Civil and Municipal Engineering

ARK Engineering and Development

Serviceability Report:
Potable Water Supply Assessment, Sewage, Stormwater Management and Grading

7564 Village Centre Place
Block 63
Plan 4M-1398
Greely Village Centre
Ottawa (Greely), Ontario

Prepared For
Greely Family Farm Inc.

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August 2019

POTABLE WATER SUPPLY ASSESSMENT, SEWAGE, STORMWATER MANAGEMENT AND GRADING

Serviceability Report

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SERVICEABILITY REPORT

1.0 BACKGROUND

1.1 General

The proposed site plan amendment situated on Block 63 with the Water's Edge Subdivision 4M-1398 consists of approximately 0.3049ha and is located on the Eastern side of the intersection of Village Centre Place and Vista Villagio St. (refer to the location map SK-1 in appendix A). The proposed site plan will consist of an additional 6,000ft^2 retail building. It will be serviced by an existing private sanitary sewer and well along with existing roadside drainage ditches.

1.2 Existing Services

This area of commercial development in Greely has no City sanitary and watermain to service this proposed site plan. The proposed sanitary and water service will be privately owned. As for the storm service the existing roadside ditches will serve as an outlet for this development.

An internal Road Network as shown on the location map in Appendix A, will provide this site plan with one main connection access point from Bank St. An alternate access is located off of Parkway Rd.

All utilities (Hydro, Bell Cable and Gas) are available and have been installed up to the property line.

2.0 PROPOSED SERVICES

2.1 Potable Water Supply Assessment

ARK Engineering was retained by Greely Family Farm Inc. to provide a verification of water supply yield and well location for a proposed site plan application amendment to a commercial development located at 7564 Village Centre Place, Ottawa (Greely), Ontario, Block 63 Plan 4M-1398

The pump test was conducted in general accordance with Ontario Ministry of the Environment and Climate Change (MOECC) guidance document Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (MOEE, 1996).

The scope of the report is limited to the description of the potential yield quantity and quality of the bedrock water supply aquifer intercepted by a drilled well, as it relates to the future servicing potential for the proposed building development within the area of the subject site.

2.1.1 Background

There is a currently a City approved Consolidated Terrain Analysis and Hydrogeological Study Report dated October 8, 2008 by the Paterson Group for the plan of subdivision 4M-1398 in which this said Block 63 forms part of. Both the water quantity and quality have already been analyzed and deemed to be excellent for this development. Also, all new well construction recommendations within this plan of subdivision (either residential or commercial), along with required casing lengths have been determined and accepted and are registered on title for this Block.

It should also be noted that in Appendix 3, page 24 of this approved report Paterson Group concluded the following:

1) A suitable water supply aquifer exists within the sandstone formation underlying the limestone formation at the subject site.
2) The sandstone water supply aquifer has an aeral extent such that all portions of the site can access it.
3) The sandstone water supply aquifer has ample quantities of water available for utilization by both the proposed residential and commercial portions of the site and has excellent water quality.

4) The sandstone water supply aquifer possesses significant upwards gradient that remains largely unaffected by maximum water taking estimates at the site and as agreed to by experts at the Ontario Municipal Board Hearing, is hydrogeologically isolated from surface activity.
5) The sandstone aquifer is considered to be an excellent aquifer for this development.

2.1.2 Supplemental Potable Water Supply Assessment

As part of the commercial phasing within plan 4M-1398 for Block 65-64-63 another proposed building will be developed and serviced by a private well. The following will demonstrate once again that that the targeted aquifer is more than adequate to support this new commercial phase.
The scope of the report is limited to the description of the potential yield quantity and quality of the bedrock water supply aquifer intercepted by a drilled well, as it relates to the future servicing potential for the proposed development within the area of the subject site.

A new drilled well (designated TW1, refer to Appendix "B" for MOE well record) was installed at the site on July 23, 2019 by D & R Drilling of St-Albert, Ontario (Well Contractor License No.3773). The new well was drilled to a total depth of 104.54 m. Steel casing was installed to a depth of approximately 70m. The test well was constructed in general conformance with the well construction requirements for the adjacent development within plan 4M-1398. As per the approved "Consolidated Terrain Analysis and Hydrogeological Study Report", which requires all wells to be cased "through the limestone formation and extend into the sandstone formation".

Table 1: Test Well summary

Well ID	Year Drilled	Depth to Bedrock (m)	Depth of Water Bearing Fractures (m)	Total Depth (m)	Recommended Pumping Rate (L/min)
A258630	2019	7.87	**103.63**	104.54	45.0

The pump test was conducted in general accordance with Ontario Ministry of the Environment, Conservation and Parks (MECP) guidance document Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (MOEE, 1996).

A pumping test at TW1 on July 23, 2019 was conducted. A pumping rate of 64 L/min was selected with the expectation that the rate would stress the aquifer enough to result in a demonstrable reduction in potentiometric head (i.e. a lowering of the static water level) within the test well. The pumping test was carried out for a 8 hour duration.

During the test the pumping rate was monitored at regular intervals to ensure the rate of discharge remained constant (i.e. < 5% variation). Drawdown observations during pumping and recovery were recorded using manual measurements taken with an electronic water level tape.

Drawdown observations during the pumping and recovery were recorded using manual measurements using an electronic water level tape. Over the course of the pumping test, the water level in the well dropped by 0.38m within minutes then it maintained its level through out the 8 hours in which it was then allowed to recover. No real recovery data was collected for the well following the completion of pumping since the 95% recovery was achieved almost immediately.

Field testing for chlorine was carried out at the time of sampling. Groundwater samples were collected in laboratory supplied bottles and preserved in the field using established sampling protocol. The samples were stored in a dedicated sample cooler maintained at a temperature between 4 and 10 degrees Celsius. The water samples were submitted to the Eurofins within one (1) hour of collection for standard "Sub. Package", refer to Appendix "B".

Turbidity measurements were taken using a Hanna C114 turbidity meter at the well head at regular intervals during the pumping test and the reading at the time of the sampling (8 hour mark) was below 1.0 NTU. Free chlorine residual measurements were taken using a HachTM Pocket Colorimeter IITM handheld unit immediately prior to the collection of each groundwater sample.

Table 1: Testing Results

Parameters	Results
Pumping Rate (L/min)	64.0
Static Water Level at start of test (m)	3.21
Static Water Level at end of test (m)	3.59
Total Drawdown during test (m)	0.38
Available Drawdown (m)	101.33
% Drawdown during pumping test	0.38%
Transmissivity	153
Specific Capacity (L/min/m)	168

The pumping test drawdown plot for TW1 is provided in Appendix "B". As for the recovery data since it was practically instantaneous no data was able to be recorded. The drawdown data provided was measured with reference to the top of the well casing at the test well location.

The pumping test data for the test well was analyzed using the method of Cooper and Jacob (1946). This method provides a reasonable estimate of the aquifer transmissivity.

Transmissivity was calculated using the following relationship:

$$T = \frac{2.3Q}{4\pi ds}$$

Where:

Q = pump rate, m^3/day
ds = change in drawdown over one time log cycle, m
T = transmissivity, m^2/day

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be about **153m^2/day**.

For the new proposed commercial building the daily water demands have been estimated based on Section 4.4.1.2 of the City guidelines, Appendix 4-A. In accordance to Appendix 4-A, the proposed development would have a demand of 1.98 L/min. Refer to Section 2.2 Sewage for a summary of the estimated sewage flow.

This is approximately 97% less than the rate utilized during the pumping test (64 L/min.). Given that the well totally recovered practically immediately of termination of pumping at a rate of 64 L/min, the water supply aquifer intercepted will provide the necessary well yield without mining the aquifer in the long term.

Based on the above there is water of sufficient quantity present in the water supply aquifer beneath the site to support the new 6,000ft^2 commercial building.

2.1.3 Water Quality

Water quality analysis data from TW1 is summarized in Table 2 (below). Laboratory certificates of analysis are included in Appendix "B".

Table 2: Groundwater Geochemistry – TW1

PARAMETER	UNITS	ODWS		6045 Bank St. Ex. Well*	6075 Bank St. Ex. Well**	NEW TW1
		TYPE	LIMIT			
MICROBIOLOGICAL PARAMETERS						
Escherichia Coli	ct/100 mL	MAC	0	0	0	**0**
Faecal Coliforms	ct/100 mL	-	-	0	0	**0**
Heterotrophic Plate Count	ct/100 mL	-	-	21	0	**0**
Total Coliforms	ct/100 mL	MAC	0	0	0	**0**
CHEMICAL PARAMETERS (HEALTH)						
F	mg/L	MAC	2.4	0.28	0.39	**0.39**
N-NO2	mg/L	MAC	10	<0.10	<0.10	**<0.10**
N-NO3 (Nitrate)	mg/L	MAC	10	<0.10	<0.10	**<0.10**
CHEMICAL PARAMETERS WITH AESTHETIC OBJECTIVES/OPERATIONAL GUIDELINES						
Alkalinity	mg/L	OG	500	223	226	**213**
Cl	mg/L	AO	250	127	122	**120**
Colour	TCU	AO	5	<2	<2	**<2**
DOC	mg/L	A0	5	1.2	1.3	**<0.5**
pH		OG	6.5-8.5	8.0	8.5	**8.49**
SO4	mg/L	AO	500	82	78	**89**
Hardness	mg/L	OG	100	298	297	**275**
Na	mg/L	AO	200	76	84	**80**
Fe	mg/L	AO	0.30	0.20	0.66	**0.64**
Mn	mg/L	AO	0.05	0.03	0.03	**0.05**
TDS	mg/L	AO	500	606	625	**565**
Turbidity (lab)	NTU	AO/MAC	5/1	2.1	1.3	**1.5**
S2-	mg/L	AO	0.05	<0.02	<0.01	**<0.01**

* water results from 6045 Bank St. - *Potable Water Supply Assessment* prepared by Paterson Group
** water results from 6075 Bank St. - *Potable Water Supply Assessment* prepared by ARK Engineering

The water results of this targeted aquifer are well in line with the results from the 6045 and 6075 Bank St. *Potable Water Supply Assessment*.

The analytical results show that water quality at the subject site is acceptable and that there are no exceedances of the applicable **health related parameter limits of the Ontario Drinking Water Standards (ODWS)**.

With respect to aesthetic objectives and operational guidelines, the analytical results indicate the following exceedances:

- Hardness
- TDS
- Iron

Hardness
Hardness, an operational guideline, does not appear in the ODWS. Rather it appears in the Technical Support Documents for Drinking Water Standards, Objectives, Guidelines (Technical Support Documents) as a parameter with an operational guideline of 100 mg/L. At the measured concentrations, the water is considered to be very hard, however it is below the reasonable treatment limit of 500 mg/L specified in Table 3 of the guidance document, titled, " Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment", published by MOECC (MOE, 1995).

TDS
Total dissolved solids (TDS) refers to the concentration of inorganic substances dissolved in water. The main constituents are typically chloride, sulphates, calcium, magnesium and bicarbonates. Procedure D-5-5 does not provide a 'treatability limit' for TDS, but it does require written rationale that corrosion, encrustation, or taste problems will not occur.

The Langelier Saturation Index is used to predict the calcium carbonate stability of water. It indicates whether the water will precipitate, dissolve, or be in equilibrium with calcium carbonate. The results of the Langelier calculation (LSI = +0.72) indicate that the water is supersaturated with respect to calcium carbonate (CaCO3) and scale forming may occur but non corrosive. Refer to Appendix "B".

Iron
The iron level at TW1 after the eight hours of pumping was 0.64mg/L, which exceeds the ODWS aesthetic objective of 0.30 mg/L. The iron level is well within the MOE treatability limit of 5.0 milligrams per litre using a water softener.

Sodium
The sodium level in the water was reported to be 80 mg/L. The ODWSOG states that *"the local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/l so that this information may be communicated to local physicians for their use with patients on sodium restricted diets."*

Well Water Treatment
The water within the bedrock aquifer displays slightly elevated hardness and iron. Installation of a standard commercial grade water softener will reduce the concentrations of hardness to acceptable levels. Some softeners can remove iron alternatively an iron filter can also installed. Conventional water softeners introduce sodium into the water supply, so it may be appropriate to bypass the water softener with a separate tap for drinking water.

2.2 Sewage

The entire commercial development will be serviced by an existing private sanitary sewage treatment facility and an existing underground gravity sewer system all in accordance to MOE reference #2418-AVJRJ5.

As mentioned above, in order to determine the sanitary flows for this proposed building Section 4.4.1.2 of the City guidelines, Appendix 4-A was consulted.

	Area (m^2)	**Flows**	**L/day**
Building	565	5 L/day per 1.0m^2	2,825

0.033 L/s

2.3 Stormwater Management

The following is to demonstrate that the proposed site plan application for 7564 Village Center Place meets the SWM criteria previously approved in the J.F Sabourin report SWM Pond Design Brief – Commercial Phase Ultimate Conditions.

It is important to note, that the subject land (Blocks 65, 64 and 63) on the Registered Plan of Subdivision 4M-1398 – Water's Edge Subdivision was clearly included in all of the subdivision reports.

On the first table found in Appendix C, of the approved J.F. Sabourin report (refer to Appendix A for this table), the author applied an impervious value of 69% for entire rural commercial area identified as COM-1. Applying a total impervious of 69% is a conservative approach in calculating runoff generated by different storm events for commercial development since it assumed a weighted runoff coefficient of C=0.70.

The Tables 1 and 2 summarizes the modeled/approved conditions vs the proposed conditions of the imperviousness for these Blocks.

Table 1: Modeled Impervious for Block 65, 64 and 63

Hard (m^2)	Soft (m^2)	Area (m^2)
-	-	8,579
Runoff Coefficient		**0.70**
Total Impervious		**69.0%**

Table 2: Proposed Impervious for Block 65, 64 and 63

Hard (m^2)	Soft (m^2)	Total (m^2)
5,364	3,215	8,579
Runoff Coefficient		**0.64**
Total Impervious		**63.0%**

As shown above, once developed these blocks will still yield a "total impervious" below the value of 69% applied in the modeling. Thus, this will have no impact on stormwater management, since the ditches and pond have been designed and sized to accommodate this portion of the development.

2.4 Site Grading

The installation of concrete curbs in a rural development which has no underground storm sewer as an outlet will definitely create problematic ponding areas especially in the vicinity of the depressed curb outlets where snow will block these outlets during the freeze thaw cycles in Winter/Spring. This ice built-up and unwanted ponding runoff will be become a safety hazard to the public. Therefore, in order to properly grade this site and to provide multiple drainage outlets via overland sheet drainage to all four corners of the site, no concrete curb are proposed along the perimeter of the parking. This will allow for runoff to simply sheet drain on a larger surface

This will allow for the surface runoff to drain away from the curbs and will promote infiltration/percolation as it reaches the edge of the asphalt onto the sodded or landscaped surface areas instead of concentrating all the precipitation towards narrow depressed curbs.

That being said, a Geotechnical investigation for this proposed site has been conducted which states that grade raises up to 1.5m would be permissible, which would in turn prevent any future possible settlement.

3.0 CONCLUSION

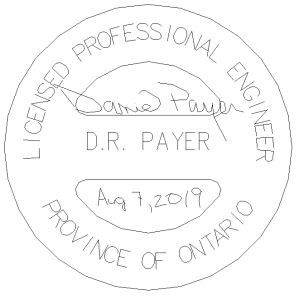
From the above statements the following can be concluded:

i) This entire site can be serviced as proposed above.
ii) The buildings will be serviced by a private sanitary sewer and well.
iii) The proposed site will drain overland towards the existing roadside ditch which ultimately discharges into an existing SWM pond which will provide adequate protection to the site and the environment.
iv) The Geotechnical report revealed a permissible grade raise of up to 1.5m.

Prepared by:

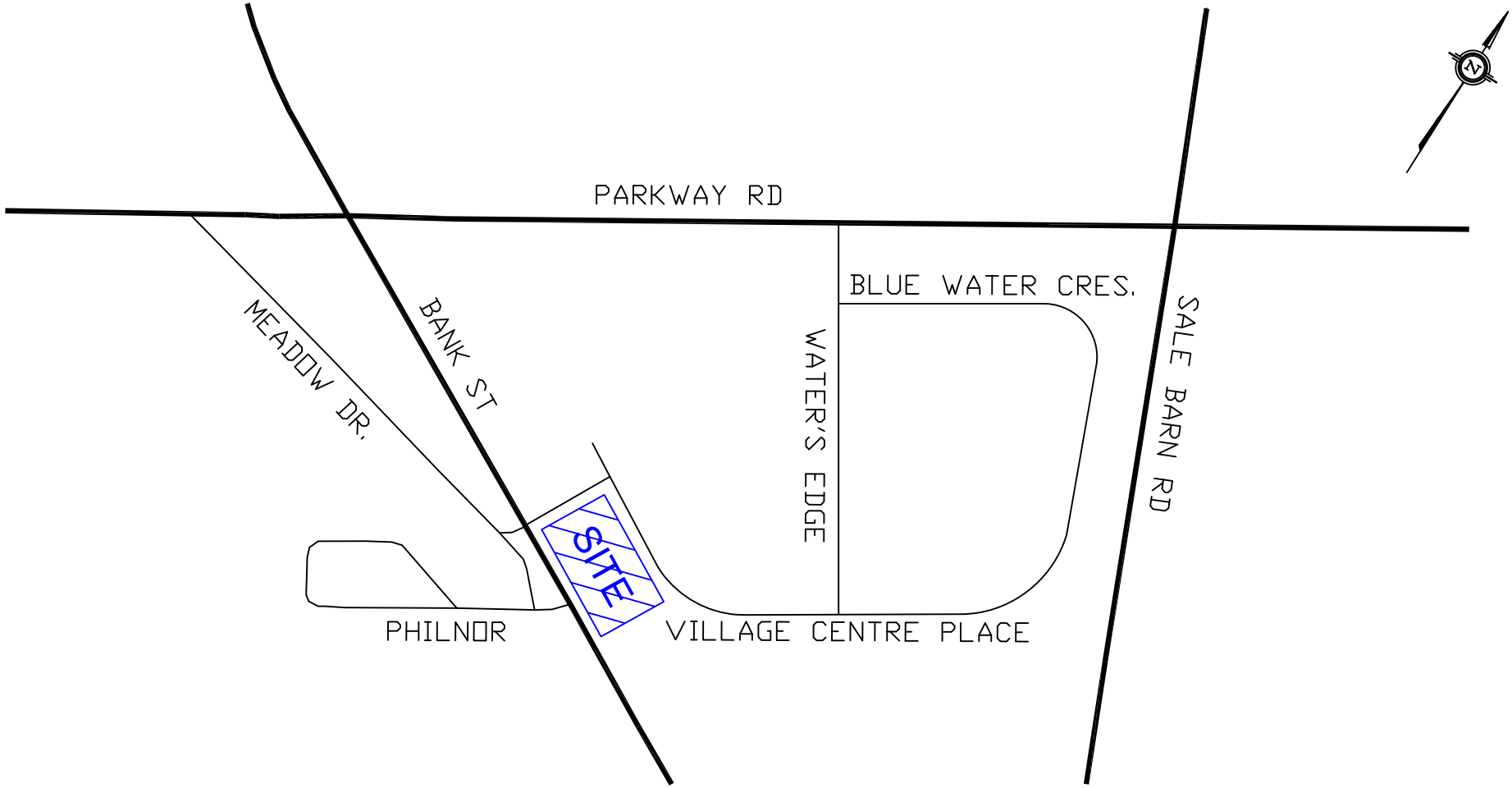
ARK Engineering and Development

Daniel Payer, P.Eng.
President



APPENDIX "A"

SK-1	Location Map
Pond Sizing	Excerpt from J.F. Sabourin



LOCATION MAP

CITY OF OTTAWA - Formerly TOWNSHIP OF OSGOODE

Completed By:	Drawing No.:
ARK ENGINEERING AND DEVELOPMENT	SK-1
Scale: NTS / Date: JUL 2013	

Project: Greely Village Centre - Commercial Phase
Project No.: 64707
Quality Pond Sizing

Date: May 28, 2008
By: JHF

POND CMRC
Lands to be developped
(Final Conditions)
(All land is developped)

Catchment No.	Description	Drainage Area (ha)	Imp. (%)		Area incl.	Area (ha)	Imp (ha)	
COM-1	Commercial lands	14.64	69		X	14.64	10.10	
RES-1	Residential lands (Phase 1)	5.83	21					
RES-2	Residential lands (Phase 2 incl. Phase 1)	9.34	21					
POND-1	Pond block (Phase 1)	3.57	48					
POND-2	Pond block (Phase 2)	5.03	47					
PK-1	Green space	4.26	0					
UND-1	Undevelopped Lands (Phase 1 & 2)	6.85	0					
EX4	Existing Residential (EX4)	0.50	22		X	0.50	0.11	
POND-C	Pond block (Commercial)	1.57	66		X	1.57	1.04	

Totals= 16.71 11.25

Avg Imp= 67.31 %

As per MOEE,
Req'd Pond Vol.= 219 cu.m/ha
Total Pond Volume = 3655 cu.m
Permanent Pool= 2987 cu.m
Ext.Det. Volume= 668 cu.m

APPENDIX "B"

MOE Well Record
Eurofins Laboratory Subdivision Package Results
Drawdown Plot
Langelier Saturation Index

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. Tag#:A258630 — A258630

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Greely	Family Farm		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1705 old Prescott	Greely	ON	K4P 1M8	613 826 1422

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
9 Bank St	Osgoodes	1	

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa City	Greely	Ontario	K4P 1M8

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	445690	5012172	Plan No. 4M-139 P	Bloc 63

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sand	Boulders	Loose	0	1.30
Grey	Sand	Clay	Soft	1.30	6.06
Grey	Gravel		Soft	6.06	7.87
Grey	Limestone.	Sandstone	Hard.	7.87	104.54

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	69.69	Quik Crete	30 Bags
		And Bentonite	10 Bag

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.55	Steel	0.48	0.60	69.69

Status of Well

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

Construction Record - Screen

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

Water Details

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

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	69.69	25.40

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 30.30

Pumping rate (l/min / GPM): 64.00

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping (m/ft): 3.59

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

Recommended pump depth (m/ft): 30.30

Recommended pump rate (l/min / GPM): 45.00

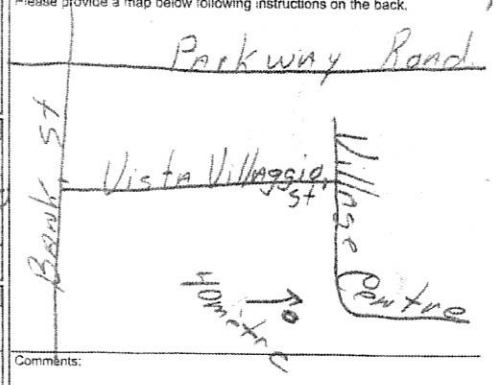
Well production (l/min / GPM): 90.00

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	3.21		3.59
1	3.58	1	3.21
2	3.59	2	3.21
3	3.59	3	3.21
4	3.59	4	3.21
5	3.59	5	3.21
10	3.59	10	3.21
15	3.59	15	3.21
20	3.59	20	3.21
25	3.59	25	3.21
30	3.59	30	3.21
40	3.59	40	3.21
50	3.59	50	3.21
60	3.59	60	3.21

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DXR Water Well Drilling	7526

Business Address (Street Number/Name)	Municipality
1763 Route 500 west	Nation

Province	Postal Code	Business E-mail Address
ON	K0A 3C0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 678 2558	Monette Kaul

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3773	Kaul Monette	2019 07 22

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☑ Yes ☐ No	2019 07 23	Audit No. Z299803
	Date Work Completed: 2019 07 23	Received

0506E (2014/11)

Well Owner's Copy

eurofins | Environment Testing

Certificate of Analysis

Client: Sunset Lakes Development Corp.
6598 Pebble Trail Way
Greely, ON
K4P 0B6
Attention: Mr. Daniel Payer
PO#:
Invoiced to: Sunset Lakes Development Corp.

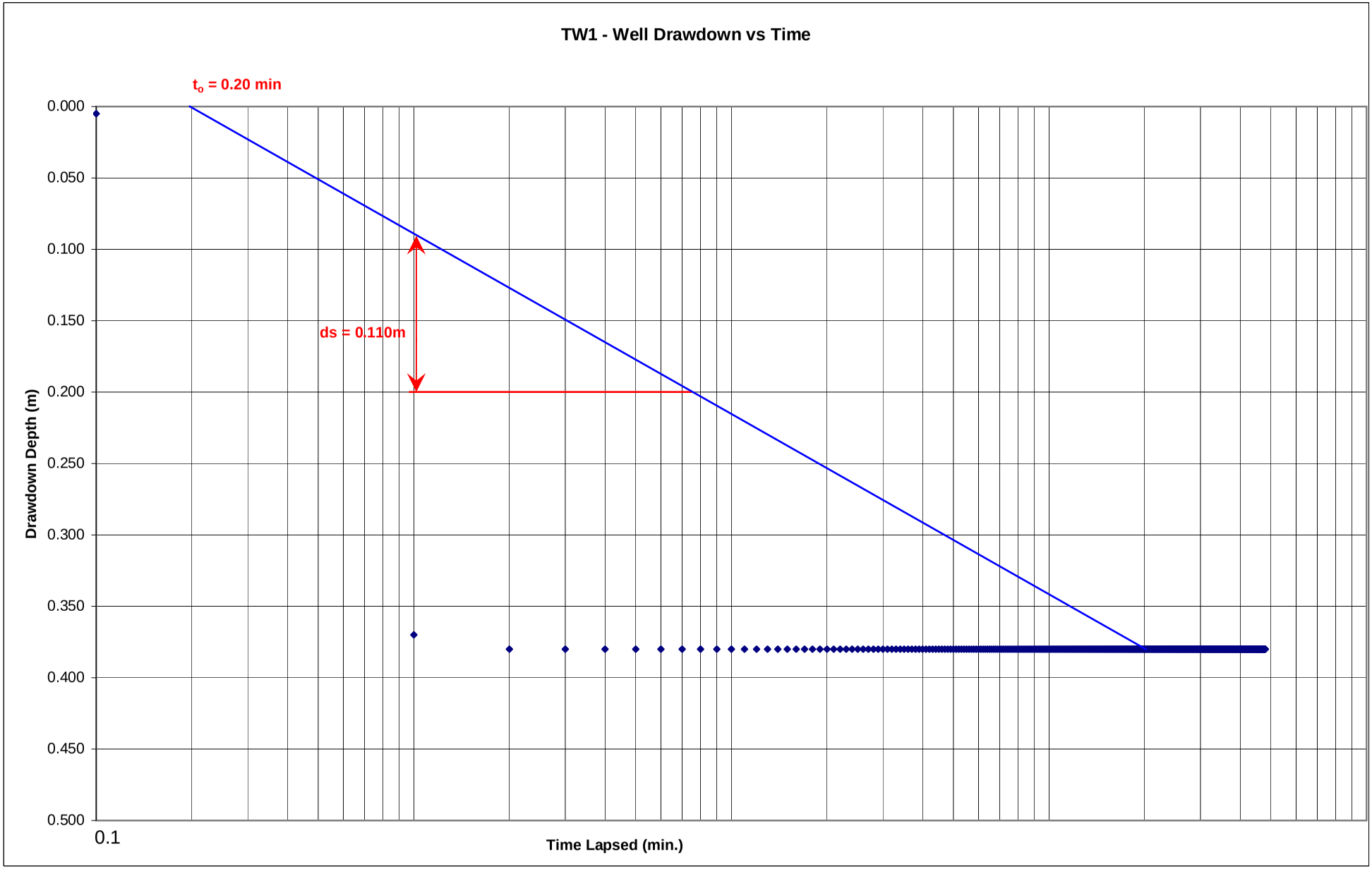
Report Number: 1913301
Date Submitted: 2019-07-25
Date Reported: 2019-08-06
Project:
COC# 96089

				LAB I.D.	1443661
				Sample Matrix	Water
				Sample Type	
				Sample Date:	2019-07-25
				Sample ID:	TW1
Group	**Analyte**	**MRL**	**Units**	**Guideline**	
Anions	Cl	1	mg/L	AO 250	120
	F	0.10	mg/L	MAC 1.5	0.39
	N-NO2	0.10	mg/L	MAC 1.0	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	<0.10
	SO4	1	mg/L	AO 500	89
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	213
	Colour	2	TCU	AO 5	<2
	Conductivity	5	uS/cm		869
	pH	1.00		6.5-8.5	8.49
	S2-	0.1	mg/L	AO 0.05	<0.01
	TDS (COND-CALC)	1	mg/L	AO 500	565*
	Turbidity	0.1	NTU	AO 5.0	1.5
Hardness	Hardness as CaCO3	1	mg/L	OG 100	275*
Indices/Calc	Ion Balance	0.01			0.96
Metals	Ca	1	mg/L		64
	Fe	0.03	mg/L	AO 0.3	0.64*
	K	1	mg/L		7
	Mg	1	mg/L		28
	Mn	0.01	mg/L	AO 0.05	0.05
	Na	2	mg/L	AO 200	80
Subcontract-Inorg	DOC	0.5	mg/L	AO 5	<0.5
	N-NH3	0.01	mg/L		0.45
	Phenols	0.001	mg/L		<0.001
	Tannin & Lignin	0.1	mg/L		0.2
	Total Kjeldahl Nitrogen	0.1	mg/L		0.4

Guideline = ODWSOG *** = Guideline Exceedence**

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

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


TW1 - Well Drawdown vs Time
t_o = 0.20 min
ds = 0.110m
Drawdown Depth (m)
0.000
0.050
0.100
0.150
0.200
0.250
0.300
0.350
0.400
0.450
0.500
0.1
Time Lapsed (min.)

LENNTECH +31 152 610 900

Home / Calculators / Langelier index calculator

Langelier Saturation Index Calculator

This calculator helps you determine the scaling potential of the water by using the Langelier Saturation Index.

Give the values of your water analysis. All the fields with * are required.

Table 1: Input table

pH *	8.49	
Conductivity / TDS *	565	mg/L
[Ca^{2+}] *	64	mg/L
[HCO_3^-] *	275	mg/L
Water temperature *	9	degree C

If you do not have a water analysis you can use th table 2. Click on a button at the bottom of table 2

Table 2 : Additional data

pH =	7.7	8	8.6
TDS =	20	34483	273
[Ca^{2+}] =	5	400	49
[HCO_3^-] =	10	140	121
T =	20	20	20

Calculate the Langlier Saturation Index

Example Seawater Tap wat

Erase input values

Table 3: Results Langelier Saturation Index

pH_s	7.8
LSI	0.72
Indication based on Langelier (1936)	Water is supersaturated with respect to calcium carbonate (CaCO3) and
Indication based on improved Langelier by Carrier (1965)	Scale forming but non corrosive.

The Langelier Saturation Index formula is

$$LSI = pH - I$$

For an explanation of the formula click here.

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