that the property slopes down to the west, towards the Mississippi River. Shallow groundwater and surface water likely drain in this direction. Shallow groundwater in the southern portion of the site may move toward what appears to be a large wetland complex, McGibbon Creek, located approximately 150 m from the Site at its closest point. Overall, the Site appears to be well-drained.

2.4.3 Hydrogeologically Sensitive Areas

The underlying bedrock appears to be continuous across the property, at an average depth of 1.3 m bgs. While much of the Site is considered to have shallow bedrock, no outcrops or areas exhibiting karst topography were observed during fieldwork.

2.4.4 Potential Sources of Contamination

A windshield survey of the area was conducted in combination with a review of maps and zoning information. The Site is located in a predominantly forested and agricultural area, with some rural subdivisions and residential-rural properties in the vicinity. None of these uses appear to pose any significant source of potential contamination to the proposed development.

It is expected that since there is no wastewater service available in the area surrounding the Site, there are likely individual on-site sewage systems at nearby residences. There are currently no known services located on the Site, aside from private services assumed to service the single detached residence and associated agricultural buildings along 9th Line Road

A review of the MECP WWIS database indicated 127 water wells located within 500 m of the Site. 121 of these wells are listed for domestic purposes, while the remaining 6 wells have either no listed use or are abandoned. The MECP WWIS records are shown on Figure 2, and data are summarized in Appendix H.

3.0 HYDROGEOLOGICAL ASSESSMENT

3.1 Preamble

McIntosh Perry conducted a detailed hydrogeological investigation at the Site to assess the feasibility of individual private wells for servicing the proposed residential lots. As noted in Section 1, the work generally followed the Guidance of MECP Procedure D-5-5: Technical Guideline for Private Wells – Water Supply Assessment.

3.2 Methodology

Air Rock Drilling Ltd. (Air Rock; Well Contractor's Licence No.1119) was retained by Cavanagh Construction to drill seven water wells at the Site for testing purposes and eventual domestic use when the property is developed. The drilling was conducted by licensed employees of Air Rock, and McIntosh Perry personnel observed the grouting of each well per O. Reg. 903 (Wells), as amended. The driller also provided and installed a pump for all pumping test activities. A summary of the test well construction based on driller-provided well records is presented in Table 1. The location of all on-site wells is noted on Figure 2.

Well ID	Depth (m bgs)	Completion Material ¹	Driller's Estimated Yield ² (L/min)
TW 1	24.4	Sandstone	75
TW 2	30.8	Sandstone	75
TW 3	30.5	Sandstone	75
TW 4	33.5	Sandstone	75
TW 5	24.7	Sandstone	75
TW 6	42.7	Sandstone	75

Table 1: On-Site Test Well Details

TW 7	36.6	Sandstone	75 ³
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¹Bedrock formations as noted on Well Record

² Recommended pumping rate as noted on Well Record

³ Test Well 7 observed to be artesian (flow) at an approximate rate of 3.8 L/min

The initial estimation of the yield and quality of water from the test well was made by the drillers during development, which occurred approximately one week after drilling was completed. The yield determined by this one-hour test is noted in Table 1. MECP water well records are provided in Appendix H.

A minimum six-hour pumping test was conducted at each of the seven test wells by McIntosh Perry staff (December 2020 – January 13, 2021). During each test, a single well was pumped at a rate not less than the driller-recommended pumping rate, and water levels were measured in the pumped well and at other on-site test wells in the vicinity, where possible. Water quality was also monitored and recorded in the field during the tests at all seven locations. Two water samples were collected from each pumped well during their respective tests (one each during the first and last hours of the test) for analysis of the "subdivision supply" suite of parameters, in addition to a select suite of metals. Additional resamples were collected at select wells where necessary, as detailed in subsequent sections of this report.

All samples were collected unfiltered and unchlorinated directly into clean bottles supplied by the analytical laboratory (Eurofins of Ottawa, ON). Prior to each sample collection, a field test for chlorine (disposable testing strips) was completed to ensure no residual chlorine persisted from the initial well shocking. Samples were kept on ice and shipped directly to Eurofins under strict chain of custody procedures. All samples were received by the laboratory within 24 hours of collection. Eurofins is fully accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA) and has accreditation for Ontario Safe Drinking Water Act (OSDWA) testing.

During all seven pumping tests, water level monitoring consisted of manual readings with a water level tape. Drawdown was measured in the pumped wells and measurements were made until at least 95% recovery was achieved in the pumping well, or 24 hours had passed (whichever came first).

Water level drawdown and recovery data from the pumping tests were plotted and analyzed using the Cooper-Jacob solution, and were used to calculate transmissivity (T) and hydraulic conductivity (K) for the aquifer. Storativity (S) of the aquifer was estimated wherever suitable observation well measurements could be made.

3.3 Results

Drawdown curves and tabular data from the pumping tests are available in Appendix D and Table 3, respectively. A summary of groundwater quality data and the official Laboratory Certificates of Analysis are available in Appendix B.

3.3.1 *Static Conditions*

Prior to the initiation of pumping, water levels were measured in the seven test wells (Table 2, below). The static groundwater elevation ranged between 138.485 – 140.339 m asl at the time of the pumping tests (Figure 4). Static groundwater elevations suggest that on-site bedrock groundwater flow is likely to the southwest, toward Mississippi Lake. On-site wells were completed in a similar geologic unit (listed by the driller as "sandstone"). Well depths are noted in Table 2, below.

Table 2: Test Well Information

Well ID	Well Depth (m bgs)	Top of Well Casing Elevation (m asl) ¹	Static Groundwater Level (m btoc)	Static Water Elevation (m asl)
TW 1	24.38	146.12	5.781	140.339
TW 2	30.78	143.14	4.175	138.965
TW3	30.48	141.21	2.725	138.485
TW4	33.53	139.92	0.781	139.139
TW5	24.69	139.94	1.668	138.272
TW6	42.67	143.27	4.274	138.996
TW7	36.58	138.14	(flowing)	(flowing)

¹ As measured by McIntosh Perry Surveyors Inc. (January 2021)

3.3.2 *Pumping Tests*

Pumping tests were conducted at each of the seven wells by McIntosh Perry. The pump, hose, and power supply were provided by Air Rock, who installed and removed the pump from each well. The discharged water

was directed away from each pumping well and allowed to flow overland away and downgradient of the Site. At the time of the pumping tests, the weather was approximately between -3 °C and 0 °C, with sun and clouds.

All the water level measurement data are presented in Table 3.

TW 1

TW 1 was drilled to a depth of 24.38 m. The overburden was approximately 0.31 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The driller described the rock as "limestone" from 0.305 – 8.53 m, and "sandstone" from 8.53 – 24.38 m. Water was encountered at 22.86 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on January 11, 2021. The well was pumped at a rate of 100 L/min for over six hours. The drawdown stabilized at approximately 0.6 m btoc (~145.477 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 2

TW 2 was drilled to a depth of 30.78 m. The overburden was approximately 0.31 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The rock was described as "sandstone" from 0.31 - 30.78 m by the driller. Water was encountered at 15.24 m bgs and again at 28.65 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on January 12, 2021. The well was pumped at a rate of 90 L/min for over six hours. The drawdown stabilized at approximately 4.2 m btoc (~138.968 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 3

TW 3 was drilled to a depth of 30.48 m. The overburden was approximately 0.31 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The driller described the rock as "limestone" from 0.31 – 6.71 m, and "sandstone" from 6.71 – 30.48 m. Water was encountered at 28.65 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on January 13, 2021. The well was pumped at a rate of 93 L/min for over six hours. The drawdown stabilized at approximately 0.8 m btoc (~140.399 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 4

TW 4 was drilled to a depth of 33.53 m. The overburden was approximately 4.57 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The rock was described as "sandstone" from 4.57 – 33.53 m by the driller. Water was encountered at 26.82 m bgs, 29.26 m bgs, and again at 31.70 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on December 22, 2020. The well was pumped at a rate of 109 L/min for over six hours. The drawdown stabilized at approximately 1.4 m btoc (~138.513 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 5

TW 5 was drilled to a depth of 24.69 m. The overburden was approximately 0.61 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The rock was described as "sandstone" from 0.61 – 24.69 m by the driller. Water was encountered at 18.59 m bgs and again at 22.56 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on January 6, 2021. The well was pumped at a rate of 100 L/min for over six hours. The drawdown stabilized at approximately 1.8 m btoc (~138.092 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 6

TW 6 was drilled to a depth of 42.67 m. The overburden was approximately 1.22 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The driller described the rock as "limestone" from 1.22

- 12.20 m and "sandstone" from 12.20 - 42.67 m. Water was encountered at 16.76 m bgs and again at 39.62 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well.

McIntosh Perry undertook a pumping test at this location on January 7, 2021. The well was pumped at a rate of 100 L/min for over six hours. The drawdown stabilized at approximately 0.3 m btoc (~142.928 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

TW 7

TW 7 was drilled to a depth of 36.58 m. The overburden was approximately 1.83 m thick at this location. A 12.8 m long steel casing (including approximately 0.61 m of above-ground stickup) was installed in the hole and sealed with a cement/bentonite grout. The hole was grouted from approximately 12.2 m to the ground surface. The remainder of the well is an open hole in the rock. The rock was described as "sandstone" from 1.83 – 36.58 m by the driller. Water was encountered at 22.25 m bgs and again at 34.75 m bgs.

The driller initially estimated a yield of 91 L/min (20 gal/min), which was also the final recommended pumping rate for this well. Both the driller and McIntosh Perry staff noted that the well was flowing (artesian) at the time of drilling and the six-hour pumping test.

McIntosh Perry undertook a pumping test at this location on December 21, 2020. The well was pumped at a rate of 109 L/min for over six hours. The drawdown stabilized at approximately 0.3 m btoc (~137.875 m asl). Over 95% recovery in water level was achieved within 24 hours of terminating the test.

Table 3: Summary of Pump Tests

Test Well ID	Final Pumping Rate (L/min)	Maximum Drawdown in Pumping Well (m)	Observation Well ID	Max Drawdown in Observation Well (m)	Approximate Distance between Pumping Well and Observation Well (m)
			TW6	0.013	705
TW 1	100	0.643	TW2	Minimal drawdown observed	425
TW 2	90	4.172	TW3	Minimal drawdown observed	375
TW 3	97	0.811	TW2	0.034	375
τ\λ/ Δ	109	1 407	TW5	0.414	380
1004	105	1.407	TW6	0.084	225
TW 5	100	1 848	TW4	0.369	375
	100	1.545	TW2	0.119	618
TW 6	100	0 342	TW2	0.056	440
1000	100	0.372	TW4	0.092	220
TW 7	109	0.265	TW4	0.092	500
	105	0.203	TW6	0.08	530

3.3.3 Well Yield

The testing and development undertaken by the driller immediately after well installation provided a reasonable indication of the yield of each well. All test wells were demonstrated to have yields suitable for supplying single family homes. During McIntosh Perry's pumping tests at the seven test wells, at least 32,400 L of water was pumped from each well. This volume exceeds the daily demand for water for a typical home (1,800 L) and the minimum volume for a 6-hour pumping test (4,932 L), as specified in the Guideline Procedure D-5-5 Private Wells: Water Supply Assessment. At each location, at least 95% recovery was achieved between 0 and 1,440 minutes (24 hours) after the cessation of pumping.

The seven test wells were spaced 225 m apart at minimum, and thus only minimal drawdown was measured at observation wells during each of the 6-hour pumping tests. Observation wells were monitored during the 6-hour pumping tests, as noted in Table 2. Drawdown in observation wells is predominantly due to pumping,

however a small component may also be attributed to changing atmospheric conditions and/or measurement error.

3.3.4 Transmissivity and Storativity

A summary of the transmissivity values calculated using the Cooper-Jacob method are presented in Table 4. An average transmissivity was calculated for each test well. The calculations for transmissivity and storativity are presented in Appendix E.

Table 4: Transmissivity and Storativity

Well ID	Well ID Transmissivity (m²/day)		Storativity	
TW 1 Pumning Test	164.8			
TW 1 Recovery	202.8	183.8	6.14 x 10 ⁻⁶	
TW 2 Pump Test	31.6	44.1		
TW 2 Recovery	56.5	44.1	-	
TW 3 Pump Test	129.5	120.7	3.37 x 10 ⁻⁴	
TW 3 Recovery	111.8	120.7		
TW 4 Pump Test	101.0	101.0	2.52 x 10 ⁻⁶ – 2.46 x 10 ⁻⁴	
TW 4 Recovery	(recovery too rapid)	101.0		
TW5 Pumping Test	74.3	61.6	9 14 x 10 ⁻⁶ – 6 21 x 10 ⁻⁵	
TW5 Recovery	48.8		5.14 × 10 = 0.21 × 10 *	
TW6 Pumping Test	659.2	802.9	8 61 x 10 ⁻⁵ – 2 74 x 10 ⁻⁴	
TW6 Recovery	976.6		0.01 × 10 2.74 × 10	
TW7 Pumping Test	738.4	738.4	5 75 x 10 ⁻⁵ – 7 43 x 10 ⁻⁵	
TW7 Recovery	(recovery too rapid)	730.4	5.75 × 10 = 7.45 × 10	

Transmissivity is calculated using the Cooper-Jacob straight line method:

T=2.3 Q / $4\pi \Delta s$

Storativity is calculated using data from an observation well with the following equation:

Where:

• T is the transmissivity (m²/day)

- Q is the pumping rate (m³/day)
- Δs is the change in hydraulic head over one log cycle (drawdown vs. log time)
- S is the storativity
- t_0 is the x-intercept of the observation well drawdown vs. log time line of best fit
- r is the distance between the pumped well and the observation well

The average transmissivity ranged from $44.1 - 802.9 \text{ m}^2/\text{day}$, as calculated based on water level drawdown and recovery data from pumped test wells.

Storativity was observed to range from $2.52 \times 10^{-6} - 3.37 \times 10^{-4}$, as calculated based on water level drawdown data collected from nearby observation wells during pumping tests.

3.3.5 *Hydraulic conductivity*

The hydraulic conductivity of each test well was calculated based on the average transmissivity.

Hydraulic conductivity is calculated using the following equation:

K=T/b

Where:

- K is the hydraulic conductivity (m/s)
- T is the transmissivity (m²/day, the average is used)
- b is the depth of the deepest test well (TW6), used as aquifer thickness (m)

Table 5: Summary of Hydraulic Conductivity Calculations

Well ID	TW1	TW2	TW3	TW4	TW5	TW6	TW7
Hydraulic Conductivity (m/s)	4.99 x 10 ⁻⁵	1.20 x 10 ⁻⁵	3.27 x 10⁻⁵	2.74 x 10 ⁻⁵	1.67 x 10⁻⁵	2.18 x 10 ⁻⁴	2.00 x 10 ⁻⁴

The hydraulic conductivity values summarized in Table 4 are generally consistent with higher values for limestone published by Freeze and Cherry (10^{-9} to 10^{-5}).

The calculations for hydraulic conductivity are presented in Appendix E.

3.3.6 Long Term Yield

Long term safe yield describes the amount of water that can safely be withdrawn from an aquifer without negative impact. The long-term safe yield of each well was estimated based on the following factors:

- Observations during six-hour pumping test;
- Driller's recommendation; and
- Calculated properties.

Using the Theis equation theory, the estimated cumulative drawdown across the Site generated by all proposed wells (118) was determined. Using the worst-case data collected during McIntosh Perry's field program (T = 44 m^2 /day; S = 6.14 x 10⁻⁶), the maximum theoretical drawdown across the Site would not exceed approximately 5 m.

Farvolden Method

Utilizing transmissivity values calculated from individual pumping tests (Table 4), the theoretical long-term safe yield for each of the pumping wells was calculated following the Farvolden Method and presented in Table 6. The following Farvolden equation calculates the long term 20-year safe pumping rate (Q₂₀).

Q20=0.68 T Ha Sf

Where:

- Q₂₀ is the twenty-year safe yield (m³/day)
- T, is the transmissivity (m²/day)
- Ha is the available water column height (m)
- S_f is a safety factor

Moell Method

The Moell Method was also used to calculate the theoretical long-term 20-year safe pumping rate for each of the pumping wells. The long-term safe pumping rate (Q₂₀) was calculated using the following equation:

$$(Q_{20}) = (Q Ha Sf) / (s100 + 5 \Delta s)$$

Where:

- Q₂₀ is the twenty-year safe yield (m³/day)
- Ha is the available water column height (m)
- S_f is a safety factor
- s100 is the drawdown at 100 minutes (semi-log long-term graph)

• Δ s is the change in hydraulic head over one log cycle (drawdown vs. log time, see Appendix D)

Based on the above Farvolden and Moell calculations, the estimated pumping rate of each test well that could be sustained for a twenty-year period of continuous pumping is shown in Table 6, below. Long term yield calculations are presented in Appendix E.

Q20 Verification – Cooper-Jacob Graphical Method

It should be noted that long-term projections of drawdown using the Cooper-Jacob method indicate that all test wells can sustain a constant pumping at rates exceeding 13.7 L/min if pumped constantly for 20 years (see Appendix D). The calculated maximum drawdown for all wells when theoretically pumped at a rate of 13.7 L/min was below 0.75 m, with the exception of TW2 which would be expected to have a drawdown of approximately 1.3 m.

Well ID	TW1	TW2	TW3	TW4	TW5	TW6	TW7
Farvolden Method Long Term Yield (Q20) (L/min)	896.6	253.5	1,096.5	954.5	498.0	7,900.9	8,406.2
Moell Method Long Term Yield (Q ₂₀) (L/min)	872.8	188.8	904.2	778.7	402.7	5,334.7	6,045.0
Tested Pumping Rate (L/min)	100	90	97	109	100	100	109
Driller- Recommended Pumping Rate (L/min)	75.7	75.7	75.7	75.7	75.7	75.7	75.7

Table 6: Summary of Long-Term Yield Calculations

The calculation and consideration of long-term yield estimations is inherently conservative; wells are typically not pumped continuously for long periods of time, and a safety factor is incorporated into the calculations. In all cases, both the tested pumping rates and the driller-recommended pumping rates are considerably lower than the estimated long-term Q₂₀ values. Data collected from the Site indicate a highly productive aquifer.

Accordingly, McIntosh Perry is of the opinion that the aquifer is capable of supplying water at a flow rate which is greater than the minimum flow rate of 13.7 L/min as outlined in Procedure D-5-5.

3.3.7 Water Quality

Laboratory Certificates of Analysis for all on-site groundwater testing are presented in Appendix B. A summary of results from the testing of the seven water wells (TW1, TW2, TW3, TW4, TW5, TW6, and TW7) is presented in Appendix B. Samples were taken twice during the six-hour test at all test well locations; pre-test samples are denoted by a '-1' (e.g. TW1-1), while post-test samples are denoted by a '-2' (e.g. TW1-2).

Maximum Acceptable Concentrations (MAC), were exceeded in total coliforms in samples TW1-1, TW1-2, TW2-1, and TW2-2. Accordingly, microbiological parameters were resampled at TW1 and TW2 on January 19, 2021. Resample results for the sample taken at TW1 (TW1-3) indicated no total coliforms, however results for the sample taken at TW2 (TW2-3) indicated the presence of total coliforms. As such, TW2 was shocked with chlorine by Air Rock, and a fourth resample was subsequently collected. Prior to sample collection, Air Rock redeveloped the well and McIntosh Perry personnel conducted a chlorine residual test using disposable testing strips. Following re-development and chlorine residual testing (showing no residual), TW2-4 was collected; data from this final sample indicated no presence of total coliforms.

Based on the overall test results, the water quality will be acceptable in terms of health-related and most aesthetic parameters.

Laboratory-noted exceedances of non-health related standards were as follows:

- Operational Guidelines (OG) for hardness were exceeded in all tested samples.
- Aesthetic Objectives (AO) for iron were exceeded in samples TW3-1, TW7-1, and TW7-2.
- Aesthetic Objectives (AO) for manganese were exceeded in samples TW3-1 and TW3-2.
- Aesthetic Objects (AO) for laboratory-reported turbidity were exceeded in TW7-1, and TW7-2. It should be noted that field measurements of turbidity were all below 1.0 NTU during the 6-hour pump test, except for the turbidity reading of 1.3 NTU at 360 minutes. Laboratory results for turbidity are typically considered exaggerated due to the precipitation of iron and other low-solubility solids with changes in temperature and pH. As such, field measurements of turbidity were treated as a more accurate indicator of water quality and were compared to the AO of 1.0 NTU as set out in Procedure D-5-5.

3.4 Water Well Record Review

From the 127 well records identified from the MECP's WWIS database, data were available for 30 water wells that are located within 500 m of the Site. All wells are listed for domestic purposes, with the exception of one 'unused' well, which is assumed abandoned. The MECP WWIS records are shown on Figure 2, and data are summarized in Appendix H.

Most wells were completed in either limestone or sandstone, with isolated records listing either "granite", "unknown rock type", or "stones". After removing obviously erroneous records, the total depths of the wells ranged from 7.9 - 30.5 m, with an average depth of 18.9 m. Static water levels averaged at approximately 3.4 m bgs (MECP 2020).

4.0 **TERRAIN ANALYSIS**

4.1 Preamble

A terrain analysis was conducted by evaluating soils cross the property. Assessment of the soils was conducted by the following (see Figure 7):

- Test pits 1 through 10, and 13 were dug with a backhoe while on site (February 22, 2021).
- Test pits 11 and 12 were dug using a hand shovel (April 9, 2021).

4.2 General Soils Evaluations

The following presents a summary of soil characteristics on the site based on the terrain analysis:

- Overburden consists of:
- Topsoil (depths range between 0.15 to 0.4 m bgs), with heterogeneous organic content.
- Silty Sand to Sand with Gravel (depth range between 0.15 to 2.2 m bgs)
- Gravel until end of hole (thickness of 2.2 m to 2.4 m bgs)
- Bedrock was encountered in all of the test well locations. Overburden thickness varies from approximately 0.3m to 4.6m based on the well records from Test Well 1 to 7.

Test Pit ID	Total Depth (m)	Depth to Water (m)	Soil Characteristics	Notes
TP-1	0.55	-	Sandy topsoil to brown silty sand underlain by bedrock	Loose
TP-2	0.20	-	Sandy topsoil with thin layer of brown silty sand underlain by bedrock	-
TP-3	1.05	-	Sandy topsoil to brown silty sand with gravel underlain by bedrock	Loose
TP-4	0.65	-	Sandy topsoil to brown silty sand with gravel underlain by bedrock	Loose
TP-5	0.70	-	Sandy topsoil to brown silty sand underlain by bedrock	Loose
TP-6	0.25	-	Sandy topsoil over bedrock	-
TP-7	1.90	1.30	Sandy topsoil / brown silty sand / brown silty sand with gravel / medium brown silty sand until bedrock	Loose

Table 7: Summary of Test Pits

Test Pit ID	Total Depth (m)	Depth to Water (m)	Soil Characteristics	Notes
TP-8	2.40		Sandy topsoil / brown silty sand with gravel / medium brown silty sand to thin layer of dense silt and gravel until bedrock	Loose Sand
TP-9	2.10	-	Sandy topsoil / brown silty sand with gravel / medium brown silty sand underlain by bedrock	Loose
TP-10	0.70	-	Sandy topsoil into brown silty sand until bedrock	Loose
TP-11	0.22	-	Sandy topsoil over bedrock	-
TP-12	0.28	-	Sandy topsoil over bedrock	-
TP-13	0.10	-	Sandy topsoil over bedrock	-

4.3 Contaminant Attenuation

As part of the subdivision application process as sewage system (septic) impact assessment was completed as per MECP requirements. The MECP Procedure D-5-4 (Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment) outlines the following steps to be completed as part of the impact assessment:

- Step 1 Lot Size Consideration
- Step 2 System Isolation Consideration
- Step 3 Contaminant Attenuation Considerations

The following outlines the results of the sewage system impact assessment undertaken by McIntosh Perry.

Step 1 - Lot Size Consideration

The proposed new subdivision consists of lots that are on average approximately 0.61 hectares each in size, which together create a combined area of 84 ha in size, when accounting for roads and other undeveloped blocks. Accordingly, McIntosh Perry considers that there does not exist enough spatial area to naturally attenuate nitrate-nitrogen to acceptable concentration based on MECP Procedure D-5-4, as the average size of the lots created would not be greater than 1 hectare. Due to this, a review of Step 2 – System Isolation Consideration was undertaken.

Step 2 - System Isolation Consideration

As previously outlined, the lots to be created through the subject consent are in the order of approximately 0.61 hectares in size (total combined area ~84 ha), therefore McIntosh Perry assessed whether System Isolation

Considerations were applicable to the proposed residential subdivision. If it can be demonstrated that the sewage system effluent is hydrogeologically isolated from the existing or potential drinking water supply aquifer, then the risk to groundwater is considered to be low. The system isolation review needs to account for lands that extend up to 500 metres from the Site.

Based on a review of available geological information and mapping, in conjunction with site observations made during the Terrain Analysis and McIntosh Perry's past experience on neighbouring properties, the Site cannot be determined to be hydrogeologically isolated and, as such, the consideration for system isolation of sewage system effluent from the groundwater supply aquifer is not applicable to this site.

Step 3 – Contaminant Attenuation Considerations

Since neither lot size or system isolation considerations apply to the proposed severances, a predictive nitratenitrogen attenuation assessment was undertaken to determine if sufficient attenuation of nitrate-nitrogen could be achieved on the subject site.

The Thorthwaite Water Balance method, in conjunction with local climatic data available from Environment Canada for Ottawa's MacDonald-Cartier Internal Airport station (Site Climate ID: 6106000), was used to estimate the net potential infiltration for the proposed residential subdivision.

The nitrate concentration at the site boundaries was calculated assuming a standard domestic strength sewage nitrate-nitrogen concentration (C_e) of 40 mg/L at the point of subsurface discharge as per procedure D-5-4.

Please see below for information regarding other inputs/parameters used in the analysis (refer to Appendix G for more information):

- A water surplus (Ws) value of **333.87 mm/yr** was calculated based on 1981-2010 Climate Normal data for Ottawa's MacDonald -Cartier Int'l A (YOW) station (Site Climate ID: 6106000);
- An infiltration factor (I_f) of **0.545** was calculated as per Table 2 of MECP's document titled "MOEE Hydrogeological Technical Requirements for Land Development Applications", dated April 1995. The factors used to calculate the Infiltration Factor (If) and the associated rational for selection are presented below:
 - A topographic factor of 0.136 was used as average slope on site is 1.6% (16 m per km). The factor represents an interpolation between the factor of 0.20 for rolling land (0.28-0.38% slope) and the factor of 0.10 for hilly land (2.8-4.7% slope).
 - A soil factor of 0.309 was used. This factor represents a weighted average of the soil conditions on-site, with site consisting of approximately 35% of the site consisting of topsoil over shallow bedrock (infiltration factor of 0.10), with the remaining 65% of the site consisting of sandy soil (infiltration factor 0.40) having a minimum depth of 0.30 m..

- A cover factor of 0.10 was used as the site is consists of primarily cultivated land.
- Available infiltration (I) was calculated by multiplying the water surplus (Ws) by the infiltration factor (If). This yielded an infiltration value of **0.187 m/yr**.
- The infiltration area (A) was determined to be 84.00456 ha (840,045 m²).
- The dilution water (D_w) available was calculated as 157,266 m³/yr (430,866 L/day) by multiplying the infiltration area (A) with the available infiltration (I).
- Background nitrate concentration (C_b) of 1.526 mg/L was used, which represents the average concentration in all samples collected (refer to Appendix B). A concentration of 0.05 mg/L was used when laboratory results were below the method detection limit as this represent half of the laboratory's lowest method reporting limit (MRL) of 0.1 mg/L for the analysis of that parameter.

Based on the above-noted information, in order to maintain the nitrate concentration at the downgradient property boundary (C_w) below the Ontario Drinking Water Objective (ODWO) of 10 mg/L for nitrate-nitrogen, the maximum number of lots in the proposed residential subdivision would be as follows:

• Assuming standard domestic strength sewage nitrate-nitrogen concentration (C_e) of 40 mg/L at the point of subsurface discharge: N = **118.29 severed lots**.

As can be seen above, the property can accommodate a subdivision of up to 118 lots to proceed while ensuring the Ontario Drinking Water Objective (ODWO) of 10 mg/L for nitrate-nitrogen is not exceeded. The proposed 118 lots residential subdivision yields a calculated nitrate-nitrogen concentration of **9.983 mg/L** at the property limit.

5.0 SUMMARY OF CONDITIONS

5.1 Preamble

The Site is located within the Township of Beckwith in central Eastern Ontario, south of the Town of Carleton Place (Figure 1).

The property is bounded to the north by 10th Line Road, undeveloped forest and rural residential to the east, 9th Line Road to the south, and Gardiner Shore Road and residential properties to the west. A single detached residence lies to the north of the Site along with a small area of forested land.

This region is characterized by thin overburden overlying Paleozoic bedrock (OGS, 2020; MECP, 2020). The climate is humid continental with cool winters and warm summers. The 1981-2010 mean annual precipitation is approximately 943.4 mm with 223.5 cm as snow, and the mean daily temperature is 6.4 °C (Environment Canada Climate Normals for Ottawa MacDonald-Cartier Int'l Airport, ON).

The Site currently consists of agricultural fields and has likely never been contemporarily developed. On-site elevation ranges between 136 and 148.5 metres above sea level (m asl), with the majority of the site at an elevation between 140 and 144 metres above sea level (m asl). The topography of the Site is generally flat and slopes downwards slightly to the west.

5.2 Regional Hydrogeology

The Site is relatively flat and appears to be well-drained. McGibbon Bay (part of the Mississippi River system) is the closest permanent waterbody to the Site, and is located approximately 150 m west of the Site at its closest point.

On a local scale, shallow groundwater flow is interpreted to reflect local topography and flow to the west.

According to Ontario Geological Survey (OGS) regional mapping, surficial overburden in the vicinity of the Site is thin, and is characterized by Paleozoic bedrock (OGS, 2020). This classification is consistent with on-site observations made by McIntosh Perry. Based on OGS 2020 data, the underlying bedrock in the area is classified as sandstone and dolostone (commonly interchanged with dolostone), which is consistent with MECP WWIS Records (MECP 2020).

5.3 Site Hydrogeology

A review of topographic data, geological maps, and Site visits show that the property slopes down to the west, towards the Mississippi River. Shallow groundwater and surface water likely drain in this direction. Shallow groundwater in the southern portion of the site may move toward what appears to be a large wetland complex, McGibbon Creek, located approximately 200 m from the Site at its closest point. Overall, the Site appears to be well-drained. On-site overburden groundwater flow is likely closely tied to surface topography.

Underlying bedrock at the Site is classified as quartz sandstone of the Nepean Formation and crystalline dolostone of the Oxford Formation (OGS, 2020), which is consistent with MECP WWIS Records (MECP 2020).

MECP WWIS Records indicate that most wells were predominantly completed in either limestone or sandstone, with isolated records listing either "granite", "unknown rock type", or "stones". After removing obviously erroneous records, the total depths of the wells ranged from 7.9 – 30.5 m, with an average depth of 18.9 m. Static water levels averaged at approximately 3.4 m bgs (MECP 2020).

The bedrock aquifer was found to have high yield and exhibited good recovery during pumping tests. There was very little groundwater level movement observed in observation wells during the pumping tests, showing minimal well interference across the Site. As noted above, TW7 is a flowing artesian well.

5.4 Water Supply

Groundwater testing at the site showed that the water yield and water quality is good. Based on calculations following the Farvolden and Moell methods, on-site test wells could theoretically supply a twenty-year safe yield ranging from 188.8 – 8,400+ L/min, as shown in Table 6.

No Maximum Allowable Concentrations, as outlined by the Ontario Drinking Water Standards (MACs), were exceeded in final samples taken from the seven on-site test wells. Field-measured turbidity was noted to be below 1.0 NTU at all wells during the pumping tests, with the exception of marginal and isolated exceedances in field and laboratory-reported data.

Several additional ODWS Aesthetic Objectives (AO) were exceeded. These exceedances were noted for hardness, laboratory-reported turbidity, iron, and manganese. Exceedances of these Aesthetic Objectives is considered normal for the region, and are considered treatable.

Escherichia Coli, Faecal Coliform, and Total Coliform counts were reported as 0 ct/100 mL in the final samples collected from all test wells.

It has been shown that the bedrock aquifer is suitable for supplying the needs of 118 lots in the proposed development in terms of both quantity and quality when incorporating standard on-site sewage systems to service the individual lots.

Based on typical residential demand, it is not expected that the subdivision will cause any water supply issues for the surrounding private wells that exist in the vicinity.

6.0 **RECOMMENDATIONS**

6.1 Water Supply

Well Construction

- The seven newly installed test wells (TW1, TW2, TW3, TW4, TW5, TW6, and TW7) are suitable for supplying groundwater for domestic use at the Site. All future wells should adhere to the requirements of O. Reg. 903 (Wells), as amended, with regards to casing length, positive drainage, stickup height, etc.
- The test wells should be maintained prior to domestic use.

Water Quality and Treatment

- Water generally meets all applicable health-related standards at the present time.
- Aesthetic parameters such as hardness, iron, and manganese can be readily treated.
- Due to the low turbidity observed in the fully developed test wells, a UV system may be used as a precaution against bacteriological impacts.
- If water softening is desired, the use of potassium salts (i.e. KCl) is recommended.

6.2 Wastewater Treatment

Private Sewage Systems

- Approval for individual on-site sewage systems will be governed by the OBC as it is understood that the Daily Design Flow proposed system will be less than 10,000 litres per day/lot.
- Based on the general characterization of overburden in the vicinity of the proposed sewage systems, imported fill materials may be necessary to provide the required vertical separation from groundwater or bedrock/impervious layer.
- The proposed lot sizes are sufficient to meet the requirements of Procedure D-5-4, assuming that each lot is serviced by a OBC-approved Class 4 sewage system.
- Any septic systems must be constructed with all appropriate setbacks, treatment units and stipulations as per applicable Ontario Regulations.

7.0 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by McIntosh Perry Consulting Engineers Ltd. for 1384341 Ontario Ltd. It is intended for the sole, and exclusive use of 1384341 Ontario Ltd., its affiliated companies and partners and their respective insurers, agents, employees, advisors, and reviewers (collectively, "Cavanagh"). The report may not be relied upon by any other person or entity without the express written consent (Reliance Letter) of McIntosh Perry Consulting Engineers Ltd.

Any use which a third party makes of this report, or any reliance on decisions made based on it, without a reliance letter are the responsibility of such third parties. McIntosh Perry Consulting Engineers Ltd. accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The investigation undertaken by McIntosh Perry Consulting Engineers Ltd. with respect to this report and any conclusions or recommendations made in this report reflect McIntosh Perry Consulting Engineers Ltd. judgment based on the site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of the preparation of this report.

This report has been prepared for specific application to this site and it is based, in part, upon visual observation of the site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the site, substances addressed by the investigation may exist in areas of the site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,

McIntosh Perry Consulting Engineers Ltd.



Monica Black, B.Sc. Environmental Scientist (343) 925-0179 m.black@mcintoshperry.com Jordan Bowman, P.Geo., P.Biol. Practice Area Lead (Hydrogeology) (613) 714-4602 j.bowman@mcintoshperry.com

Angela Gulley, P.Geo. Sr. Hydrogeologist a.gulley@mcintoshperry.com Patrick Leblanc, P.Eng. Environmental Engineer p.leblanc@mcintoshperry.com

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HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



FIGURES

MCINTOSH PERRY









Approximate Property Boundary



Unevaluated Wetland

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources, 2021.

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LEGEND



- Test Well Location

Approximate Property Boundary

→ Watercourse

- Unevaluated Wetland
- -----> Groundwater Flow Direction

138.996 Groundwater Elevation (masl)

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources, 2021.

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	LEG	GEND			
N		Approximate Prope	rty Bound	lary	
4		— Local Road			
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5		Bedrock Geology			
		Upper Ordovician			
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	11	Billings Formation: Dark brov calcareous siltstone, and silt	vn to black s / bioclastic li	hale, with lamin mestone	ations of
	10	Eastview Formation: Interbe limestone and dark brown to	ded sublitho dark grey sh	ographic to fine nale	crystalline
		Middle to Upper Ordovi	cian		
	9	Lindsay Formation: Sublitho	graphic to fin	e crystalline lim	estone,
	8	Verulam Formation: Interbed	ded bioclasti	ic limestone, su	blithographic
	-	Bohcavgeon Formation: Into	hedded eith	dolomite litho	araphic to
	,	fine crystalline limestone,ool calcareous quartz sandstone	tic limestone	e, shale, and find	e-grained
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	LEGEND
N	Approximate Property Boundary
	——— Local Road
Ň	——— Major Road
, Д	Surficial geology
	Description
	Organic Deposits
$X \setminus $	Sand Dunes
	Floodplains, sand, silt, clay
	Fluvial Terraces, sand, silt
	Reworked Marine Sediments
	Beach Formations
V	Sand, reworked glaciofluvial
	Deltaic and Estuarian Deposits
	Marine Deposits, clay, silt
	Erosional Terraces
	Glaciofluvial Deposits
	Till, plain
	Till, drumlinized
	Till, hummocky to rolling
	Paleozoic Bedrock
NE	Precambrian Bedrock
ALLE	Water
	REFERENCE
	GIS data provided by the Ontario Ministry of Natural Resources
	and Forestry, 2021. Surficial Geology of Southern Ontario provided by the Ontario
	Geological Survey, Miscellaneous Release - Data 128 - Revised
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JE.	GARDINER PROPERTY SUBDIVISION
	REGIONAL SURFICIAL GEOLOGY

	PROJECT N	O:CCO-20-0203	FIGURE:
MCINTOSH PERRY	Date	Apr., 19, 2021	G
115 Walgreen Road, RR3, Carp, ON K0A1L0 Tel: 613-836-2184 Fax: 613-836-3742	GIS	EU	0
www.mcintoshperry.com	Checked By	MB	



ENAME: U:\Perth\MPCE JOBS\MPCE Projects\2020\CCO-20-0203-Tweedsmuir-Gardiner Property\12 -Dwgs\05 - Concept Dwgs\00 - Superseded\CCO-20-0203-Tweedsmuir-Gardiner Property-Concept_TF

HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



APPENDIX A – PRELIMINARY CONCEPT PLAN

MCINTOSH PERRY

AME: \\mcintoshperry.loca\Share\Perth\MPCE JOBS\MPCE Projects\2020\CCO-20-0203-Tweedsmuir-Gardiner Property\12 -Dwgs\07 - Preliminary Drawings\CCO-20-0203 - Tweedsmuir - Gardiner Property - Preliminary.dw <u>SAVED</u>: Wednesday, May 26, 2021 LAST SAVED BY: m.shettell-morris PLOTTED: Thursday, June 03, 2021 CTB FILE USED:----



HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



APPENDIX B – LABORATORY RESULTS AND LABORATORY CERTIFICATES OF ANALYSIS

MCINTOSH PERRY

Certificate of Analysis

Client: Attention: PO#:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black		Report Number: Date Submitted: Date Reported: Project: COC #:	1946063 2021-01-11 2021-01-13 20-0203 212328	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2			

Dear Monica Black:

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:



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

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number:	19
Date Submitted:	20
Date Reported:	20
Project:	20
COC #:	21

1946063 2021-01-11 2021-01-13 20-0203 212328

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1537599 GW 2021-01-11 TW1-1	1537600 GW 2021-01-11 TW1-2
Group	Analyte	MRL	Units	Guideline		
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0	0
	Faecal Coliforms	0	ct/100mL		0	0
	Faecal Streptococcus	0	ct/100mL		0	0
	Heterotrophic Plate Count	0	ct/1mL		55	51
	Total Coliforms	0	ct/100mL	MAC 0	9*	8*

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.

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

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

Certificate of Analysis

	Environment Testing			
Client:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0		Report Number: Date Submitted: Date Reported: Project:	1946066 2021-01-11 2021-01-18 20-0203
Attention: PO#:	Mr. Monica Black	Page 1 of 6	COC #:	212328
invoice to:	Micintosh Perry Consulting Engineers Ltd.	Fage 1010		

Dear Monica Black:

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:

Sarah Horner Jush Imm 2021.01.18 16:06:16 -05'00'

APPROVAL:

Sarah Horner, Inorganics Technician

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Certificate of Analysis

McIntosh Perry Consulting Engineers Ltd. Client: 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black Attention: PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Environment Testing

1946066 2021-01-11 2021-01-18 20-0203

212328

1537603 1537604 labID Sample Matrix GW GW Sample Type Sampling Date 2021-01-11 2021-01-11 Sample I.D. TW1-1 TW1-2 MRL Units Guideline Group Analyte AO 250 30 33 Anions CI 1 mg/L F 0.10 MAC 1.5 <0.10 <0.10 mg/L N-NO2 0.10 MAC 1.0 < 0.10 <0.10 mg/L N-NO3 0.10 MAC 10.0 4.54 4.70 mg/L AO 500 12 15 SO4 1 mg/L General Chemistry Alkalinity as CaCO3 5 mg/L OG 500 226 233 2 TCU 3 Colour 4 Conductivity 5 uS/cm 555 575 0.5 AO 5 22 22 DOC mg/L pН 1.00 6.5-8.5 8.04 7.98 <0.05 < 0.05 S2-0.05 AO 0.05 mg/L TDS 10 AO 500 320 330 mg/L Turbidity 0.1 NTU AO 5 0 1.0 0.2 Hardness Hardness as CaCO3 OG 100 267 1 mg/L Indices/Calc 1.02 1.06 Ion Balance 0.01 Metals 69 71 Ca 1 mg/L AO 0.3 Fe 0.03 0.06 < 0.03 mg/L Κ 1 mg/L 1 1 23 23 Mg 1 mg/L Mn 0.01 mg/L AO 0.05 <0.01 <0.01 AO 200 16 18 Na 2 mg/L Nutrients N-NH3 0.010 <0.010 <0.010 mg/L Total Kjeldahl Nitrogen 0 172 0 160 0.100 mg/L 0.001 <0.001 <0.001 Subcontract-Inorg Phenols mg/L Tannin & Lignin 0.1 mg/L <0.1 <0.1

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

Invoice to: McIntosh Perry Consulting Engineers Ltd.

1946066 2021-01-11 2021-01-18 20-0203 212328

QC Summary

Ai	nalyte	Blank		QC % Rec	QC Limits
Run No 394945	Analysis/Extraction Date 20	021-01-12 Ana	alyst	SKH	
Method EPA 350.1					
N-NH3		<0.010 mg/L		108	80-120
Run No 394979	Analysis/Extraction Date 20	21-01-12 A na	alyst	SKH	
Method EPA 351.2					
Total Kjeldahl Nit	rogen	<0.100 mg/L		115	70-130
Run No 394985	Analysis/Extraction Date 20	021-01-13 Ana	alyst	SKH	
Method C SM2120C					
Colour		<2 TCU		93	90-110
Run No 395019	Analysis/Extraction Date 20	021-01-13 Ana	alyst	AET	
Method SM2320,2510),4500H/F				
Alkalinity (CaCO	3)	<5 mg/L		100	90-110
Conductivity		<5 uS/cm		97	90-110
F		<0.10 mg/L		102	90-110
pH				101	90-110
Run No 395058 Method C SM2130B	Analysis/Extraction Date 20	021-01-14 Ana	alyst	H_D	
Turbidity		<0.1 NTU		101	70-130

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 3 of 6

PO#:

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black

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

1946066 2021-01-11 2021-01-18 20-0203 212328

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 395060 Analysis/Extraction Date 20 Method M SM3120B-3500C 20)21-01-14 Ana	l yst Z_S	
Calcium	<1 mg/L	102	90-110
Potassium	<1 mg/L	95	87-113
Magnesium	<1 mg/L	100	76-124
Sodium	<2 mg/L	96	82-118
Run No 395069 Analysis/Extraction Date 20 Method SM 4110 20 <td>)21-01-14 Ana</td> <td>lyst SKH</td> <td></td>)21-01-14 Ana	lyst SKH	
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	106	90-110
N-NO3	<0.10 mg/L	107	90-110
SO4	<1 mg/L	100	90-110
Run No 395088 Analysis/Extraction Date 20 Method C SM2540)21-01-18 Ana	lyst SKH	
TDS	<10 mg/L	100	90-110
Run No 395091 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG 20)21-01-14 Ana	lyst AET	
Phenols	<0.001 mg/L	76	69-132
Tannin & Lignin	<0.1 mg/L	110	

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 4 of 6

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1946066 2021-01-11 2021-01-18 20-0203 212328

QC Summary

Ai	nalyte	Blank		QC % Rec	QC Limits
Run No 395092 Method C SM2340B	Analysis/Extraction Date 20)21-01-15 A r	alyst	AET	
Hardness as CaC	03				
Ion Balance					
Run No 395095 Method EPA 200.8	Analysis/Extraction Date 20	021-01-15 A r	alyst	SKH	
Iron		<0.03 mg/L		101	80-120
Manganese		<0.01 mg/L		117	80-120
Run No 395105 Method SM 4110	Analysis/Extraction Date 20	021-01-15 A r	alyst	SKH	
N-NO3		<0.10 mg/L		104	90-110
Run No 395115 Method SM 5310B	Analysis/Extraction Date 20)21-01-15 A r	alyst	AET	
DOC		<0.5 mg/L		97	80-120
Run No 395117 Method C SM4500-S2	Analysis/Extraction Date 20 2-D	021-01-15 A r	alyst	AET	
S2-		<0.01 mg/L		99	80-120

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 5 of 6

Environment Testing

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Certificate of Analysis

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

1946066 2021-01-11 2021-01-18 20-0203 212328

Sample Comment Summary

Sample ID: 1537603 TW1-1 Holding time for turbidity analysis was exceeded. S2- MRL elevated due to matrix interference (dilution was done). Sample ID: 1537604 TW1-2 Holding time for turbidity analysis was exceeded. S2- MRL elevated due to matrix interference (dilution was done).

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.

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

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

Page 6 of 6

Certificate of Analysis

Client: Attention: PO#:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black		Report Number: Date Submitted: Date Reported: Project: COC #:	1946321 2021-01-13 2021-01-15 20-0203 212329	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2			

Dear Monica Black:

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:



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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

194
202
202
20-
212

1946321 2021-01-13 2021-01-15 20-0203 212329

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1538197 GW 2021-01-13 TW2-1	1538198 GW 2021-01-13 TW2-2
Group	Analyte	MRL	Units	Guideline		
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0	0
	Faecal Coliforms	0	ct/100mL		0	0
	Faecal Streptococcus	0	ct/100mL		0	0
	Heterotrophic Plate Count	0	ct/1mL		28	24
	Total Coliforms	0	ct/100mL	MAC 0	4*	4*

Guideline = ODWSOG

* = Guideline Exceedence

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

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Certificate of Analysis

	Environment lesting
Client:	McIntosh Perry Consulting Engineers Ltd.
	115 Walgreen Rd., R.R. #3
	Carp, ON
	K0A 1L0
Attention:	Mr. Monica Black
PO#:	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.

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

1946332 2021-01-13 2021-01-20 20-0203 212329

Dear Monica Black:

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).

Page 1 of 5

Report Comments:



APPROVAL:

Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

1538210

GW

1538209

GW

1946332 2021-01-13 2021-01-20 20-0203 212329

Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.

				Sampling Date Sample I.D.	2021-01-13 TW2-1	2021-01-13 TW2-2
Group	Analyte	MRL	Units	Guideline		
Anions	CI	1	mg/L	AO 250	9	10
	F	0.10	mg/L	MAC 1.5	<0.10	<0.10
	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	4.70	4.91
	SO4	1	mg/L	AO 500	8	8
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	288	281
	Colour	2	TCU		<2	<2
	Conductivity	5	uS/cm		568	575
	DOC	0.5	mg/L	AO 5	2.0	1.9
	рН	1.00		6.5-8.5	8.05	8.05
	S2-	0.01	mg/L	AO 0.05	<0.01	<0.01
	TDS	10	mg/L	AO 500	330	340
	Turbidity	0.1	NTU	AO 5.0	3.0	0.6
Hardness	Hardness as CaCO3	1	mg/L	OG 100	321*	321*
Indices/Calc	Ion Balance	0.01			1.01	1.02
Metals	Са	1	mg/L		84	84
	Fe	0.03	mg/L	AO 0.3	0.07	0.04
	К	1	mg/L		2	2
	Mg	1	mg/L		27	27
	Mn	0.01	mg/L	AO 0.05	<0.01	<0.01
	Na	2	mg/L	AO 200	2	2
Nutrients	N-NH3	0.010	mg/L		<0.010	<0.010
	Total Kjeldahl Nitrogen	0.100	mg/L		0.259	0.164
Subcontract-Inorg	Phenols	0.001	mg/L		<0.001	<0.001
	Tannin & Lignin	0.1	mg/L		<0.1	<0.1

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

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

Report Number:1Date Submitted:2Date Reported:2Project:2COC #:2

1946332 2021-01-13 2021-01-20 20-0203 212329

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Ar	nalyte	Blank		QC % Rec	QC Limits
Run No 395048 Method EPA 350.1	Analysis/Extraction Date 20)21-01-14 An	alyst	SKH	
N-NH3		<0.010 mg/L		104	80-120
Run No 395058 Method C SM2130B	Analysis/Extraction Date 20	021-01-14 An	alyst	H D	
Turbidity		<0.1 NTU		101	70-130
Run No 395060 Method M SM3120B-3	Analysis/Extraction Date 20 3500C)21-01-14 An	alyst	Z S	
Calcium		<1 mg/L		102	90-110
Potassium		<1 mg/L		95	87-113
Magnesium		<1 mg/L		100	76-124
Sodium		<2 mg/L		96	82-118
Run No 395064 Method EPA 200.8	Analysis/Extraction Date 20	021-01-14 An	alyst	H D	
Iron		<0.03 mg/L		95	80-120
Manganese		<0.01 mg/L		109	80-120
Run No 395088 Method C SM2540	Analysis/Extraction Date 20)21-01-18 An	alyst	SKH	
TDS		<10 mg/L		100	90-110

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

Page 3 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

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

1946332 2021-01-13 2021-01-20 20-0203 212329

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 395104 Analysis/Extraction Date 20 Method EPA 351.2 20<	021-01-15 Ana	ilyst SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L	110	70-130
Run No 395105 Analysis/Extraction Date 20 Method SM 4110)21-01-15 Ana	ilyst SKH	
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	104	90-110
SO4	<1 mg/L	100	90-110
Run No 395114 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F 20	021-01-15 Ana	alyst AET	
Alkalinity (CaCO3)	<5 mg/L	101	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	102	90-110
рН		102	90-110
Run No 395198 Analysis/Extraction Date 20 Method C SM2120C	021-01-19 Ana	alyst SKH	
Colour	<2 TCU	102	90-110

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

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Page 4 of 5

Invoice to: McIntosh Perry Consulting Engineers Ltd.

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1946332 2021-01-13 2021-01-20 20-0203 212329

QC Summary

Analyte Blank		QC % Rec	QC Limits
Run No 395250 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG 20	021-01-15 Ana	ilyst K_A	
Phenols	<0.001 mg/L	96	69-132
Tannin & Lignin	<0.1 mg/L	100	
Run No 395277 Analysis/Extraction Date 20 Method SM 5310B 20 </td <td>021-01-15 Ana</td> <td>ilyst AET</td> <td></td>	021-01-15 Ana	ilyst AET	
DOC	<0.5 mg/L	97	80-120
Run No 395279 Analysis/Extraction Date 20 Method C SM2340B 20)21-01-20 Ana	llyst AET	
Hardness as CaCO3			
Ion Balance			
Run No 395294 Analysis/Extraction Date 20 Method C SM4500-S2-D 20)21-01-20 Ana	llyst AET	
S2-	<0.01 mg/L	101	80-120

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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Page 5 of 5

Certificate of Analysis

	Environment Testing					
Client: Attention:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black		Report Number: 1946203 Date Submitted: 2021-01- Date Reported: 2021-01- Project: 20-0203		6203 1-01-12 1-01-14 2203	
PO#: Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2	000 #.	212330		

Dear Monica Black:

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:



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

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number:	19
Date Submitted:	20
Date Reported:	20
Project:	20-
COC #:	21

1946203 2021-01-12 2021-01-14 20-0203 212330

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1537912 GW 2021-01-12 TW3-1	1537913 GW 2021-01-12 TW3-2
Group	Analyte	MRL	Units	Guideline		
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0	0
	Faecal Coliforms	0	ct/100mL		0	0
	Faecal Streptococcus	0	ct/100mL		0	0
	Heterotrophic Plate Count	0	ct/1mL		0	0
	Total Coliforms	0	ct/100mL	MAC 0	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.

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

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

Certificate of Analysis

	Environment Testing			
Client:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0		Report Number: Date Submitted: Date Reported: Project: COC #:	1946189 2021-01-12 2021-01-19 20-0203 212330
PO#: Invoice to:	Mr. Monica Black McIntosh Perry Consulting Engineers Ltd.	Page 1 of 5	000 #	212000

Dear Monica Black:

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:



Sarah Horner, Inorganics Technician

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Certificate of Analysis

McIntosh Perry Consulting Engineers Ltd. Client: 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black Attention: PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Environment Testing

1946189 2021-01-12 2021-01-19 20-0203

212330

1537895 1537896 labID Sample Matrix Water Water Sample Type Sampling Date 2021-01-12 2021-01-12 Sample I.D. TW3-1 TW3-2 MRL Units Guideline Group Analyte AO 250 18 18 Anions CI 1 mg/L F 0.10 MAC 1.5 0.18 0.17 mg/L N-NO2 0.10 MAC 1.0 < 0.10 <0.10 mg/L N-NO3 0.10 MAC 10.0 < 0.10 0.12 mg/L AO 500 SO4 19 19 1 mg/L General Chemistry Alkalinity as CaCO3 5 mg/L OG 500 276 272 <2 2 TCU <2 Colour Conductivity 5 uS/cm 579 577 0.5 AO 5 15 DOC mg/L 11 pН 1.00 6.5-8.5 8.08 8.12 <0.01 <0.01 S2-0.01 AO 0.05 mg/L TDS 10 AO 500 320 320 mg/L Turbidity 0.1 NTU AO 5 0 2.6 3.0 Hardness Hardness as CaCO3 OG 100 314' 316 1 mg/L Indices/Calc 1.05 1.07 Ion Balance 0.01 Metals 86 87 Ca 1 mg/L AO 0.3 Fe 0.03 0.29 mg/L Κ 2 2 mg/L 1 24 24 Mg 1 mg/L Mn 0.01 mg/L AO 0.05 0.12 0.11 AO 200 10 10 Na 2 mg/L Nutrients N-NH3 0.010 <0.010 <0.010 mg/L Total Kjeldahl Nitrogen < 0.100 0 266 0.100 mg/L 0.001 <0.001 <0.001 Subcontract-Inorg Phenols mg/L Tannin & Lignin 0.1 mg/L <0.1 < 0.1

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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

Invoice to:

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

McIntosh Perry Consulting Engineers Ltd.

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

1946189 2021-01-12 2021-01-19 20-0203 212330

QC Summary

Analyte	Blank		QC % Rec	QC Limits
Run No 394985 Analysis/Extraction Date 20 Method C SM2120C	021-01-13 Ana	alyst	SKH	
Colour	<2 TCU		93	90-110
Run No 395019 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F	021-01-13 Ana	alyst	AET	
Alkalinity (CaCO3)	<5 mg/L		100	90-110
Conductivity	<5 uS/cm		97	90-110
F	<0.10 mg/L		102	90-110
pH			101	90-110
Run No 395048 Analysis/Extraction Date 20 Method EPA 350.1)21-01-14 Ana	alyst	SKH	
N-NH3	<0.010 mg/L		104	80-120
Run No 395057 Analysis/Extraction Date 20 Method EPA 351.2)21-01-14 Ana	alyst	SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L		93	70-130
Run No 395058 Analysis/Extraction Date 20 Method C SM2130B 20)21-01-14 Ana	alyst	H_D	
Turbidity	<0.1 NTU		101	70-130

Guideline = ODWSOG

* = Guideline Exceedence

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

Page 3 of 5

PO#:

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black

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

1946189 2021-01-12 2021-01-19 20-0203 212330

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Analyte	Blank	QC % Rec		QC Limits
Run No 395060 Analysis/Extraction Date 20 Method M SM3120B-3500C)21-01-14 An a	alyst	Z_S	
Calcium	<1 mg/L		102	90-110
Potassium	<1 mg/L		95	87-113
Magnesium	<1 mg/L		100	76-124
Sodium	<2 mg/L		96	82-118
Run No 395064 Analysis/Extraction Date 20 Method EPA 200.8	021-01-14 An a	alyst	ΗD	
Iron	<0.03 mg/L		95	80-120
Manganese	<0.01 mg/L		109	80-120
Run No 395088 Analysis/Extraction Date 20 Method C SM2540	021-01-18 An a	alyst	SKH	
TDS	<10 mg/L		100	90-110
Run No 395091 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG	021-01-14 Ana	alyst	AET	
Phenols	<0.001 mg/L		92	69-132
Tannin & Lignin	<0.1 mg/L		110	
Run No 395105 Analysis/Extraction Date 20 Method SM 4110)21-01-15 An a	alyst	SKH	

Guideline = ODWSOG

* = Guideline Exceedence

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

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Page 4 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1946189 2021-01-12 2021-01-19 20-0203 212330

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	104	90-110
SO4	<1 mg/L	<1 mg/L 100	
Run No 395115 Analysis/Extraction Date 2 Method SM 5310B	021-01-15 Ana	llyst AET	
DOC	<0.5 mg/L	97	80-120
Run No 395117 Analysis/Extraction Date 2 Method C SM4500-S2-D 2	021-01-15 Ana	ilyst AET	
S2-	<0.01 mg/L	99	80-120
Run No 395236 Analysis/Extraction Date 2 Method C SM2340B	021-01-19 Ana	ilyst SKH	
Hardness as CaCO3			
Ion Balance			

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 5 of 5

Certificate of Analysis

	Environment Testing				
Client:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0		Report Number: Date Submitted: Date Reported:	1945418 2020-12-22 2020-12-24	
Attention: PO#:	Mr. Jordan Bowman		COC #:	212250	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2			

Dear Jordan Bowman:

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:

Steven Tosh, Operations Manager

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Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

🔅 eurofins

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Deport Number:	1045410
Report Number.	1945410
Date Submitted:	2020-12-2
Date Reported:	2020-12-2
Project:	
COC #:	212250

020-12-22 020-12-24

Lab I.D. Sample Matrix 1535943 1535944 Water Water Sample Type Sampling Date Sample I.D. 2020-12-22 2020-12-22 TW4-1 TW4-2 MRL Units Guideline Group Analyte ct/100mL 0 0 MAC 0 Microbiology Escherichia Coli Λ Faecal Coliforms 0 ct/100mL 0 0 Faecal Streptococcus 0 2 0 ct/100mL Heterotrophic Plate Count 0 ct/1mL 0 0 . Total Coliforms MAC 0 ct/100mL 0 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.

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

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

Certificate of Analysis

	Environment lesting	
Client:	McIntosh Perry Consulting Engineers Ltd.	
	115 Walgreen Rd., R.R. #3	
	Carp, ON	
	K0A 1L0	
Attention:	Mr. Jordan Bowman	
PO#:		
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 5

 Report Number:
 1945427

 Date Submitted:
 2020-12-22

 Date Reported:
 2021-01-04

 Project:
 212250

Dear Jordan Bowman:

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 2021.01.04 14:38:23 - 05'00'

APPROVAL:

Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#:

2020-12-22 2021-01-04

212250

Invoice to: McIntosh Perry Consulting Engineers Ltd.

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1535957 GW 2020-12-22 TW4-1	1535958 GW 2020-12-22 TW4-2
Group	Analyte	MRL	Units	Guideline		
Anions	CI	1	mg/L	AO 250	10	10
	F	0.10	mg/L	MAC 1.5	<0.10	<0.10
	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	0.28	0.31
	SO4	1	mg/L	AO 500	13	12
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	326	319
	Colour	2	TCU		<2	<2
	Conductivity	5	uS/cm		594	586
	DOC	0.5	mg/L	AO 5	1.0	1.0
	рН	1.00		6.5-8.5	8.10	8.12
	S2-	0.01	mg/L	AO 0.05	0.02	<0.01
	TDS	10	mg/L	AO 500	330	320
	Turbidity	0.1	NTU	AO 5.0	2.2	0.4
Hardness	Hardness as CaCO3	1	mg/L	OG 100	316*	316*
Indices/Calc	Ion Balance	0.01			0.91	0.93
Metals	Са	1	mg/L		72	72
	Fe	0.03	mg/L	AO 0.3	0.07	0.05
	К	1	mg/L		<1	<1
	Mg	1	mg/L		33	33
	Mn	0.01	mg/L	AO 0.05	<0.01	<0.01
	Na	2	mg/L	AO 200	3	3
Nutrients	N-NH3	0.010	mg/L		0.032	<0.010
	Total Kjeldahl Nitrogen	0.100	mg/L		<0.100	0.130
Subcontract	Phenols	0.001	mg/L		<0.001	<0.001
	Tannin & Lignin	0.1	mg/L		<0.1	<0.1

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#:

Report Number: 1945427 Date Submitted: 2020-12-22 Date Reported: Project: COC #:

2021-01-04

212250

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

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Aı	nalyte	Blank		QC % Rec	QC Limits
Run No 394399 Method C SM2130B	Analysis/Extraction Date 20)20-12-23 An	alyst	H D	
Turbidity		<0.1 NTU		105	70-130
Run No 394433 Method M SM3120B-3	Analysis/Extraction Date 20 3500C	ction Date 2020-12-23 Anal		Z S	
Calcium		<1 mg/L		104	90-110
Potassium		<1 mg/L		94	87-113
Magnesium		<1 mg/L		103	76-124
Sodium		<2 mg/L		95	82-118
Run No 394475 Method SM 5310B	Analysis/Extraction Date 20)20-12-24 An	alyst	AET	
DOC		<0.5 mg/L		80	80-120
Run No 394494 Method EPA 200.8	Analysis/Extraction Date 20)20-12-24 An	alyst	H D	
Iron		<0.03 mg/L		96	80-120
Manganese		<0.01 mg/L		106	80-120
Run No 394503 Method C SM2540	Analysis/Extraction Date 20)20-12-30 An	alyst	SKH	
TDS		<10 mg/L		98	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.

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

Page 3 of 5

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#:

Report Number: 1945427 Date Submitted: 2020-12-22 Date Reported: Project: COC #:

2021-01-04 212250

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394519 Analysis/Extraction Date 20	20-12-29 Ana	llyst SKH	
N-NH3	<0.010 mg/L	115	80-120
Run No 394526 Analysis/Extraction Date 20 Method SM 4110)20-12-29 Ana	l iyst SKH	•
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	103	90-110
SO4	<1 mg/L	105	90-110
Run No 394530 Analysis/Extraction Date 20 Method EPA 351.2)20-12-29 Ana	llyst SKH	'
Total Kjeldahl Nitrogen	<0.100 mg/L	113	70-130
Run No 394541 Analysis/Extraction Date 20 Method C SM4500-S2-D	020-12-29 Ana	llyst HD	
\$2-	<0.01 mg/L	83	80-120
Run No 394556 Analysis/Extraction Date 20 Method C SM2120C)20-12-30 Ana	il yst SKH	
Colour	<2 TCU	107	90-110

Guideline = ODWSOG

* = Guideline Exceedence

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

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Page 4 of 5

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number: 1945427 Date Submitted: 2020-12-22 Date Reported: Project: COC #:

2021-01-04

212250

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394594 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F)20-12-30 Ana	l yst H_D	
Alkalinity (CaCO3)	<5 mg/L	107	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	102	90-110
рН		102	90-110
Run No 394600 Analysis/Extraction Date 20 Method SUBCONTRACT-A	020-12-24 Ana	l yst KK	
Phenols	<0.001 mg/L	84	
Tannin & Lignin	<0.1 mg/L	110	
Run No 394625 Analysis/Extraction Date 20 Method C SM2340B	021-01-04 Ana	lyst AET	
Hardness as CaCO3			
lon Balance			

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 5 of 5

Certificate of Analysis

PO#: Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2	000 #.	212112
Attention:	115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black		Date Report Number: Date Submitted: Date Reported: Project: COC #:	1945869 2021-01-06 2021-01-08 20-0203 212172
Client:	McIntosh Perry Consulting Engineers Ltd.		Dan art Number	1015000

Dear Monica Black:

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:



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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number:	19
Date Submitted:	20
Date Reported:	20
Project:	20
COC #:	21

1945869 2021-01-06 2021-01-08 20-0203 212172

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1537086 GW 2021-01-06 TW5-1	1537087 GW 2021-01-06 TW5-2
Group	Analyte	MRL	Units	Guideline		
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	0	0
	Faecal Coliforms	0	ct/100mL		0	0
	Faecal Streptococcus	0	ct/100mL		0	0
	Heterotrophic Plate Count	0	ct/1mL		4	1
	Total Coliforms	0	ct/100mL	MAC 0	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.

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

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Certificate of Analysis

	Environment Testing	
Client:	McIntosh Perry Consulting Engineers Ltd.	
	115 Walgreen Rd., R.R. #3	
	Carp, ON	
	K0A 1L0	
Attention: PO#:	Mr. Monica Black	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 5

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

1945852 2021-01-06 2021-01-08 20-0203 212172

Dear Monica Black:

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:

Rebecca Koshy, Project Manager

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

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

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Certificate of Analysis

McIntosh Perry Consulting Engineers Ltd. Client: 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Mr. Monica Black Attention: PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Environment Testing

1945852 2021-01-06 2021-01-08 20-0203

212172

1537052 1537053 labID Sample Matrix Water Water Sample Type Sampling Date 2021-01-06 2021-01-06 Sample I.D. TW5-1 TW5-2 MRL Units Guideline Group Analyte AO 250 10 9 Anions CI 1 mg/L F 0.10 MAC 1.5 0.10 <0.10 mg/L N-NO2 0.10 MAC 1.0 <0.10 <0.10 mg/L N-NO3 0.10 MAC 10.0 0.33 0.36 mg/L AO 500 13 SO4 13 1 mg/L General Chemistry Alkalinity as CaCO3 5 mg/L OG 500 326 325 <2 <2 2 TCU Colour Conductivity 5 uS/cm 593 588 0.5 AO 5 12 12 DOC mg/L pН 1.00 6.5-8.5 8.09 8.03 <0.01 <0.01 S2-0.01 AO 0.05 mg/L TDS 10 AO 500 340 330 mg/L Turbidity 0.1 NTU AO 5 0 1.6 0.5 Hardness Hardness as CaCO3 OG 100 320' 1 mg/L Indices/Calc 0.92 0.94 Ion Balance 0.01 Metals 72 73 Ca 1 mg/L AO 0.3 Fe 0.03 0.08 0.03 mg/L Κ mg/L 1 1 1 34 34 Mg 1 mg/L Mn 0.01 mg/L AO 0.05 <0.01 <0.01 AO 200 3 Na 2 mg/L 3 Nutrients N-NH3 0.010 <0.010 <0.010 mg/L Total Kjeldahl Nitrogen 0 111 <0 100 0.100 mg/L 0.001 <0.001 <0.001 Subcontract-Inorg Phenols mg/L Tannin & Lignin 0.1 mg/L <0.1 <0.1

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

Report Number:1Date Submitted:2Date Reported:2Project:2COC #:2

1945852 2021-01-06 2021-01-08 20-0203 212172

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394793 Analysis/Extraction Date 20 Method C SM2130B	021-01-07 Ana	llyst HD	
Turbidity	<0.1 NTU	103	70-130
Run No 394797 Analysis/Extraction Date 20 Method EPA 200.8	021-01-07 Ana	llyst HD	
Iron	<0.03 mg/L	101	80-120
Manganese	<0.01 mg/L	108	80-120
Run No 394799 Analysis/Extraction Date 20 Method M SM3120B-3500C	021-01-07 Ana	llyst ZS	
Calcium	<1 mg/L	99	90-110
Potassium	<1 mg/L	97	87-113
Magnesium	<1 mg/L	98	76-124
Sodium	<2 mg/L	100	82-118
Run No 394801 Analysis/Extraction Date 20 Method EPA 351.2	021-01-07 Ana	ilyst SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L	105	70-130
Run No 394805 Analysis/Extraction Date 20 Method EPA 350.1	021-01-07 Ana	l iyst SKH	
N-NH3	<0.010 mg/L	119	80-120

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

Page 3 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#:

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

1945852 2021-01-06 2021-01-08 20-0203 212172

Invoice to: McIntosh Perry Consulting Engineers Ltd.

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394808 Analysis/Extraction Date 20 Method SM 4110 20	021-01-07 Ana	lyst SKH	
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	103	90-110
SO4	<1 mg/L	100	90-110
Run No 394811 Analysis/Extraction Date 20	21-01-07 Ana	lyst AET	
Method SM2320,2510,4500H/F			
Alkalinity (CaCO3)	<5 mg/L	105	90-110
Conductivity	<5 uS/cm	101	90-110
F	<0.10 mg/L	103	90-110
pH		103	90-110
Run No 394833 Analysis/Extraction Date 20 Method C SM2120C 20	021-01-08 Ana	l yst SKH	
Colour	<2 TCU	100	90-110
Run No 394837 Analysis/Extraction Date 20 Method SM 5310B 20	021-01-08 Ana	lyst AET	
DOC	<0.5 mg/L	97	80-120

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

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Page 4 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945852 2021-01-06 2021-01-08 20-0203 212172

QC Summary

Analyte	Blank		QC Limits
Run No 394841 Analysis/Extraction Date 20 Method C SM2340B	21-01-08 Ana	lyst AET	
Hardness as CaCO3			
Ion Balance			
Run No 394857 Analysis/Extraction Date 20 Method C SM2540 C	21-01-08 Ana	lyst AET	
TDS	<10 mg/L	100	90-110
Run No 394861 Analysis/Extraction Date 20 Method C SM4500-S2-D C	21-01-08 Ana	lyst AET	
S2-	<0.01 mg/L	95	80-120
Run No 394883 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG	21-01-08 Ana	lyst RK	
Phenols	<0.001 mg/L	92	69-132
Tannin & Lignin	<0.1 mg/L	100	

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

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Page 5 of 5

Certificate of Analysis

	Environment lesting
Client:	McIntosh Perry Consulting Engineers Ltd.
	115 Walgreen Rd., R.R. #3
	Carp, ON
	K0A 1L0
Attention:	Mr. Monica Black
PO#:	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.

at Testine

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

1945922 2021-01-07 2021-01-11 20-0203 212173

Dear Monica Black:

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).

Page 1 of 7

Report Comments:



APPROVAL:

Addrine Thomas, Inorganics Supervisor

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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Environment Testing

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC =

Objective, TDR = Typical Desired Range

Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality

1945922 2021-01-07 2021-01-11 20-0203 212173

1537250 1537251 labID Sample Matrix GW GW Sample Type Sampling Date 2021-01-07 2021-01-07 Sample I.D. TW6-1 TW6-2 MRL Units Guideline Group Analyte AO 250 22 21 Anions CI 1 mg/L F 0.10 MAC 1.5 <0.10 <0.10 mg/L N-NO2 0.10 MAC 1.0 < 0.10 <0.10 mg/L N-NO3 0.10 MAC 10.0 0.46 0.50 mg/L AO 500 22 22 SO4 1 mg/L General Chemistry Alkalinity as CaCO3 5 mg/L OG 500 326 326 <2 <2 2 TCU Colour Conductivity 5 uS/cm 664 667 0.5 AO 5 17 DOC 16 mg/L pН 1.00 6.5-8.5 8.06 8.18 <0.01 <0.01 S2-0.01 AO 0.05 mg/L TDS 10 AO 500 390 290 mg/L Turbidity 0.1 NTU AO 5 0 4.4 0.8 Hardness Hardness as CaCO3 OG 100 371 375 1 mg/L Indices/Calc 1 02 1.03 Ion Balance 0.01 Metals 86 86 Ca 1 mg/L AO 0.3 Fe 0.03 0.18 < 0.03 mg/L Κ <1 mg/L 1 1 38 39 Mg 1 mg/L 0.01 mg/L AO 0.05 <0.01 <0.01 Mn AO 200 8 9 Na 2 mg/L Microbiology Escherichia Coli 0 ct/100mL MAC 0 0 0 0 Faecal Coliforms 0 ct/100mL 0 Faecal Streptococcus 0 ct/100mL 0 0 Heterotrophic Plate Count 0 ct/1mL 27 19

Guideline = ODWSOG

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

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number:	19
Date Submitted:	20
Date Reported:	20
Project:	20-
COC #:	21

1945922 2021-01-07 2021-01-11 20-0203 212173

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1537250 GW 2021-01-07 TW6-1	1537251 GW 2021-01-07 TW6-2
Group	Analyte	MRL	Units	Guideline		
Microbiology	Total Coliforms	0	ct/100mL	MAC 0	0	0
Nutrients	N-NH3	0.010	mg/L		0.029	<0.010
	Total Kjeldahl Nitrogen	0.100	mg/L		<0.100	<0.100
Subcontract-Inorg	Phenols	0.001	mg/L		<0.001	<0.001
	Tannin & Lignin	0.1	mg/L		<0.1	<0.1

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

Page 3 of 7

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Monica Black PO#: Invoice to:

McIntosh Perry Consulting Engineers Ltd.

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

1945922 2021-01-07 2021-01-11 20-0203 212173

QC Summary

Analyte	Blank		QC % Rec	QC Limits
Run No 394793 Analysis/Extraction Date 20 Method C SM2130B)21-01-07 Ana	alyst	H D	
Turbidity	<0.1 NTU		103	70-130
Run No 394797 Analysis/Extraction Date 20 Method EPA 200.8 EPA 200	2021-01-07 A na		ΗD	
Iron	<0.03 mg/L		101	80-120
Manganese	<0.01 mg/L		108	80-120
Run No 394821 Analysis/Extraction Date 20 Method AMBCOLM1	021-01-08 Ana	lyst	DRA	
Escherichia Coli				
Faecal Coliforms				
Faecal Streptococcus				
Heterotrophic Plate Count				
Total Coliforms				
Run No 394833 Analysis/Extraction Date 20 Method C SM2120C 20<)21-01-08 Ana	alyst	SKH	
Colour	<2 TCU		100	90-110
Run No 394849 Analysis/Extraction Date 20 Method EPA 350.1 20<	021-01-08 Ana	alyst	AET	

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

Page 4 of 7

Certificate of Analysis

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

1945922 2021-01-07 2021-01-11 20-0203 212173

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NH3	<0.010 mg/L	100	80-120
Run No 394853 Analysis/Extraction Date 20 Method M SM3120B-3500C	021-01-08 Ana	llyst ZS	
Calcium	<1 mg/L	101	90-110
Potassium	<1 mg/L	98	87-113
Magnesium	<1 mg/L	100	76-124
Sodium	<2 mg/L	101	82-118
Run No 394857 Analysis/Extraction Date 20 Method C SM2540 C	021-01-08 Ana	ilyst AET	
TDS	<10 mg/L	100	90-110
Run No 394860 Analysis/Extraction Date 20 Method EPA 351.2	021-01-08 Ana	ilyst AET	
Total Kjeldahl Nitrogen	<0.100 mg/L	94	70-130
Run No 394861 Analysis/Extraction Date 20 Method C SM4500-S2-D 20	021-01-08 Ana	ilyst AET	
S2-	<0.01 mg/L	95	80-120
Run No 394872 Analysis/Extraction Date 20 Method SM 4110 20 <td>021-01-08 Ana</td> <td>llyst SKH</td> <td></td>	021-01-08 Ana	llyst SKH	
Chloride	<1 mg/L	100	90-110

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

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Page 5 of 7

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945922 2021-01-07 2021-01-11 20-0203 212173

QC Summary

Analyte	Blank		QC % Rec	QC Limits
N-NO2	<0.10 mg/L		104	90-110
N-NO3	<0.10 mg/L		104	90-110
SO4	<1 mg/L		105	90-110
Run No 394888 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG	021-01-08 Ana	alyst	AET	
Phenols	<0.001 mg/L		92	69-132
Tannin & Lignin	<0.1 mg/L		100	
Run No 394898 Analysis/Extraction Date 20 Method SM 5310B	021-01-11 Ana	lyst	AET	
DOC	<0.5 mg/L		97	80-120
Run No 394900 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F)21-01-11 Ana	alyst	AET	
Alkalinity (CaCO3)	<5 mg/L		95	90-110
Conductivity	<5 uS/cm		97	90-110
F	<0.10 mg/L		101	90-110
pH			102	90-110
Run No 394905 Analysis/Extraction Date 20 Method C SM2340B 20	021-01-11 Ana	lyst	AET	
Hardness as CaCO3				

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

Page 6 of 7

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945922 2021-01-07 2021-01-11 20-0203 212173

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Ion Balance			

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

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Page 7 of 7

Certificate of Analysis

Client: Attention: PO#:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Mr. Jordan Bowman		Report Number: Date Submitted: Date Reported: Project: COC #:	1945361 2020-12-21 2020-12-23 20-0203 212249	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2			

Dear Jordan Bowman:

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:



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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number: Date Submitted: Date Reported:	19- 20: 20:
Project:	20-
COC #:	21

1945361 2020-12-21 2020-12-23 20-0203 212249

Lab I.D. Sample Matrix 1535721 1535722 Water Water Sample Type Sampling Date Sample I.D. 2020-12-21 2020-12-21 TW7-1 TW7-2 MRL Units Guideline Group Analyte ct/100mL 0 0 Escherichia Coli MAC 0 Microbiology Λ Faecal Coliforms 0 ct/100mL 0 0 Faecal Streptococcus 0 0 0 ct/100mL Heterotrophic Plate Count 0 ct/1mL 7 5 . Total Coliforms MAC 0 ct/100mL 0 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.

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

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Certificate of Analysis

	Environment resting
Client:	McIntosh Perry Consulting Engineers Ltd.
	115 Walgreen Rd., R.R. #3
	Carp, ON
	K0A 1L0
Attention:	Mr. Jordan Bowman
PO#:	
Invoice to:	McIntosh Perry Consulting Engineers Ltd.

wironmont Tecting

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

1945350 2020-12-21 2020-12-30 20-0203 212249

Dear Jordan Bowman:

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).

Page 1 of 5

Report Comments:

Hongyuan Deng 2020.12.30 16:04:45 -05'00'

APPROVAL:

Hongyuan Deng, Inorganics Technician

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Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

1945350 2020-12-21 2020-12-30 20-0203 212249

Group	Analyte	MRL	Units	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D. Guideline	1535703 GW 2020-12-21 TW7-1	1535704 GW 2020-12-21 TW7-2
Anions	CI	1	mg/L	AO 250	18	18
-	F	0.10	mg/L	MAC 1.5	0.16	0.17
-	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10	<0.10
	SO4	1	mg/L	AO 500	21	22
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	320	318
	Colour	2	TCU		<2	3
	Conductivity	5	uS/cm		631	623
	DOC	0.5	mg/L	AO 5	1.2	1.2
	pH	1.00		6.5-8.5	8.05	8.28
	S2-	0.01	mg/L	AO 0.05	0.01	<0.01
	TDS	10	mg/L	AO 500	370	370
	Turbidity	0.1	NTU	AO 5.0	10.3*	10.5*
Hardness	Hardness as CaCO3	1	mg/L	OG 100	323*	323*
Indices/Calc	Ion Balance	0.01			0.92	0.92
Metals	Са	1	mg/L		80	80
	Fe	0.03	mg/L	AO 0.3	0.80*	0.87*
	К	1	mg/L		1	2
	Mg	1	mg/L		30	30
	Mn	0.01	mg/L	AO 0.05	0.03	0.04
	Na	2	mg/L	AO 200	6	6
Nutrients	N-NH3	0.010	mg/L		<0.010	<0.010
	Total Kjeldahl Nitrogen	0.100	mg/L		0.249	0.212
Subcontract-Inorg	Phenols	0.001	mg/L		<0.001	<0.001
	Tannin & Lignin	0.1	mg/L		<0.1	<0.1

Guideline = ODWSOG

* = Guideline Exceedence

Exceedence

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

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

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

Certificate of Analysis

Environment Testing Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945350 2020-12-21 2020-12-30 20-0203 212249

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394272 Analysis/Extraction Date 20 Method C SM2540 C)20-12-23 Ana	lyst SKH	
TDS	<10 mg/L	101	90-110
Run No 394297 Analysis/Extraction Date 20 Method EPA 200.8 EPA 200)20-12-22 Ana	lyst HD	
Iron	<0.03 mg/L	98	80-120
Manganese	<0.01 mg/L	106	80-120
Run No 394320 Analysis/Extraction Date 20 Method EPA 350.1	020-12-22 Ana	lyst SKH	
N-NH3	<0.010 mg/L	117	80-120
Run No 394399 Analysis/Extraction Date 20 Method C SM2130B)20-12-23 Ana	lyst HD	
Turbidity	<0.1 NTU	105	70-130
Run No 394433 Analysis/Extraction Date 2020-12-23 Analysis/Extraction Date Method M SM3120B-3500C Analysis/Extraction Date Analysis/ExtractionDate		lyst ZS	
Calcium	<1 mg/L	104	90-110
Potassium <1 mg/L		94	87-113
Magnesium <1 mg/L		103	76-124
Sodium	<2 mg/L	95	82-118

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

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

Page 3 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945350 2020-12-21 2020-12-30 20-0203 212249

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 394475 Analysis/Extraction Date 20 Method SM 5310B)20-12-24 Ana	alyst AET	
DOC	<0.5 mg/L	80	80-120
Run No 394501 Analysis/Extraction Date 20 Method SUBCONTRACT P-INORG)20-12-23 Ana	alyst RK	
Phenols	<0.001 mg/L	100	69-132
Tannin & Lignin	<0.1 mg/L	100	
Run No 394526 Analysis/Extraction Date 20 Method SM 4110 20 <td>)20-12-29 Ana</td> <th>alyst SKH</th> <td></td>)20-12-29 A na	alyst SKH	
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	104	90-110
N-NO3	<0.10 mg/L	103	90-110
SO4	<1 mg/L	105	90-110
Run No 394530 Analysis/Extraction Date 20 Method EPA 351.2)20-12-29 Ana	alyst SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L	113	70-130
Run No 394541 Analysis/Extraction Date 20 Method C SM4500-S2-D 20	020-12-29 Ana	alyst HD	
S2-	<0.01 mg/L	83	80-120

Guideline = ODWSOG

* = Guideline Exceedence

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

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

Page 4 of 5

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Jordan Bowman PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

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

1945350 2020-12-21 2020-12-30 20-0203 212249

QC Summary

Analyte Blank		QC % Rec	QC Limits
Run No 394556 Analysis/Extraction Date 20 Method C SM2120C)20-12-30 Ana	l yst SKH	
Colour	<2 TCU	107	90-110
Run No 394594 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F 20	020-12-30 Ana	lyst HD	
Alkalinity (CaCO3)	<5 mg/L	107	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	102	90-110
pН		102	90-110
Run No394613Analysis/Extraction Date2020-12-30MethodC SM2340B		lyst HD	
Hardness as CaCO3			
Ion Balance			

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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

Page 5 of 5

Certificate of Analysis

	Environment Testing		
Client:	McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON K0A 11.0		Repor Date Date Projec
Attention: PO#:	Mr. Monica Black		COC
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2	

rt Number: 1946557 Submitted: 2021-01-19 Reported: ct: #:

2021-01-22 212335

Dear Monica Black:

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

Report Comments:

Rebecca Koshy 2021.01.22 09:52:22 -05'00'

APPROVAL:

Rebecca Koshy, Project Manager

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

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

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. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

🔅 eurofins

Certificate of Analysis

	Environment Testing
Client:	McIntosh Perry Consulting Engineers Ltd.
	115 Walgreen Rd., R.R. #3
	Carp, ON
	K0A 1L0
Attention: PO#:	Mr. Monica Black
Invoice to:	McIntosh Perry Consulting Engineers Ltd.

Report Number:	1946557
Date Submitted:	2021-01-
Date Reported:	2021-01-2
Project:	
COC #:	212335

21-01-19 21-01-22

1538777 1538778 Lab I.D. Sample Matrix GW GW Sample Type Sampling Date Sample I.D. 2021-01-19 2021-01-19 TW2-3 TW1-3 Group Analyte MRL Units Guideline MAC 0 0 0 Escherichia Coli ct/100mL Microbiology 0 Faecal Coliforms 0 ct/100mL 0 0 ct/100mL 0 0 Faecal Streptococcus 0 Heterotrophic Plate Count 0 ct/1mL 33 0 MAC 0 Total Coliforms ct/100mL 2* 0 0

Guideline = ODWSOG

* = Guideline Exceedence

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

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

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



Certificate of Analysis

Client:	McIntosh Perry Consulting Engineers Ltd.			
	115 Walgreen Rd., R.R. #3 Carp, ON		Report Number: Date Submitted: Date Reported:	1947278 2021-02-02 2021-02-05
Attention:	K0A 1L0 Mr. Monica Black		Project: COC #:	212707
Invoice to:	McIntosh Perry Consulting Engineers Ltd.	Page 1 of 2		

Dear Monica Black:

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:

Steven Tosh, Operations Manager

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

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

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Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

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. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

Client: McIntosh Perry Consulting Engineers Ltd. 115 Walgreen Rd., R.R. #3 Carp, ON KOA 1L0 Attention: Mr. Monica Black PO#: Invoice to: McIntosh Perry Consulting Engineers Ltd.

Report Number:	1
Date Submitted:	2
Date Reported:	2
Project:	
COC #:	2

1947278 2021-02-02 2021-02-05

212707

Lab I.D. Sample Matrix 1540720 GW Sample Type Sampling Date Sample I.D. 2021-02-02 TW2-4 MRL Units Guideline Group Analyte ct/100mL 0 Escherichia Coli MAC 0 Microbiology Λ Faecal Coliforms 0 ct/100mL 0 Faecal Streptococcus 0 0 ct/100mL Heterotrophic Plate Count 0 ct/1mL 87 Total Coliforms MAC 0 ct/100mL 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.

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

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

HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



APPENDIX C – ON-SITE WATER WELL RECORDS (AIR ROCK DRILLING LTD.)

MCINTOSH PERRY

(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the

LOCATED AT (No CIVIC) Gordiner Shore, Carleton Place (Civic Address) Test well LOT # 7 CON # 9 PLANH X Test Well	PROPERTY OF # 1384-341 (Name of Landowner)	Ontariol	inite	d Constru	tion)
LOT # 7 CON # 9 PLAN # X Test Well	LOCATED AT (No CIVIC) G	ordiner S	shore,	Carleton	Place
	$\frac{\text{(CIVIC Address)}}{\text{LOT # 7 CON # 9}}$	ΡΙ ΔΝΙ #	×	Testw	ell 1

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required. **BIH** ecember Signed this dav of 2020 Ćo. Ltd. (C-7681) Jeremy Hanna Witness **Debbie Davis** 3315

ONTAR

HYDROLOGIST (Signature / Stamp)

000095

James Gardin Horry Gordiner & Kathryn Chapman

Untaric	Ministry Conserv	of the Envi vation and P	ronment, T	ag#:A313134	r Print Below)	[:	W	ell F	Rec
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First Name		Last Name/O	rganization 84341 Onta	rio Limited (clo Car	E-mail Address	۱			Well (Cons ell Ou
Mailing Address	s (Street Number/Na	me)		Municipality	Province	Postal Code	Te	elephone N	lo. (inc.	area
Well Locatio	n n	80		ASNION		<u> Koa</u>	<u>160 </u>	L L L	2.50	
Address of Well Gardin	Location (Street Nu	D CIVIC)		Township Beckwith		Lot 7	C	Concession	<u>009 1999 - 20</u>	10.000
County/District/	Municipality		· · · · · · · · · · · · · · · · · · ·	City/Town/Village		1 6	Province	<u></u>	Posta	God
Landinat	K es Zone Lasting	IN	orthing	Carleton Plac Municipal Plan and Sublot	Number		Officer	F10		
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(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that Lam

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the PROPERTY OF # 1384341 Ontario Limited (Cloce vanash) (Name of Landowner) LOCATED AT (No Civic) Goodiner Shore, Carleton Place (Civic Address) LOT # _ 7 _ CON # _ 9 _ PLAN # ____X _ = # _ 2 OF 7

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required.

21ST day of Signed this ecember 2020



Air Rock Drilling Co. Ltd. (C-7681) Jeremy Hanna

Witness

Debbie Davis

2020960 TAGA313112 James Goudiner + Horry Gardiner + Kathryn Chopman

HYDROLOGIST (Signature / Stamp)

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(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the

(Name of Landowner)	d (Construction)
LOCATED AT (NO CIVIC) Gordiner Shore,	CarletonPlace
LOT # CON # PLAN #X	Testwell AFI

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required. December Signed this day of 2020



Air Rock Dyilling Co. Ltd. (C-7681) Jeremy Hanna

Witness

Debble Davis

2020958 TAGA 313135

James Gardiner + Horry Gordiner + Kathryn Chapman

HYDROLOGIST (Signature / Stamp)

Measurements	recorded in:	Metric Mimperial		A313135	· · ·	Regulation 9	03 <i>Ontari</i> c I Pa	Vater Ros	of
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6" 00	en Hole	40/	100/	Observation and/or Monitoring Hole	Well production (I/min/eF)	4	11,8	40	9.4
		· · ·	┝──┥	Atteration (Construction)	Distriected?	5	11.9	50	8.4
	Construction F	ecord - Screen	Stef-Basic	LI Abandoned, Insufficient Supply	No.	Man of Well'	17.8	60	9;4 "
Outside Diameter (cm/in) (Plastic	Material , Galvanized, Steel)	Slot No. Dept	h (m/it)	Water Quality	Please provide a map be	elow following in:	structions on I	he back	N)
				specify		Ral	r	<u> </u>	
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ter found at Dep 4. (mt)	Ass Other, app Nh Kind.of Water as Other, app th Kind.of Water as Other, app Well.Contractor Well.Contractor Well.Contractor Well.Contractor Nell Contractor Nell Cont	C Fresh Untested C Fresh Untested	11/4/ormation Weil C Weil C 76 Murris @sympation ast Name, Fin tractor Date2	100 6 «	Comments:	7 77 L1 0 0 0 11 12 1 12 0 119 0 0 0 12 0 12 0 12 0 12 0 12 0 12 0 12	NE 1 Sec	2016	2 FT 2/34

(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the PROPERTY OF # 1384341 Ontario Livnited (Clocevarach) (Name of Landowner) LOCATED AT (No Civic) Cordiner Share, Carleton Place (Civic Address) LOT # _____ CON # ____ PLAN # _____X ____ # 4 OF 7

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern

well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

Signed this day of	December	20 <u>20</u>
	Air Rock Drilling Co. I	Ltd. (C-7681) Jeremy Hanna
ST ONAL CEOSCIE	Witness	Debbie Davis
PRACTISING MEMBER 3315		∂o2n95

HYDROLOGIST (Signature / Stamp)

James Gardiner + Horry Gardiner + Kathryn Chopman

Measurem	ents record	ied in: 🔲 l	Vietric 🙀	mperial		A313138		regulation	1 345 0	Pag	alei 7,63	of
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(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the

(Name of Landowner)	ed (Construction)
LOCATED AT (NO CIVIC) Gordiner Shore	, Carleton Place
(Civic Address)	Testwell 5
LOT # CON # PLAN #	OF7

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required.

Signed this <u>215t</u> day of <u>December</u> 2020



g Ćo. Ltd. (C-7681) Jeremy Hanna

Witness

Debbie Davis

2020961 TAGA 313/13 James Gardiner Horry Gardiner Kathryn Chapma

HYDROLOGIST (Signature / Stamp)

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(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

I, Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the

PROPERTY OF # 384341 Of (Name of Landowner)	ntario Limites	(Construction)
LOCATED AT (NO CIVIC) Gore	diner Shore,	CarletonPlace
LOT # CON # F	PLAN #X	Testivell

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and the guidelines, recommendations and regulations of the Ministry of the Environment as they govern well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required.

18TH day of ____ December Signed this 2020



Air Rock Drilling Co. Ltd. (C-7681) Jeremy Hanna

Witness

Debbie Davis

2020956 TAGA 313137

James Gardiner + Horry Gardiner + Kathryn Chapman

HYDROLOGIST (Signature / Stamp)
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Meit Cable To Rotary (C Rotary (F Boring Selin percu Other, sp Inside Diameter	iod of Con of conventional) keverse) ssion eclify Con Open Hole;	Struction Dlamon Jetting Driving Digging Struction F	d Pu Do Liv Ind Other Well	ublic orneatic vestočk igation dustrial ther, specify sing Dep	Well Us Comme Municip Test Hol Cooling	Se rotal Dewatering le Monttoring & Air Conditioning Status, of Welf. Veter Supply	Pump injeke se Pumping rete (i) 20 Duration of pum <u>1. hrs +</u> Final water leve <u>16.8</u> / ² If flowing give ra Reportmention	t at (n(h) min / (h) ping p:- min l end of pu te (l/min/G	PM)	2 3 4 5 10 15 20	16. 16. 16. 16. 16. 16. 16. 16.	3 1 3 2 4 3 4 4 5 5 5 10 5 10 5 20	
Mati	nod of Con of conventional) Reverse) ssion eoffy Con Gelvarized Concrete, P	Struction Damon Dating Driving Digging Struction - Struction - Struction - Fibrediass, Jastic, Steel)		ufilic omesilic vestočk igation dustrial ther, specify stng Diep From:	Well Us Comme Muricip Test Hol Cooling th (n@)	se rciel Not used sl Dewatering le Monitoring & Air Conditioning. Status of Welf Veter Supply Replacement Well Test Hole	Pump injetsese 1000 Pumping rete (L 20 Duration of pum <u>1</u> .hrs + Final water leve 16.6 4" If flowing give ra	t at (n(n)) min / (E)) ping n min Lend of pu tie (I/min/G pump dep O (PM)	2 3 4 5 10 15 20 25	16. 16. 16. 16. 16. 16. 16. 16.	3 1 3 2 4 -3 4 4 5 5 5 10 5 15 5 20 5 25	
Cable To Cable To Cable To Rotary (f Baring Sair percu Other, sp Inside Diamater (crrgm) Cy44	riod of Con of Zoriventional) Reverse) ssion colly Generation Contrels, P Steel	Struction:	d Pu Do Liv Ind oth Well Thickness (cmin 188	utilic omesilic vestočik igatjon dustrial ber, specify Stng: From: +21	Well Us Comme Municipa Test Hol Cooling th (n@h) To 48.1	se	Pump Injelie se 100- Pumping rete (u 20 Duration of pum fris + Final water leve 16.8 '' Recommended Recommended Recommended	t at (n(1)) min/(2) ping (): min tend of pu te (//min/G pump dep pump rate	PM)	2 3 4 5 10 15 20 25 30	46. 16.4 16.4 16.4 16.4 16.4 16.4 16.4 1	3 1 3 2 4 -3 4 4 5 5 5 10 5 15 5 20 5 25 5 30	
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CERTIFICATE OF WELL COMPLIANCE

(REQUIRED FOR OCCUPANCY INSPECTION ONLY)

], Jeremy Hanna (License T3632) of AIR ROCK DRILLING CO. LTD. - do hereby certify that I am

Licensed to drill wells in the Province of Ontario and that I have supervised the drilling of a well on the PROPERTY OF # 1384341 Ontario Limited (Clo Grandel) (Name of Landowner) LOCATED AT (No Civic) Gardiner Shore, Calleton Place

(Civic Address) con# 9 LOT# 7 PLAN #

IN the TOWNSHIP OF BECKWITH - IN the COUNTY OF LANARK

AND FURTHER THAT I am aware of the well drilling requirements of the Township of Beckwith and

the guidelines, recommendations and regulations of the Ministry of the Environment as they govern

well installation in the Province of Ontario.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased and cement grouted to the

standards required.

1714 day of December Signed this 2020

Co. Ltd. (C-7681) Jeremy Hanna

Witness

Debbie Davis

2020955 1AGA 313141 ames Goodiner Horry Goodiner Kathryn Chapma



HYDROLOGIST (Signature / Stamp)

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La	narik	pany				City/Town/Village			Province	Posta	Code
NAD	rdinates Zon	e Easting	beloil	lorthing	ا أحف	Municipal Plan and Sub	lot Number		Other		<u> </u>
Overbur	den and Be	drock Mate	nals/Aband	onment Sea	iling Rec	ord (see instructions on t	he back of this form)		Test We	#77	ភ្
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Depth S	et at (mm)		Annula Type of Se	Space. Iant Used		Volume, Placed	After test of well vield	Results of We	ell Yield Testin	<u>a</u>	
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30 /	0 /	Benton	ite slurry			12.8	If pumping discontinuer	LOC LOSIDE 1, give reason:	Static Level FLoo	3	
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							Pump intake set at (m@) 80	μ <u>ν</u>	2 0.8	" 2 F	-10
Meti Cable To	hod of Con ol	Struction		in C	Well Us		Pumping rate (limin / CP	AP-	3	3	
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Boning	ssion	Digging	indi	ation [] Istrial	Cooling a	& Air Conditioning	Final water level end of	pumping (mat)	10	10	+
] Other, sp	ediy	druction P	Oth	er, specify	neres (ne		If flowing give rate (i/min/	(PMD)	15	15	-†
Inside Diameter	Open Hole (OR Material	Wall	ng Depth (r	ni (ji na se	Status of Well	Recommended ourmed	enth (mth)	20	20	+
(cm#b)?	Concrete, Pl	astic, Steet)	(cm)	From	To	Beplacement Well	801	epart (mage	25	25	\top
5 /4"	Steel		.188`'	+2 '	40 7	Recharge Well Dewatering Well	(I/min(CPM)	te	30	30	T
6"	Open H	óle.		40.7	120 /	Observation and/or Monitoring Hole	Well production (/minGE	WAP	40	40	
						Construction	Disinfected?		50	50	4
	Cons	truction Re	cord - Scre	en solo S	873C)	Insufficient Supply		Man of Wel	<u>60 Y</u>	60 1	Y
Outside Diameter (cm/in)	Mate (Plastic, Galya	nial nizec, Steel)	Slot No.	Depth (n	/ft)	Water Quality	Please provide a map b	elow following	instructions on	the back.	-7
				$ \rightarrow $	<u> </u>	specify	Sa l	-		B	
		A				Other, specify	1- 8	CNOC	und)	R	
ter found	at Depth Ivi	Water Deta			Ho	le Diameter	E X C	SARD	INER		oH
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vince ON	Posta	l Code	Business E	-mail Address			Yatto- (1	ogin	n Sede	₽80	,R
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HYDROGEOLOGICAL ASSESSMENT GARDINERS SHORE SUBDIVISION, BECKWITH ON



APPENDIX D –HYDRAULIC TESTING ANALYSIS RESULTS (DRAWDOWN CURVES)

MCINTOSH PERRY

Summary of Water Level Data Pumping Test - TW1 - January 11, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 5.791 m BTOC 94.209 m AD (Above Datum) 5.82315 m BTOC 94.17685 m AD (Above Datum)

Flansed	Elansed			Water	Water		
Time	Time	т/т'	Turbidity	level (m	level (m	Drawdown	Notes
(minutos)	(Recovery)	1/1	(NTU)			(m)	Notes
	(Recovery)			БТОС) Г. 701	A3L)	0	
				5.791	94.209	0 222	Pump on @ 8:30
1.05				6.113	93.887	0.322	
2.25				6.134	93.866	0.343	
3.27				6.141	93.859	0.35	
4.07				6.149	93.851	0.358	
5.12				6.153	93.847	0.362	
6.08				6.155	93.845	0.364	
7.42				6.165	93.835	0.374	
8.23				6.169	93.831	0.378	
9.27				6.171	93.829	0.38	
11.22				6.175	93.825	0.384	
16.27				6.188	93.812	0.397	
29.67				6.219	93.781	0.428	
49.23				6.226	93.774	0.435	
60.83				6.255	93.745	0.464	
120.5				6.315	93.685	0.524	
185.53				6.35	93.65	0.559	
243.33				6.375	93.625	0.584	
300.83				6.385	93.615	0.594	
413.08				6.434	93.566	0.643	
414.5	1	414.5		6.101	93.899	0.31	
415.18	2	207.59		6.081	93.919	0.29	
416.27	3	138.7567		6.073	93.927	0.282	
417.13	4	104.2825		6.066	93.934	0.275	
418.5	5	83.7		6.056	93.944	0.265	
419.3	6	69.88333		6.045	93.955	0.254	
420.67	7	60.09571		6.039	93.961	0.248	
421.25	8	52.65625		6.036	93.964	0.245	
428.08	15	28.53867		6.021	93.979	0.23	
432.07	19	22.74053		6.025	93.975	0.234	
439.83	26	16,91654		6.005	93,995	0.214	
448 17	35	12 80486		6.002	93 998	0.211	
465.5	52	2 951923		5 985	94 015	0.194	
480.75	67	7 175373		5.956	94 044	0.154	
400.75	07	F 026E40		5.550	04.051	0.105	
F10 22	07	5.920540 E 261124		5.949	94.051	0.138	
1429.67	97	3.201134		5.955	94.005	0.144	
1428.67	1015	1.407557		5.881	94.119	0.09	









Summary of Water Level Data Pumping Test - TW1, Observation TW2 - January 11, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.172 m BTOC 95.828 m AD (Above Datum) 4.172 m BTOC 95.828 m AD (Above Datum)

Elapsed Time	Elapsed Time	т/т'	Water Level (m	Water Level (m	Drawdown (m)	Notes
(minutes)	(Recovery)		BTOC)	ASL)	()	
0			4.172	95.828	0	
82.83			4.085	95.915	-0.087	
142.58			4.094	95.906	-0.078	
204.27			4.1	95.9	-0.072	
260.12			4.106	95.894	-0.066	
401.17			4.115	95.885	-0.057	
458.78			4.112	95.888	-0.06	
491.5			4.11	95.89	-0.062	
1422.08			4.131	95.869	-0.041	



Summary of Water Level Data Pumping Test - TW1, Observation TW6 - January 11, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.469 m BTOC 95.531 m AD (Above Datum) 4.46965 m BTOC 95.53035 m AD (Above Datum)

Elapsed Time	Elapsed Time	Т/Т'	Water Level (m	Water Level (m	Drawdown	Notes		
(minutes)	(Recovery)		BTOC)	ASL)	(m)			
0			4.469	95.531	0			
78.5			4.476	95.524	0.007			
139.17			4.479	95.521	0.01			
200.7			4.479	95.521	0.01			
256.83			4.481	95.519	0.012			
404.02			4.481	95.519	0.012	Pump off at 413		
454.5	41	11.08537	4.482	95.518	0.013			
488.17	75	6.508933	4.481	95.519	0.012			
1425.75	1012	1.408844	4.516	95.484	0.047			





Summary of Water Level Data Pumping Test - TW2 - January 13, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.07 m BTOC 95.93 m AD (Above Datum) 4.2786 m BTOC 95.7214 m AD (Above Datum)

		1	1				
Elapsed	Elapsed	T (T)	Turbidity	Water	Water	Drawdown	.
lime	lime	1/1	(NTU)	Level (m	Level (m	(m)	Notes
(minutes)	(Recovery)			BTOC)	ASL)		
0				4.07	95.93	0	
1.25				6.131	93.869	2.061	
2.33				6.665	93.335	2.595	
3.18				6.934	93.066	2.864	
4.92				7.266	92.734	3.196	
5.58				7.342	92.658	3.272	
6.67				7.424	92.576	3.354	
7.25				7.483	92.517	3.413	
8.38				7.569	92.431	3.499	
9.17				7.608	92.392	3.538	
10.2				7.669	92.331	3.599	
12.07				7.747	92.253	3.677	
16.22				7.892	92.108	3.822	
23.57				8.036	91.964	3.966	
38.77				8.182	91.818	4.112	
60.07				8.233	91.767	4.163	generator shut off
130.07				7.864	92.136	3.794	
158.08				8.00	92	3.93	
180.17				8.099	91.901	4.029	
210.83				8.141	91.859	4.071	
240.03				8.172	91.828	4.102	
270.5				8.173	91.827	4.103	
300.03				8.21	91.79	4.14	
395.17				8.242	91.758	4.172	
399.6				8.242	91.758	4.172	
401.08	1	401.08		5.345	94.655	1.275	
402.13	2	201.065		4.823	95.177	0.753	
403.45	3	134,4833		4.615	95.385	0.545	
404 67	4	101 1675		4 509	95 491	0.439	
405.45	5	81.09		4 466	95 534	0.396	
406.2	6	67.7		4 438	95 562	0.368	
400.2	7	58 16714		4.407	95.502	0.337	
407.17	8	51 0/125		/ 381	95.619	0.337	
400.33	10	/1 037		4.301	95.657	0.311	
410.37	10	20 58571		4.343	05 701	0.275	
417.5	17	23.30371		4.255	05 726	0.225	
417.5	17	24.55002		4.274	95.720	0.204	
419.45	19	22.07520		4.259	95.741	0.169	









Summary of Water Level Data Pumping Test - TW2, Observation TW3 - January 11, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.172 m BTOC 95.828 m AD (Above Datum) 4.1031 m BTOC 95.8969 m AD (Above Datum)

Elapsed Time	Elapsed Time	т/т'	Water Level (m	Water Level (m	Drawdown (m)	Notes
(minutes)	(Recovery)		вюс	ASL)		
0			2.757	97.243	-1.415	
75.25			2.771	97.229	-1.401	
155.5			2.778	97.222	-1.394	
244.25			2.786	97.214	-1.386	
389.5			2.794	97.206	-1.378	
427			2.789	97.211	-1.383	
444.5			2.785	97.215	-1.387	
456			2.785	97.215	-1.387	



Summary of Water Level Data Pumping Test - TW3 - January 12, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 2.726 m BTOC 97.274 m AD (Above Datum) 2.76655 m BTOC 97.23345 m AD (Above Datum)

Elapsed	Elapsed		Turbidity	Water	Water	Drawdown	
Time	Time	T/T'		Level (m	Level (m	(m)	Notes
(minutes)	(Recovery)		(1110)	BTOC)	ASL)	(11)	
0				2.726	97.274	0	
1.1				3.132	96.868	0.406	
2.03				3.164	96.836	0.438	
3.5				3.204	96.796	0.478	
4.22				3.214	96.786	0.488	
5.25				3.235	96.765	0.509	
6.07				3.247	96.753	0.521	
7.17				3.261	96.739	0.535	
8.2				3.275	96.725	0.549	
9.27				3.284	96.716	0.558	
10.23				3.295	96.705	0.569	
17.2				3.346	96.654	0.62	
27.83	-			3.394	96.606	0.668	
60.03				3.462	96.538	0.736	
122.67				3.511	96.489	0.785	
179.17				3.526	96.474	0.8	
240.62				3.535	96.465	0.809	
300.67				3.535	96.465	0.809	
397.08				3.537	96.463	0.811	Pump off at 400 min
401.07	1	401.07		3.081	96.919	0.355	
402.08	2	201.04		3.061	96.939	0.335	
403.33	3	134.4433		3.036	96.964	0.31	
404.18	4	101.045		3.022	96.978	0.296	
405.45	5	81.09		3	97	0.274	
406.28	6	67,71333		2,991	97.009	0.265	
407.47	7	58.21		2.974	97.026	0.248	
408.85	8	51,10625		2.957	97.043	0.231	
409 75	9	45 52778		2 947	97.053	0.221	
410 57	10	41 057		2 942	97.058	0.216	
413.08	13	31,77538		2.914	97.086	0.188	
420.1	20	21 005		2 882	97 118	0.156	
425.17	25	17 0068		2.86	97.14	0.130	
425.17	35	12/38		2.00	97.17	0.102	
446.47	446	1 001054		2.020	97 193	0.102	
460.17	60	7 6695		2.007	97.100	0.065	
470.85	70	6 726420		2.751	07 219	0.005	
470.85	20 20	6.010275		2.702	07.210	0.030	
480.85	01	5 /01000		2.775	97.225	0.045	
491.5 502.2	102	1 996 409		2.771	97.229	0.045	
505.5	105	4.000400		2.705	97.255	0.039	









Summary of Water Level Data Pumping Test - TW3, Observation TW2 - January 12, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.131 m BTOC 95.869 m AD (Above Datum) 4.1327 m BTOC 95.8673 m AD (Above Datum)

Elapsed Time	Elapsed Time	Т/Т'	Water Level (m	Water Level (m	Drawdown	Notes
(minutes)	(Recovery)	-	BTOC)	ASL)	(m)	
0			4.131	95.869	0	
67			4.142	95.858	0.011	
140			4.151	95.849	0.02	
206			4.162	95.838	0.031	
245			4.161	95.839	0.03	
388			4.165	95.835	0.034	
431			4.164	95.836	0.033	
495			4.159	95.841	0.028	
1425			4.175	95.825	0.044	





Summary of Water Level Data Pumping Test - TW4 - December 21, 2020

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 2.19 m BTOC 97.81 m AD (Above Datum) 2.2602 m BTOC 97.7398 m AD (Above Datum)

Elapsed	Elapsed		T	Water	Water	Describer	
Time	Time	T/T'	Turbidity	Level (m	Level (m	Drawdown	Notes
(minutes)	(Recovery)		(NIU)	BTOC)	ASL)	(m)	
0				2.19	97.81	0	
1.25				2.935	97.065	0.745	
3.6				3.094	96.906	0.904	
4.25				3.113	96.887	0.923	
5.19				3.139	96.861	0.949	
6.42				3.164	96.836	0.974	
7.5				3.182	96.818	0.992	
8.58				3.196	96.804	1.006	
9.12				3.205	96.795	1.015	
10.27				3.216	96.784	1.026	
11.33				3.227	96.773	1.037	
12.42				3.241	96.759	1.051	
13.38				3.252	96.748	1.062	
19.05				3.286	96.714	1.096	
24.35				3.322	96.678	1.132	
30.27				3.352	96.648	1.162	
39.42				3.392	96.608	1.202	
60.3				3.442	96.558	1.252	
83.6				3.478	96.522	1.288	
103.75				3.505	96.495	1.315	
120.67				3.511	96.489	1.321	
150.35				3.533	96.467	1.343	
180.5				3.535	96.465	1.345	
213.28				3.545	96.455	1.355	
240.17				3.562	96.438	1.372	
300.12				3.569	96.431	1.379	
391.12				3.594	96.406	1.404	
403.5				3.597	96.403	1.407	pump off at 404 min
405.08	1	405.08		2.175	97.825	-0.015	
406.67	2	203.335		2.195	97.805	0.005	
409.25	5	81.85		2.151	97.849	-0.039	
415.5	11	37.77273		2.093	97.907	-0.097	
438.42	34	12.89471		1.963	98.037	-0.227	









Summary of Water Level Data Pumping Test - TW4, Observation TW5 - December 21, 2020

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 2.091 m BTOC 97.909 m AD (Above Datum) 2.1117 m BTOC 97.8883 m AD (Above Datum)

Elapsed Time (minutes)	Elapsed Time (Recovery)	Т/Т'	Water Level (m BTOC)	Water Level (m ASL)	Drawdown (m)	Notes
0			2.091	97.909	0	
51.28			2.324	97.676	0.233	
99.5			2.401	97.599	0.31	
129.75			2.411	97.589	0.32	
159.78			2.425	97.575	0.334	
194.58			2.43	97.57	0.339	
226.93			2.445	97.555	0.354	
270.5			2.449	97.551	0.358	
397.17			2.505	97.495	0.414	Pump off at 404 min
425.17			2.312	97.688	0.221	
456.5			2.215	97.785	0.124	






Summary of Water Level Data Pumping Test - TW4, Observation TW6 - December 21, 2020

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.789 m BTOC 95.211 m AD (Above Datum) 4.79275 m BTOC 95.20725 m AD (Above Datum)

Elapsed	Elapsed	ד/די	Water	Water	Drawdown	Notos
(minutes)	(Recovery)	1/1	BTOC)		(m)	Notes
	(necovery)		4 700	7.52)	0	
0			4.789	95.211	0	
46.33			4.819	95.181	0.03	
93.3			4.83	95.17	0.041	
124.27			4.833	95.167	0.044	
154.7			4.836	95.164	0.047	
189.33			4.841	95.159	0.052	
220.17			4.844	95.156	0.055	
243.43			4.845	95.155	0.056	
265.67			4.846	95.154	0.057	
400.58			4.864	95.136	0.075	Pump off at 404 minutes
419.67	15	27.978	4.855	95.145	0.066	
459	55	8.345455	4.849	95.151	0.06	
580.28	176	3.297045	4.85	95.15	0.061	
1390	986	1.409736	4.873	95.127	0.084	







Summary of Water Level Data Pumping Test - TW5 - January 6, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 1.663 m BTOC 98.337 m AD (Above Datum) 1.7554 m BTOC 98.2446 m AD (Above Datum)

Elapsed	Elapsed		To calc ballet a	Water	Water		Notes
Time	Time	T/T'	Turbidity	Level (m	Level (m	Drawdown	
(minutes)	(Recovery)		(NIU)	BTOC)	ASL)	(m)	
0				1.663	98.337	0	
1.07				2.075	97.925	0.412	
2.05				2.824	97.176	1.161	
3.25				2.9	97.1	1.237	
4.17				2.945	97.055	1.282	
5.47				2.992	97.008	1.329	
6.5				3.014	96.986	1.351	
7.25				3.026	96.974	1.363	
8.07				3.051	96.949	1.388	
9.3				3.067	96.933	1.404	
10.23				3.088	96.912	1.425	
15.5				3.137	96.863	1.474	
20.58				3.184	96.816	1.521	
26.42				3.231	96.769	1.568	
33.83				3.272	96.728	1.609	
45.92				3.281	96.719	1.618	
60.33				3.321	96.679	1.658	
82.47				3.344	96.656	1.681	
122.43				3.423	96.577	1.76	
180.6				3.474	96.526	1.811	
206.75				3.476	96.524	1.813	
240.55				3.485	96.515	1.822	
296.5				3.488	96.512	1.825	
403.67				3.511	96.489	1.848	
405.58	1	405.58		2.235	97.765	0.572	
406.33	2	203.165		2.195	97.805	0.532	
407.17	3	135.7233		2.156	97.844	0.493	
408.52	4	102.13		2.107	97.893	0.444	
409.22	5	81.844		2.094	97.906	0.431	
410.5	6	68.41667		2.068	97.932	0.405	
411.33	7	58.76143		2.052	97.948	0.389	
412.27	8	51.53375		2.041	97.959	0.378	
414.4	10	41.44		2.016	97.984	0.353	
418.67	14	29.905		1.966	98.034	0.303	
429.25	25	17.17		1.895	98.105	0.232	
436.33	32	13.63531		1.855	98.145	0.192	
474.5	70	6.778571		1.771	98.229	0.108	
482.17	78	6.181667		1.764	98.236	0.101	
499.83	95	5.261368		1.743	98.257	0.08	









Summary of Water Level Data Pumping Test - TW5, Observation TW2 - January 6, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 3.845 m BTOC 96.155 m AD (Above Datum) 3.84785 m BTOC 96.15215 m AD (Above Datum)

Elapsed Time (minutes)	Elapsed Time (Recovery)	Т/Т'	Water Level (m BTOC)	Water Level (m ASL)	Drawdown (m)	Notes
0			3.845	96.155	0	
68.08			3.866	96.134	0.021	
133.67			3.876	96.124	0.031	
171.75			3.884	96.116	0.039	
212.5			3.889	96.111	0.044	
246.75			3.902	96.098	0.057	
396.33			3.885	96.115	0.04	
424.75			3.885	96.115	0.04	
442.28			3.864	96.136	0.019	
504.67			3.835	96.165	-0.01	







Summary of Water Level Data Pumping Test - TW5, Observation TW4 - January 6, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 1.294 m BTOC 98.706 m AD (Above Datum) 1.31245 m BTOC 98.68755 m AD (Above Datum)

Elapsed Time	Elapsed Time	T/T'	Water Level (m	Water Level (m	Drawdown (m)	Notes
(minutes)	(Recovery)		BTOC)	ASL)	. ,	
0			1.543	98.457	0.249	
64.83			1.601	98.399	0.307	
130.75			1.622	98.378	0.328	
175.42			1.634	98.366	0.34	
209.9			1.642	98.358	0.348	
243.83			1.663	98.337	0.369	
398.28			1.541	98.459	0.247	
421.83			1.415	98.585	0.121	







Summary of Water Level Data Pumping Test - TW6 - January 7, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.271 m BTOC 95.729 m AD (Above Datum) 4.2881 m BTOC 95.7119 m AD (Above Datum)

Elapsed	Elapsed		Turbidity	Water	Water	Drawdown	
Time	Time	T/T'		Level (m	Level (m	(m)	Notes
(minutes)	(Recovery)		(1110)	BTOC)	ASL)	(11)	
0				4.271	95.729	0	
1				4.315	95.685	0.044	
2				4.516	95.484	0.245	
3				4.519	95.481	0.248	
4				4.526	95.474	0.255	
5				4.533	95.467	0.262	
6				4.536	95.464	0.265	
7				4.539	95.461	0.268	
9				4.542	95.458	0.271	
12				4.548	95.452	0.277	
29				4.557	95.443	0.286	
53				4.562	95.438	0.291	
60				4.566	95.434	0.295	
91				4.573	95.427	0.302	
120				4.579	95.421	0.308	
180				4.586	95.414	0.315	
240				4.592	95.408	0.321	
300				4.604	95.396	0.333	
401				4.613	95.387	0.342	
403				4.364	95.636	0.093	
404	1	404		4.354	95.646	0.083	Pump off @ 403 min
405	2	202.5		4.349	95.651	0.078	
406	3	135.3333		4.347	95.653	0.076	
409	6	68.16667		4.344	95.656	0.073	
413	10	41.3		4.339	95.661	0.068	
420	17	24.70588		4.334	95.666	0.063	
430	27	15.92593		4.329	95.671	0.058	
441	38	11.60526		4.325	95.675	0.054	
450	47	9.574468		4.324	95.676	0.053	
464	61	7.606557		4.324	95.676	0.053	
480	77	6.233766		4.323	95.677	0.052	
490	87	5.632184		4.323	95.677	0.052	
624	221	2.823529		4.328	95.672	0.057	
1591	1188	1.339226		4.325	95.675	0.054	









Summary of Water Level Data Pumping Test - TW2, Observation TW6 - January 7, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 3.845 m BTOC 96.155 m AD (Above Datum) 3.8475 m BTOC 96.1525 m AD (Above Datum)

Elapsed Time (minutes)	Elapsed Time (Recovery)	Т/Т'	Water Level (m BTOC)	Water Level (m ASL)	Drawdown (m)	Notes
0			3.845	96.155	0	
72			3.864	96.136	0.019	
98			3.865	96.135	0.02	
127			3.865	96.135	0.02	
186			3.868	96.132	0.023	
247			3.872	96.128	0.027	
391			3.894	96.106	0.049	
426			3.895	96.105	0.05	
460			3.885	96.115	0.04	
1585			3.901	96.099	0.056	





Summary of Water Level Data Pumping Test - TW6, Observation TW4 - January 7, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 1.339 m BTOC 98.661 m AD (Above Datum) 1.3436 m BTOC 98.6564 m AD (Above Datum)

Elapsed Time (minutes)	Elapsed Time (Recovery)	Т/Т'	Water Level (m BTOC)	Water Level (m ASL)	Drawdown (m)	Notes
0			1.339	98.661	0	
70.17			1.386	98.614	0.047	
95.33			1.387	98.613	0.048	
125.67			1.388	98.612	0.049	
183.5			1.397	98.603	0.058	
245.08			1.399	98.601	0.06	
393.42			1.431	98.569	0.092	
423.78			1.415	98.585	0.076	
457.38			1.399	98.601	0.06	
1588.67			1.392	98.608	0.053	





Summary of Water Level Data Pumping Test - TW7 - December 21, 2020

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 0 m BTOC 100 m AD (Above Datum) 0.01325 m BTOC 99.98675 m AD (Above Datum)

Elapsed	Elapsed		Turbidity	Water	Water	Drawdawn	
Time	Time	T/T'		Level (m	Level (m		Notes
(minutes)	(Recovery)		(NTU)	BTOC)	ASL)	(m)	
0				0	100	0	*Artesian well
1.28				0.15	99.85	0.15	
3.42				0.175	99.825	0.175	
5.65				0.18	99.82	0.18	
7.9				0.195	99.805	0.195	
12.58				0.2	99.8	0.2	
23.08				0.225	99.775	0.225	
45.03				0.224	99.776	0.224	
55.45				0.23	99.77	0.23	
60.03				0.231	99.769	0.231	
79.42				0.235	99.765	0.235	
88.5				0.24	99.76	0.24	
110.08				0.249	99.751	0.249	
116				0.249	99.751	0.249	
180.67				0.253	99.747	0.253	
213.25				0.256	99.744	0.256	
246.45				0.253	99.747	0.253	
311.23				0.264	99.736	0.264	
326.4				0.264	99.736	0.264	
360.07				0.265	99.735	0.265	
360.4				0	100	0	







Summary of Water Level Data Pumping Test - TW7, Observation TW4 - January 13, 2021

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 0.72 m BTOC 99.28 m AD (Above Datum) 0.7246 m BTOC 99.2754 m AD (Above Datum)

Elapsed	Elapsed		Water	Water	Drawdown	
Time	Time	T/T'	Level (m	Level (m	(m)	Notes
(minutes)	(Recovery)		BTOC)	ASL)	(11)	
0			0.72	99.28	0	
66.42			0.746	99.254	0.026	
120.83			0.791	99.209	0.071	
190.45			0.799	99.201	0.079	
240			0.8	99.2	0.08	
315.53			0.812	99.188	0.092	
347.75			0.801	99.199	0.081	
377.67			0.789	99.211	0.069	Pump off at 360 min
390.5			0.785	99.215	0.065	
444.93			0.783	99.217	0.063	
572.67			0.769	99.231	0.049	
1391			0.781	99.219	0.061	




Summary of Water Level Data Pumping Test - TW7, Observation TW6 - December 21, 2020

TOC Elevation (assumed) Static Water Level Static Water Elevation 95% Recovery 100 m AD (Above Datum) 4.721 m BTOC 95.279 m AD (Above Datum) 4.725 m BTOC 95.275 m AD (Above Datum)

Elapsed Time	Elapsed Time	т/т'	Water Level (m	Water Level (m	Drawdown (m)	Notes
(minutes)	(Recovery)		вюс	ASL)		
71.7			4.761	95.239	0.04	
124.25			4.771	95.229	0.05	
193.87			4.781	95.219	0.06	
240.5			4.79	95.21	0.069	
318.97			4.801	95.199	0.08	
348.67			4.8	95.2	0.079	
383.53			4.797	95.203	0.076	
403.83			4.799	95.201	0.078	
440.5			4.785	95.215	0.064	
576.67			4.781	95.219	0.06	
1386			4.789	95.211	0.068	





APPENDIX E – CALCULATIONS

Transmissivity Calculations

Test Well 1 $T = 2.3 O / 4 \pi \Delta S$ T= 2.3 (144 m3/day)/4π (0.16 m) T= 164.8 m2/day

Test Well 2 T= 2.3 Q / $4\pi \Delta S$ T= 2.3 (129.6 m3/day)/4π (0.75 m) T= 31.6 m2/day

Test Well 3 T= 2.3 Q / 4π ΔS $T= 2.3 (134.35 \text{ m}3/\text{day})/4\pi (0.19 \text{ m})$ T= 129.5 m2/day

Q = 100 L/min Q=((100 L/min)/(1000L))*(60 min)(24 hour) Q= 144 m3/day

∆s = 0.16m

Q = 90 L/min Q=((90 L/min)/(1000L))*(60 min)(24 hour) Q= 129.6 m3/day

 $\Delta s = 0.75$

Q = 93.3 L/min Q=((93.3 L/min)/(1000L))*(60 min)(24 hour) Q= 134.35 m3/day

∆s = 0.19

Test Well 4

T= 2.3 Q / $4\pi \Delta S$ T= 2.3 (157.17 m3/day)/4π (0.285 m) T= 101.0 m2/day

Q = 109.15 L/min

Test Well 5

T= 2.3 Q / 4π ΔS T= 2.3 (144 m3/day)/4π (0.355 m) T= 74.3 m2/day

Test Well 6

T= 2.3 Q / 4π ΔS T= 2.3 (144 m3/day)/4π (0.04 m) T= 659.2 m2/day

Test Well 7

T= 2.3 Q / 4π ΔS T= 2.3 (157.25 m3/day)/4π (0.039 m) T= 738.4 m2/day

Q=((109.15 L/min)/(1000L))*(60 min)(24 hour) Q= 157.17 m3/day ∆s = 0.285

Q = 100 L/min Q=((100 L/min)/(1000L))*(60 min)(24 hour) Q= 144 m3/day

∆s = 0.355

Q = 100 L/min Q=((100 L/min)/(1000L))*(60 min)(24 hour) Q= 144 m3/day

∆s = 0.04

Q = 109.2 L/min Q=((109.2 L/min)/(1000L))*(60 min)(24 hour) Q= 157.25 m3/day

Δs = 0.039

Test Well 1 Recovery T= 2.3 Q / 4π ΔS T= 2.3 (144 m3/day)/4π (0.13 m)

T= 202.8 m2/dav

Test Well 2 Recovery T= 2.3 Q / $4\pi \Delta S$ T= 2.3 (129.6 m3/day)/4π (0.42) T= 56.5 m2/day

Test Well 3 Recovery T= 2.3 Q / 4π ΔS $T= 2.3 (134.35 \text{ m}3/\text{day})/4\pi (0.22)$ T= 111.8 m2/day

Q= 134.35 m3/day ∆s = 0.22

Q = 100 L/min

Q= 144 m3/day

∆s =0.13m

Q = 90 L/min

 $\Lambda s = 0.42$

Q= 129.6 m3/day

Q = 93.3 L/min

Q=((100 L/min)/(1000L))*(60 min)(24 hour)

Q=((90 L/min)/(1000L))*(60 min)(24 hour)

Q=((93.3 L/min)/(1000L))*(60 min)(24 hour)

Test Well 5 Recovery T= 2.3 Q / 4π ΔS T= 2.3 (144 m3/day)/4π (0.54 m)

T= 48.8 m2/day

Test Well 6 Recovery

T= 2.3 Q / 4π ΔS T= 2.3 (144 m3/day)/4π (0.027 m) T= 976.6 m2/day

Q= 144 m3/day ∆s = 0.027

Q=((100 L/min)/(1000L))*(60 min)(24 hour)

Q = 100 L/min Q=((100 L/min)/(1000L))*(60 min)(24 hour) Q= 144 m3/day

∆s = 0.54

Q = 100 L/min

Storativity Calculations

 $S{=}2.25\ T\ t_{0}\,/\,r^{2}$

T is the transmissivity (m²/day) t_0 is the x-intercept of the observation well drawdown vs. log time line of best fit

r is the distance between the pumped well and the observation well

Test Well 1 - Observation Test Well 6

S =	2.25 (376.7 m2/day)(3.47e-3)/(705^2)	t0= 3.60E-03	days	T= 2.3 Q / 4π Δs	Q = 100 L/min
S =	6.13917E-06	T= 376.7	m2/day	T= 2.3 (144 m3/day)/4π (0.07 m)	Q=((100 L/min)/(1000L))*(60 min)(24 hour)
		r= 705	m	T= 376.7 m2/day	Q= 144 m3/day
	Test Well 2 Observation Test Well 2				Δs = 0.07m
	Test well 3 - Observation Test well 2			T= 2 3 Ω / 4π ΔS	0 = 93 3 I /min
S =	2.25 (1640.2 m2/day)(0.035m)/(375^2)	t0= 0.03	davs	$T = 2.3 (134.35 \text{ m}3/\text{dav})/4\pi (0.035 \text{ m})$	Q = ((93.3 L/min)/(1000 L))*(60 min)(24 hour)
S =	3.37E-04	T= 702.9	m2/dav	T = 702.9 m ² /day	Q= 134.35 m3/day
		r= 375	m		
					ΔS = 0.035m
	Test Well 4 - Observation Test Well 5				
				T= 2.3 Q / 4π ΔS	Q = 109.15 L/min
S =	2.25 (179.9 m2/day)(9x10-4days)/(380^2)	t0= 9.00E-04	days	T= 2.3 (157.17 m3/day)/4π (0.16 m)	Q=((109.15 L/min)/(1000L))*(60 min)(24 hour)
S =	2.52E-06	T= 179.9	m2/day	T= 179.9 m2/day	Q= 157.17 m3/day
		r= 380	m		
					Δs = 0.16m
	Test Well 4 - Observation Test Well 6				
				T= 2.3 Q / 4π ΔS	Q = 109.15 L/min
S =	2.25 (442.8 m2/day)(0.0125)/(225^2)	t0= 0.0125	days	T= 2.3 (157.17 m3/day)/4π (0.065 m)	Q=((109.15 L/min)/(1000L))*(60 min)(24 hour)
S =	2.46E-04	T= 442.8	m2/day	T= 442.8 m2/day	Q= 157.17 m3/day
		r= 225	m		
					Δs = 0.065m
	Test Well 5 - Observation Test Well 2			7 /	0. 400.4
				$I = 2.3 Q / 4\pi \Delta S$	Q = 100 L/min
S =	2.25 (376.7 m2/day)(0.028day)/(618^2)	t0= 0.028	days	T= 2.3 (144m3/day)/4π (0.07 m)	Q=((100 L/min)/(1000L))*(60 min)(24 hour)
5 =	6.21383E-05	1= 442.8	m2/day	1= 376.7 m2/day	Q= 144 m3/day
		r= 618	m		A. 0.07
	Test Well 5 - Observation Test Well 4				$\Delta S = 0.07 \text{ m}$
				$T = 2.3 \Omega / 4\pi \Lambda S$	$\Omega = 100 \text{J/min}$
S =	2 25 (109 9 m2/day)(5 2x10-3d)/(375^2)	t0= 5 20E-03	davs	T = 2.3 (27 + 7.13) T = 2.3 (144m3/day)/4 π (0.24 m)	$\Omega = (100 \text{ L/min})/(1000 \text{ L})*(60 \text{ min})(24 \text{ hour})$
S =	9 14F-06	T= 109 9	m2/day	$T = 109.9 m^2/day$	$Q = (100 \text{ c})^{1111} (1000 \text{ c})^{1} (00 \text{ mm})(24 \text{ mod})^{1}$
5-	5.142 00	r= 375	m	1- 105.5 m2/ddy	Q= 144 m3/ day
					Δs = 0.24m
	Test Well 6 - Observation Test Well 2				
				T= 2.3 Q / 4π ΔS	Q = 100 L/min
S =	2.25 (144 m2/day)(0.0625d)/(375^2)	t0= 0.0625	day	T= 2.3 (144m3/day)/4π (0.07 m)	Q=((100 L/min)/(1000L))*(60 min)(24 hour)
S =	2.74E-04	T= 376.7	m2/day	T= 376.7 m2/day	Q= 144 m3/day
		r= 440	m		
					Δs = 0.07m
	Test Well 6 - Observation Test Well 4				
				T= 2.3 Q / 4π ΔS	Q = 100 L/min
S =	2.25 (296.3 m2/day)(0.025d)/(440^2)	t0= 0.025	days	T= 2.3 (144m3/day)/4π (0.089 m)	Q=((100 L/min)/(1000L))*(60 min)(24 hour)
S =	8.60851E-05	T= 296.3	m2/day	T= 296.3 m2/day	Q= 144 m3/day
		r= 440	m		
					Δs = 0.089m
	Test Well 7 - Observation Test Well 4			7	0. 400 45 1 / 1
۶.	2.25 (205.2 m2/dou)(0.02d)/(44042)	t0- 0.02		$I = 2.5 \text{ Q} / 4\pi \Delta S$ $T = 2.2 (457.2 \text{ m} 2 (453)) (4 = (0.000 \text{ m}))$	Q = 109.15 L/min
5=	2.25 (296.3 m2/day)(0.02d)/(440^2)	t0= 0.02	days	$T = 2.3 (157.2m3/day)/4\pi (0.089 m)$	Q=((109.15 L/min)/(1000L))*(60 min)(24 nour)
5 =	5.75732E-05	r = 500	m2/day	T= 319.9 m2/day	Q= 157.17 m3/day
		1= 500	m		$\Delta c = 0.09m$
	Test Well 7 - Observation Test Well 6				23 - 0.09III
	rest went / - Observation rest wento			T= 2.3 Q / 4π ΔS	Q = 109.15 L/min
S =	2 25 (319 9 m2/day)(0 029d)/(530^2)	t0= 0.029	davs	$T = 2.3 (157 2m3/dav)/4\pi (0.089 m)$	$\Omega = ((109.15 \text{ L/min})/(1000 \text{ L}))*(60 \text{ min})(24 \text{ hour})$
S =	7.4298E-05	T= 319.9	m2/dav	T = 319.9 m2/day	Q= 157.17 m3/day
÷ .		r= 530	,, m		
					Δs = 0.089m

Farvolden Method - Long Term Yeild Calculations

Q20= 0.68 T Ha Sf

Ha=	the available water column height (m)
Sf=	safety factor

T= Transmissivity (m2/day)

Test Well 1

		T= 164.8	m2/dav	
020-060	$2(164.8 \text{ m}^2/\text{d}_{23})/(16.450 \text{ m})/(0.7)$	sf= 0.7	1112/ 443	
Q20- 0.00	(104.8 mz/uay)(10.439 m)(0.7)	SI= 0.7		
		pump at 73 ft = 22.2	5 m	
Q20=	1291.123 m3/day	static WL: 5.791 m		
Q20=	1291123 L/day	Ha = 22.25 m - 5.79	1 m	
Q20=	896.6132 L/min	Ha= 16.459		

Test Well 2

Q20= 0.68 (31	.6 m2/day)(24.27 m)(0.7)	T= 31.6 m2/day Sf = 0.7 pump at 93 ft = 28.34 m	
Q20=	365.0596 m3/day	static WL: 4.070 m	
Q20=	365059.6 L/day	Ha = 28.34 m - 4.070 m	
Q20=	253.5136 L/min	Ha= 24.27 m	
Test Well 3			
		T= 129.5 m2/day	
Q20= 0.68 (12	9.5 m2/day)(25.614 m)(0.7)	Sf = 0.7	
		pump at 93 ft = 28.34 m	
Q20=	1578.898 m3/day	static WL: 2.726 m	
Q20=	1578898 L/day	Ha = 28.34 m - 2.726 m	
Q20=	1096.457 L/min	Ha= 25.614 m	

Test Well 4

Q20= 0.68 (101 m2/day)(28.59 m)(0.7)		Sf = 0.7
		pump at 101 ft = 30.78 m
Q20=	1374.493 m3/day	static WL: 2.19 m
Q20=	1374493 L/day	Ha = 30.78 m - 2.19 m
Q20=	954.5089 L/min	Ha= 28.59 m

Test Well 5

		T= 74.3 m2/day
Q20= 0.68	(74.3 m2/day)(20.277 m)(0.7)	Sf = 0.7
		pump at 72 ft = 21.94 m
Q20=	717.1326 m3/day	static WL: 1.663 m
Q20=	717132.6 L/day	Ha = 21.94 m - 1.663 m
Q20=	498.0088 L/min	Ha= 20.277 m

Test Well 6

Q20= 0.68	(659.2	m2/dav)(3	36.259	m)(0.7)
Q20 0.00	(000.2		50.200	,(0,

(20-0.08(0))		31 = 0.7
		pump at 133 ft = 40.53 m
Q20=	11377.32 m3/day	static WL: 4.271 m
Q20=	11377320 L/day	Ha = 40.53 m - 4.271 m
Q20=	7900.917 L/min	Ha= 36.259 m

Test Well 7

Q20= 0.68 (738.4 m2/day)(34.44 m)(0.7)

Q20=	12104.92 m3/day
Q20=	12104916 L/day
Q20=	8406.192 L/min

T= 738.4 m2/day Sf = 0.7 pump at 113 ft = 34.44 m static WL: 0 m Ha= 34.44 m

T= 659.2 m2/day Sf = 0.7

T= 101.0 m2/day

Moell Method - Long Term Yeild Calculations

Q20 = (Q Ha Sf) / (s100 + 5 Δs)

Q=	the pumping rate (m3/day)
Ha=	the available water column height (m)
Sf=	safety factor
s100=	the drawdown at 100 minutes (semi-log long-term graph)
∆s=	the change in hydraulic head over one log cycle (drawdown vs. long time)

Test Well 1

		Ha= 16.459
Q20=	((144 m3/day)(16.459 m)(0.7))/[(0.52 m + 5(0.16 m)]	Sf = 0.7
Q20=	1256.869 m3/day	s100 = 0.52 m
Q20=	1256869 L/day	ΔS = 0.16m
Q20=	872.8258 L/min	

Q = 144 m3/day

Q = 129.6 m3/day

Q= 134.35 m3/day

Q= 157.17 m3/day Ha= 28.59 m Sf = 0.7 s100 = 1.38 m ΔS = 0.285

Q= 144 m3/day Ha= 20.277 m Sf = 0.7 s100 = 1.75 m $\Delta S = 0.355$

Q= 144 m3/day Ha= 36.259 m Sf = 0.7 s100 = 0.31 m $\Delta S = 0.04$

Q= 157.25 m3/day Ha= 34.44 m Sf = 0.7 s100 = 0.24 m $\Delta S = 0.039$

Test Well 2

		Ha= 24.27 m
Q20=	((129.6 m3/day)(16.459 m)(0.7))/[(0.485 m + 5(0.10 m)]	Sf = 0.7
Q20=	271.824 m3/day	s100 = 4.35
Q20=	271824 L/day	ΔS = 0.75 m
Q20=	188.7667 L/min	

Test Well 3

		Ha= 25.614 m
Q20=	((134.35 m3/day)(25.614 m)(0.7))/[(0.70 m + 5(0.19 m)]	Sf = 0.7
Q20=	1302.091 m3/day	s100 = 0.90 m
Q20=	1302091 L/day	ΔS = 0.19 m
Q20=	904.23 L/min	

Test Well 4

Q20=	((157.17 m3/day)(28.59 m)(0.7))/(1.38 m + 5(0.285 m)
Q20=	1121.37 m3/day
Q20=	1121370 L/day
Q20=	778.7293 L/min

Test Well 5

Q20=	((144 m3/day)(20.277 m)(0.7))/(1.75 m + 5(0.355 m)
Q20=	593.9336 m3/day
Q20=	593933.6 L/day
Q20=	412.4539 L/min

Test Well 6

Q20=	((144 m3/day)(36.259 m)(0.7))/(0.31 m + 5(0.04 m)
Q20=	7166.485 m3/day
Q20=	7166485 L/day
Q20=	4976.725 L/min

Test Well 7

Q20=	((157.25 m3/day)(34.44 m)(0.7))/(0.24 m + 5(0.039 m)
Q20=	8714.903 m3/day
Q20=	8714903 L/day
Q20=	6052.016 L/min



APPENDIX F – MECP WELL RECORDS SUMMARY

WELL_ID	COMPLETED	WELL DEPTH (m)	STATIC WATER LEVEL (m)	DEPTH TO BEDROCK (m)	GEOLOGY
3505867	21-Apr-80	21.3	4.6		TOPSOIL,,
3505867	21-Apr-80	21.3	4.6	0.6	SANDSTONE,,
7318042	13-Aug-18	41.5	3.8		SAND, GRAVEL, BOULDERS
7318042	13-Aug-18	41.5	3.8		LIMESTONE,,
7318042	13-Aug-18	41.5	3.8	0	SANDSTONE,,
3512961	18-May-00	20.1	9.1		CLAY,BOULDERS,
3512961	18-May-00	20.1	9.1		SANDSTONE,,
3512961	18-May-00	20.1	9.1		SANDSTONE,,
3512961	18-May-00	20.1	9.1		SANDSTONE,,
3512961	18-May-00	20.1	9.1		SANDSTONE,,
3512961	18-May-00	20.1	9.1	0.9	SANDSTONE,,
3514631	30-Aug-04	16.4	0.6		CLAY,SANDY,
3514631	30-Aug-04	16.4	0.6	4	SANDSTONE,,
3515314	18-Apr-06	24.4	3.1		SAND,GRAVEL,
3515314	18-Apr-06	24.4	3.1	0.9	SAND,LIMESTONE,
7287927	08-May-17	31.1	5		STONES,CLAY,
7287927	08-May-17	31.1	5		SANDSTONE,LIMESTONE,
7287927	08-May-17	31.1	5		SANDSTONE,LIMESTONE,
7287927	08-May-17	31.1	5	0	SANDSTONE,LIMESTONE,
7209640	27-Sep-13	25.9	0		CLAY,,
7209640	27-Sep-13	25.9	0		SANDSTONE,,
7209640	27-Sep-13	25.9	0		SANDSTONE,,
7209640	27-Sep-13	25.9	0	0	SANDSTONE,,
3508974	16-Aug-89	18.3	2.4		SAND,PACKED,
3508974	16-Aug-89	18.3	2.4		SANDSTONE,SOFT,
3508974	16-Aug-89	18.3	2.4	0.6	SANDSTONE,LAYERED,
3514471	03-Mar-04	19.2	1.2		TOPSOIL,STONES,
3514471	03-Mar-04	19.2	1.2	1.2	SANDSTONE,,
7301339	03-Nov-17	42.7	1.9		CLAY,SANDY,BOULDERS
7301339	03-Nov-17	42.7	1.9		LIMESTONE,,
7301339	03-Nov-17	42.7	1.9	0	SANDSTONE,,
7210743	22-Aug-13	30.5	7.6		CLAY,SANDY,
7210743	22-Aug-13	30.5	7.6		SANDSTONE,,
7210743	22-Aug-13	30.5	7.6	0	SANDSTONE,,
7296387	08-Sep-17	25	0.7		SAND,CLAY,
7296387	08-Sep-17	25	0.7		SANDSTONE,,
7296387	08-Sep-17	25	0.7		SANDSTONE,,
7296387	08-Sep-17	25	0.7	0	SANDSTONE,,
3505948	24-Jul-80	15.2	3		TOPSOIL,,
3505948	24-Jul-80	15.2	3		SANDSTONE, GRAVEL, LAYERED
3505948	24-Jul-80	15.2	3	0.3	SANDSTONE, MEDIUM-GRAINED,
3510361	08-Jun-92	13.7	0.6		TOPSOIL.WATER-BEARING.
3510361	08-Jun-92	13.7	0.6		SAND,WATER-BEARING,
3510361	08-Jun-92	13.7	0.6	4.3	SANDSTONE, HARD,
3502882	30-Jul-71	17.7	2.4		MEDIUM SAND,STONES,
3502882	30-Jul-71	17.7	2.4		SANDSTONE,,
3502882	30-Jul-71	17.7	2.4	1.5	SANDSTONE, MEDIUM SAND,
7226480	04-Jun-14	31.1	0		SANDSTONE, TOPSOIL,
7226480	04-Jun-14	31.1	0		SANDSTONE,LIMESTONE,
7226480	04-Jun-14	31.1	0		SANDSTONE,LIMESTONE,
7226480	04-Jun-14	31.1	0		SANDSTONE,LIMESTONE,
7226480	04-Jun-14	31.1	0	0	SANDSTONE,LIMESTONE,
7167524	07-Jun-11	18.9	2.2		CLAY,,
7167524	07-Jun-11	18.9	2.2		SANDSTONE,,
7167524	07-Jun-11	18.9	2.2		SANDSTONE,,
7167524	07-Jun-11	18.9	2.2		SANDSTONE,,
7340324	25-Jun-19	37.5	7.4		CLAY,BOULDERS,SANDY
7340324	25-Jun-19	37.5	7.4		SANDSTONE,,
7340324	25-Jun-19	37.5	7.4		SANDSTONE,,
7340324	25-Jun-19	37.5	7.4		SANDSTONE,,
7340324	25-Jun-19	37.5	7.4	0	SANDSTONE,,
3502894	29-Sep-71	18.3	2.7		MEDIUM SAND,,
3502894	29-Sep-71	18.3	2.7		GRANITE,,
3502894	29-Sep-71	18.3	2.7		GRANITE,,
3502894	29-Sep-71	18.3	2.7	1.2	GRANITE,,
3505705	23-Oct-79	15.2	2.1		SAND,GRAVEL,
3505705	23-Oct-79	15.2	2.1		SANDSTONE,FRACTURED,

3505705	23-Oct-79	15.2	2.1	0.9	SANDSTONE, MEDIUM-GRAINED,
7310015	26-Feb-18	42.7	1.2		SAND,CLAY,
7310015	26-Feb-18	42.7	1.2	0	SANDSTONE,,
3514236	28-Jun-03	0	0	0	,,
3511246	26-Aug-94	15.2	0		SAND,BOULDERS,PACKED
3511246	26-Aug-94	15.2	0	1.8	SANDSTONE,HARD,
7210746	23-Aug-13	36.6	1.2		CLAY,BOULDERS,
7210746	23-Aug-13	36.6	1.2		SANDSTONE,,
7210746	23-Aug-13	36.6	1.2		SANDSTONE,
7210746	23-Aug-13	36.6	1.2	0	SANDSTONE
7287173	25-Oct-16	30.2	10.7		TOPSOIL.STONES.
7287173	25-Oct-16	30.2	10.7		LIMESTONE,,HARD
7287173	25-Oct-16	30.2	10.7	0	SANDSTONEHARD
7296316	15-Aug-17	36.6	6.5		SAND.CLAY.
7296316	15-Aug-17	36.6	6.5		SANDSTONE
7296316	15-Aug-17	36.6	6.5		SANDSTONE
7296316	15-Aug-17	36.6	6.5		SANDSTONE.
7296316	15-Aug-17	36.6	6.5	0	SANDSTONE.
7252387	06-Oct-15	30.5	1.1		CLAY GRAVEL BOULDERS
7252387	06-Oct-15	30.5	1.1		SANDSTONE
7252387	06-Oct-15	30.5	11		GRANITE OLIARTZITE
7252387	06-Oct-15	30.5	1.1		GRANITE OLIARTZITE
7252387	06-Oct-15	30.5	1.1		GRANITE OUARTZITE
7252387	06-Oct-15	30.5	1.1	0	GRANITE OLIARTZITE
7287860	15-May-17	27.7	3.8		CLAY STONES
7287860	15 May 17	27.7	3.8		
7287860	15 May 17	27.7	3.8		SANDSTONE
7287860	15 May 17	27.7	3.0		
7287860	15-May-17	27.7	3.0	0	SANDSTONE,
720745	22 Aug 12	27.7	3.8	0	
7210745	22-Aug-13	24.4	2.8		
7210745	22-Aug-13	24.4	2.8		SANDSTONE,
7210745	22-Aug-13	24.4	2.8		SANDSTONE,
7210745	22-Aug-13	24.4	2.8	0	SANDSTONE,
7210745	22-Aug-15	24.4	2.8	0	
3508910	15-Jul-69	10.0	0		
3508910	15-Jul-89	18.0	0		CLAY, BOULDERS, PACKED
2514247	10 Oct 02	10.0	2.7	4	TOPSOU POCK
2514247	10-0ct-03	24.4	3.7	0	
3514347	27 Mari 01	24.4	5.7	0	SANDSTONE,
3300093	27-1Vidy-01	19.5	5.5	0	SANDSTONE,,
7210744	21-Aug-15	24.4	5.9		GRAVEL,
7210744	21-Aug-15	24.4	5.9		SANDSTONE,
7210744	21-Aug-13	24.4	5.9		SANDSTONE,
7210744	21-Aug-13	24.4	5.9	0	SANDSTONE,
7310034	10-Aug-18	30.5	6.7		SAIND, STONES,
7318034	10-Aug-18	30.5	6.7		
7318034	10-Aug-18	30.5	6.7	0	SANDSTONE,,
7235501	05-Dec-14	32	0.6		
7235561	05-Dec 14	3Z 27	0.6		
3510095	14 May 01	32 30 E	0.6	0	EIII
3510085	1/-May-01	30.3 20 E	1.5		
2510085	14-iviay-91	30.3 20 E	1.5	7.2	
7301340	06-Nov 17	30.3 20 F	1.5	/.3	
7301340	06 Nov 17	30.3 30 E	6.4		
7501540	10 Aug 08	30.5	6.4	0	CLAY, SANDY, BOULDERS
7111072	19-Aug-08	24.4	0	0	CLAT, STONES,
2515220	19-Aug-06	24.4	0	0	TOPSOUL STONES
3515320	29-Apr-06	10.5	4.9	0.2	SANDSTONE
3313320	23-Apt-00	10.5	4.9	0.3	SANDSTONE,,
3505865	10 Jun 80	25	6.1		
2502605	13-10U-90	25	6.1	0.9	SANDSTUNE,,
2512000	20-FED-UZ	24.4	5.5	1.2	
3513088	26-FED-UZ	24.4	5.5	1.2	
35005/3	12-JUI-03	22.9	0.6		SAND, FILL,
3500573	15-JUI-83	22.9	0.6		
3506573	15-JUI-83	22.9	0.6	6.4	
3500348	25-Sep-82	21.3	3.7		
3506348	25-Sep-82	21.3	3.7	-	UNKNOWN TYPE,
3506348	25-Sep-82	21.3	3.7	0	UNKNOWN TYPE,,

3515475	16-Aug-06	0	0	0	11
3507175	16-Aug-85	27.4	9.1		SAND, STONES, PACKED
3507175	16-Aug-85	27.4	9.1		SANDSTONE,,
3507175	16-Aug-85	27.4	91	27	SANDSTONE
2502210	20 Feb 72	27.4	3.1	2.7	CAND
3303310	20-Feb-73	23.5	3		SAND,
3503310	28-Feb-73	23.5	3	1.8	SANDSTONE,,
7279801	10-Nov-16	18.6	3		SANDSTONE, SANDY, CLAY
7279801	10-Nov-16	18.6	3		SANDSTONE,,
7279801	10-Nov-16	18.6	3		SANDSTONE,,
7279801	10-Nov-16	18.6	3		SANDSTONE.
7270801	10-Nov-16	18.6	2	0	SANDSTONE
7275001	20 10 10	25	3	0	CDAVEL
7200700	50-Jul-15	25	5.7		GRAVEL,
/206/00	30-Jul-13	25	3.7		SANDSTONE,,
7206700	30-Jul-13	25	3.7		SANDSTONE,,
7206700	30-Jul-13	25	3.7	0	SANDSTONE,,
7287926	05-May-17	31.7	5.7		CLAY,STONES,
7287926	05-May-17	31.7	5.7		SANDSTONE.LIMESTONE.
7287926	05-May-17	31.7	5 7		SANDSTONELIMESTONE
7207520		21.7	5.7	0	
7287920	05-10129-17	51.7	5.7	0	SANDSTONE, LIVIESTONE,
3513520	05-Sep-01	0	0	0	"
7318044	15-Aug-18	40.8	4.2		SAND,GRAVEL,BOULDERS
7318044	15-Aug-18	40.8	4.2		LIMESTONE,,
7318044	15-Aug-18	40.8	4.2	0	SANDSTONE,,
3500437	10-Aug-55	9.8	2.7		CLAY
3500/37	10_Aug_55	0.8	2.7	ر د	
3500437	10-Aug-55	5.8	2.7	7.5	
3502838	31-Jul-71	11	2.1		MEDIUM SAND,,
3502838	31-Jul-71	11	2.1	0.9	SANDSTONE,,
3513522	05-Sep-01	0	0	0	,,
3503337	11-May-73	14.6	3		SAND,,
3503337	11-May-73	14.6	3	0.9	LIMESTONE
7292141	21-lun-17	42.7	37		SAND STONES
7202141	21 Jun 17	42.7	2.7		
7292141	21-Juli-17	42.7	5.7		
7292141	21-Jun-17	42.7	3.7		SANDSTONE,,
7292141	21-Jun-17	42.7	3.7		SANDSTONE,,
7292141	21-Jun-17	42.7	3.7	0	SANDSTONE,,
3513232	19-Jan-01	19.8	11.6		CLAY,STONES,
3513232	19-Jan-01	19.8	11.6		SANDSTONE
3513232	19-lan-01	19.8	11.6		SANDSTONE
2512222	10 lon 01	10.8	11.0		
3313232	19-Jan-01	19.8	11.0	1.2	SANDSTONE,
3513232	19-Jan-01	19.8	11.6	1.2	SANDSTONE,,
7187428	06-Jun-12	25.9	1.9		TOPSOIL,STONES,
7187428	06-Jun-12	25.9	1.9	0	SANDSTONE,,
3505949	07-Jul-80	14.6	0.9		SAND,STONES,
3505949	07-Jul-80	14.6	0.9	4.3	SANDSTONE,,
3514233	28-lun-03	11.6	0	0	UNKNOWN TYPE
3512364	13-May-98	20.5	0.0		
5512504	13-1018y-50	30.5	0.9		CLAT, SANDT,
3512364	13-May-98	30.5	0.9		SAND, STONES, WATER-BEARING
3512364	13-May-98	30.5	0.9		SANDSTONE,HARD,
3512364	13-May-98	30.5	0.9	3.7	GRANITE,HARD,VERY
3515167	19-Oct-05	18.3	1.5		CLAY,SAND,
3515167	19-Oct-05	18.3	1.5	2.4	SANDSTONE,,
7187580	20-Jul-12	26.8	6.1		TOPSOIL
7187580	20 301 12	26.0	C 1		
7107500	20-Jul-12	20.0	0.1	_	
/18/580	20-Jul-12	26.8	6.1	0	SANDSTONE,,
7210747	10-Sep-13	30.5	0		LIMESTONE,,
7210747	10-Sep-13	30.5	0		SANDSTONE,,
7210747	10-Sep-13	30.5	0		SANDSTONE, LIMESTONE,
7210747	10-Sep-13	30.5	0	0	SANDSTONE,LIMESTONE.
7336868	31-May-19	44.8	4.2		SAND.CLAY.
7336869	21_May 10	11.0	т. <u>с</u> л Э		
7330000	31 NAC 10	44.0	4.2		
7336868	31-May-19	44.8	4.2		SANDSTONE,LIMESTONE,
7336868	31-May-19	44.8	4.2	0	SANDSTONE,LIMESTONE,
7296315	14-Aug-17	36.6	5.5		SAND,ROCK,FRACTURED
7296315	14-Aug-17	36.6	5.5		LIMESTONE,,
7296315	14-Aug-17	36.6	5.5		SANDSTONE,,
7296315	14-Διισ-17	36.6	5 5		SANDSTONE
7206315	1/_Aug 17	36.6	5.5	0	SANDSTONE
1230313	14-Mug-17	50.0	5.5	0	JANUJIUNE,
3502509	20-Nov-69	24.7	3.7		CLAY, MEDIUM SAND, BOULDERS

1					
3502509	20-Nov-69	24.7	3.7	1.2	SANDSTONE,,
3507240	06-Nov-85	22.6	9.1		SAND,GRAVEL,
3507240	06-Nov-85	22.6	9.1		SAND, GRAVEL, HARDPAN
3507240	06-Nov-85	22.6	9.1		SANDSTONE,,
3507240	06-Nov-85	22.6	9.1	6.7	SANDSTONE
3503828	09-Sep-74	18.3	2.4		TOPSOIL
3503828	09-Sep-74	18.3	2.4	0.6	SANDSTONE
2500407	00 Jun 61	12.4	2.4	0.0	
3500407	09-Juli-61	13.4	2.7		SANDSTONE,
3500407	09-Jun-61	13.4	2.7	0	SANDSTONE,,
3502909	06-Nov-71	15.2	3		MEDIUM SAND,SILT,
3502909	06-Nov-71	15.2	3	3	SANDSTONE,,
3506858	15-Jun-84	24.4	4.6		TOPSOIL,PACKED,
3506858	15-Jun-84	24.4	4.6		SANDSTONE, POROUS,
3506858	15-Jun-84	24.4	4.6		SANDSTONE,HARD,
3506858	15-Jun-84	24.4	4.6	0.6	SANDSTONE, POROUS,
3513523	05-Sep-01	7.9	0		OUICKSAND.
3513523	05-Sep-01	7 9	0	0	STONES
7307175	29-Sep-17	/1.1	3.6	0	НАРО
7507175	23-3ep-17	41.1	5.0	0	TOROU
3506953	17-Jul-84	18.3	5.5		TOPSOIL,
3506953	17-Jul-84	18.3	5.5	1.2	SANDSTONE,,
3514624	18-Aug-04	24.4	3.4		TOPSOIL,SAND,
3514624	18-Aug-04	24.4	3.4	1.2	SANDSTONE,,
3502870	14-Aug-71	11.9	1.5		MEDIUM SAND,,
3502870	14-Aug-71	11.9	1.5	4.6	SANDSTONE,,
7313720	23-May-18	28	8.1		SAND,STONES,
7313720	23-May-18	28	8.1		LIMESTONE
7313720	23-May-18	28	8.1	0	SANDSTONE
7187/25	07-lup-12	0	0	0	S, ((D) FOILE,)
7107433	15 Mar 17	33.6	6	0	
7287859	15-IVIAy-17	32.6	0.7		SAND, CLAY, BOULDERS
/28/859	15-May-17	32.6	6.7		LIMESTONE,,
7287859	15-May-17	32.6	6.7		SANDSTONE,,
7287859	15-May-17	32.6	6.7		SANDSTONE,,
7287859	15-May-17	32.6	6.7	0	SANDSTONE,,
7040887	20-Nov-06	30.5	0	0	SANDSTONE,,
7222478	04-Jun-14	36	0		TOPSOIL,SANDY,LOOSE
7222478	04-Jun-14	36	0		SANDSTONEHARD
7222478	04-lun-14	36	0	0	GRANITE HARD
7298664	20-Oct-17	39.6	0		
7298664	20-Oct-17	39.6	0		
7298004	20-0ct-17	39.0	0		
7298004	20-001-17	39.0	0		SANDSTONE,
7298664	20-Oct-17	39.6	0	0	SANDSTONE,,
3508657	12-May-88	18.6	4.9	0	SANDSTONE,,
3505026	17-Mar-78	14.9	1.2		SAND,PACKED,
3505026	17-Mar-78	14.9	1.2	5.2	SANDSTONE,HARD,
7285379	17-Jan-17	25	3.7		SAND,STONES,
7285379	17-Jan-17	25	3.7		LIMESTONE,,FRACTURED
7285379	17-Jan-17	25	3.7		LIMESTONE
7285379	17-Jan-17	25	3.7		SANDSTONE LIMESTONE
7285379	17-lan-17	25	3.7		SANDSTONE LIMESTONE
7205575	17 Jan 17	25	2.7	0	
7203379	17-Jall-17	23	5.7	0	SANDSTONE, LIWIESTONE,
3513044	20-Aug-02	13.1	0.0	• •	
3513844	26-Aug-02	13.1	0.6	4.6	SANDSTONE,,
3506294	30-Apr-82	17.7	1.5		FINE SAND,,
3506294	30-Apr-82	17.7	1.5	0.9	SANDSTONE,LAYERED,
3515528	27-Oct-06	0	0	0	
3502842	08-Jul-71	18.9	7		MEDIUM SAND, CLAY, GRAVEL
3502842	08-Jul-71	18.9	7		LIMESTONE,,
3502842	08-Jul-71	18.9	7	5.8	SANDSTONE
3505086	16-May-78	19.5	0		CLAY
3505086	16-May-78	19 5	0	Q ک	SANDSTONE
3514751	04-Nov 04	20.5	2 5	0.2	
3514751	04-1107-04	30.5	3.3	~	
3514/51	04-INOV-04	30.5	3.5	0	SANDSTONE,
/299160	18-Sep-17	42.7	3.8		SAND,STUNES,
7299160	18-Sep-17	42.7	3.8		SANDSTONE,LIMESTONE,
7299160	18-Sep-17	42.7	3.8		SANDSTONE,,
7299160	18-Sep-17	42.7	3.8		SANDSTONE,,
7299160	18-Sep-17	42.7	3.8	0	SANDSTONE,,
3511193	16-Aug-94	26.2	4.6		GRAVEL,,
3511193	16-Aug-94	26.2	4.6	1 8	SANDSTONE LIMESTONE
1				1.0	

3500406	07-Jun-61	13.7	3		TOPSOIL, MEDIUM
					SAND,BOULDERS
3500406	07-Jun-61	13.7	3	0.9	SANDSTONE,,
3515312	18-Apr-06	32	5		SAND,CLAY,
3515312	18-Apr-06	32	5	1.2	SANDSTONE,,
3513720	23-May-02	25	7.3		CLAY,STONES,
3513720	23-May-02	25	7.3		SANDSTONE,,
3513720	23-May-02	25	7.3		SANDSTONE.
3513720	23-May-02	25	7.3	0.9	SANDSTONE
3514472	27-Eeb-04	18.9	13	0.5	
2514472	27 Feb 04	18.5	4.3	2 4	SANDSTONE
3314472	27-Feb-04	10.9	4.3	3:4	SANDSTONE,,
/114/30	21-000-08	0	0	0	
3513797	30-IVIar-02	22.3	0		SAND,BOULDERS,LOUSE
3513797	30-Mar-02	22.3	0	5.2	SANDSTONE,HARD,
7313717	22-May-18	27.4	5.9		SAND,STONES,
7313717	22-May-18	27.4	5.9		LIMESTONE,,
7313717	22-May-18	27.4	5.9	0	SANDSTONE,LIMESTONE,
3510814	23-Aug-93	21.6	6.7		GRAVEL,,
3510814	23-Aug-93	21.6	6.7	0.6	SANDSTONE,,
7118461	26-Sep-08	42.7	3.2		SAND,GRAVEL,
7118461	26-Sep-08	42.7	3.2	0	SANDSTONE
3515249	19-Dec-05	24.4	2.4		TOPSOIL
3515249	19-Dec-05	24.4	2.4	1 2	SANDSTONE
3510004	12_Son 01	24.4	2.4	1.2	
2504101	10 Aug 75	10 7	0.1	0	
3504101	10-Aug-75	13.7	1.2		SAND, LOUSE,
3504101	10-Aug-75	13.7	1.2		SAND,GRAVEL,PACKED
3504101	10-Aug-75	13.7	1.2	3.4	SANDSTONE,HARD,
7050455	13-Aug-07	30.5	0		CLAY,GRAVEL,STONES
7050455	13-Aug-07	30.5	0		SANDSTONE,,
7050455	13-Aug-07	30.5	0		SANDSTONE,,
7050455	13-Aug-07	30.5	0	0	SANDSTONE,,
3514232	28-Jun-03	0	0	0	"
3508658	12-May-88	18.9	3.4		TOPSOIL,
3508658	12-May-88	18.9	3.4	1.2	SANDSTONE.
3508256	31-Mar-88	25.9	3		SAND
3508256	31-Mar-88	25.5	2	1.9	SANDSTONE
7226960	31-Wiai-00	25.9	3	1.0	SAND CRAVEL ROLL DERS
7330609	29-IVIdy-19	30.9	2		SAND, GRAVEL, BOULDERS
7330609	29-IVIAy-19	30.9	2		SANDSTONE, LINESTONE,
/336869	29-May-19	36.9	2	0	SANDSTONE,LIMESTONE,
3515479	15-Sep-06	15.2	3.7		TOPSOIL, STONES,
3515479	15-Sep-06	15.2	3.7	0.6	SANDSTONE,,
7270162	18-May-16	30.5	10.3		TOPSOIL,ROCK,FILL
7270162	18-May-16	30.5	10.3		LIMESTONE,,HARD
7270162	18-May-16	30.5	10.3	0	SANDSTONE,,HARD
3500438	26-Aug-58	14.6	3.7		MEDIUM SAND,CLAY,
3500438	26-Aug-58	14.6	3.7	1.5	SANDSTONE,,
7270189	16-Nov-15	37.2	8.1		TOPSOIL,ROCK,FRACTURED
7270189	16-Nov-15	37.2	8.1		LIMESTONEHARD
7270189	16-Nov-15	37.2	8.1	0	SAND HARD
3500409	18-Jan-65	17.1	8.8		
3500409	18-lan-65	17.1	0.0		LIMESTONE
3500409	18-lan-65	17.1	0.0		SANDSTONE
2500409	10-Jail-0J	17.1	0.0		
3500409	10-Jan-05	1/.1	8.8		LINIESTONE,
3500409	18-Jan-65	1/.1	8.8	0	RUCK,,
7324309	06-Nov-18	29.9	5.4		SAND,STONES,
7324309	06-Nov-18	29.9	5.4		LIMESTONE,,
7324309	06-Nov-18	29.9	5.4		SANDSTONE,,
7324309	06-Nov-18	29.9	5.4	0	SANDSTONE,,
3500408	02-Feb-62	11.3	7.6		TOPSOIL,,
3500408	02-Feb-62	11.3	7.6		SANDSTONE,,
3500408	02-Feb-62	11.3	7.6	0.3	SANDSTONE,,
7109803	05-Jun-08	30.5	9.1		SAND,GRAVEL,
7109803	05-Jun-08	30.5	9.1	0	LIMESTONE.SANDSTONE.
3504651		55.5	5.1		SANDSTONE ERACTURED
	24-May-77	22.5	4.6		
3504651	24-May-77	22.3	4.6		SANDSTONE HARD
3504651	24-May-77 24-May-77	22.3 22.3	4.6	<u>^</u>	SANDSTONE, HARD,
3504651 3504651 3487501	24-May-77 24-May-77 24-May-77	22.3 22.3 22.3	4.6 4.6 4.6	0	SANDSTONE,HARD, SANDSTONE,HARD,
3504651 3504651 7187581	24-May-77 24-May-77 24-May-77 20-Jul-12	22.3 22.3 22.3 26.8	4.6 4.6 4.6 6.1	0	SANDSTONE,HARD, SANDSTONE,HARD, HARDPAN,TILL,
3504651 3504651 7187581 7187581	24-May-77 24-May-77 24-May-77 20-Jul-12 20-Jul-12	22.3 22.3 22.3 26.8 26.8 26.8	4.6 4.6 4.6 6.1 6.1	0	SANDSTONE,HARD, SANDSTONE,HARD, HARDPAN,TILL, LIMESTONE,,,
3504651 3504651 7187581 7187581 7187581	24-May-77 24-May-77 24-May-77 20-Jul-12 20-Jul-12 20-Jul-12	22.3 22.3 22.3 26.8 26.8 26.8 26.8	4.6 4.6 4.6 6.1 6.1 6.1	0	SANDSTONE,HARD, SANDSTONE,HARD, HARDPAN,TILL, LIMESTONE,, SANDSTONE,,

3505126	14-Jul-78	22.9	8.2	1.2 SANDSTONE,,
3504007	21-Apr-75	14.6	1.5	CLAY,,
3504007	21-Apr-75	14.6	1.5	0.3 GRANITE,,
7340325	21-Jun-19	37.5	3.2	CLAY, BOULDERS, SANDY
7340325	21-Jun-19	37.5	3.2	SANDSTONE,,
7340325	21-Jun-19	37.5	3.2	SANDSTONE,,
7340325	21-Jun-19	37.5	3.2	0 SANDSTONE,,
3504630	26-Apr-77	21.9	0.9	SAND, GRAVEL, LOOSE
3504630	26-Apr-77	21.9	0.9	SANDSTONE,FRACTURED,SOFT
3504630	26-Apr-77	21.9	0.9	0.6 SANDSTONE,HARD,
3515030	13-Jul-05	30.5	0	COARSE GRAVEL, STONES,
3515030	13-Jul-05	30.5	0	FINE GRAVEL,,
3515030	13-Jul-05	30.5	0	SANDSTONE,,
3515030	13-Jul-05	30.5	0	SANDSTONE,,
3515030	13-Jul-05	30.5	0	SANDSTONE,,
3515030	13-Jul-05	30.5	0	SANDSTONE,,
3515030	13-Jul-05	30.5	0	7.9 GRANITE,,
7315310	12-Jun-18	41.8	3.2	SAND,CLAY,
7315310	12-Jun-18	41.8	3.2	0 SANDSTONE,,
7296375	08-Sep-17	0	0	0 ,,



APPENDIX G – NITRATE DILUTION CALCULATIONS

CCO-20-0203

Proposed Subdivision - Tweedsmuir Gardiner Property Nitrate Loading Calculations (Apr.9.2021)

Land Area		84.004556	ha		
		840045.56	m2		
Water Surplus (Ws)					
Ws = Precipitation - Evapotranspiration					
Precipitation		943.4	mm/yr		
Evapotranspiration		609.52387	mm/yr		
	Ws	333.87613	mm/yr		
		0.3338761	m/yr		
Infiltration Factor (I _f) per MOEE 1995					
Topo Rolling Land/Hilly Land (1.6% slope)		0.14			
Soil 30:70 ratio of bedrock/sand		0.31			
Cover Cultivated Land		0.1			
	I _f =	0.545006			
Infiltration (I)					
1-\\/c * I		191 0645	mmhur		
I-VVS I _f	1-	0 1819645	m/vr		
		0.1015045	111/ ¥1		
Dilution Water Avaiable (D _w)					
$D_w = A * I$	D -	152858 /7	m2/ur		
	D _w =	110700 22	L/day		
		410790.33	L/ Udy		
Background Nitrate Concentration (C _b)	C _b =	1.526	mg/L		
Max Boundary Nitrate Concentration (C_{boun})	C _{boun} =	10	mg/L		
Effluent Leading (Q)	0	1000			
Effluent Loading (Q_e)	Q _e =	1000	L/udy/Residential Lot		
Effluent Nitrate Concentration (C_e)	C _e =	40	mg/L		
Maximum Allowable Number of Lots (N)	or	Calculated Nitrate Concentration (C.,.)			
		N=	118		
$N = [(C_{boun}*D_{w}) - (C_{b}*D_{w})] / [(C_{e}*Q_{e}) - (C_{boun}*Q_{e})]$]	$C_w = [(C_b * D_b)]$	w)+(Ce*Qe*N)]/[Dw+(Qe*N)]		
N = 118.298		C _w =	9.983		
		C - C	the setere second develo		

Potential Evapotranspiration

Thornthwaite Method, "Hydrology & Hydraulic Systems", Gupta

Etmonth = 1.62 (10*Tm)/l)^a where: $a = 675*10^{-9}|^{3} - 771*10^{-7}|^{2} + 179*10^{-4}*| + 492*10^{-3}$

l = sum (Ti	m/5)^1.514		Stn:	Ottawa M	IacDonald	l -Carti
				Site Clim	ate ID: 61	06000
Month	Temp C	I	ET (cm)	Daylight	ET (cm)	
			unadjusted	Factor	adjusted	
January	-10.3					
Feb	-8.1					
March	-2.3					
April	6.3	1.4189	2.8610	1.13	3.2330	
May	13.3	4.3982	6.4518	1.28	8.2583	
June	18.5	7.2487	9.2396	1.29	11.9191	
July	21	8.7821	10.6062	1.31	13.8942	
Aug	19.8	8.0336	9.9484	1.21	12.0375	
Sept	15	5.2767	7.3542	1.04	7.6483	
Oct	8	2.0372	3.7105	0.94	3.4879	
Nov	1.5	0.1616	0.6001	0.79	0.4741	
Dec	-6.2					
I		37.35695	50.7719		60.9524	
thus a =		1.0883				

-Daylight Factor is an adjustment Factor for possible hours of sunshine based on latitude for Ottawa.

-Monthly temperatures from Environment Canada Climate Normals (1981-2010)

Input data from user Set value Site Constant (adjustment for latitude) Calculated by worksheet

 $\rm C_w$ <= $\rm C_{\rm boun}$, therefore proposed development will not exceed ODWO at property limit



APPENDIX H – BECKWITH TOWNSHIP OFFICIAL PLAN





unopened row

Industrial Wetlands Airport



