

June 18, 2020

File: 64853.01

CannaGenetics Inc.  
28 Bluemeadow Way  
Ottawa, Ontario  
K2M 1L6

**Re: Hydrogeological Investigation  
Proposed Rezoning  
Part of Lots 13 and 14, Concession 3  
Huntley, Ontario**

## **BACKGROUND**

This report presents the results of a hydrogeological investigation carried out as part of a proposed rezoning application for a portion of the property located at Part of Lots 13 and 14, Concession 3 in Huntley, Ontario. The properties legal description is Blocks 10 and 12, Plan 4M-1511 (1500 Thomas Argue Road). The property is currently zoned as Air Transportation Facility Zone – Carp Airport Subzone (T1B) and the rezoning application is to allow for “Cannabis Production Facility” as a permitted use.

The property is currently vacant and has been used as agricultural land in the past. A newly drilled on site test well (TW19-1) was used to evaluate water quality and quantity for this investigation.

The purpose of the investigation was to confirm the following:

- The quality of the well water meets the Ontario Drinking Water Standards and maximum treatable limits prescribed in Ontario Ministry of Environment, Conservation and Parks (MECP) Procedure D-5-5; and,
- The quantity of well water meets the MECP Procedure D-5-5 requirements.

## **SITE GEOLOGY**

Surficial geology maps of the Ottawa area (Ontario Geologic Survey, 2010) indicate that the site is underlain by coarse textured glaciomarine deposits (sand, gravel, minor silt and clay). Bedrock geology maps of the Ottawa area (Ontario Geological Survey, 2011 and Paleozoic Geology of Southern Ontario, 1972) show that the overburden has a thickness of 25 to 50 metres and is underlain by interbedded limestone and shale bedrock of the Verulam Formation.

## WELL CONSTRUCTION

The water supply well was constructed at 1500 Thomas Argue Road on May 24, 2019, by a licensed MECP well contractor (Air Rock Drilling; License No. 1119) using a rotary air percussion drill rig. The approximate location of the water well is provided on the Detailed Site Plan, Figure 1. A copy of the MECP Water Well Record is provided in Attachment A.

The construction details from the MECP Water Well Record are summarized in the following table.

Well Construction Details ("TW19-1"; Well Tag A260891)	
Depth to Bedrock	41.4 metres
Length of Well Casing	43.3 metres
Length of Well Casing Above Ground Surface	0.61 metres
Length of Well Casing Set Into Bedrock	1.8 metres
Depth Water Found	45.7 metres
Total Well Depth	48.8 metres

## GROUNDWATER QUANTITY

A pumping test was carried out on the water well by a member of GEMTEC staff on June 12, 2019. The well was pumped at a constant rate of approximately 57 litres per minute for a period of eight hours. The water from the pumping test was discharged to the ground surface a minimum of 10 metres from the test well such that the discharge flow was away from the well head.

Water level measurements were taken at regular intervals throughout the pumping test. Water levels were also taken during the recovery phase of the pumping test (after the pump was turned off). The drawdown and recovery graph is provided in Attachment B. The transmissivity of the water supply aquifer was estimated from the pump test drawdown data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. An analysis of the pump test and recovery data was carried out using the Cooper-Jacob method of analysis. The results of the Aqtesolv 4.5 analysis are provided in Attachment B.

The Cooper-Jacob and Theis Recovery analyses indicates that the transmissivity of the water supply aquifer is approximately 5.2 to 6.9 m<sup>2</sup>/day. A qualitative evaluation of the drawdown

pumping test data indicates approximately 10 metres of drawdown within the first hour of pumping from a static water level of 8.33 metres below ground surface. The water level gradually decreased throughout the remaining seven hours of pumping, to a maximum measured drawdown of 11.6 metres and final water level of 19.94 metres below ground surface. The pumping test discharged a total of about 27,816 litres from the well over the course of the pumping test. Based on the depth of the well and the water level after eight hours of pumping, the remaining available drawdown in the well is approximately 28 metres.

The septic system and water demand considerations were assessed by Novatech in a memorandum entitled “Cannagenetics Inc. – Westkan Business Park and Septic System Considerations” and dated March 7, 2019 – revised June 12, 2020 (Attachment C). The septic demands were estimated to be less than 10,000 litres per day, which includes 1,500 L/day assuming 20 employees and 8,500 L/day for process and production discharge. The water demand within the facility for process and production (fertilising and irrigation) will utilize 53,000 litre reservoirs, which will have a maximum discharge of 8,500 L/day. Therefore, the daily water demand is expected to be limited to 10,000 litres per day. The 53,000-litre reservoir can be initially filled over a 2-day period by pumping 26,500 litres per day, which is less than the 27,816 litres pumped during the 8-hour pumping test.

The high sustained flow rate in combination with the remaining available drawdown indicates that the well should be capable of providing adequate quantities of groundwater for typical commercial and/or industrial use, including a cannabis production facility. Furthermore, the recovery of the well following the pumping test indicates that the water well should be able to sustain repeated pumping in the long term.

## **GROUNDWATER QUALITY**

Water samples were collected by GEMTEC during the pumping test on June 12, 2019 (TW19-1). Due to elevated organic and bacteriological water quality results, TW19-1 was chlorinated and resampled on May 11, 2020 and June 1, 2020.

A summary of the field measurements is provided in Tables D1 (Attachment D). The results of the laboratory analysis on the water samples are summarized in Table D2 along with the applicable standards, guidelines and objectives provided in the Ontario Drinking Water Quality Standards (ODWQS). Copies of the laboratory certificates of analysis for the water samples are provided in Attachment D.

The following comments are provided regarding the drinking water quality and exceedances of the ODWQS.

## **Maximum Acceptable Concentration Exceedances**

Total chlorine measurements made at regular intervals during the pumping test and prior to sampling confirmed that total chlorine concentrations in the well water was non-detectable at the time of bacteriological sampling.

The results of the bacteriological analysis from the June 12, 2019 pumping test indicate that the water samples met all the standards of the ODWQS for bacteriological parameters. Upon resampling on May 11, 2020 total coliform, e.coli and fecal coliform concentrations were detected; however, following a second round of chlorination and re-sampling on June 1, 2020, TW19-1 reported non-detectable total coliform, e.coli and fecal coliform concentrations. The bacterial exceedances detected on May 11, 2020 may be the result of insufficient well chlorination combined with the well sitting idle for a period of approximately 11 months.

## **Operational Guideline Exceedances**

Operational related exceedances of the ODWQS were detected for hardness and for organic nitrogen. The operational guideline exceedances are discussed in the following section:

### Hardness

The hardness of the water samples was reported to be 123, 135 and 144 mg/L as CaCO<sub>3</sub>, which exceeds the ODWQS operational guideline for hardness. Water having a hardness above 100 milligrams per litre as CaCO<sub>3</sub> is often softened for domestic use. Water softeners are widely used throughout rural areas to treat hardness and there is no upper treatable limit for hardness. The ODWQS indicates that hardness levels exceeding 200 mg/L as CaCO<sub>3</sub> is considered poor but tolerable and hardness levels exceeding 500 mg/L as CaCO<sub>3</sub> is considered to be unacceptable for most domestic purposes.

### Organic Nitrogen

The organic nitrogen concentration was reported to be 0.4 and 0.3 mg/L [TKN – ammonia] during the pumping test which slightly exceeds the operational guideline of 0.15 mg/L for ODWQS. The ODWQS indicates that levels of organic nitrogen in excess of 0.15 mg/L may be caused by septic tank or sewage effluent contamination and may cause taste and odour problems.

It is noted that following well chlorination and resampling on May 11, 2020 and June 1, 2020, the organic nitrogen concentrations decreased below the ODWQS operational guideline of 0.15 mg/L.

## **Aesthetic Objective Exceedances**

Aesthetic objective exceedances of the ODWQS were detected for total dissolved solids, dissolved organic carbon, colour and sulphide. These exceedances are discussed in the following sections:

### Total Dissolved Solids (TDS)

The TDS concentration during the pumping test were measured to be 548 and 552 mg/L. Elevated levels of TDS can lead to problems associated with encrustation and corrosion. Following additional well development on May 11, 2020 the TDS concentration decreased to 448 mg/L which meets the ODWQS.

Nevertheless, to determine the corrosive nature of the groundwater, the Langelier Saturation Index (LSI) was calculated for the samples obtained from the well. These values are based on the TDS, temperature, pH, alkalinity, and calcium observed in the June 12, 2019 8-hr sample. A copy of the calculation to determine the LSI value is provided in Attachment E. The LSI was calculated to be 0.67 using an estimated groundwater temperature of 10°C. This indicates that the water is scale forming but non-corrosive.

### Dissolved Organic Carbon (DOC)

The analyses of the water samples collected during the June 12, 2019 pumping test indicated DOC concentrations of 1.5 and 2.1 mg/L, which are within the ODWQS aesthetic objective of 5 mg/L. Following well chlorination and resampling on May 11, 2020 and June 1, 2020, the DOC concentrations increased to 12.0 and 24.4 mg/L respectively, which exceed the ODWQS aesthetic objective and the maximum concentration considered reasonably treatable of 10.0 mg/L. It is noted that the DOC concentrations are currently under quality assurance / quality control review by the laboratory based on the sharp increase in May 11 and June 1, 2020 results and corresponding decreases in other organic parameters such as tannins and lignins, ammonia, TKN and organic nitrogen.

Elevated DOC concentrations may be caused by organic material and is usually higher in surface waters. Dissolved organic carbon above the aesthetic objective of 5 mg/L can result in unpleasant taste, odour and colour. Furthermore, high DOC concentrations when chlorinated can result in harmful by-products (i.e. trihalomethanes) which have long-term health effects. Dissolved organic carbon can be treated using coagulation/flocculation, biological filtration, granulated charcoal and distillation. It is noted that treatment requirements dramatically increase and the maximum concentration considered reasonably treatable of 10 mg/L.

### Colour

The colour concentrations from the 4-hr and 8-hr samples collected during the pumping test were reported to be 11 and 10 TCU which exceeded the aesthetic objective of 5 TCU listed by the ODWQS. The field measured colour concentrations were also measured to be 12 and 10 TCU, respectively (refer to Table D1 in Attachment D). The samples exceeded the treatable limits of 7 TCU provided in Table 3 of the Appendix in the MECF Guideline D-5-5. Elevated levels of colour can be associated with certain metals, hydrogen sulphide and organic substances in the water.

Following additional well development and re-sampling, the field measured colour decreased to 0 TCU and the laboratory measured colour on May 11 and June 1, 2020 were reported to be 12 and 6 TCU, respectively. The sample collected on June 1, 2020 meets the maximum treatable limit of 7 TCU for the laboratory and field measured samples. The decrease in colour may be attributed to the measured decrease in hydrogen sulphide. Furthermore, it is noted that dissolved organic carbon (DOC) can also contribute to colour; however, the colour in the samples decreased as the DOC concentrations continued to increase.

Water having a faint purple colour can be caused by elevated sulphide concentrations, which ranged from 3.00 mg/L to 1.51 mg/L. Colour is not generally considered a health issue and the aesthetic objective is set by appearance. The use of carbon filter treatment systems can be used to reduce colour levels. Furthermore, hydrogen sulphide related colour can be treated through hydrogen sulphide treatment using manganese greensand filters, aeration and/or oxidation.

### Hydrogen Sulphide

Hydrogen sulphide concentrations in TW19-1 were measured to be 3.00, 2.30, 1.94 and 1.51 mg/L. The sulphide concentrations continued to decrease following additional well development on May 11, 2020 and June 1, 2020 and are expected to continue to decrease with additional pumping. Hydrogen sulphide concentrations of up to 2.5 mg/L can be reasonably treatable using manganese greensand filters and can also be treated at higher concentrations using adsorption, aeration, chlorination/filtration, chlorination/activated-carbon filters and/or oxidation.

### **Notable Parameters**

The results of the chemical testing on the water samples indicate elevated sodium concentrations. Although the parameter does not exceed the ODWQS, they are noted, and are discussed in the follow sections:

### Sodium

The sodium concentration was reported to be 156, 142 and 106 mg/L, which is not considered an exceedance of the ODWQS aesthetic objective of 200 milligrams per litre; however, it exceeds the health-related limit of 20 mg/L for persons on sodium restricted diets and should be reported to the local Medical Officer of Health. Furthermore, conventional water softeners could introduce elevated concentrations of sodium into the drinking water, therefore, a separate faucet, which bypasses the softener may be considered for drinking water purposes.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **1.1 Conclusions**

Based on the results of this investigation, the following conclusions are provided:

- Surficial geology maps of the Ottawa area (Ontario Geologic Survey, 2010) indicate that the site is underlain by coarse textured glaciomarine deposits (sand, gravel, minor silt and clay). The overburden is further characterized as clay on the water well record (Well Tag #A260891) and is approximately 41.5 metres thick.
- The water supply well is completed in the limestone bedrock, with a total completion depth of approximately 48.8 metres.
- The test well (TW19-1) is capable of providing at least 27,816 litres per day, which is greater than the septic demand of 10,000 L/day which includes 8,500 L/day for process water (septic and water demand requirements provided by Novatech – Attachment C). The 53,000-litre reservoir can be initially filled over a period of two days. The maximum drawdown in the water level of the well was approximately 11.6 metres following 8 hours of pumping at a flow rate of 57 litres per minute. Based on a static water level of 8.33 metres below ground surface, the total well depth of 48.8 metres and the water level after 8 hours of pumping, the remaining available drawdown in the well is approximately 28 metres.
- The groundwater quality exceeds the ODWQS for the operational guideline for hardness, the aesthetic objectives for hydrogen sulphide, dissolved organic carbon and colour, the warning levels for sodium and the maximum acceptable concentration dissolved organic carbon.
  - The operational guideline for organic nitrogen was initially exceeded during the pumping test on June 19, 2019. The subsequent sampling on May 11 and June 1, 2020 did not exceed the ODWQS operational guideline.
  - The maximum acceptable concentration for total coliform, e.coli and fecal coliform exceeded the ODWQS following the first round of chlorination and re-sampling on May 11, 2020. The bacteriological parameters were non-detectable during the June 12, 2019 pumping test and following the second round of chlorination and re-sampling on June 1, 2020.
  - The DOC maximum acceptable concentration exceedances of 12.0 and 24.4 mg/L reported on May 11 and June 1, 2020 are currently under quality assurance / quality control review by Paracel Laboratories.
- The test well displays elevated organic parameters, namely tannins and lignins, organic nitrogen, colour, dissolved organic carbon and bacteriological parameters (total coliform, e.coli and fecal coliform). The source of organic material has not been confirmed and based on the current results the groundwater is considered to be non-potable.

## 1.2 Recommendations

Based on the results of this investigation, the following water supply recommendations are provided:

### Water Supply Recommendations

- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change document “Water Supply Wells - Requirements and Best Management Practices, Revised April 2015”.
- Groundwater quality treatment may be utilized to treat the following ODWQS exceedances:
  - Hardness – Hardness levels in TW19-1 exceed the ODWQS operational guideline and can be treated using water softening by conventional sodium ion exchange.
  - Hydrogen sulphide – Exceeds the ODWQS aesthetic objective of 0.05 mg/L and can be treated using manganese greensand filters, adsorption, aeration, chlorination/filtration, chlorination/activated-carbon filters and oxidation.
  - Colour – Colour exceeded the ODWQS aesthetic objective concentration of 5 TCU. Colour can be treated using carbon filter treatment systems and may be further reduced through hydrogen sulphide removal.
  - Sodium - Sodium concentrations in the raw water supply exceed the ODWQS warning level for persons on sodium restricted diets and the local Medical Officer of Health should be notified.
  - Dissolved organic carbon – Dissolved organic carbon can be treated using coagulation/flocculation, biological filtration, granulated charcoal and distillation. It is noted that treatment requirements dramatically increase and the ODWQS maximum concentration considered reasonably treatable is 10 mg/L. Furthermore, chlorination as a treatment option is not recommended as it may result in harmful by-products (i.e. trihalomethanes).
- A water quality treatment specialist should be retained to correctly size treatment systems, confirm maximum treatability limits and ensure there are no interference effects between systems.
- The water supply well should be used for plumbing and process water (i.e. fertilization and irrigation) only and potable water should be provided to employees. Based on the bacteriological and organic exceedances, the groundwater is considered non-potable. Additional water quality sampling is recommended to confirm bacteriological and organic parameters.

## LIMITATIONS OF REPORT

This report was prepared for CannaGenetics Inc. and is intended for the exclusive use of CannaGenetics Inc. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and CannaGenetics Inc. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgments of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report.

Should new information become available during future work, including water quality sampling, environmental site assessments or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

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

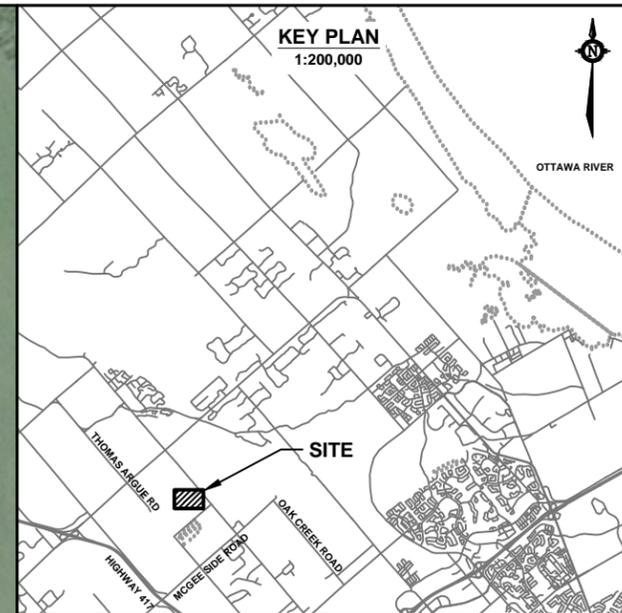
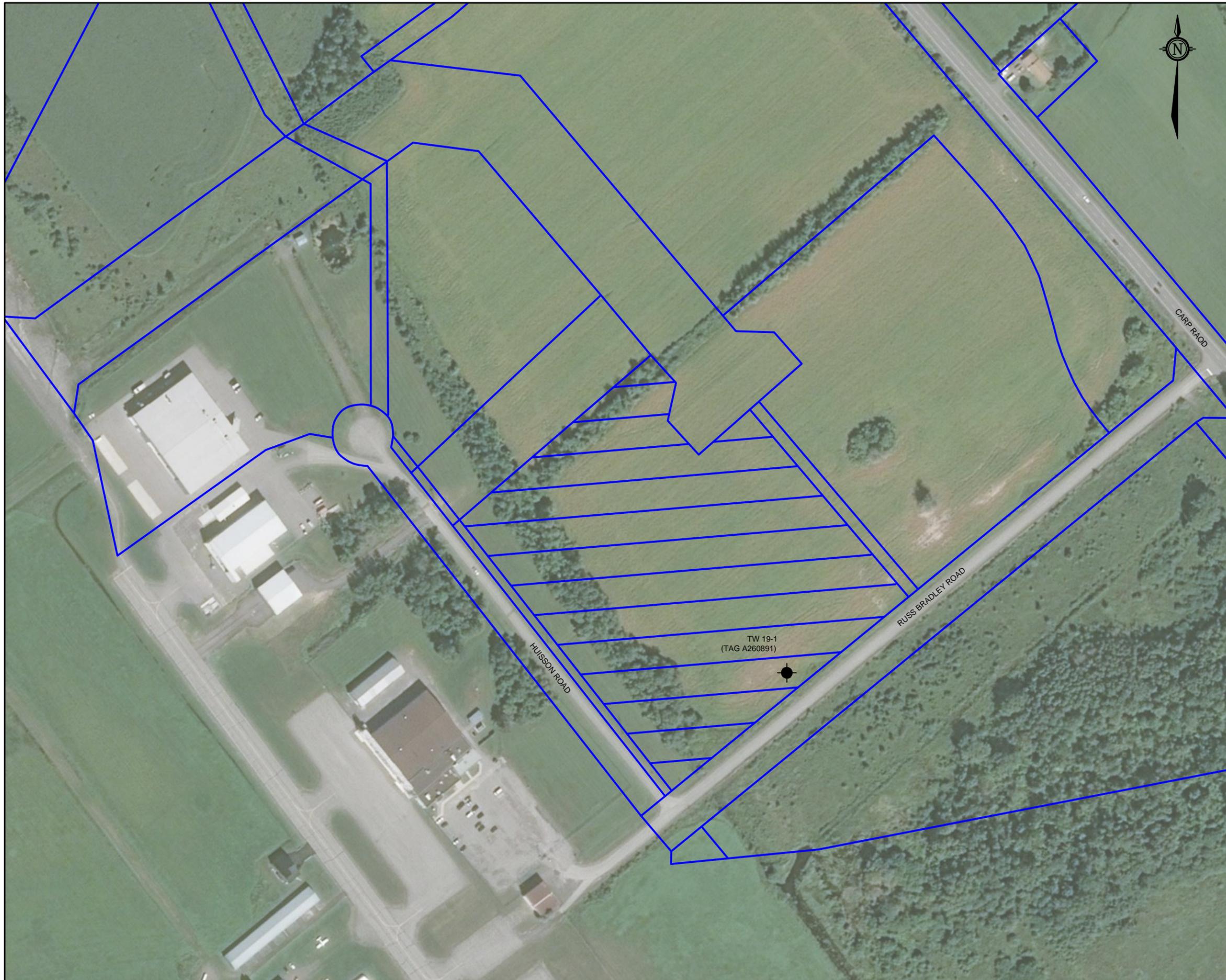


Andrius Paznekas, M.Sc., P.Geo.  
Hydrogeologist



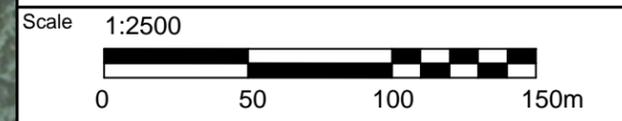
Shaun Pelkey, M.Sc.E., P.Eng.  
Principal, Environmental Engineer





**LEGEND**

- TEST WELL LOCATION IN PLAN  
(current investigation by GEMTEC)
- TW** ← TW ID
- XXXXXXX** ← MECP WELL TAG NUMBER
- SITE BOUNDARY
- SUBJECT AREA



**GEMTEC**  
CONSULTING ENGINEERS  
AND SCIENTISTS

32 Steacie Drive  
Ottawa, ON K2K 2A9  
Tel: (613) 836-1422  
www.gemtec.ca  
ottawa@gemtec.ca

Client		CANNAGENETICS INC.	Project	64853.01
Location		1500 THOMAS ARGUE ROAD, OTTAWA, ON		
Drwn by	Chkd by	SITE PLAN		
A.N.	A.P.			
Date	JUNE, 2020	Rev.	0	<b>FIGURE 1</b>



## **ATTACHMENT A**

MECP Water Well Record



Measurements recorded in:  Metric  Imperial

A260891

Page of

Well-Owner's Information

First Name: G. G. Graham, Last Name / Organization: Cannagenetics Premium Cannabis Products Incorporated, E-mail Address: [redacted], Well Constructed: [checked], Well Owner: [checked]

Well Location

Address of Well Location: 28 Bluemeadow Way, Municipality: Ottawa, Province: ON, Postal Code: K2M 1L8, Township: West Carleton, City/Town/Village: Carp, Province: Ontario, Postal Code: [redacted]

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

Table with 5 columns: General Colour, Most Common Material, Other Materials, General Description, Depth (m/ft) From To. Rows include Clay, Limestone, Limestone.

Annular Space table with 3 columns: Depth Set at (m/ft) From To, Type of Sealant Used (Material and Type), Volume Placed (m³/G). Rows include Neat cement, Bentonite slurry.

Method of Construction and Well-Use section with checkboxes for Cable Tool, Rotary, Boring, etc.

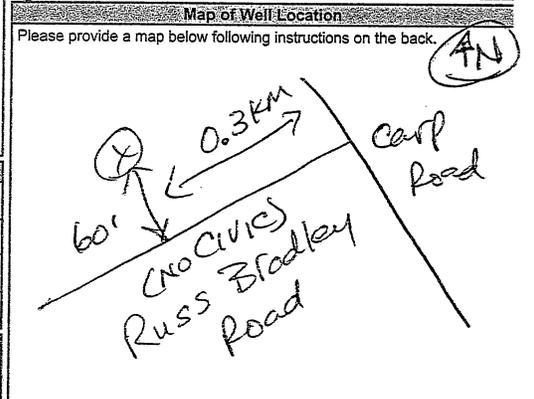
Construction Record - Casing table with 4 columns: Inside Diameter (cm/in), Open Hole OR Material, Wall Thickness (cm/in), Depth (m/ft) From To.

Construction Record - Screen table with 4 columns: Outside Diameter (cm/in), Material, Slot No., Depth (m/ft) From To.

Water Details and Hole Diameter section with checkboxes for Fresh, Untested, Gas, etc.

Well Contractor and Well Technician Information section with fields for Business Name, Address, E-mail, etc.

Results of Well Yield Testing table with columns for Draw Down and Recovery, including Time (min) and Water Level (m/ft).



Well Owner's Information, Date Package Delivered, Date Work Completed, and Ministry Use Only section.

# CERTIFICATE OF WELL COMPLIANCE



I ( **Jeremy Hanna** ) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of the water well on the property of :

OWNER: Cannagenetics Premium Cannabis Products

Location: Incorporated (NOCVIC) Russ Bradley Road, Carp

LOT: X CON: X PLAN # 4M-1511 S/L # X

Ottawa-Carleton / Geographical Township of West Carleton

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 24<sup>TH</sup> Day of MAY, 2019

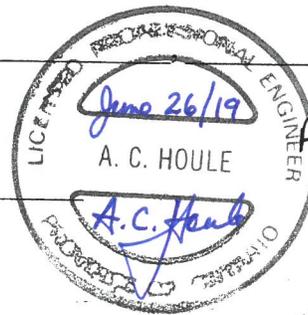
Jeremy Hanna (T3632)

Air Rock Drilling Co. Ltd. (# 1119)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, <sup>and</sup> this report ~~and the Hydrogeological Report~~ with regards to casing length and grouting requirements.

Signed this 26 day of June, 2019

A.C. Houle, P. Eng.  
(Engineer) Gemtec



209277  
A 260891



Shaping our future together  
Ensemble, formons notre avenir

City of Ottawa  
Client Service Centre  
8743 Victoria Street

Ville d'Ottawa  
Centre de service  
8743, rue Victoria



## **ATTACHMENT B**

TW19-1 Drawdown and Recovery  
&  
TW19-1 Transmissivity Analyses



# GEMTEC

CONSULTING ENGINEERS  
AND SCIENTISTS

Pumping Test Analysis Report

Project: Hydrogeological Investigation

Project Number: 64853.01

Client: Cannagenetics Inc.

Location: 1500 Thomas Argue Road, Ottawa, Ontario

P-Test Date: June 12, 2019

Test Conducted by: LT

Pumping Well: TW19-1

Well Tag: A260891

Analysis Performed by: AP

Method: Raw Pumping Test Data

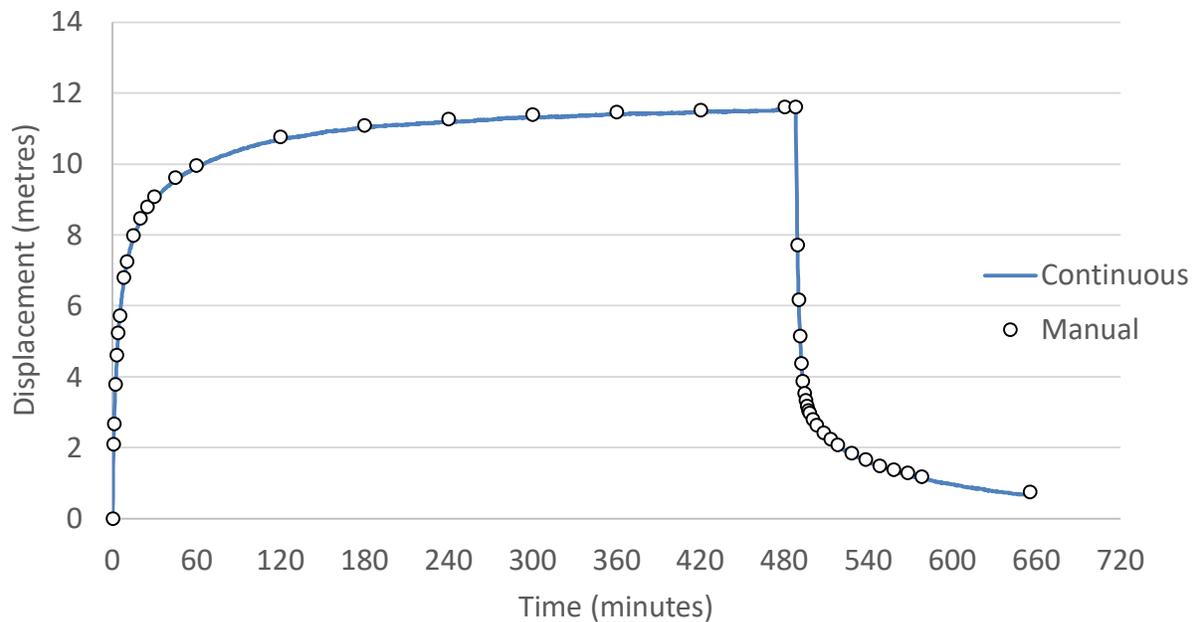
Static WL: 8.33 m bgs

Well Depth: 48.8 m

Discharge: Constant: 57 L/min

Duration: 8 hours, 8 minutes

## Pumping Test Data (TW19-1): Drawdown and Recovery





# GEMTEC

CONSULTING ENGINEERS  
AND SCIENTISTS

Pumping Test Analysis Report

Project: Hydrogeological Investigation

Project Number: 64853.01

Client: Cannagenetics Inc.

Location: 1500 Thomas Argue Road, Ottawa, Ontario

P-Test Date: June 12, 2019

Test Conducted by: LT

Pumping Well: TW19-1

Well Tag: A260891

Analysis Performed by: AP

Method: Cooper-Jacob

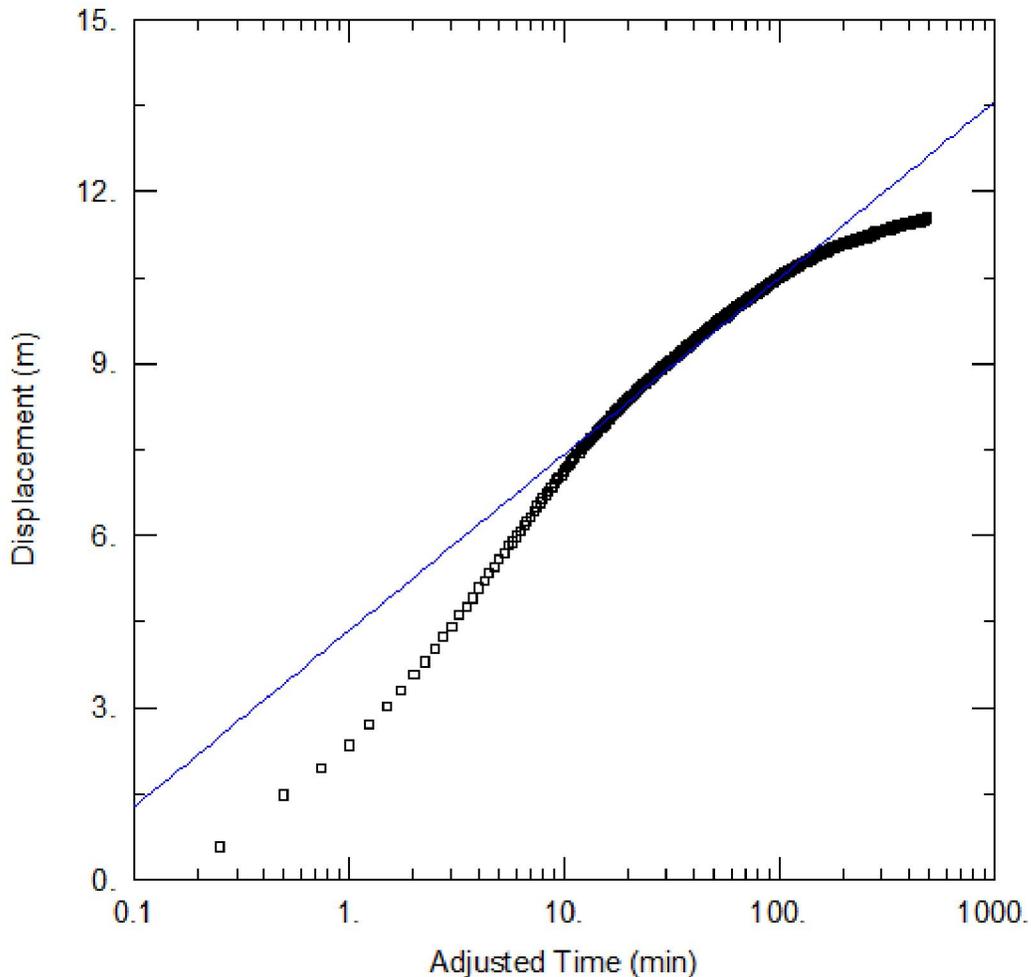
Static WL: 8.33 m bgs

Well Depth: 48.8 m

Discharge: Constant: 57 L/min

Duration: 8 hours, 8 minutes

## Pumping Test Data (TW19-1): Transmissivity Analysis Drawdown



Estimated Hydraulic Conductivity ( $k$ ) =  $6 \times 10^{-5} \text{ m}^2/\text{s}$  or  $5.2 \text{ m}^2/\text{day}$



# GEMTEC

CONSULTING ENGINEERS  
AND SCIENTISTS

Pumping Test Analysis Report

Project: Hydrogeological Investigation

Project Number: 64853.01

Client: Cannagenetics Inc.

Location: 1500 Thomas Argue Road, Ottawa, Ontario

P-Test Date: June 12, 2019

Test Conducted by: LT

Pumping Well: TW19-1

Well Tag: A260891

Analysis Performed by: AP

Method: Theis Recovery

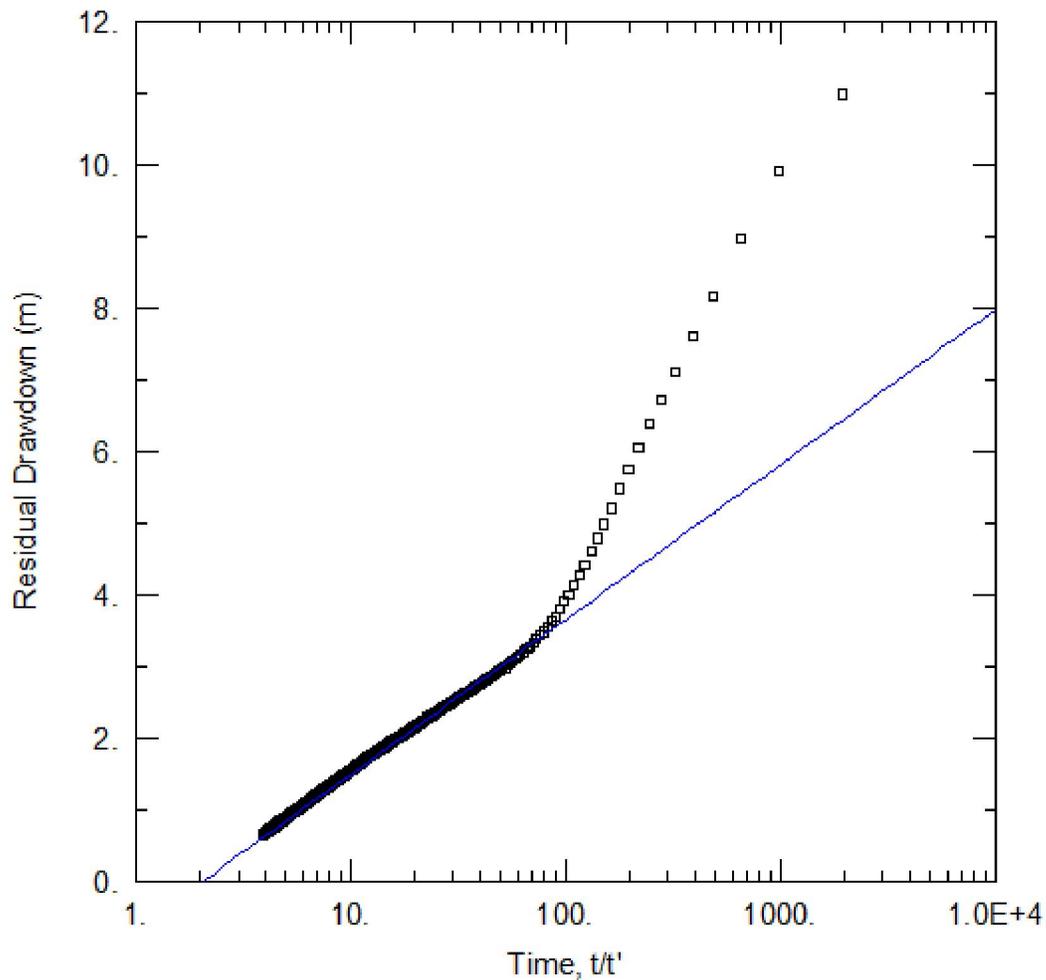
Static WL: 8.33 m bgs

Well Depth: 48.8 m

Discharge: Constant: 57 L/min

Duration: 8 hours, 8 minutes

## Pumping Test Data (TW19-1): Transmissivity Analysis Recovery



Estimated Hydraulic Conductivity ( $k$ ) =  $8 \times 10^{-5} \text{ m}^2/\text{s}$  or  $6.9 \text{ m}^2/\text{day}$



## **ATTACHMENT C**

Septic Demand – Novatech

# MEMORANDUM

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**DATE:** MARCH 7, 2019  
**REVISED:** JUNE 12, 2020  
**TO:** ADAM THOMPSON, NOVATECH  
**FROM:** ALEX MCAULEY, P.ENG  
**RE:** CANAGENETICS INC. – WESTKAN BUSINESS PARK  
SEPTIC SYSTEM CONSIDERATIONS  
  
NOVATECH FILE # 118179  
  
**CC:**

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As discussed, Novatech has prepared a memo based on our review of the Septic Demands email (dated 6/2/2019) provided by Cannagenetics. The items noted below are items for further discussion and consideration as the design progresses.

## **Assumptions**

- Due to the elevated ground water table, a fully raised septic system is anticipated.
- Imported sand for the septic system will have a Percolation Rate of 8 min/cm.
- The underlying soil has a Percolation Rate of 50 min/cm.
- It is assumed that all process/production discharge is suitable for onsite disposal within the proposed septic system.
- Septic System flow allowance is 10,000L/day per lot to avoid triggering Reasonable Use criteria which has onerous treatment, cost and approvals considerations.
- There will be up to 20 employees daily.
- There will be 280 reservoirs (50 USgal, or 189L) within the facility for fertilising and irrigation, with a combined total volume of approximately 53,000L.
- The reservoirs will be drained periodically (approximately once every 4 weeks) to the septic system.

## Considerations

- For preliminary design purposes, the proposed septic system will be limited to 10,000 L/day.
- The demands have been divided into two main categories, employee usage and production/process.
  - The theoretical design flow is based on 20 employees 1,500L/day (75L/day/employee).
  - Process and Production discharge, which includes the draining of reservoirs, would be limited to 8,500L/day (10,000L/day limit minus 1,500L/day for employee usage).
- Based on a total reservoir volume of 53,000L, and a maximum discharge of 8,500L/day, draining of the reservoirs would need to be completed over a minimum of 7 days to not overload the septic system.
- Recommend flow monitoring after construction to confirm the flow numbers based on actual usage.
- Discharge in excess of 10,000L/day, or any water not suitable for the proposed septic system would be required to be hauled offsite for disposal at a licensed facility.
- Minimum setbacks required per the Ontario Building Code (OBC) based on a 1.5m raised septic field from the septic tiles are:
  - To property lines: 6.0m
  - To buildings: 8.0m
  - To any well: 18.0m
  - To the septic tank: 1.5m
- Mounding calculations will be required and may increase the above noted setback requirements.

Refer to attached Septic System Design Flows Sheet (Dated March 7, 2019) for preliminary calculations.

<b>SEPTIC SYSTEM DESIGN FLOWS</b>			
<b>Activity</b>			<b>Flow/Unit (L/day) [1]</b>
<b>Proposed Production Facility</b>			
	Qty	Multiplier	
Employees	20	75 L/day	1,500
Process Water	1	8,500 L/day	8,500
		<b>Site TOTAL [2]</b>	<b>10,000</b>
<b>Septic Sizing Options (Conventional System)</b>			
	<b>Flow</b>	<b>Pipe length</b>	<b>Tank Size</b>
	<b>Q (L/day)</b>	<b>(m)</b>	<b>(L)</b>
<b>Absorption Trench (OBC 8.7.3)</b>		$= (Q \cdot 8) \div 200$	$= Q \cdot 3$
Phase 1	10,000	400	30,000
Percolation Rate [3]	T	8	=min/cm
<b>Loading Rate Calculations</b>			
	<b>Flow</b>	<b>Loading Rate</b>	<b>Area Req'd</b>
	<b>Q (L/day)</b>	<b>L/m<sup>2</sup>/day</b>	<b>(m<sup>2</sup>)</b>
<b>Contact Area Required</b>	10,000	6	1,667
	<b>Length (m)</b>	<b>Width (m)</b>	<b>Area (m<sup>2</sup>)</b>
<b>Contact Area Provided (Preliminary Dimensions)</b>	50	34	1,700

**Notes:**

[1] Flows per OBC Table 8.2.1.3B and per MOECC guidelines

[2] Max allowable flow is based on a maximum 10,000L/day to fall below the limit where Reasonable Use would apply.

[3] Percolation Rate is assumed to be 8 for imported septic sand, and 50 for the underlying soil due to ground water.

**[4] Assumptions:**

- 20 employees per day
- 8,500L/day of discharged production water



## **ATTACHMENT D**

Summary of Field and Laboratory Measurements  
Laboratory Certificates of Analysis

**Table 1**  
Summary of Field Parameters (TW19-1)

Date	Time Since Pumping Started (hr:min) @ Flow Rate	Temp (°C)	pH	EC <sup>1</sup> (us/cm)	TDS <sup>2</sup> (ppm)	Turbidity (NTU)	Colour (ACU)	Filtered Colour <sup>3</sup> (TCU)	Chlorine (mg/L)
Jun 12/19	1 @ 15 gpm	13.2	8.11	499	249	17.5	-	-	-
	2 @ 15 gpm	12.3	8.21	799	399	8.8	-	-	-
	3 @ 15 gpm	12.1	8.18	816	408	5.1	-	-	-
	4 @ 15 gpm	11.9	8.18	820	410	3.8	10	12	0
	5 @ 15 gpm	12.1	8.19	830	415	4.3	-	-	-
	6 @ 15 gpm	12.0	8.15	848	424	5.0	-	-	-
	7 @ 15 gpm	11.8	8.15	851	425	3.5	-	-	-
	8 @ 15 gpm	11.3	8.14	836	418	4.3	5	10	0
May 8/20	<b>Well Chlorination</b>								
May 11/20	7.5 hours @ 15 gpm	9.2	7.80	850	425	3.1	0	0	0
May 28/20	<b>Well Chlorination</b>								
Jun 1/20	7.5 hours @ 10 gpm	9.6	7.95	800	400	2.4	0	0	0

Notes:

1. EC: Electrical Conductivity
2. TDS: Total Dissolved Solids
3. Filtered using 0.45 micron filter.

**Table 2**  
**Summary of Laboratory Parameters Analyzed (TW19-1)**

Parameter		Units	TW19-1 Jun 12/19 4 hr P-Test	TW19-2 Jun 12/19 8 hr P-Test	TW19-1 R1 May 11/20	TW19-1 R2 Jun 1/20	Ontario Drinking Water Standard	Type of Std.
Microbiological Parameters	Escherichia coli	CFU/100mL	ND	ND	<b>3</b>	ND	0	MAC
	Fecal Coliform	CFU/100mL	ND	ND	<b>3</b>	ND	0	MAC
	Total coliforms	CFU/100mL	ND	ND	<b>3</b>	ND	0	MAC
	Heterotrophic Plate Count	CFU/1mL	<10	<10	<1	150	-	-
General Inorganics	Alkalinity (as CaCO <sub>3</sub> )	mg/L	338	326	297	-	30-500	OG
	Ammonia as N (NH <sub>3</sub> )	mg/L	0.44	0.44	0.38	0.39	-	-
	Dissolved Organic Carbon (DOC)	mg/L	1.5	2.1	<b>12.0</b>	<b>24.4</b>	5	AO
	Colour	TCU	<b>11</b>	<b>10</b>	<b>12</b>	<b>6</b>	5	AO
	Electrical Conductivity	uS/cm	957	904	884	-	-	-
	Total Hardness (as CaCO <sub>3</sub> )	mg/L	<b>123</b>	<b>135</b>	<b>144</b>	-	80-100	OG
	pH	pH units	8.4	8.3	8.3	-	6.5-8.5	OG
	Phenols	mg/L	<0.001	<0.001	<0.001	-	-	-
	Total Dissolved Solids (TDS)	mg/L	<b>548</b>	<b>552</b>	448	-	500	AO
	Sulphide (S <sub>2</sub> )	mg/L	<b>3.00</b>	<b>2.30</b>	<b>1.94</b>	<b>1.51</b>	0.05	AO
	Tannins and Lignins	mg phenol/L	0.7	0.6	0.4	0.4	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.8	0.7	0.4	0.4	-	-
	Organic Nitrogen (TKN - NH <sub>3</sub> )	mg/L	<b>0.4</b>	<b>0.3</b>	0	0	0.15	OG
Turbidity	NTU	1.3	1.4	1.2	4.2	5	AO	
Anions	Chloride (Cl)	mg/L	113	105	112	-	250	AO
	Fluoride (F)	mg/L	1.1	1.0	0.9	-	1.5	MAC
	Nitrate as N (NO <sub>3</sub> )	mg/L	<0.1	<0.1	<0.1	-	10	MAC
	Nitrite as N (NO <sub>2</sub> )	mg/L	<0.05	<0.005	<0.05	-	0.1	MAC
	Sulphate (SO <sub>4</sub> )	mg/L	16	20	30	-	500	AO
Metals	Calcium (Ca)	mg/L	25.7	29.2	30.7	-	-	-
	Iron (Fe)	mg/L	<0.1	<0.1	<0.1	-	0.3	AO
	Magnesium (Mg)	mg/L	14.3	15.0	16.3	-	-	-
	Manganese (Mn)	mg/L	<0.005	<0.005	<0.005	-	0.05	AO
	Potassium (K)	mg/L	8.1	8.0	7.1	-	-	-
	Sodium (Na)	mg/L	156	142	106	-	200	AO

**Bolded** = Exceeds Ontario Drinking Water Standards

\* Sample collected from outdoor tap

MAC = Maximum acceptable concentration

NR = Not Reportable

OG = Operational guideline

AO = Aesthetic objective

ND = Not Detectable

Date: June 2020

Project: 64853.01

## Certificate of Analysis

### **GEMTEC Consulting Engineers and Scientists Limited**

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Andrius Paznekas

Client PO:  
Project: 64853.01  
Custody: 10163

Report Date: 18-Jun-2019  
Order Date: 13-Jun-2019

**Order #: 1924467**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

<b>Parcel ID</b>	<b>Client ID</b>
1924467-01	19-1 4h
1924467-02	19-2 8h

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO:

Report Date: 18-Jun-2019  
 Order Date: 13-Jun-2019  
 Project Description: **64853.01**

### Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	13-Jun-19	14-Jun-19
Ammonia, as N	EPA 351.2 - Auto Colour	13-Jun-19	13-Jun-19
Anions	EPA 300.1 - IC	14-Jun-19	14-Jun-19
Colour	SM2120 - Spectrophotometric	13-Jun-19	13-Jun-19
Conductivity	EPA 9050A- probe @25 °C	13-Jun-19	14-Jun-19
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	14-Jun-19	14-Jun-19
E. coli	MOE E3407	13-Jun-19	13-Jun-19
Fecal Coliform	SM 9222D	13-Jun-19	13-Jun-19
Heterotrophic Plate Count	SM 9215C	13-Jun-19	13-Jun-19
Metals, ICP-MS	EPA 200.8 - ICP-MS	14-Jun-19	14-Jun-19
pH	EPA 150.1 - pH probe @25 °C	13-Jun-19	14-Jun-19
Phenolics	EPA 420.2 - Auto Colour, 4AAP	14-Jun-19	14-Jun-19
Subdivision Package	Hardness as CaCO <sub>3</sub>	14-Jun-19	14-Jun-19
Sulphide	SM 4500SE - Colourimetric	18-Jun-19	18-Jun-19
Tannin/Lignin	SM 5550B - Colourimetric	13-Jun-19	14-Jun-19
Total Coliform	MOE E3407	13-Jun-19	13-Jun-19
Total Dissolved Solids	SM 2540C - gravimetric, filtration	13-Jun-19	14-Jun-19
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	15-Jun-19	17-Jun-19
Turbidity	SM 2130B - Turbidity meter	13-Jun-19	13-Jun-19

Certificate of Analysis  
 Client: GEMTEC Consulting Engineers and Scientists Limited  
 Client PO:

Report Date: 18-Jun-2019  
 Order Date: 13-Jun-2019  
 Project Description: 64853.01

<b>Client ID:</b>	19-1 4h	19-2 8h	-	-
<b>Sample Date:</b>	12-Jun-19 12:00	12-Jun-19 16:00	-	-
<b>Sample ID:</b>	1924467-01	1924467-02	-	-
<b>MDL/Units</b>	Drinking Water	Drinking Water	-	-

**Microbiological Parameters**

E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	10	-	-

**General Inorganics**

Alkalinity, total	5 mg/L	338	326	-	-
Ammonia as N	0.01 mg/L	0.44	0.44	-	-
Dissolved Organic Carbon	0.5 mg/L	1.5	2.1	-	-
Colour	2 TCU	11	10	-	-
Conductivity	5 uS/cm	957	904	-	-
Hardness	mg/L	123	135	-	-
pH	0.1 pH Units	8.4	8.3	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	548	552	-	-
Sulphide	0.02 mg/L	3.00	2.30	-	-
Tannin & Lignin	0.1 mg/L	0.7	0.6	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.8	0.7	-	-
Turbidity	0.1 NTU	1.3	1.4	-	-

**Anions**

Chloride	1 mg/L	113	105	-	-
Fluoride	0.1 mg/L	1.1	1.0	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	16	20	-	-

**Metals**

Calcium	0.1 mg/L	25.7	29.2	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-
Magnesium	0.2 mg/L	14.3	15.0	-	-
Manganese	0.005 mg/L	<0.005	<0.005	-	-
Potassium	0.1 mg/L	8.1	8.0	-	-
Sodium	0.2 mg/L	156	142	-	-

Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO:

Report Date: 18-Jun-2019  
 Order Date: 13-Jun-2019  
 Project Description: **64853.01**

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
<b>General Inorganics</b>									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
<b>Metals</b>									
Calcium	ND	0.1	mg/L						
Iron	ND	0.1	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Sodium	ND	0.2	mg/L						
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO:

Report Date: 18-Jun-2019  
 Order Date: 13-Jun-2019  
 Project Description: **64853.01**

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	28.3	1	mg/L	28.4			0.4	10	
Fluoride	0.72	0.1	mg/L	0.74			2.8	10	
Nitrate as N	0.34	0.1	mg/L	0.35			1.5	10	
Nitrite as N	ND	0.05	mg/L	ND				10	
Sulphate	27.0	1	mg/L	27.1			0.5	10	
<b>General Inorganics</b>									
Alkalinity, total	90.6	5	mg/L	91.1			0.6	14	
Ammonia as N	0.338	0.01	mg/L	0.344			2.0	17.7	
Dissolved Organic Carbon	52.9	0.5	mg/L	53.8			1.7	37	
Colour	6	2	TCU	6			0.0	12	
Conductivity	322	5	uS/cm	314			2.8	5	
pH	7.7	0.1	pH Units	7.6			0.8	10	
Phenolics	ND	0.001	mg/L	ND				10	
Total Dissolved Solids	166	10	mg/L	190			13.5	10	
Sulphide	ND	0.02	mg/L	ND				10	
Tannin & Lignin	ND	0.1	mg/L	ND			0.0	11	
Total Kjeldahl Nitrogen	0.17	0.1	mg/L	0.15			9.0	16	QR-01
Turbidity	0.3	0.1	NTU	0.2			3.9	10	
<b>Metals</b>									
Calcium	116	0.1	mg/L	114			2.6	20	
Iron	4.3	0.1	mg/L	4.1			6.2	20	
Magnesium	39.6	0.2	mg/L	37.6			5.3	20	
Manganese	0.113	0.005	mg/L	0.108			4.7	20	
Potassium	6.2	0.1	mg/L	5.9			3.8	20	
Sodium	109	0.2	mg/L	103			5.2	20	
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	ND	1	CFU/100 mL	ND				30	
Heterotrophic Plate Count	30	10	CFU/mL	40			29.0	30	

Certificate of Analysis  
 Client: **GEMTEC Consulting Engineers and Scientists Limited**  
 Client PO:

Report Date: 18-Jun-2019  
 Order Date: 13-Jun-2019  
 Project Description: **64853.01**

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	38.4	1	mg/L	28.4	100	77-123			
Fluoride	1.75	0.1	mg/L	0.74	102	79-121			
Nitrate as N	1.53	0.1	mg/L	0.35	118	79-120			
Nitrite as N	0.883	0.05	mg/L	ND	88.3	84-117			
Sulphate	37.7	1	mg/L	27.1	106	74-126			
<b>General Inorganics</b>									
Ammonia as N	0.571	0.01	mg/L	0.344	90.9	81-124			
Dissolved Organic Carbon	61.3	0.5	mg/L	53.8	75.3	60-133			
Phenolics	0.021	0.001	mg/L	ND	84.1	69-132			
Total Dissolved Solids	104	10	mg/L		104	75-125			
Sulphide	0.51	0.02	mg/L	ND	101	79-115			
Tannin & Lignin	0.8	0.1	mg/L	ND	84.1	71-113			
Total Kjeldahl Nitrogen	2.42	0.1	mg/L	0.15	113	81-126			
<b>Metals</b>									
Calcium	18300		ug/L	7300	110	80-120			
Iron	6520		ug/L	4080	97.5	80-120			
Magnesium	47700		ug/L	37600	101	80-120			
Manganese	157		ug/L	108	97.9	80-120			
Potassium	17500		ug/L	5930	116	80-120			
Sodium	110000		ug/L	103000	69.0	80-120			QM-07

Certificate of Analysis  
Client: **GEMTEC Consulting Engineers and Scientists Limited**  
Client PO:

Report Date: 18-Jun-2019  
Order Date: 13-Jun-2019  
Project Description: **64853.01**

**Qualifier Notes:**

***Login Qualifiers :***

Container(s) - Bottle and COC sample ID don't match -  
*Applies to samples: 19-1 4h, 19-2 8h*

***Sample Qualifiers :***

***QC Qualifiers :***

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable  
ND: Not Detected  
MDL: Method Detection Limit  
Source Result: Data used as source for matrix and duplicate samples  
%REC: Percent recovery.  
RPD: Relative percent difference.

## Certificate of Analysis

**GEMTEC Consulting Engineers and Scientists Limited**

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Andrius Paznekas

Client PO:  
Project: 64853.01  
Custody: 11437

Report Date: 19-May-2020  
Order Date: 11-May-2020

**Order #: 2020119**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2020119-01	TW19-1 R1

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis

Report Date: 19-May-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-May-2020

Client PO:

Project Description: 64853.01

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	15-May-20	15-May-20
Ammonia, as N	EPA 351.2 - Auto Colour	15-May-20	15-May-20
Anions	EPA 300.1 - IC	13-May-20	14-May-20
Colour	SM2120 - Spectrophotometric	13-May-20	13-May-20
Conductivity	EPA 9050A- probe @25 °C	15-May-20	15-May-20
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	14-May-20	14-May-20
E. coli	MOE E3407	12-May-20	12-May-20
Fecal Coliform	SM 9222D	12-May-20	12-May-20
Heterotrophic Plate Count	SM 9215C	12-May-20	12-May-20
Metals, ICP-MS	EPA 200.8 - ICP-MS	15-May-20	15-May-20
pH	EPA 150.1 - pH probe @25 °C	15-May-20	15-May-20
Phenolics	EPA 420.2 - Auto Colour, 4AAP	14-May-20	14-May-20
Hardness	Hardness as CaCO <sub>3</sub>	15-May-20	15-May-20
Sulphide	SM 4500SE - Colourimetric	19-May-20	19-May-20
Tannin/Lignin	SM 5550B - Colourimetric	14-May-20	14-May-20
Total Coliform	MOE E3407	12-May-20	12-May-20
Total Dissolved Solids	SM 2540C - gravimetric, filtration	12-May-20	13-May-20
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	14-May-20	19-May-20
Turbidity	SM 2130B - Turbidity meter	13-May-20	13-May-20

Certificate of Analysis

Report Date: 19-May-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-May-2020

Client PO:

Project Description: 64853.01

Client ID:	TW19-1 R1	-	-	-
Sample Date:	11-May-20 15:15	-	-	-
Sample ID:	2020119-01	-	-	-
MDL/Units	Drinking Water	-	-	-

**Microbiological Parameters**

E. coli	1 CFU/100 mL	3 [1]	-	-	-
Fecal Coliforms	1 CFU/100 mL	3 [1]	-	-	-
Total Coliforms	1 CFU/100 mL	3 [1]	-	-	-
Heterotrophic Plate Count	10 CFU/mL	ND [1]	-	-	-

**General Inorganics**

Alkalinity, total	5 mg/L	297	-	-	-
Ammonia as N	0.01 mg/L	0.38	-	-	-
Dissolved Organic Carbon	0.5 mg/L	12.0	-	-	-
Colour	2 TCU	12	-	-	-
Conductivity	5 uS/cm	884	-	-	-
Hardness	mg/L	144	-	-	-
pH	0.1 pH Units	8.3	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	448	-	-	-
Sulphide	0.02 mg/L	1.94	-	-	-
Tannin & Lignin	0.1 mg/L	0.4	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	-	-	-
Turbidity	0.1 NTU	1.2	-	-	-

**Anions**

Chloride	1 mg/L	112	-	-	-
Fluoride	0.1 mg/L	0.9	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	30	-	-	-

**Metals**

Calcium	0.1 mg/L	30.7	-	-	-
Iron	0.1 mg/L	<0.1	-	-	-
Magnesium	0.2 mg/L	16.3	-	-	-
Manganese	0.005 mg/L	<0.005	-	-	-
Potassium	0.1 mg/L	7.1	-	-	-
Sodium	0.2 mg/L	106	-	-	-

Certificate of Analysis

Report Date: 19-May-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-May-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
<b>General Inorganics</b>									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
<b>Metals</b>									
Calcium	ND	0.1	mg/L						
Iron	ND	0.1	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Sodium	ND	0.2	mg/L						

Certificate of Analysis

Report Date: 19-May-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-May-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	6.91	1	mg/L	6.90			0.1	10	
Fluoride	0.62	0.1	mg/L	0.67			8.1	10	
Nitrate as N	0.17	0.1	mg/L	0.17			1.9	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	31.5	1	mg/L	31.7			0.7	10	
<b>General Inorganics</b>									
Alkalinity, total	298	5	mg/L	297			0.4	14	
Ammonia as N	0.381	0.01	mg/L	0.376			1.4	17.7	
Dissolved Organic Carbon	13.1	0.5	mg/L	12.0			8.4	37	
Colour	12	2	TCU	12			0.0	12	
Conductivity	877	5	uS/cm	884			0.7	5	
pH	8.3	0.1	pH Units	8.3			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	172	10	mg/L	186			7.8	10	
Sulphide	1.94	0.10	mg/L	1.94			0.0	10	
Tannin & Lignin	0.3	0.1	mg/L	0.2			8.4	11	
Total Kjeldahl Nitrogen	0.36	0.1	mg/L	0.41			13.9	16	
Turbidity	0.3	0.1	NTU	0.3			7.1	10	
<b>Metals</b>									
Calcium	30.5	0.1	mg/L	30.7			0.6	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium	15.8	0.2	mg/L	16.3			2.8	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	7.1	0.1	mg/L	7.1			0.8	20	
Sodium	104	0.2	mg/L	106			1.7	20	

Certificate of Analysis

Report Date: 19-May-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 11-May-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>Anions</b>									
Chloride	18.6	1	mg/L	6.90	117	77-123			
Fluoride	1.57	0.1	mg/L	0.67	90.6	79-121			
Nitrate as N	1.35	0.1	mg/L	0.17	118	79-120			
Nitrite as N	1.01	0.05	mg/L	ND	101	84-117			
Sulphate	42.9	1	mg/L	31.7	112	74-126			
<b>General Inorganics</b>									
Ammonia as N	0.660	0.01	mg/L	0.376	114	81-124			
Dissolved Organic Carbon	20.9	0.5	mg/L	12.0	88.8	60-133			
Phenolics	0.023	0.001	mg/L	ND	92.0	69-132			
Total Dissolved Solids	76.0	10	mg/L	ND	76.0	75-125			
Sulphide	0.50	0.02	mg/L	ND	101	79-115			
Tannin & Lignin	1.1	0.1	mg/L	0.2	85.5	71-113			
Total Kjeldahl Nitrogen	2.17	0.1	mg/L	0.41	87.8	81-126			
<b>Metals</b>									
Calcium	9090	0.1	mg/L	ND	90.9	80-120			
Iron	2390	0.1	mg/L	4.4	95.3	80-120			
Magnesium	9530	0.2	mg/L	ND	95.3	80-120			
Manganese	66.7	0.005	mg/L	20.2	93.1	80-120			
Potassium	16000	0.1	mg/L	6190	98.4	80-120			
Sodium	8210	0.2	mg/L	ND	82.1	80-120			

Certificate of Analysis

Report Date: 19-May-2020

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 11-May-2020

Client PO:

Project Description: **64853.01**

**Qualifier Notes:**

*Sample Qualifiers :*

1 : Subcontracted analysis - Caduceon

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

## Certificate of Analysis

### **GEMTEC Consulting Engineers and Scientists Limited**

32 Steacie Drive  
Kanata, ON K2K 2A9  
Attn: Andrius Paznekas

Client PO:  
Project: 64853.01  
Custody: 11397

Report Date: 4-Jun-2020  
Order Date: 2-Jun-2020

**Order #: 2023165**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

<b>Paracel ID</b>	<b>Client ID</b>
2023165-01	TW19-1 R2

Approved By:



Dale Robertson, BSc  
Laboratory Director

Certificate of Analysis

Report Date: 04-Jun-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Jun-2020

Client PO:

Project Description: 64853.01

**Analysis Summary Table**

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ammonia, as N	EPA 351.2 - Auto Colour	4-Jun-20	4-Jun-20
Colour	SM2120 - Spectrophotometric	3-Jun-20	3-Jun-20
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	2-Jun-20	3-Jun-20
E. coli	MOE E3407	2-Jun-20	2-Jun-20
Fecal Coliform	SM 9222D	2-Jun-20	2-Jun-20
Heterotrophic Plate Count	SM 9215C	2-Jun-20	2-Jun-20
Sulphide	SM 4500SE - Colourimetric	4-Jun-20	4-Jun-20
Tannin/Lignin	SM 5550B - Colourimetric	4-Jun-20	4-Jun-20
Total Coliform	MOE E3407	2-Jun-20	2-Jun-20
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	3-Jun-20	4-Jun-20
Turbidity	SM 2130B - Turbidity meter	3-Jun-20	3-Jun-20

Certificate of Analysis

Report Date: 04-Jun-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Jun-2020

Client PO:

Project Description: 64853.01

<b>Client ID:</b>	TW19-1 R2	-	-	-
<b>Sample Date:</b>	01-Jun-20 16:00	-	-	-
<b>Sample ID:</b>	2023165-01	-	-	-
<b>MDL/Units</b>	Drinking Water	-	-	-

**Microbiological Parameters**

E. coli	1 CFU/100 mL	ND [2]	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND [2]	-	-	-
Heterotrophic Plate Count	10 CFU/mL	150	-	-	-

**General Inorganics**

Ammonia as N	0.01 mg/L	0.39	-	-	-
Dissolved Organic Carbon	0.5 mg/L	24.4	-	-	-
Colour	2 TCU	6	-	-	-
Sulphide	0.02 mg/L	1.51	-	-	-
Tannin & Lignin	0.1 mg/L	0.4	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	-	-	-
Turbidity	0.1 NTU	4.2	-	-	-

Certificate of Analysis

Report Date: 04-Jun-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Jun-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Blank**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Certificate of Analysis

Report Date: 04-Jun-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Jun-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Duplicate**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Ammonia as N	0.532	0.02	mg/L	0.579			8.4	17.7	
Dissolved Organic Carbon	9.7	0.5	mg/L	11.1			13.5	37	
Colour	ND	2	TCU	ND			NC	12	
Sulphide	1.51	0.04	mg/L	1.51			0.0	10	
Tannin & Lignin	0.4	0.1	mg/L	0.4			2.7	11	
Total Kjeldahl Nitrogen	0.38	0.1	mg/L	0.42			10.5	16	
Turbidity	0.6	0.1	NTU	0.5			7.3	10	
<b>Microbiological Parameters</b>									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	150			175.0	30	BAC04

Certificate of Analysis

Report Date: 04-Jun-2020

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Jun-2020

Client PO:

Project Description: 64853.01

**Method Quality Control: Spike**

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
<b>General Inorganics</b>									
Ammonia as N	0.250	0.01	mg/L	ND	99.9	81-124			
Dissolved Organic Carbon	20.6	0.5	mg/L	11.1	95.1	60-133			
Sulphide	0.51	0.02	mg/L	ND	103	79-115			
Tannin & Lignin	1.5	0.1	mg/L	0.4	109	71-113			
Total Kjeldahl Nitrogen	2.06	0.1	mg/L	0.42	81.8	81-126			

Certificate of Analysis

Report Date: 04-Jun-2020

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 2-Jun-2020

Client PO:

Project Description: **64853.01**

**Qualifier Notes:**

*Sample Qualifiers :*

2 : A2C - Background counts greater than 200

*QC Qualifiers :*

BAC04 : Duplicate QC data falls within method prescribed 95% confidence limits.

BAC14 : A2C - Background counts greater than 200

**Sample Data Revisions**

None

**Work Order Revisions / Comments:**

None

**Other Report Notes:**

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

## **ATTACHMENT E**

Langelier Saturation Index (LSI)

# Langelier Saturation Index Calculation

Project: 64853.01

Location: Part of Lots 13 and 14, Concession 3, Huntley, Ontario

Sample ID: TW19-1 8 hr

Well Tag: A260891

## Inputs

pH =	8.3	
Total Dissolved Solids =	552	
Calcium (as CaCO <sub>3</sub> ) =	144	Note: Ca (as CaCO <sub>3</sub> ) = 2.5 x Ca
Alkalinity (as CaCO <sub>3</sub> ) =	297	
Temperature (°C) =	10	Assumed average groundwater temperature

Where Langelier Saturation Index (LSI) is defined as:  $LSI = pH - pH_s$

Where:  $pH_s = (9.3 + A + B) - (C + D)$

And:  $A = \frac{(\log_{10}[TDS] - 1)}{10}$

$$B = -13.12 \cdot \log_{10}[Temp + 273] + 34.55$$

$$C = \log_{10}[Calcium] - 0.4$$

$$D = \log_{10}[Alkalinity]$$

## Output:

A =	0.17
B =	2.38
C =	1.76
D =	2.47
pH <sub>s</sub> =	7.63

**LSI = 0.67**

## LSI Value

-2.0 to -0.5

-0.5 to 0.0

LSI = 0

0.0 to 0.5

0.5 to 2

## Indication

Serious corrosion

Slight corrosion but non-scale forming

Balanced but corrosion possible

Slightly scale forming and corrosive

Scale forming but non corrosive



**GEMTEC**  
CONSULTING ENGINEERS  
AND SCIENTISTS