PATERSON GROUP

Consulting Engineers
9 Auriga Drive
Ottawa, Ontario
K2E 7T9
Tel: (613) 226-7381

Geotechnical Engineering
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May 29, 2025

PH4991-LET.02

Titan Environmental Management
777 Quest Boulevard
Ile de Chenes, Manitoba
R0A 0T1

Attention: Lucky Montierro

Subject: **Hydrogeological Assessment and Terrain Analysis**
Proposed Commercial Development
541 Somme Street, Ottawa, Ontario

INTRODUCTION

Further to your request, Paterson has conducted a Hydrogeological Assessment and Terrain Analysis in support of a Site Plan Control Application (hereby referred to as a Site Plan application) for the proposed commercial development located at 541 Somme Street in Ottawa. Please refer to the Figure 1 - Key Plan attached for the approximate site location.

The purpose of this work has been to determine the suitability of the water supply aquifer underlying the site to support the Site Plan Application for a new commercial building.

The Subject Site consists of a 0.80 ha lot and which is mostly grass covered with a treed area on the far east portion of the site. The ground surface is generally flat with a downward slope towards the eastern end of the site.

The suitability of the aquifer to supply the subject site was assessed using the methodology provided in City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG).

The following Assessment is for a non-drinkable water supply source, due to the manganese concentration encountered in the test well which exceeded the Ontario Drinking Water Standards and Operational Guidelines (ODWSOG) Maximum Acceptable Concentration (MAC).

HYDROGEOLOGICAL PRE-CONSULTATION

A Hydrogeological pre-consultation was completed with a City of Ottawa Hydrogeologist on December 3, 2024. The City Hydrogeologist suggested that additional sampling be completed during the 8-hour pumping test for Polycyclic Aromatic Hydrocarbons (PAH's) in addition to the standard Subdivision Package suite of parameters, trace metals and Volatile Organic Compounds (VOCs) required by the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG).

DESCRIPTION OF SUBJECT SITE

The subject site is an approximately 0.80 ha lot, generally infilled with fill material. The Site Plan application is for a proposed commercial development. Please refer to Figure-1 Key Plan and Novatech Drawing No. 1241111-SP Site Plan dated February, 2025 attached for the proposed site location and site layout.

The subject site is currently vacant, and will be serviced by a private water supply and sewage system. A new drilled well was installed onsite, hereafter referred to as Test Well 1 (TW1), is the well which will service the new building.

The site is bordered by vacant land to the north and south, by agricultural lands to the east and by Somme Street to the west. The subject site itself and the surrounding commercial areas are zoned RH for Rural Heavy Industrial Zone (GeoOttawa).

POTENTIAL KARST

Based on available Ontario Geological Survey (OGS) mapping (GRS005), the subject site is not within an area of known, potential or inferred karst.

RAISIN-SOUTH NATION SOURCE PROTECTION PLAN

The Raisin-South Nation Source Protection Plan (RSNSPP) provides guidance as to which policies apply to a given property, municipality or specific activity and if there are specific designations that apply to the area. The subject site and surrounding areas have been designated as a Highly Vulnerable Aquifer (HVA within the RSNSPP) and is identified as one of four groundwater related vulnerable areas identified within the Clean Water Act (2006). The four vulnerable areas consist of Significant Groundwater Recharge Area (SGRA), HVA, Intake Protection Zone (IPZ), and wellhead protection area (WHPA).

Based upon the designation, the RSNSPP provides a list of activities that are prohibited, managed or encouraged to change/educate dependent upon the vulnerable area type. There is no restrictions of land uses on the subject site based upon its proposed usage.

Therefore, there are no related requirements for an HVA at this location.

FIELDWORK PROGRAM

Well Testing

As a means to demonstrate the adequacy of the aquifer underlying the subject lands with respect to water quality and quantity, TW1 was installed and submitted to a pumping test. TW1 has a Water Well Record (WWR) Well ID of A421912. TW1 has a 152.4 mm diameter steel casing that extends to 12.1 m below ground surface (bgs) with a 0.65 m stick up. The well itself extends to a depth of 42.67 m bgs. Based on available geological mapping, the drift thickness at TW1 varies from 0 to 1 m. Refer to Novatech Drawing 124111-SP Site Plan, dated February 2025, attached, for the approximate location of TW1.

As a means to evaluate the water supply aquifer intercepted by the well, the well was subjected to an 8-hour constant rate pumping test. The pumping test was conducted on March 4, 2025 under the full-time supervision of Paterson personnel. Prior to the pumping test the well was disinfected, and a data-logger was installed to monitor the background groundwater levels.

A submersible pump was installed by Air Rock Drilling Co Ltd and used for the 8-hour pumping test. The pumping test was carried out at a pumping rate of 57 L/min for a duration of 8 hours. The water was discharged at surface towards the northwest portion of the site. During the pumping test, the pumping rate was periodically measured using the timed volume correlation method. The pumping rate was maintained within 5% of the selected pumping rate. The static water level was recorded manually and an electric datalogger (VanEssen TD-Diver) was installed in the test well prior to the start of the pumping test.

The selected rate of 57 L/min provides approximately 27.2 times the maximum total daily design volume of 1,005 L/day for the septic system during the 8-hour pumping test. The total daily design sanitary sewage flows (TDDSSF) were calculated as per the Ontario Building Code Section 8.2.1.3. The TDDSSF calculation was performed by Novatech and the approved Ottawa Septic System Office (OSSO) Sewage System Installation Permit (SSIP) is available under separate cover. The rate was determined to be representative of a flow rate which would be in excess of what the development would require.

The data logger recorded water levels at 30 second intervals. In addition, manual water level readings were taken at periodic intervals during the test.

Recovery data was collected from the well following the completion of the pumping. The well was noted to have achieved 95% recovery approximately 15 minutes after the completion of pumping.

Groundwater samples were collected at 4 hours and 8 hours after the start of pumping. Prior to collection of the groundwater samples, the free chlorine residual was verified as

non-detectable. The water samples were submitted for comprehensive testing of bacteriological, chemical, and physical water quality parameters consistent with the standard “Subdivision Supply” suite of parameters plus trace metals, VOCs, and PAHs.

Due to elevated field parameters, after completing the 8-hour pumping test of 57 L/min, the flow rate was reduced to 24 L/min for an additional hour, where additional field sampling was performed and additional laboratory samples were obtained for colour and turbidity.

All samples were collected unfiltered and unchlorinated and were placed directly into clean bottles supplied by the analytical laboratory. Samples were placed immediately into a cooler with ice and were transported directly to Environmental Testing Canada Inc. (Eurofins) laboratory in Ottawa. All samples were received by the laboratory within 24 hours of collection.

A series of field tests of the pumped water were carried out at the well head during the 8-hour pumping test. The parameters tested at the well head included: pH, total dissolved solids, conductivity, turbidity, apparent colour, hydrogen sulfide, and temperature. Calibration / confirmation of calibration of all field-testing equipment was performed in Paterson’s laboratory the day prior to the pumping test. Values are then confirmed again onsite prior to the start of the pumping test.

Aquifer Analysis

Water Quantity

Pumping test data was analyzed using AQTESOLV Pro Version 4 aquifer analysis software package by HydroSOLVE Inc. Drawdown data was measured using an electronic water level tape and an electronic datalogger unit.

Table 1: SUMMARY OF WATER SUPPLY AQUIFER CHARACTERISTICS OF TW1

AQUIFER PARAMETER	RESULT OF ANALYSIS
Transmissivity (m^2/day)	52
Storativity	3.44E-04
Pumping Rate (L/min)	57
Pre-test Static Water Level (m)	6.7
Post-test Static Water Level (m)	9.0
Available Drawdown (m)	36.0
% Drawdown During Pumping Test (%)	6
Specific Capacity (L/min/m drawdown)	24.9

The drawdown data was analyzed using the Theis and Cooper Jacob methods of analysis. Aquifer transmissivity is estimated to be 52 m^2/day. The aquifer storativity is

estimated to be 3.44E-04. Refer to the Theis and Cooper Jacob methods of analysis data sheets attached to this report.

The water level varied over the constant-rate pumping test, with a trend of decreasing with time. The variance in drawdown can be attributed to the development of the well during the pumping test.

The pumping test results show that TW1 has a high yield to support the water demands that may be required. Overall maximum drawdown at a constant pumping rate for a period of 8 hours was approximately 2.3 m (6% of the available drawdown). Full Recovery was attained within 15 hours after pumping ceased.

The total volume of water pumped during the 8-hour pumping event was approximately 27,360 L. This is approximately 27.2 times the maximum total daily design volume of water (1,005 L/d) required to support the Site Plan Control Application.

The suitability of the aquifer to supply the proposed Site Plan Application for the proposed commercial modification was assessed using the methodology provided in the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (HTAG).

Based on the information summarized in Table 1, it is readily apparent that the water supply well has intercepted an adequately strong water supply aquifer which has sufficient quantity to service the proposed Site Plan Control Application.

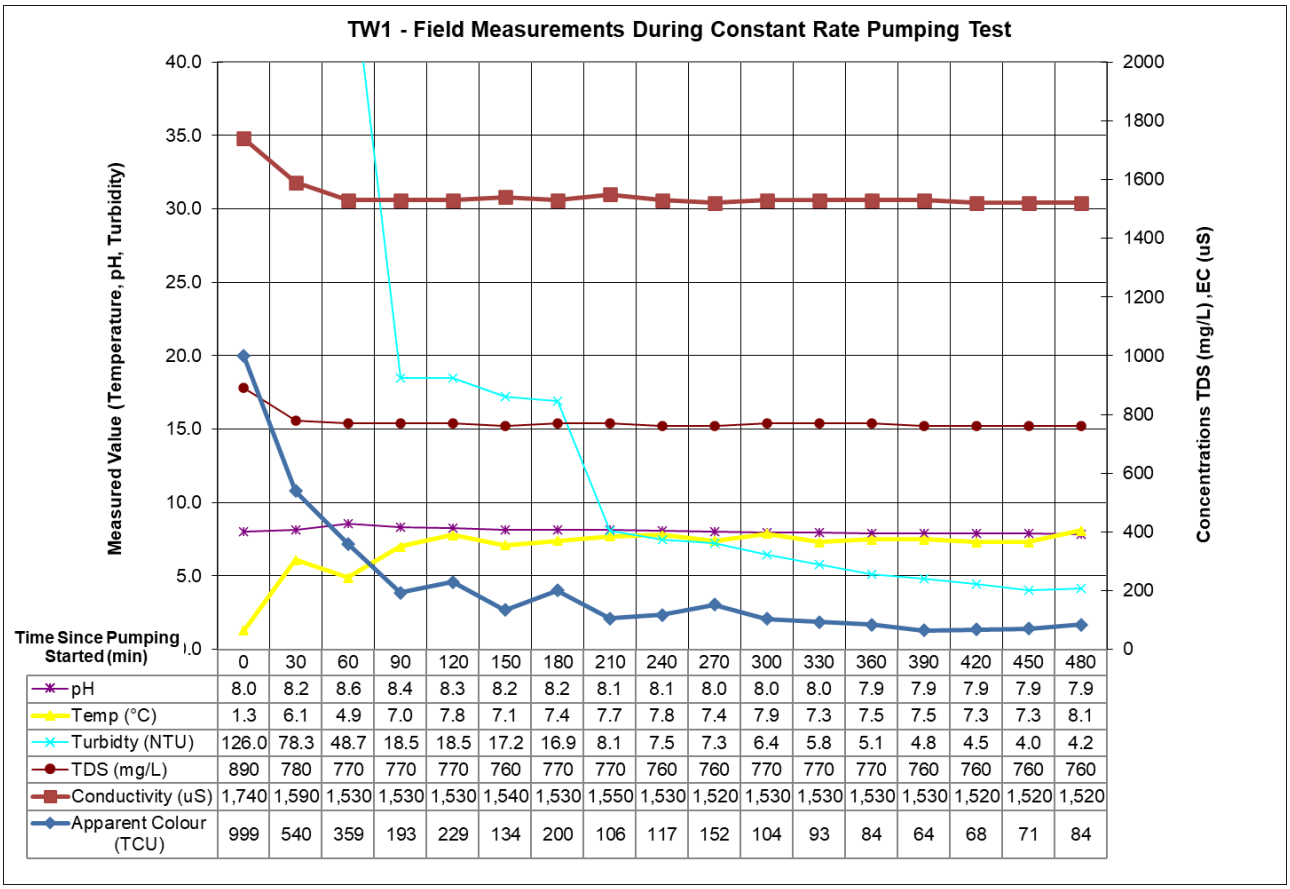
Given the analyses presented and summarized above, it is our opinion that there is an adequate supply of water to support the proposed Site Plan Control Application. Available water well records (WWR) of the neighboring properties on the MECP Well Record mapping website indicated that the wells were screened in limestone. Surrounding WWRs are attached to this report.

Water Quality

Field Data

Turbidity, electrical conductivity, total dissolved solids (TDS), pH, apparent color and temperature were measured at the wellhead during the pumping test. The measurements and time intervals for each of these parameters are summarized on the graphical representation (Figure 1) below. In addition, a HACH Pocket Colorimeter II chlorine reader was used to measure the free chlorine residual level. No chlorine residual was detected in the discharge water prior to the collection of the water samples.

Hydrogen sulfide was detected olfactorily during the pumping test. Hydrogen sulfide was measured using the HACH Hydrogen Sulfide Test Kit, Model HS−C, (# 2537800) when it was detected. Hydrogen sulfide was measured in the range of 0-0.1 mg/L at each point.



Time Since Pumping Started (min)	0	30	60	90	120	150	180	210	240	270	300	330	360	390	420	450	480
pH	8.0	8.2	8.6	8.4	8.3	8.2	8.2	8.1	8.1	8.0	8.0	8.0	7.9	7.9	7.9	7.9	7.9
Temp (°C)	1.3	6.1	4.9	7.0	7.8	7.1	7.4	7.7	7.8	7.4	7.9	7.3	7.5	7.5	7.3	7.3	8.1
Turbidty (NTU)	126.0	78.3	48.7	18.5	18.5	17.2	16.9	8.1	7.5	7.3	6.4	5.8	5.1	4.8	4.5	4.0	4.2
TDS (mg/L)	890	780	770	770	770	760	770	770	760	760	770	770	770	760	760	760	760
Conductivity (uS)	1,740	1,590	1,530	1,530	1,530	1,540	1,530	1,550	1,530	1,520	1,530	1,530	1,530	1,530	1,520	1,520	1,520
Apparent Colour (TCU)	999	540	359	193	229	134	200	106	117	152	104	93	84	64	68	71	84

Figure 1: *Field Measurements*

Laboratory Data

The Subdivision Package suite of parameters and trace metals laboratory water quality obtained from the pumping test of TW1 is provided in Table 2a and 2b below, and the laboratory analyses reports can be found attached. VOC and PAH laboratory analytical testing were completed and measured to be non-detect in the sample results. All laboratory test results can be found attached to this report.

TABLE 2a: GROUNDWATER MICROBIOLOGY & GENERAL GEOCHEMISTRY						
PARAMETER	UNITS	ODWS		TW1		
		LIMIT	TYPE	GW1 (4 hr) 3/4/2025	GW2 (8 hr) 3/4/2025	GW3 (9 hr) 3/4/2025
MICROBIOLOGICAL						
Escherichia Coli (E.Coli)	ct/100mL	0	MAC	0	0	-
Total Coliforms	ct/100mL	0	MAC	4	3	-
GENERAL CHEMICAL - HEALTH RELATED						
Fluoride (F)	mg/L	1.5	MAC	0.16	0.18	-
Ammonia ($N\text{-}NH_3$)	mg/L	-	-	0.80	0.83	-
Nitrite ($N\text{-}NO_2$)	mg/L	1	MAC	<0.5	<0.5	-
Nitrate ($N\text{-}NO_3$)	mg/L	10	MAC	<0.5	<0.5	-
Total Kjeldahl Nitrogen	mg/L	-	-	1.24	1.10	-
Turbidity (Field)	NTU	1.0 (5.0)	MAC/AO	7.5	4.20	2.38
Turbidity (Laboratory)	NTU	1.0 (5.0)	MAC/AO	16.4	17.0	18.3
GENERAL CHEMICAL - AESTHETIC RELATED						
Alkalinity (as CaCO3)	mg/L	30-500	OG	578	570	-
Chloride (Cl)	mg/L	250	AO	116	115	-
Colour (Apparent - Lab)	TCU	5	AO	97	86	116
Colour (Apparent - Field)	TCU	5	AO	117	84	76
Conductivity	uS/cm	-	-	1,530	1,530	-
Dissolved Organic Carbon	mg/L	5	AO	7.70	7.20	-
Hardness (as CaCO3)	mg/L	100	OG	708	704	-
Ion Balance	unitless	-	-	1.01	1.02	-
pH	unitless	6.5-8.5	AO	7.91	7.72	-
Phenols	mg/L	-	-	<0.001	<0.001	-
Sulphate (SO_4)	mg/L	500	AO	185	185	-
Sulphide (S_2^-)	mg/L	0.05	AO	<0.01	<0.01	-
Tannin & Lignin	mg/L	-	-	0.70	0.70	-
Total Dissolved Solids	mg/L	500	AO	995	993	-

1. ODWS identifies the following types of parameters:
   MAC = Maximum Allowable Concentration
   AO = Aesthetic Objective
   OG = Operational Guideline
2. Shaded Concentration Indicates an Exceedance of the ODWS Objective

TABLE 2b: GROUNDWATER GEOCHEMISTRY - METALS						
PARAMETER	UNITS	ODWS		TW1		
		LIMIT	TYPE	GW1 (4 hr) 3/4/2025	GW2 (8 hr) 3/4/2025	GW3 (9 hr) 3/4/2025
Volatiles						
Aluminum (Al)	mg/L	0.1	OG	0.07	0.03	0.03
Antimony (Sb)	mg/L	0.006	IMAC	<0.0005	<0.0005	<0.0005
Arsenic (As)	mg/L	0.01	IMAC	<0.001	<0.001	<0.001
Barium (Ba)	mg/L	1.0	MAC	0.22	0.21	0.214
Beryllium (Be)	mg/L	-	-	<0.0005	<0.0005	<0.0005
Boron (B)	mg/L	5.0	IMAC	0.10	0.11	0.11
Cadmium (Cd)	mg/L	0.005	MAC	<0.0001	<0.0001	<0.0001
Calcium (Ca)	mg/L	-	-	190	188	188
Chromium (Cr)	mg/L	0.05	MAC	<0.001	<0.001	<0.001
Cobalt (Co)	mg/L	-	-	0.0002	0.0002	0.0002
Copper (Cu)	mg/L	1.0	AO	<0.001	<0.001	<0.001
Iron (Fe)	mg/L	0.3	AO	2.22	2.19	2.29
Lead (Pb)	mg/L	0.01	MAC	<0.001	<0.001	<0.001
Magnesium (Mg)	mg/L	-	-	57	57	57
Manganese (Mn)	mg/L	0.05	AO	2.89	2.87	2.89
Mercury (Hg)	mg/L	0.001	MAC	<0.0001	<0.0001	<0.0001
Molybdenum (Mo)	mg/L	-	-	0.001	0.01	0.009
Nickle (Ni)	mg/L	-	-	<0.005	<0.005	<0.005
Potassium (K)	mg/L	-	-	11	11	11
Selenium (Se)	mg/L	0.05	MAC	<0.001	<0.001	<0.001
Silver (Ag)	mg/L	-	-	<0.0001	<0.0001	<0.0001
Sodium (Na)	mg/L	200	AO	100	101	101
Strontium (Sr)	mg/L	-	-	4.5	4.56	4.62
Thallium (Tl)	mg/L	-	-	<0.0001	<0.0001	<0.0001
Uranium (U)	mg/L	0.02	MAC	0.001	0.001	0.001
Vanadium (V)	mg/L	-	-	<0.001	<0.001	<0.001
Zinc (Zn)	mg/L	5.0	AO	<0.01	<0.01	<0.01

1. ODWS identifies the following types of parameters:
   MAC = Maximum Acceptable Concentration
   IMAC = Interim Maximum Acceptable Concentration
   AO = Aesthetic Objective
   OG = Operational Guideline
2. Shaded Concentration Indicates an Exceedance of the ODWS Objective

The bacteriological test results (Certificate of Analysis – Report No. 4259100) indicated that the test samples at the 4- and 8-hour interval were non-detect (0 ct/100 mL) for E.Coli. Total coliforms were detected in concentrations of 4 and 3 ct/100 mL at the 4-hour and 8-hour marks, respectively. According to the City of Ottawa HTAG, a total coliform concentration of less than 6 ct/100 mL is deemed acceptable.

The water quality of the subject water supply well meets all the Ontario Drinking Water Standards maximum acceptable concentrations (MAC) with the exception of Manganese. As there is an exceedance of a health-related parameter and the exceedance is above the Maximum Concentration Considered Reasonably Treatable (MCCRT), the water source can only be used as a non-drinking water source. The water meets all of the

Aesthetic Objectives (AO) and Operational Guidelines (OG) with the exception of the following:

- Hardness (as $CaCO_3$)
- Alkalinity (as $CaCO_3$)
- Dissolved Organic Carbon (DOC)
- Colour
- Turbidity
- Total Dissolved Solids (TDS)
- Iron (Fe)

Each of these groundwater parameters are discussed in detail below.

Should any water treatment be desired by the owner, it is recommended that a water treatment specialist be retained to ensure that water treatment occurs in a safe manner.

As the water is considered to be a non-drinking water source, there will be **no consumption** of the non-drinking water supply, and signs will be posted to indicate that there should be no consumption from the available faucets. The public will not have access to the proposed bathroom facilities. Drinking water will need to be brought in from external sources such as water coolers.

Hardness as $CaCO_3$

Hardness, expressed as calcium carbonate, is an operational guideline and does not appear in the ODWS. Rather, it appears in the Technical Support Documents for Ontario Drinking Water Standards, Objectives and Guidelines as a parameter with an operational guideline at 100 mg/L. At the measured concentrations of 708 and 704 mg/L, the water is considered to be extremely hard, and it is above the reasonably treatable limit of 500 mg/L specified in Table 3 of the MOECC guidance document Procedure D-5-5 (1996).

The Technical Support Document for Ontario Drinking Water Standards, Objectives, and Guidelines sets the MCCRT of hardness at 500 mg/L as, at concentrations removed above this limit, the salt exchange would make the water unpalatable and unsuitable for domestic use (i.e. consumption). As the water well is being used as a non-drinking water source (i.e. not used for consumption), the MCCRT does not apply in this case.

The Langelier Saturation Index (LSI) calculation provided an LSI of 0.6. Based on the evaluation of the result, the water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive). Based on the range of stability in the positive direction, there are no mitigative measures needed to prevent corrosion, however, hardness reduction technologies can be implemented to prevent scaling which may inhibit boilers and cause staining. See Langelier Saturation Index Calculation attached for calculation details.

It is recommended that water hardness be treated using conventional technologies such as water softening or reverse osmosis, if desired by the owner. Without treating hardness, scaling can occur which can result in discolouration and residue buildup on water fixtures, or reduction in boiler efficiency due to scale build-up. According to Health Canada's *Guidelines for Canadian Drinking Water Quality - Summary Tables,* "Although hardness may have significant aesthetic effects, a guideline has not been established because public acceptance of hardness may vary considerably according to the local conditions; major contributors to hardness (calcium and magnesium) are not of direct public health concern".

Alkalinity

Alkalinity, expressed as calcium carbonate, is a measure of the resistance of the water to the effects of acids added to water. Alkalinity is an operation guideline and does not appear in the ODWS. Rather, it appears in the Technical Support Documents for Ontario Drinking Water Standards, Objectives and Guidelines as a parameter with an operational guideline at 500 mg/L. At concentrations above the operational guideline, scaling may form on service pipes and water heaters. The alkalinity concentration in the groundwater was 578 and 570 mg $CaCO_3$/L at 4 and 8 hours, respectively. As there is no MCCRT or health related effects related to alkalinity, no treatment is required. It is anticipated that the treatment of hardness would reduce alkalinity to within acceptable limits.

The Langelier calculation provided an LSI of 0.6. Based on the evaluation of the result, the water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive). Based on the range of stability in the positive direction, there are no mitigative measures needed to prevent corrosion, however, hardness reduction technologies can be implemented to prevent scaling which may inhibit boilers and cause staining. See Langelier Saturation Index Calculation attached for calculation details.

Dissolved Organic Carbon

Dissolved Organic Carbon (DOC) is a key indicator of potential water quality deterioration, as it can serve as a nutrient source that promotes bacterial growth. Furthermore, DOC can react with chlorine to create disinfection by-products which may be harmful. DOC was found in the groundwater at concentrations of 7.7 and 7.2 mg/L at the 4- and 8-hour marks, respectively. The DOC concentrations found in the groundwater exceed the aesthetic objective of 5 mg/L. As the water is to be used as a non-drinking water source, there will be no consumption of the water and, therefore, the aesthetic objective exceedance is not anticipated to be an issue.

Total Dissolved Solids (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. The TDS concentration of 993 mg/L exceeds the

Aesthetic Objective of 500 mg/L. At concentrations above 500 mg/L, some consumers may find the taste objectionable, however, as the objective is an aesthetic objective and the water will be used for non-drinking water sources, no treatment is required.

The Langelier calculation provided an LSI of 0.6. Based on the evaluation of the result, the water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive). Based on the range of stability in the positive direction, there are no mitigative measures needed for TDS specifically. See Langelier Saturation Index Calculation attached for calculation details.

Iron

Concentrations of iron above 0.3 mg/L can contribute to staining of fixtures and a metallic taste at higher concentrations. Precipitation of iron can promote the growth of iron bacteria in pipes. The concentration of iron in the groundwater in TW1 was measured to be 2.19 to 2.29 mg/L. The concentration of iron in the groundwater is considered to be reasonably treatable in accordance with Procedure D-5-5. It is recommended that a water softener or manganese greensand filter be used to reduce the levels of iron and reduce the potential for excessive precipitate occurring in the water supply system, if desired by the property owner. If treatment is not used, negative impacts such as discolouration of water fixtures, precipitation of iron and staining may occur.

Manganese

The manganese concentration results from the laboratory test samples yielded a value of 2.89 mg/L in the onsite well, which is above the aesthetic objective in the ODWSOG of 0.05 mg/L and the health related MAC of 0.12 mg/L. As the manganese concentration is well above the MAC of 0.12 mg/L and the MCCRT of 1 mg/L, the water is considered not safe to consume. Therefore, the water source will be considered only as a non-drinking water source.

Manganese, like iron, can stain fixtures at concentrations above 0.05 mg/L. Procedure D−5−5 gives a maximum concentration considered reasonably treatable for manganese as 1.0 mg/L. It is recommended that a reverse osmosis system, ion exchange / water softeners and / or an oxidizing filter be used to reduce the manganese concentration, if desired by the owner.

As the concentration of manganese is elevated above the Health Canada Federal Drinking Water Guidelines, a notice regarding the elevated levels of manganese in the aquifer accessed by TW1 is recommended to be registered on title so that future owners are made aware.

The City of Ottawa (Ottawa Public Health) has prepared a Manganese in drinking Water Factsheet, which can be found attached to this report.

Colour

Colour may occur in drinking water for several reasons. It may be due to organic substances from the decay of vegetation, or the presence of metals such as iron, manganese, and copper, which are abundant in nature. The provincial aesthetic objective for colour in drinking water is 5 True Colour Units (TCU). The federal (Health Canada) guideline aesthetic objective limit for colour is 15 TCU (Guidelines for Canadian Drinking Water Quality, Health Canada June 2019). Procedure D-5-5 gives a maximum concentration considered reasonably treatable for colour as 7 TCU.

During the field pumping test, a DR900 colorimeter was used to measure apparent colour in the groundwater at regular intervals. Apparent colour in the groundwater was measured as 86 TCU at the end of the 8 hour pumping test which is above the aesthetic guidelines of 5 TCU and above the MCCRT of 7 TCU. The elevated apparent colour levels detected in the lab samples and field samples is attributed to the precipitation of iron and manganese out of the groundwater. Due to the elevated concentrations of iron and manganese in the groundwater, rapid discolouration can occur when exposed to oxygen. It is anticipated that the colour concentration will decrease with the treatment of other parameters such as iron and manganese.

Turbidity

Turbidity, which is generally an aesthetic parameter, was detected in the laboratory test samples at values of 16.4 to 18.3 NTU in pumping test. Field testing detected the samples at values of 7.48, 4.15 and 2.38 NTU in the 4, 8, and 9-hour field tests, respectively. Continued pumping showed a decrease towards the end of the test. It is expected that continued use of the well would further reduce turbidity values. The elevated turbidity in the laboratory analyzed samples is attributed to the precipitation of iron and manganese. Therefore, it is anticipated that turbidity levels will also decrease due to treatment of other constituents, if treatment is desired by the owner.

During the pumping test, a Hanna Instruments HI98703 Fast Tracker Turbidity Meter was used to measure the turbidity in the groundwater at regular intervals. The ODWS maximum acceptable concentration for turbidity in drinking water entering the distribution system is 1 NTU. The Aesthetic Objective for turbidity in drinking water reaching the consumer is 5 NTU. The field test parameters are below the 5 NTU objective. As turbidity was detected above 1 NTU, particular care must be taken during testing to ensure that the bacteria requirements of Table 1 are met. The bacteriological test results indicated that the test samples at the 4 and 8 hour interval were non-detect (0 ct/100 mL) for E.Coli, and Total Coliforms was below 6 ct/100 mL which is considered acceptable.

Terrain Analysis

Surficial Geology

A series of boreholes were put down on the subject parcel to delineate the subsurface soil conditions as part of the Geotechnical Investigation (Paterson Report PG7327-1 dated November 25, 2024). On November 11, 2024 three (3) boreholes were excavated on the property for the design of the proposed building and its associated infrastructure. The boreholes were advanced to a maximum depth of 1.3 m below ground surface (bgs). Additionally, one borehole (Paterson Report PE4828-1R, 2019) and one test pit (Paterson Report PG6452-1, 2022) were excavated at the site during previous investigations. The boreholes were distributed in a manner to provide general coverage of the subject site, taking into consideration underground services and available site access. The locations of the test pits on the property are delineated on the Test Hole Location Plan, drawing PG7327-1, attached.

The borehole locations were recorded and the subsurface conditions, including the soil morphology and depth to the groundwater table (if encountered), were carefully observed and recorded. The soils encountered were classified texturally in the field and later reviewed in the laboratory.

Generally, the subsurface profile at the borehole locations were observed to consist of imported fill material to a depth of 0.6 to 1.3 m. The fill material was generally observed to consist of loose to compact, grey to brown silty sand to sandy silt with traces of topsoil and gravel. Practical refusal to augering was encountered on inferred bedrock at depths ranging from 0.6 to 1.3 m bgs. No groundwater was observed within the boreholes.

It should be noted that groundwater levels can fluctuate both seasonally and in conjunction with precipitation events. Therefore, the groundwater levels could vary at the time of construction.

Reference should be made to the test pit logs appended to this report for the details of the soil profiles encountered at each test hole location. The client should be aware that any information pertaining to soils are furnished as a matter of general information only and borehole descriptions are not to be interpreted as descriptive of conditions at locations other than those described by the boreholes themselves.

Hydrogeological Sensitivity of the Site

The subject site is currently vacant and undeveloped. The subject site is to be serviced by a private well and septic system. The site is bordered by vacant land to the north and south, by agricultural lands to the east and by Somme Street to the west. All surrounding properties are on private services.

The overburden at the test hole locations generally consists of a fill overlying bedrock. Refusal was encountered between 0.6 to 1.3 m bgs. According to available geological mapping, the drift thickness within the site varies from 0 to 1 m bgs.

According to the geotechnical field investigation, the overburden thickness was observed to be less than 2 m. Due to the shallow nature of the inferred bedrock, the site is considered to be hydrogeologically sensitive and, therefore, mitigating measures are recommended. It is recommended that any sewage system be located a minimum of 30 m from the water supply well, and that the sewage system is lined with a **100 mm** clay seal.

Conceptual Lot Development Plan

A one-storey warehouse with a mezzanine and an office along with associated parking and infrastructure is proposed to be constructed onsite. The location of the proposed structure can be found on the attached Novatech Drawing 124111-SP, Site Plan dated February, 2025. The proposed private sewage servicing and site grading design is provided by Novatech.

Proposed Sewage System

A sewage system design was completed by Novatech. Novatech provided a total daily design sewage flow (TDDSF) of 1,005 L/day and a sewage system capacity of 1,100 L/day.

Predictive Nitrate Impact Assessment

Nitrate is considered to be a critical parameter of concern when assessing impacts to groundwater quality downgradient of an onsite sewage system. The City's HTAG, including the annotated MECP Procedure D-5-4 applies for the proposed development. For the purpose of this guideline, the Ontario Drinking Water Objective of 10 mg/L of nitrate is used as an indicator of groundwater impact potential.

Under this guideline, where the average lot size is one hectare or larger and the minimum lot size is 0.8 ha or greater, a detailed impact assessment may not be required. It has been the City of Ottawa's policy that where the lot size of 0.8 ha or larger, a detailed assessment is typically not required since it is considered to be a low-risk development.

The subject site is located within the Hawthorne Industrial Park industrial subdivision (Golder Associates 08-1122-0215-3, September 2011). The subject site is 0.8 ha in size, while the industrial subdivision has an average lot size of 3.15 ha, with lot sizes ranging from 0.8 – 11.04 ha. As such, a detailed nitrate impact assessment (NIA) would not typically be necessary. An NIA was completed below to corroborate our opinion that the property can adequately support the proposed lot severances without having adverse impacts on the underlying bedrock aquifer should the minimum separation distances, well construction, and septic system be completed as per the recommendations of this report and the OBC. The values shown in the Predictive Nitrate Impact Assessment attached to

this report are summarized below. To be conservative, the maximum sewage system capacity of 1,100 L/day was used for the assessment.

- ❑ Site area — 0.8 ha
- ❑ Impervious area (%) — 56 %
- ❑ Daily sewage flow — 1.1 m^3/d
- ❑ Concentration of nitrate in effluent — 40 mg/L
  (Value based on typical effluent concentration)
- ❑ Concentration of nitrate in effluent with treatment — 20 mg/L
  (Value based on nitrate reduction system (Ecoflo ECDn Series) with 50 % nitrate reduction)
- ❑ Surplus Water — 379 mm/yr
  (The surplus water value was estimated based on Environment Canada Climate Office values with a soil type comprised of fine sandy loam (Urban Lawns) and anthropogenic sources.)
- ❑ Combined infiltration factor based on: — 0.70
- Topography infiltration factor — 0.30
- Soil texture infiltration factor — 0.30
- Cover infiltration factor — 0.10

The topography infiltration factor of 0.30 is based upon a flat land with an average slope of 0.6 m/km. The soil texture infiltration factor was based upon a silty sand-based fill which is approximated to be between “open sandy loam” and “medium combinations of loam and clay” with a value of 0.3. This is a reasonable generalization of the overburden. The “cover infiltration factor” was calculated at 0.10 based upon a conservative cultivated land type cover.

There are numerous tertiary treatment technologies that are NSF/ANSI 245 and/or BNQ certified for 50% nitrate reduction, resulting in an effluent nitrate concentration of 20 mg/L. When using an effluent nitrate concentration of 20 mg/L, the predicted nitrate concentration at the property boundary is **5.97 mg/L**. This is below the limit of 10 mg/L of nitrate at the property boundary.

Based on the results of the predicted nitrate impact assessment, it is our opinion that the property can adequately support the proposed building addition without having an adverse impact on the underlying bedrock aquifer, provided that a NSF/ANSI 245 and/or BNQ certified 50% nitrate reduction technology is used in the septic system.

CONCLUSIONS

Based on the information contained within the body of this report the following conclusions can be drawn:

1. The water supply aquifer intercepted by the existing well is considered to be adequate to support the water quantity demands for the proposed commercial development.

2. The property owner will need to ensure that protective measures are taken to protect the wellhead, such as the use of a barrier, when constructing the proposed commercial development.

3. The groundwater contains elevated concentrations of hardness, alkalinity, DOC, TDS, colour, turbidity, iron, and manganese. The noted parameters can be treated to functional concentrations with current readily available water conditioning equipment.

4. Elevated concentrations of manganese were encountered in the water supply intercepted by TW1. The manganese concentration was recorded to be 2.29 mg/L in the groundwater, which exceeded the MAC of 0.12 mg/L and the MCCRT of 1.0 mg/L. Therefore, as there is a health-related risk, the water is considered not suitable to consume and can only be used for non-drinking water sources such as toilet flushing. As the manganese exceedance is health related, a notice regarding the elevated levels of manganese in the aquifer accessed by TW1 is recommended to be registered on title so that future owners are made aware. Manganese treatment is recommended to reduce staining.

5. If desired by the property owner, a residential grade water softener can be used to facilitate the reduction of the hardness concentration and reduce scaling. If a water softener is used for the proposed development, the owner should be made aware that additional sodium will be added to the water to reduce hardness. Note that elevated hardness is above the MCCRT, however, the MCCRT for hardness is related to aesthetic reasons, therefore, as the water is for non-drinking water purposes, the hardness can be treated. It is anticipated that alkalinity will be reduced as hardness is reduced.

6. If desired by the property owner, iron and manganese can be reduced using greensand filters to reduce staining. It is not anticipated that the manganese can be reduced to a concentration that would allow the water to be drinkable.

7. As the well water is to be used for non-drinking water purposes, DOC, TDS, colour, and turbidity do not need to be treated.

8. The predicted nitrate concentrations at the property boundary is calculated to be below the required 10 mg/L threshold when an NSF/ANSI 245 and/or certified BNQ system with a minimum of 50 % nitrate reduction tertiary treatment system is used.

9. Due to the hydrogeological sensitivity of the site, a 30 m setback between the drinking water well and sewage system is recommended. It is recommended that a 100 mm clay seal be used at the base of the sewage system.

10. Well water can only be used for non-drinking water purposes such as toilet flushing and/or hand washing, and drinking water will have to be obtained from offsite sources such as water coolers.

11. A Sewage System Permit and Building Permit need to be issued prior to the commencement of construction on the proposed commercial building or the proposed septic system.

12. The results of the Hydrogeological Assessment and Terrain Analysis have provided satisfactory evidence that the subject site can support the proposed building addition with respect to water quantity and sewage system placement.

We trust that the current submission satisfies your immediate requirements.

Best Regards,

Paterson Group Inc.

PROFESSIONAL GEOSCIENTIST
EA
May 29, 2025
ERIK ARDLEY
PRACTISING MEMBER
3667
ONTARIO

Alexander Schopf, PhD, EIT

Erik Ardley, P.Geo

Attachments:

- Key Plan
- Novatech 124111-SP Site Plan dated February , 2025
- MECP Water Well Records
- Eurofins Certificate of Analysis
- Paterson Borehole Logs
- AQTESOLV - Pumping Test Analysis Reports
- Nitrate Impact Assessment Calculations
- Langelier Saturation Index (LSI) Calculation
- Paterson Drawing PG7327-1 - Test Hole Location Plan

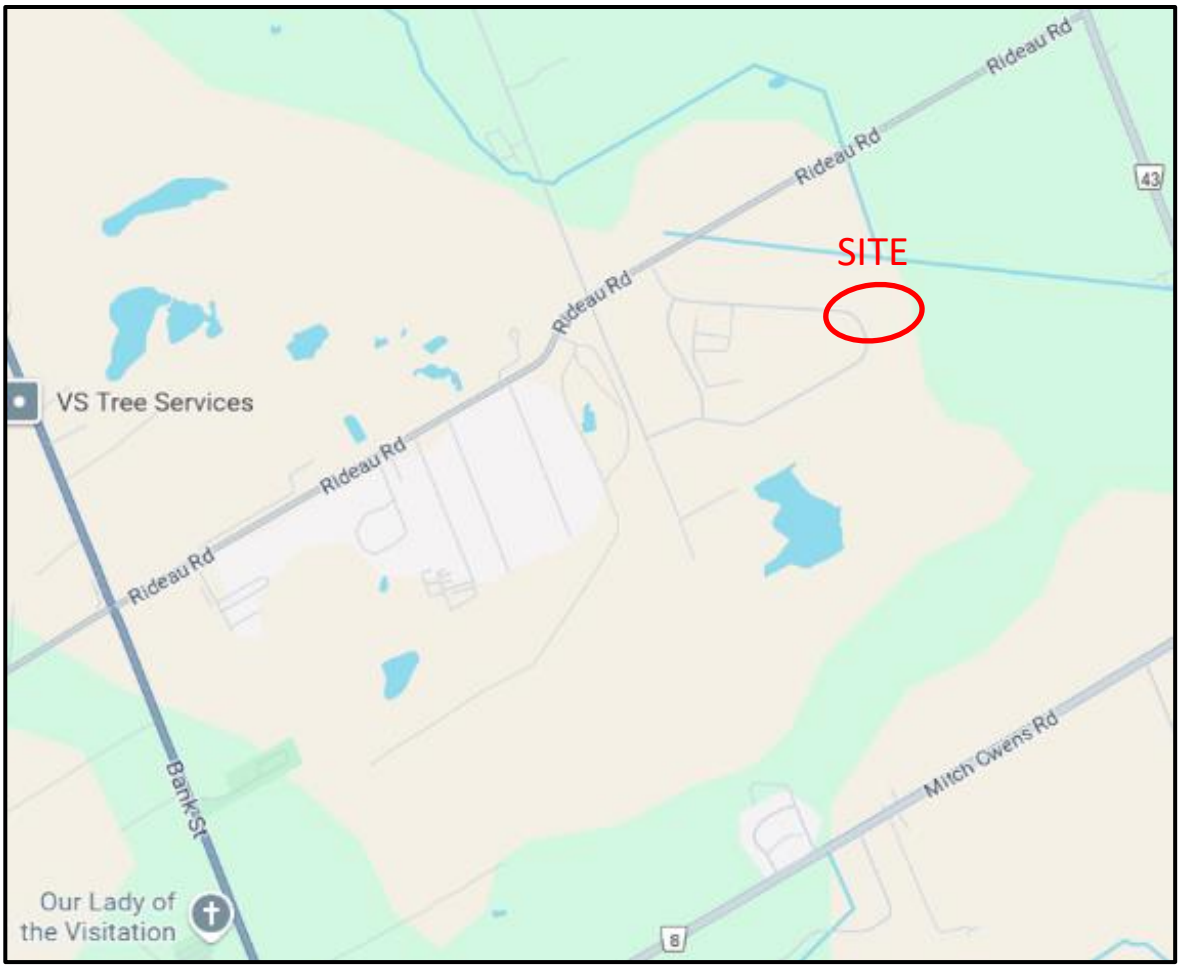


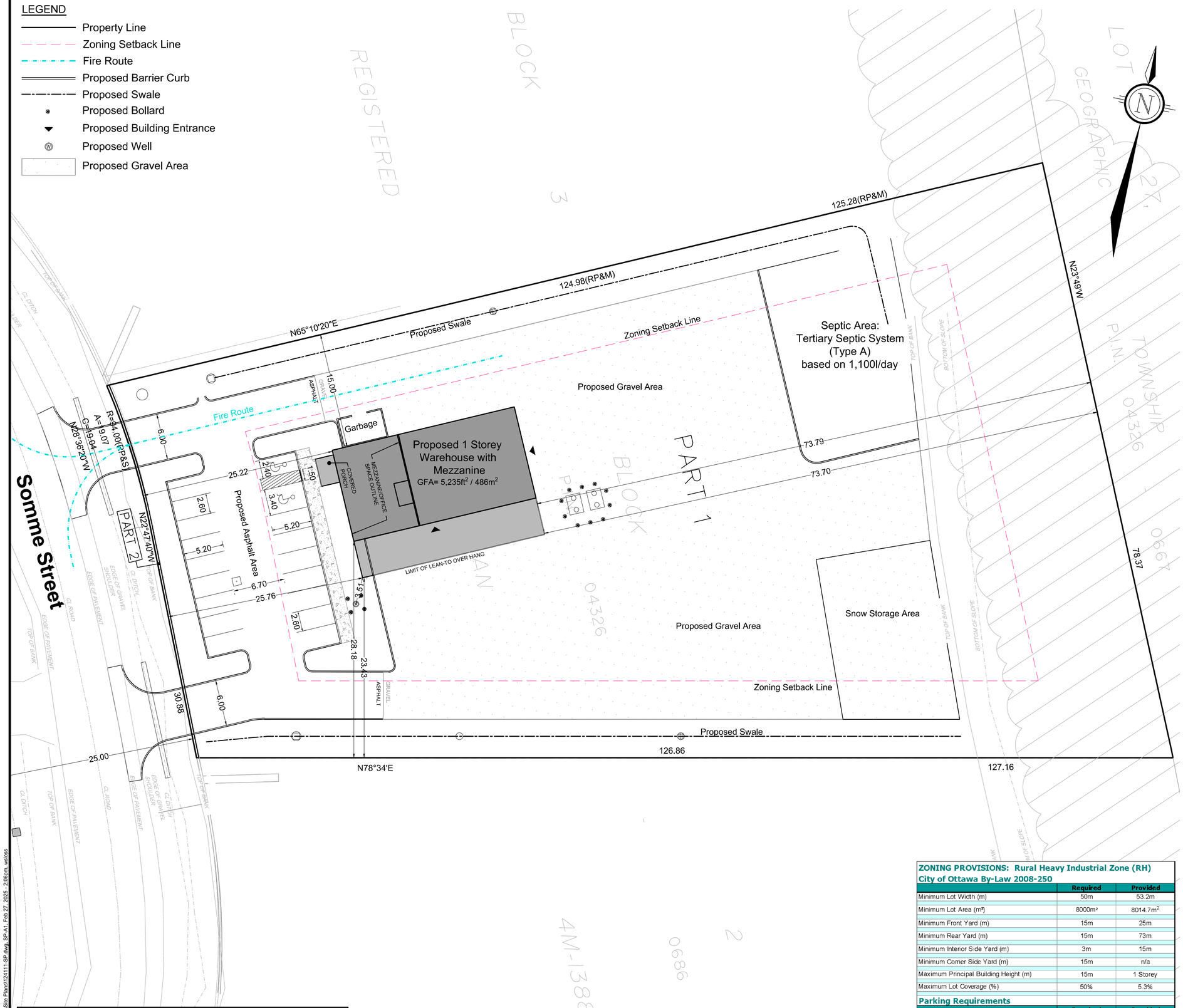
FIGURE 1

KEY PLAN

PATERSON GROUP

LEGEND

- Property Line
- Zoning Setback Line
- Fire Route
- Proposed Barrier Curb
- Proposed Swale
- Proposed Bollard
- Proposed Building Entrance
- Proposed Well
- Proposed Gravel Area



KEYPLAN
NOT TO SCALE

SITE PLAN

HAWTHORNE LOT 541

PART OF BLOCKS 2 AND
RESERVE BLOCK 17
REGISTERED PLAN 4M-1388
CITY OF OTTAWA

Titan Environmental Containment
Unit #7 - 812 Burton Road
Vars, Ontario

1 : 250 (0, 2.5, 5, 10, 20, 25)

ZONING PROVISIONS: Rural Heavy Industrial Zone (RH)
City of Ottawa By-Law 2008-250

	Required	Provided
Minimum Lot Width (m)	50m	53.2m
Minimum Lot Area (m²)	8000m²	8014.7m²
Minimum Front Yard (m)	15m	25m
Minimum Rear Yard (m)	15m	73m
Minimum Interior Side Yard (m)	3m	15m
Minimum Corner Side Yard (m)	15m	n/a
Maximum Principal Building Height (m)	15m	1 Storey
Maximum Lot Coverage (%)	50%	5.3%

Parking Requirements

	Required	Provided
Minimum Parking Spaces (Office, Area D) 2.4 per 100m² of GFA	7	10
Minimum Parking Spaces (Warehouse, Area D) 0.8 per 100m² for the first 500m²	3	8
Total	10	18

No.	REVISION	DATE	BY
1	ISSUED FOR SITE PLAN APPROVAL		

SOURCE REFERENCE:
Legal Information: *Plan of Survey*
Annis, O'Sullivan, Vollebekk Ltd. / 2024 / MTM Zone 9, NAD83 (CSRS)
Topographic Information: *Field Survey*
Novatech / 2024 / MTM Zone 9, NAD83 (CSRS)

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

ISSUED
FEBRUARY, 2025

PROJECT No.
124111

DRAWING No.
124111-SP

M:\2024\124111\CAD\Planning\Site Plans\124111-SP.dwg, SP-A1, Feb 27, 2025 - 2:06pm, wsloss

DXX-XX-XXXX

#XXXXX

TW1

Ontario Ministry of the Environment, Conservation and Parks

Well Tag#:A421912 Below) A421912

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	Titan Environmental Containment Ltd.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
777 Quest Blvd	Ile des Chenes,	Manitoba	R0A 0T1	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
541 Somme Street	Gloucester	27	6 R.F.

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Gloucester	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	457218	5017054	Plan 4M-1388	(Part 1+2)

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sandy Clay			0'	5'
Grey	Sandstone	Mixed w/	Grey Limestone	5'	140'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
40'	30'	Neat Cement Slurry	10.92
30'	0'	Bentonite Slurry	16.80

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	40'
6"	Open Hole		40'	140'

Status of Well

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

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	
128	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify ____	
134	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify ____	
	☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify ____	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	40'	9 3/4"
40'	140'	6"

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 120

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 32' 1"

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

Recommended pump depth (m/ft): 100'

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

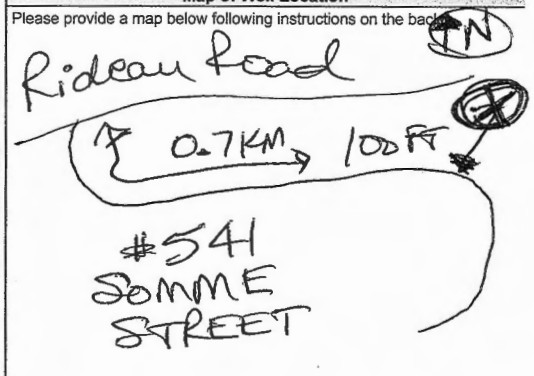
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	22'9"		32'1"
1	27.2	1	26.
2	28.5	2	25.2
3	29.1	3	24.7
4	29.6	4	24.3
5	29.9	5	24.
10	30.8	10	23.4
15	31.3	15	23.1
20	31.6	20	22'9"
25	31.8	25	22'9"
30	31.9	30	
40	32.	40	
50	32.1	50	
60	32'1"	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1 HP-20GPM Set @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
AirRock Drilling Co Ltd	7681

Business Address (Street Number/Name)	Municipality
6659 Frankford Road	Richmond

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

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 838 2170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		20250228

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	20250225	Audit No. Z443347
	Date Work Completed 20250221	Received

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 — 1527048 — MUNICIP 15002 — CON. CON 06

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT
Ottawa Carleton	Gloucester	6	26

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Beaver Road Builders Ltd.	P.O. Box 4208 st. "E" Ottawa, Ontario K1S 5B2	DAY 19 MO 4 YR 93

21 — UTM ZONE — EASTING — NORTHING — RC — ELEVATION — RC — BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Sandy Clay	Broken Rock	Fill	0	9
Gray	Hardpan	Boulders		9	15
Gray	Limestone		Soft	15	33
White & Gray	Sandstone		Hard	33	135

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
56	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
120	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
NOT TESTED	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	31
6 1/8	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		31	75
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		75	135

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
31	0	Grouted - Cement (18)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	15-20 GPM	1 HOURS ___ MINS.

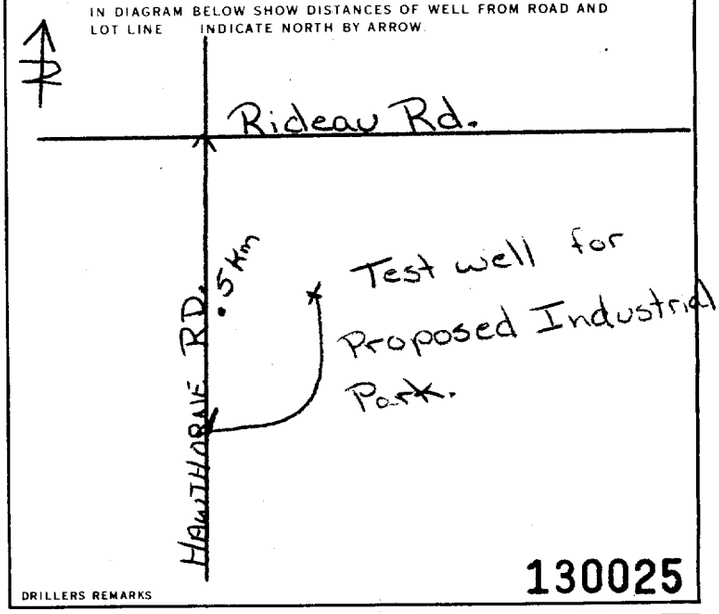
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☐ PUMPING 2 ☒ RECOVERY)			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
31 FEET	130 FEET	40 FEET	32 FEET	31 FEET	31 FEET

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

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	125 FEET	5 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 130025

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING
WATER USE	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF CONSTRUCTION	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd.
WELL CONTRACTOR'S LICENCE NUMBER: 1558
ADDRESS: P.O. Box 490 Stittsville, Ontario K2S 1A6
NAME OF WELL TECHNICIAN: S. Miller
WELL TECHNICIAN'S LICENCE NUMBER: T0097
SIGNATURE OF TECHNICIAN/CONTRACTOR: [signature]
SUBMISSION DATE: DAY 20 MO. 4 YR. 93

OFFICE USE ONLY

DATA SOURCE: 58 — CONTRACTOR: 1558 — DATE RECEIVED: MAY 06 1993
DATE OF INSPECTION — INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 | 1527383 | MUNICIP 15002 | CON. CON | LOT 06

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC	LOT 25-27
[redacted]	[redacted]ucester	6	26
[redacted]	[redacted] Box 4208 stn. "E" Ottawa, Ontario K1S 5B2	DATE COMPLETED 48-53: DAY 16 MO 8 YR 93	

ELEVATION | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Sand	Stone		0	5
Gray	Hardpan	Boulders		5	28
Gray	Sandstone		Hard	28	100

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
58	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
88	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
NOT TESTED	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6 1/4	1 ☐ STEEL 2 ☒ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	39
5 15/16	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		39	100
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

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

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
37.5	0	Cement - Grouted

71 PUMPING TEST

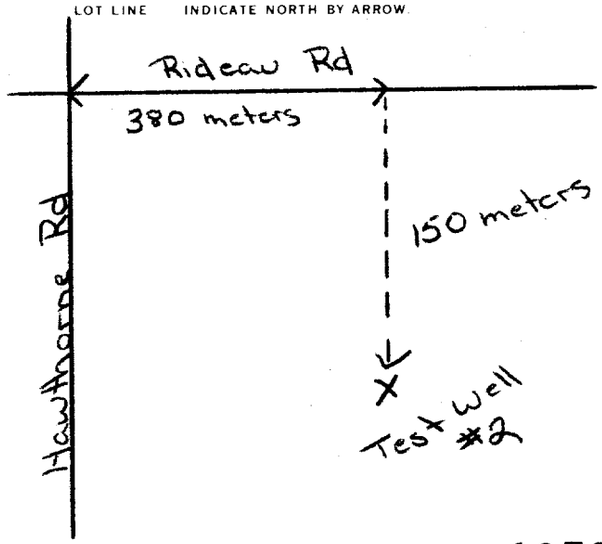
PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	20 GPM	1 HOURS ___ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (1 ☒ PUMPING 2 ☐ RECOVERY) 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
7'6" FEET	14'6" FEET	13'11" FEET	14 FEET	14'4" FEET	14'6" FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☐ CLEAR 2 ☒ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP	RECOMMENDED PUMP SETTING: 50 FEET	RECOMMENDED PUMPING RATE: 5 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 135946

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING
WATER USE	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF CONSTRUCTION	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Capital Water Supply Ltd.	1558
ADDRESS: Box 490 Stittsville, Ontario K2S 1A6	
NAME OF WELL TECHNICIAN: S.Miller/T. Harrison	WELL TECHNICIAN'S LICENCE NUMBER: T0097/T2251
SIGNATURE OF TECHNICIAN/CONTRACTOR	SUBMISSION DATE: DAY 18 MO 8 YR 93

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
	1558	SEP 21 1993
DATE OF INSPECTION	INSPECTOR	
REMARKS		

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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

11 | 1527384 | MUNICIP. 15002 | CON. COX | 06

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC.	LOT
Ottawa Carleton	Gloucester	6	26

[redacted]

Box 4208 stn "B" Ottawa, Ontario K1S 5B2

DATE COMPLETED: DAY 16 MO 8 YR 93

NG | RC. | ELEVATION | RC | BASIN CODE | II | III | IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Gray & White	Sandstone		Hard	0	100

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
30	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
84	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
NOT TESTED	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	22
6 1/16	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		22	100
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

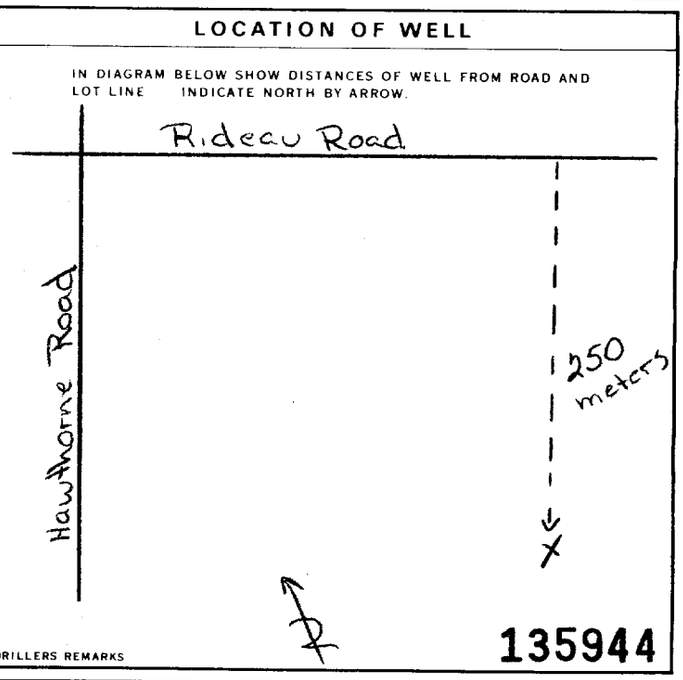
DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
20'8"	0	Grouted cement (3)

71 PUMPING TEST

PUMPING TEST METHOD	1 ☒ PUMP 2 ☐ BAILER
PUMPING RATE	15-20 GPM
DURATION OF PUMPING	1 HOURS ___ MINS
STATIC LEVEL	21'6" FEET
WATER LEVEL END OF PUMPING	24'4" FEET
WATER LEVELS DURING	1 ☐ PUMPING 2 ☒ RECOVERY
15 MINUTES	23'6" FEET
30 MINUTES	24 FEET
45 MINUTES	24'4" FEET
60 MINUTES	24'4" FEET
IF FLOWING, GIVE RATE	GPM
PUMP INTAKE SET AT	40 FEET
WATER AT END OF TEST	1 ☐ CLEAR 2 ☒ CLOUDY
RECOMMENDED PUMP TYPE	☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING	50 FEET
RECOMMENDED PUMPING RATE	5 GPM

LOCATION OF WELL

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



DRILLERS REMARKS: 135944

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING
WATER USE	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF CONSTRUCTION	1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd.
WELL CONTRACTOR'S LICENCE NUMBER: 1558
ADDRESS: Box 490 Stittsville, Ontario K2S 1A6
NAME OF WELL TECHNICIAN: S. Miller/T. Harrison
WELL TECHNICIAN'S LICENCE NUMBER: T0097/T2251
SIGNATURE OF TECHNICIAN/CONTRACTOR: [signature]
SUBMISSION DATE: DAY 18 MO. 8 YR. 93

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 1558 | DATE RECEIVED SEP 21 1993
DATE OF INSPECTION | INSPECTOR
REMARKS

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506 (11/86) FORM 9

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A068335 A 068335

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

[redacted]

Address of Well Location (Street Number/Name): TW #5 - Rideau

Township: Gloucestor 26 6

County/District/Municipality: Ottawa Carleton

City/Town/Village: Gloucestor

Province: Ontario

Postal Code:

UTM Coordinates: Zone NAD 83 18 | Easting 457043 | Northing 5016848

Municipal Plan and Sublot Number:

Other:

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	Soil	Stones	Fill	0	1.21
Gray	Sandy Soil	Stones	Wet	1.21	3.96
Gray	Sandstone		Very Hard	3.96	29.86

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
12.80	0	Grouted Cement	.525m^3

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[X] Rotary ~~(Reverse)~~ Air [ ] Driving
[ ] Boring [ ] Digging
[X] Air percussion
[ ] Other, specify

Well Use

[ ] Public [X] Commercial [ ] Not used
[X] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [ ] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[X] Industrial
[ ] Other, specify Test Well

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
15.86	Steel	.48	+.45	12.80

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth 27.12 (m/ft) [ ] Gas — Kind of Water: [ ] Fresh [X] Untested [ ] Other, specify

Water found at Depth (m/ft) [ ] Gas — Kind of Water: [ ] Fresh [ ] Untested [ ] Other, specify

Water found at Depth (m/ft) [ ] Gas — Kind of Water: [ ] Fresh [ ] Untested [ ] Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	12.80	15.86
12.80	29.86	15.23

Results of Well Yield Testing

After test of well yield, water was: [X] Clear and sand free [ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 22.85

Pumping rate (l/min / GPM): 54.6

Duration of pumping: 6 hrs + ____ min

Final water level end of pumping (m/ft): 9.99

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

Recommended pump depth (m/ft): 22.85

Recommended pump rate (l/min / GPM): 45.5

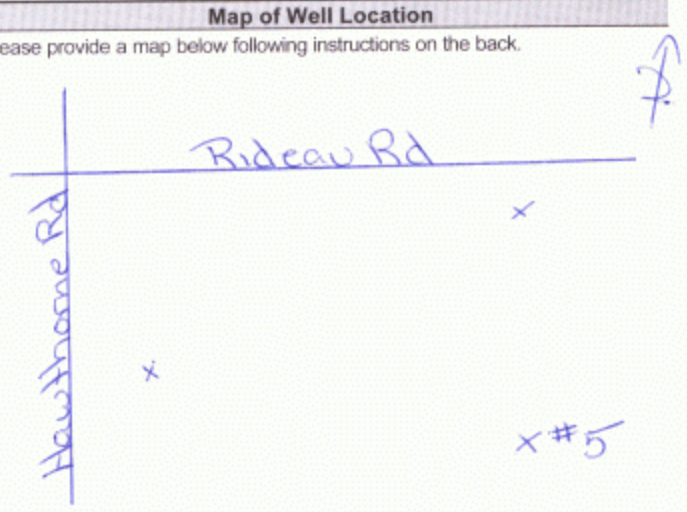
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	6.85		
1	8.03	1	8.97
2	8.35	2	8.69
3	8.60	3	8.55
4	8.76	4	8.46
5	8.88	5	8.40
10	9.20	10	8.23
15		15	
20	9.49	20	8.04
25	9.62	25	7.99
30	9.68	30	7.93
40	9.82	40	7.84
50	9.91	50	7.77
60	9.99	60	7.69

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: Capital Water Supply Ltd.

Well Contractor's Licence No.: 1558

Business Address (Street Number/Name): Box 490

Municipality: Stittsville

Province: Ontario

Postal Code: K2S1A6

Business E-mail Address: office@capitalwater.ca

Bus. Telephone No. (inc. area code): 6138361766

Name of Well Technician (Last Name, First Name): Miller, Stephen

Well Technician's Licence No.: 0097

Signature of Technician and/or Contractor:

Date Submitted: 2008 10 10

Well owner's information package delivered: [ ] Yes [X] No

Date Package Delivered: 2008 10 07

Date Work Completed: 2008 09 26

Ministry Use Only

Audit No. Z 84410

Received DEC 02 2008

0506E (12/2007)

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Ontario Ministry of the Environment

Well Tag No. for Master Well (Place Sticker and/or Print Below)

A 074584 MW 6-08

Master Well Record for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page 1 of 2

Master Well Owner's and Land Owner's Information

First Name	Last Name	E-
Orgaworld Canada Real Estate via Tomlinson Environmental Services Inc.		[redacted]

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
5597 Power Road	Ottawa	ON	K1G3N4	613 821 8667

Location and Construction of the Master Well in the Cluster

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Hawthorne Road at Rideau Road		26 & 27	6

County/District/Municipality	City/Town/Village	Province	Postal Code
	Ottawa	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	18	456400	5016852	Garmin	Etrex	☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Grey/Brown	very fine sand + silt		dense, moist	0	0.8
Brown	Fill - sand/silt/clay/gravels			0.8	4.7
Grey/Brown	Sand with silt		compact oxidized	4.7	6.0
Brown	Till - silty sand, gravel			6.0	7.6

Hole Details

Depth (Metres) From	To	Diameter (Centimetres)
0	7.6	20

Water Use

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

Method of Construction

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

Status of Well

☑ Test Hole ☐ Abandoned, Insufficient Supply
☐ Replacement Well ☐ Abandoned, Poor Water Quality
☐ Dewatering Well ☐ Other, specify
☐ Alteration (Construction) ☐ Abandoned, other, specify

No Casing and Screen Used

Open Hole ☐ Yes ☑ No

Static Water Level Test

1.7 Metres

Screen

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Concrete ☑ Plastic

Outside Diameter (Centimetres)	Slot No.
5.8	10

Construction Details

Inside Diameter (Centimetres)	Material (steel, plastic, fibreglass, concrete, galvanized)	Wall Thickness	Depth (Metres) From	To
5.1	PVC	Sched 40	0	3.0

Water Details

Water found at Depth	Kind of Water
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Used (Cubic Metres)
0.6	2.4	Bentonite	66 kgs

Disinfected ☐ Yes ☑ No If no, provide reason: Monitoring Well

Date Master Well Completed (yyyy/mm/dd): 2008/07/14

Cluster Information *(Please also fill out the additional Cluster Well Information for Well Construction for each parcel of land and cluster.)*

Total Wells in Cluster: 10

Total Wells on this Property: unknown

Please indicate Number of Cluster Well Information Log Sheets Submitted: 1

Location of Well Cluster

Detailed Map must be provided as an attachment no larger than legal size (8.5" x 14"). Sketches are not allowed.

☑ Check box to confirm detailed map is provided as per Section 11.1 (3)

Consent to release additional information concerning the cluster to the Director upon request

Signature of Technician/Contractor: Bruce Downing

Date (yyyy/mm/dd): 2008/10/20

Master Well Owner's/Land Owner's consent to use Cluster Form

[redacted]

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
George Downing Estate Drilling	1844

Business Address (Street No./Name, number, RR)	Municipality
410 Rue Principale	Grenville-sur-la-Rouge

Province	Postal Code	Business E-mail Address
QC	J0V1B0	downing@xplornet.com

Business Phone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
1 264 619	Downing, Bruce

Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
	Bruce Downing	2008/10/20

Ministry Use Only

Audit No.	Well Contractor No.
M 02897	
Date Received (yyyy/mm/dd)	**Date of Inspection (yyyy/mm/dd)**
NOV 26 2008	

Remarks

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Ontario — Ministry of the Environment

Well Tag No. for Master Well (Print Well Tag No.)
A 074584
A074584

Cluster Well Information for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Property Owner's Information

First Name	Last Name	Mailing Address (Street No./Name, RR)	Municipality
Orgaworld Canada Real Estate via	Tomlinson Environmental Services Inc.	5597 Power Road	Ottawa

Province	Postal Code	E-mail Address	Telephone No. (inc. area code)
Ontario	K1G3N4	rtomlinson@tomlinsongroup.com	6138221867

Cluster Well Information

Address of Well Location (Street Number/Name, RR)	Lot	Concession	Township	County/District/Municipality
Hawthorne Road at Rideau Road	26 & 27	6		

City/Town/Village	Province	Postal Code	GPS Unit Make	Model	Unit Mode of Operation
Ottawa	Ontario	~~K1G3N4~~			☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify:

[redacted]

upon request

Signature of Technician/Contractor	Date (yyyy/mm/dd)
[signature]	2008/10/20

Well # on Sketch	UTM Coordinates Zone	Easting	Northing	Full Depth of Hole (metres)	Hole Diameter (cm)	Method of Construction	Casing Material	Casing Length (metres)	Screen Interval (metres) From	To	Annular Space Sealant Used	Static Water Level (metres)	Abandonment Sealant Used	Comments	Date of Completion (yyyy/mm/dd)
MW 1-08	18	456831	5016712	2.97	20	HSA	PVC	1.5	1.5	2.97	Bentonite	1.3			2008/07/07
MW 2-08	18	456799	5016553	2.77	10	DiA		0.6	0.6	2.77		1.6		overburden from 0 to 0.18	2008/07/08
MW 3-08	18	456533	5016411	17.37	10	DiA		2.13	2.13	17.37		13.2		" " 0 to 0.30	2008/07/09
MW 4-08	18	456474	5016604	2.84	10/20	HSA/DiA		1.22	1.22	2.8		0.7			2008/07/08
MW 5-08	18	456598	5016675	2.77	20	HSA		1.5	1.5	2.77		1.0			2008/07/07
MW 7-08	18	456622	5017219	6.98	20	HSA		3.0	3.0	6.10		3.6			2008/07/14
MW 8-08	18	456687	5017036	4.72	20	HSA		3.0	3.0	4.2		3.0			2008/07/15
MW 9-08	18	457086	5017625	3.66	20	HSA		1.5	1.5	3.0		1.7			2008/07/15
MW 10-08	18	457206	5017303	2.90	20	HSA		1.37	1.37	2.90		1.6			2008/07/15

Well Contractor and Well Technician Information

Business Name of Well Contractor	Business Address (Street Number/Name, RR)	Municipality	Province
George Downing Estate Drilling LTD.	410 Rue Principale	Grenville-sur-la-Rouge	Qc

Postal Code	Business Telephone No. (inc. area code)	Well Contractor's Licence No.	Business E-mail Address
J0V1B0	8192426469	1844	downing@xplornet.com

Name of Well Technician (First Name, Last Name)	Well Technician's Licence No.	Date Submitted (yyyy/mm/dd)	Signature of Technician
Bruce Downing	2173	2008/10/20	[signature]

Date 1st Well in Cluster Constructed (yyyy/mm/dd)	Date Last Well in Cluster Constructed (yyyy/mm/dd)
2008/07/07	2008/07/15

Ministry Use Only

Date Received (yyyy/mm/dd)	Date Inspected (yyyy/mm/dd)
NOV 26 2008	
Audit No.	**Remarks**
C 01984	m02897

1991 (11/2006)

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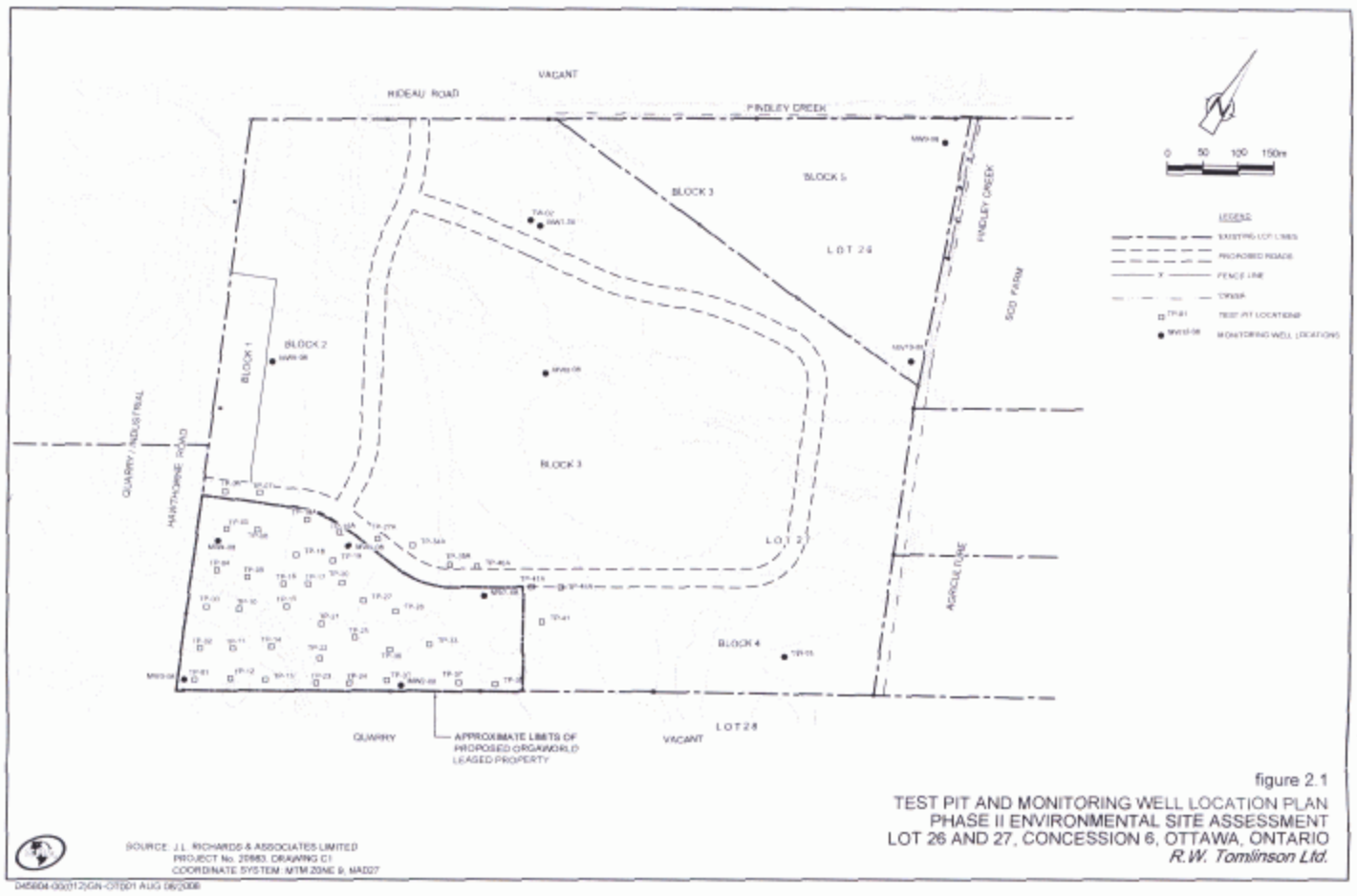


SOURCE: J.L. RICHARDS & ASSOCIATES LIMITED
PROJECT No. 20983, DRAWING C1
COORDINATE SYSTEM: NTM ZONE 9, NAD27

045604-00(012)GN-CT001 AUG 06/2008

figure 2.1
TEST PIT AND MONITORING WELL LOCATION PLAN
PHASE II ENVIRONMENTAL SITE ASSESSMENT
LOT 26 AND 27, CONCESSION 6, OTTAWA, ONTARIO
R.W. Tomlinson Ltd.

C-1844 mo2897 c01984

NOV 26 2008

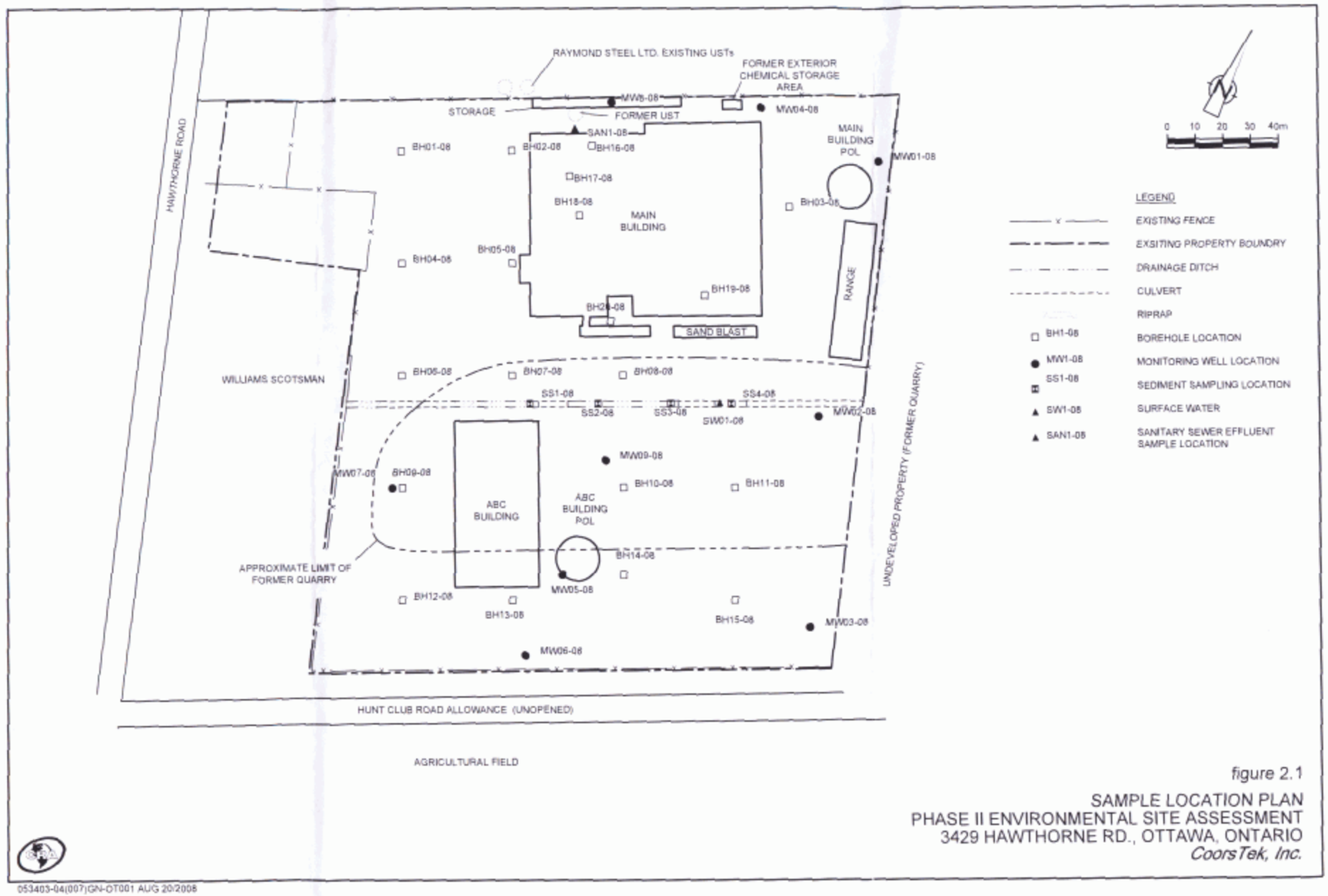


figure 2.1

SAMPLE LOCATION PLAN
PHASE II ENVIRONMENTAL SITE ASSESSMENT
3429 HAWTHORNE RD., OTTAWA, ONTARIO
CoorsTek, Inc.

053403-04(007)GN-OT001 AUG 20/2008

NOV 26 2008
C-18441 m02888 C03068

Ontario — Ministry of the Environment

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. (Place Sticker and/or Print Below): A082844 **A 082844**

Well Record

...ion 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Orgaworld		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
c/o 400-179 Colonnade Road	Ottawa	Ontario	K2E 7J4	613 727 0510

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
TW #7 Hawthorne Road	Gloucester	27	6

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Gloucester	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	456879	5016752		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	Soil Stones		Packed	0	4.26
Grey & White	Sandstone		Very Hard	4.26	29.86

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
6.40	0	Grouted Cement	.21m^3

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[X] Rotary (Reverse Air) [ ] Driving
[ ] Boring [ ] Digging
[X] Air percussion
[ ] Other, specify ____

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
15.86	Steel	.48	+.45	6.40

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	
9.14-12.19	[ ] Gas	[ ] Fresh [X] Untested [ ] Other, specify ____
18.28-21.33	[ ] Gas	[ ] Fresh [X] Untested [ ] Other, specify ____
	[ ] Gas	[ ] Fresh [ ] Untested [ ] Other, specify ____

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.40	15.86
6.40	29.86	15.23

Results of Well Yield Testing

After test of well yield, water was: [X] Clear and sand free [ ] Other, specify ____

If pumping discontinued, give reason:

Pump intake set at (m/ft): 24.38

Pumping rate (l/min / GPM): 27.3

Duration of pumping: 6 hrs + ____ min

Final water level end of pumping (m/ft): 7.01

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

Recommended pump depth (m/ft): 24.38

Recommended pump rate (l/min / GPM): 27.3

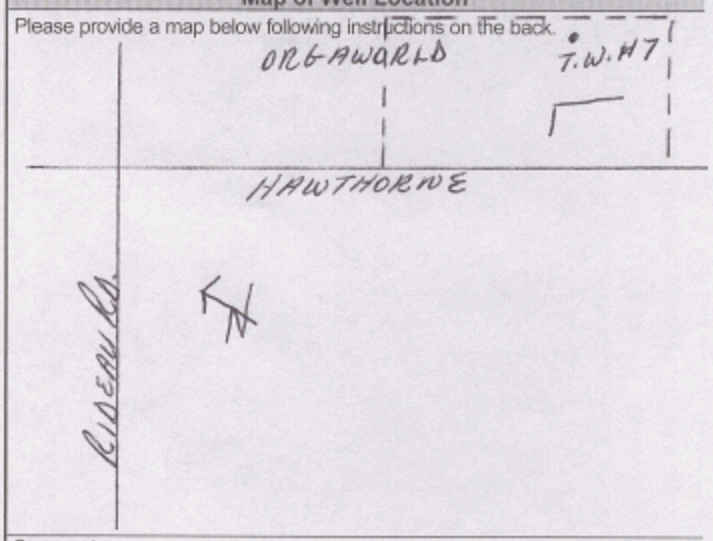
Well production (l/min / GPM):

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	4.41		
1	5.20	1	6.07
2	5.57	2	5.68
3	5.78	3	5.46
4	5.94	4	5.33
5	6.05	5	5.25
10	6.37	10	5.01
15	6.52	15	4.89
20	6.60	20	4.81
25	6.68	25	4.76
30	6.72	30	4.72
40	6.81	40	4.65
50	6.86	50	4.61
60	6.89	60	4.58

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.
Capital Water Supply Ltd.	1558

Business Address (Street Number/Name)	Municipality
Box 490	Stittsville

Province	Postal Code	Business E-mail Address
Ontario	K2S 1A6	office@capitalwater.ca

Bus.Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 836 1766	Miller, Stephen

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0097		20100528

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[ ] Yes [X] No	20100527	20100525

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Audit No. Z101832

Received AUG 04 2010

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Tag#:A295280

A295280

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	TECHO-BLOC INC.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
#5255 Albert-Millichamp	Saint-Hubert	Quebec	J3Y 8Z8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
5123 Hawthorne Road	[redacted] Gloucester	27	6

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	[redacted] Ottawa	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	457054	5016813	4m-1388 Part 23-4 / 4R-32280	Block 2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sandy	Clay & Gravel		0'	15'
Grey	Limestone			15'	80'
Grey & White	Sandstone			80'	83'
Grey & White	Sandstone			83'	116'
Grey & White	Sandstone			116'	122'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
41'	31'	Neat cement	18.7
31'	0'	Bentonite slurry	16.8

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	41'
6"	Open Hole		41'	122'

Status of Well

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

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	
83 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	
116 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	41'	9 3/4"
41'	122'	6"

Results of Well Yield Testing

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

If pumping discontinued, give reason: Not tested

Pump intake set at (m/ft): 100

Pumping rate (l/min/GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 33.5'

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

Recommended pump depth (m/ft): 100'

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

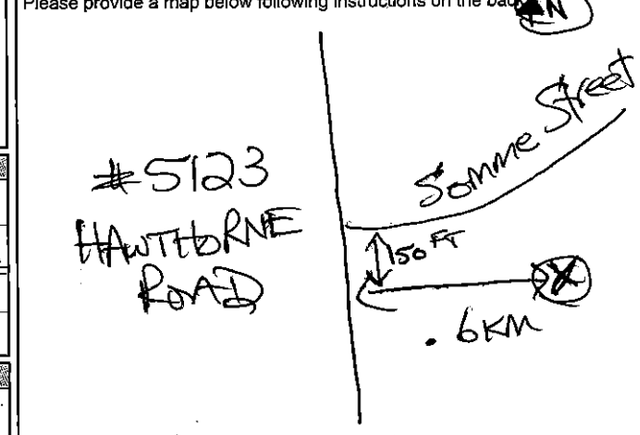
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	26.5"		33.5'
1	29.8	1	26.5
2	30.5	2	26.5
3	30.8	3	26.5
4	31.1	4	26.5
5	31.3	5	26.5
10	31.9	10	26.5
15	32.3	15	26.5
20	32.6	20	26.5
25	32.9	25	26.5
30	33.1	30	26.5
40	33.3	40	26.5
50	33.5	50	26.5
60	33.5'	60	26.5"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP-15 GPM Set @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6659 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3058		2020 08 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020 08 22	2020 08 20

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Audit No. Z344019

Received OCT 30 2020

Ontario — Ministry of the Environment, Conservation and Parks

Well Tag#:A295342 (Below)

A295342

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	Paul Lalonde Holdings Inc		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
5146 Bank Street	Ottawa	ON	K1X 1G8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
5123 Hawthorne Road	Gloucester	27	6

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carleton	Ottawa	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	456956	5016788	4M-1388	Parts 2,3,4

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sandy Till	& Boulders		0'	6'
Grey	Limestone			6'	45'
Grey & White	Sandstone			45'	60'
Grey & White	Sandstone			60'	96'
Grey & White	Sandstone			96'	153'
Grey & White	Sandstone			153'	159'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
40'	30'	Neat cement	9.36
30'	0'	Bentonite slurry	16.8

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2'	40'
6"	Open Hole		40'	159'

Status of Well

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

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	
60	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	
96	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	
154	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	40'	9 1/4"
40'	159'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 140

Pumping rate (l/min/GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 32'8"

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

Recommended pump depth (m/ft): 100'

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

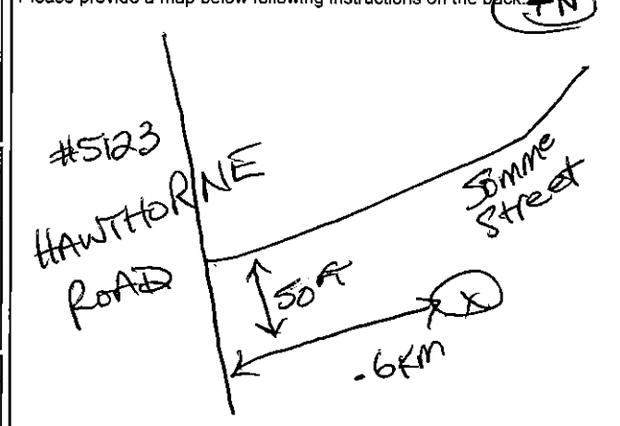
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	27'5"		32'8"
1	29	1	29
2	29.2	2	27.5
3	29.3	3	27.5
4	29.4	4	27.5
5	29.5	5	27.5
10	30.1	10	27.5
15	30.5	15	27.5
20	30.8	20	27.5
25	31	25	27.5
30	31.3	30	27.5
40	31.9	40	27.5
50	32.3	50	27.5
60	32'8"	60	27'5"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 HP - 20 GPM SET @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6659 Franktown Road	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3058		2020 08 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020 08 28	2020 08 26

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Well Record for Well Cluster – Part 1 of 3

(Only for Multiple Test Holes or Dewatering Wells)

Regulation 903 Ontario Water Resources Act

All measurements recorded in: ☒ Metric ☐ Imperial

Follow instructions on the front and back of this form. Print or Type

Well Tag No. of Deepest Well: *(Print Well Tag No.)* A290221

Well No. on Drawing of Deepest Well: 109-21

☐ Dewatering wells
☒ Test holes

No. of wells reported 3

Page 1 of 1

Well Cluster Location Information

Address of Well Location (Street Number(s)/Name(s), RR, if available)	Lot(s)	Concession(s)	Geographic Township	County/District/Upper Tier Municipality
300 SOMME STREET, BESIDE 5123 HAWTHORNE ROAD				

City, Town, Village or Hamlet	Province	GPS Unit Make	Model	Unit Mode of Operation
OTTAWA	Ontario	GARMIN	ETREX	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify:

Mandatory Attachments/Additional Information

☒ Land Owner Consent Form must be attached.

☒ Detailed Drawing of All Well Locations must be attached.

I, the person constructing the well, will promptly submit to the Director, on request, any additional information in my custody or control related to any well in the well cluster that I have constructed.

Signature of Technician/Contractor — Date (yyyy/mm/dd): 2021/10/22

Well Details

Well # on Drawing	UTM Coordinates Zone	Easting	Northing	Hole Depth (m/ft)	Hole Diameter (cm/in)	Method of Construction	Casing Material; Diameter (cm/in)	Casing (m/ft) From	Casing (m/ft) To	Screen Interval (m/ft) From	Screen Interval (m/ft) To	Annular Space Material (m/ft) From	Annular Space Material (m/ft) To	Material:	Overburden/Bedrock or Abandonment Filing Material Intervals (m/ft)	Static Water Level (m/ft)	Date of Completion (yyyy/mm/dd)
109	18	456697	5017052	6.1	20.3	HSA	5.08	0.1	3.05	3.05	6.1	0.25	2.44	BENTONITE	0-4.57 SURFACE W. SAND/CLAY/GRAVEL/DEBRIS, 4.57-6.1 TILL	1.465	2021/10/05
110	18	456775	5017046	4.42	20.3	HSA	5.08	0.1	2.9	2.9	4.42	0.25	2.6	BENTONITE	" " " "	1.681	2021/10/05
111	18	456825	5017039	3.66	20.3	HSA	5.08	0.1	2.13	2.13	3.66	0.25	1.83	BENTONITE	" " " "	1.041	2021/10/05

Well Contractor and Well Technician Information

Business Name of Well Contractor	Business Address (Street Number/Name, RR)	Municipality	Province
GEORGE DOWNING ESTATE DRILLING LTD	410 AVE PRINCIPALE	GRENVILLE-SUR-LA-ROUGE	QC

Postal Code	Bus. Telephone No.	Well Contractor's Licence No.	Business E-mail Address
J0V1B0	(819) 242-6469	1844	info@georgedowningdrilling.com

Name of Well Technician (First Name, Last Name)	Well Technician's Licence No.	Signature of Well Technician	Date Submitted (yyyy/mm/dd)
STEPHEN DOWNING	3326		2021/10/22

Date First Well in Cluster Constructed or Abandoned (yyyy/mm/dd)	Date Last Well in Cluster Completed (yyyy/mm/dd)
2021/10/05	2021/10/05

Well Abandonment

Person Abandoning the Wells:

Name N/A

(Print or Type) - See instruction 11 on the back of this form

Ministry Use Only

Date Received (yyyy/mm/dd)	Audit No.
NOV 08 2021	C 53081

Comments:

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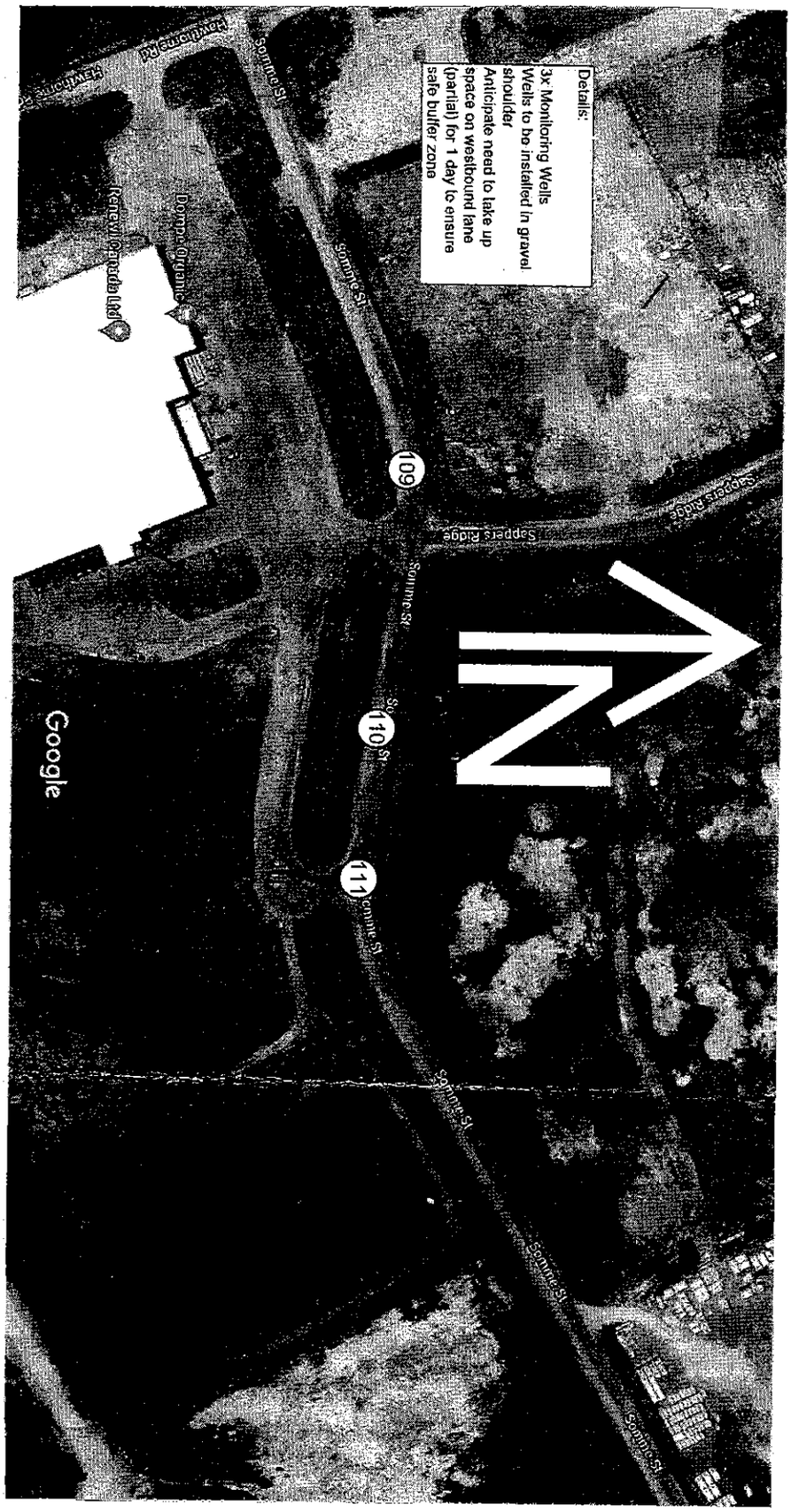
Well Record for Well Cluster - Part 3 of 3
Detailed Drawing of All Well Locations

Note: This **Well Record for Well Cluster Part 3 - Detailed Drawing of all Well Locations,** must be attached to Parts 1 and 2.
The drawing must include all property boundaries, an arrow indicating the North direction, all named roads and sufficient measurements to locate all wells in the cluster in relation to fixed points. The drawing must show the location of each well and each well must be numbered on the drawing to match number used for that well on the **Well Record for Well Cluster Parts 1 and 2.**
The well with the well tag must be clearly identified on the Drawing.
UTM coordinates should appear beside each well, if space permits. Additional comments on wells can be included on the drawing

Well Tag Number: # A290221

"Well Record for Well Cluster" Form Audit Number: # C53081



NOV 08 2021

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C53081

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146 Colonnade Rd, Unit 8, Ottawa, ON K2E 7Y1 (613) 727-5692

OFFICIAL CERTIFICATE OF ANALYSIS : 4259100

WORK REQUEST : 100341628

Report Date : 2025-03-11

Paterson Group
9 Auriga Dr
Nepean, Ontario
K2E 7T9
Attention : Alex Schopf

Reception Date : 2025-03-05
Project : PH4991
Sampler : NA
PO Number : 62526
Temperature : 9 °C

Analysis	Quantity	External Method
Alkalinity (Water, Automated)	2	Modified from SM 2320 B
Ammonia, Total (Water, Colorimetry)	2	Modified from EPA 350.1
Base Neutrals (Water, GC/MS)	1	Modified from EPA 8270
Chloride (Water, IC)	2	Modified from SM 4110 B and C
Colour, Apparent (Water, Spectrophotometry)	3	Modified from SM 2120 C
Conductivity (Water, Automated)	2	Modified from SM 2510 B
DOC (Water, IR)	2	Modified from SM 5310 B
Escherichia coli (DC Plate)	2	Modified from MECP E3407
Fluoride (Water, Auto/ISE)	2	Modified from SM 4500-F A and 4500-F C
Hardness (Water, Calculation Only)	2	SM 2340 B
Ion Balance (Water, Calculation)	2	Modified from SM1030 E
Metals Scan (Water, ICP/MS)	3	Modified from EPA 200.8
Metals Scan (Water, ICP/OES)	3	Modified from SM 3120 B
Nitrate (Water, IC)	2	Modified from SM 4110 B and C
Nitrite (Water, IC)	2	Modified from SM 4110 B and C
PAH (Water, GC/MS)	1	Modified from EPA 8270
pH (25°C) (Water, Automated)	2	Modified from SM 4500-H+ B
Phenolics (Water, GC/MS)	1	Modified from EPA 8270
Phenols (Water, Colorimetry)	2	Modified from EPA 420.2
Sulphate (Water, IC)	2	Modified from SM 4110 B and C
Sulphide (Water, Colorimetry)	2	Modified from SM 4500-S2 D
Tannin and Lignin (Water, Spec)	2	Modified from SM 5550 B
TDS (Estimated)	2	Modified from SM 2510 A
Total Coliforms (DC Plate)	2	Modified from MECP E3407
Total Kjeldahl Nitrogen (Water, Colorimetry)	2	Modified from EPA 351.2
Turbidity (Water, Turbidimeter)	3	Modified from SM 2130 B
VOCs (Water, GC/MS)	1	Modified from EPA 8260

Criteria :

A : Ontario Regulation 169/03 (Non-Regulated Drinking Water)

Sample status upon receipt :

8408304 8408306 8408308
Compliant

Certificate Comments :

8408304 8408306
N-NO2 and N-NO3 MRL increased due to matrix interference.

Notes :

- All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise stated.
- Eurofins Environment Testing Canada Inc. 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 https://directory.cala.ca/
- Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline or regulatory limits listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official guideline or regulation as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Legend :

This certificate of analysis corrects and replaces any previous version. The analysis results refer only to what was provided for testing.
This certificate shall not be reproduced except in full, without the written approval of Eurofins Environment Testing Canada Inc.
Method references and/or additional QA/QC information available on request.

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RL : Reporting limit	N/A : Not applicable	* : Analysis conducted by external subcontracting
QC : Reference material (QC)	1 : Results in annex	^ : Analysis not accredited

OFFICIAL CERTIFICATE OF ANALYSIS - EXCEEDENCE SUMMARY

Client : Paterson Group
Project : PH4991

Reception Date : 2025-03-05

Eurofins Sample No	Client Sample Identification	Analyte	Result	Units	Exceeded Criteria		
					A	B	C
Alkalinity (Water, Automated)							
8408304	TW1 - GW1	Alkalinity (as CaCO3)	578	mg/L	500		
8408306	TW1 - GW2	Alkalinity (as CaCO3)	570	mg/L	500		
Colour, Apparent (Water, Spectrophotometry)							
8408304	TW1 - GW1	Colour (Apparent)	97	TCU	5		
8408306	TW1 - GW2	Colour (Apparent)	86	TCU	5		
8408308	TW1 - GW3	Colour (Apparent)	116	TCU	5		
DOC (Water, IR)							
8408304	TW1 - GW1	Dissolved Organic Carbon	7.7	mg/L	5		
8408306	TW1 - GW2	Dissolved Organic Carbon	7.2	mg/L	5		
Hardness (Water, Calculation Only)							
8408304	TW1 - GW1	Hardness as CaCO3 (Calculation)	708	mg/L	80-100		
8408306	TW1 - GW2	Hardness as CaCO3 (Calculation)	704	mg/L	80-100		
Metals Scan (Water, ICP/MS)							
8408304	TW1 - GW1	Iron	2.22	mg/L	0.3		
8408306	TW1 - GW2	Iron	2.19	mg/L	0.3		
8408308	TW1 - GW3	Iron	2.29	mg/L	0.3		
8408304	TW1 - GW1	Manganese	2.89	mg/L	0.05		
8408306	TW1 - GW2	Manganese	2.87	mg/L	0.05		
8408308	TW1 - GW3	Manganese	2.89	mg/L	0.05		
TDS (Estimated)							
8408304	TW1 - GW1	TDS (Estimated)^	995	mg/L	500		
8408306	TW1 - GW2	TDS (Estimated)^	993	mg/L	500		
Total Coliforms (DC Plate)							
8408304	TW1 - GW1	Total Coliforms (DC)	4	CFU/100mL	0		
8408306	TW1 - GW2	Total Coliforms (DC)	3	CFU/100mL	0		
Turbidity (Water, Turbidimeter)							
8408304	TW1 - GW1	Turbidity	16.4	NTU	5		
8408306	TW1 - GW2	Turbidity	17.0	NTU	5		
8408308	TW1 - GW3	Turbidity	18.3	NTU	5		

This certificate of analysis corrects and replaces any previous version. The analysis results refer only to what was provided for testing.
This certificate shall not be reproduced except in full, without the written approval of Eurofins Environment Testing Canada Inc.
Method references and/or additional QA/QC information available on request.

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	8408304	8408306			
					Matrix :	Groundwater	Groundwater			
					Sampling Date :	2025-03-04	2025-03-04			
					Client Sample Identification :	TW1 - GW1	TW1 - GW2			
Anions			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Chloride	0.5	mg/L	250			116	115			
Nitrate (as Nitrogen)	0.1	mg/L	10.0			<0.5	<0.5			
Nitrite (as Nitrogen)	0.1	mg/L	1.0			<0.5	<0.5			
Sulphate	1	mg/L	500			185	186			

		Eurofins Sample No :	8408304	8408306					
		Matrix :	Groundwater	Groundwater					
		Sampling Date :	2025-03-04	2025-03-04					
		Client Sample Identification :	TW1 - GW1	TW1 - GW2					
Calculations	**RL**	**Unit**							
Ion Balance (Calculation)^	0.1		1.01	1.02					

					Eurofins Sample No :	8408304	8408306	8408308		
					Matrix :	Groundwater	Groundwater	Groundwater		
					Sampling Date :	2025-03-04	2025-03-04	2025-03-04		
					Client Sample Identification :	TW1 - GW1	TW1 - GW2	TW1 - GW3		
General Chemistry			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Alkalinity (as CaCO3)	5	mg/L	500			578	570			
Colour (Apparent)	2	TCU	5			97	86	116		
Conductivity @ 25°C	5	µS/cm				1530	1530			
Dissolved Organic Carbon	0.5	mg/L	5			7.7	7.2			
Fluoride	0.1	mg/L	1.5			0.16	0.18			
Hardness as CaCO3 (Calculation)	1	mg/L	80-100			708	704			
pH @ 25°C	1		6.5-8.5			7.91	7.72			
Phenols-4AAP	0.001	mg/L				<0.001	<0.001			
Sulphide (S2-)	0.01	mg/L	0.05			<0.01	<0.01			
Tannin and Lignin	0.1	mg/L				0.7	0.7			
TDS (Estimated)^	5	mg/L	500			995	993			
Turbidity	0.1	NTU	5			16.4	17.0	18.3		

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	**8408304**	**8408306**	**8408308**		
					Matrix :	Groundwater	Groundwater	Groundwater		
					Sampling Date :	2025-03-04	2025-03-04	2025-03-04		
					Client Sample Identification :	TW1 - GW1	TW1 - GW2	TW1 - GW3		
Metals			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Metals Scan (Water, ICP/MS)										
Aluminum	0.01	mg/L	0.1			0.07	0.03	0.03		
Antimony	0.0005	mg/L	0.006			<0.0005	<0.0005	<0.0005		
Arsenic	0.001	mg/L	0.01			<0.001	<0.001	<0.001		
Barium	0.001	mg/L	1			0.219	0.212	0.214		
Beryllium	0.0005	mg/L				<0.0005	<0.0005	<0.0005		
Boron	0.01	mg/L	5			0.10	0.11	0.11		
Cadmium	0.0001	mg/L	0.005			<0.0001	<0.0001	<0.0001		
Chromium	0.001	mg/L	0.05			<0.001	<0.001	<0.001		
Cobalt	0.0002	mg/L				0.0002	0.0002	<0.0002		
Copper	0.001	mg/L	1			<0.001	<0.001	<0.001		
Iron	0.03	mg/L	0.3			2.22	2.19	2.29		
Lead	0.001	mg/L	0.01			<0.001	<0.001	<0.001		
Manganese	0.01	mg/L	0.05			2.89	2.87	2.89		
Mercury	0.0001	mg/L	0.001			<0.0001	<0.0001	<0.0001		
Molybdenum	0.005	mg/L				0.010	0.010	0.009		
Nickel	0.005	mg/L				<0.005	<0.005	<0.005		
Selenium	0.001	mg/L	0.05			<0.001	<0.001	<0.001		
Silicon	0.1	mg/L						6.5		
Silver	0.0001	mg/L				<0.0001	<0.0001	<0.0001		
Strontium	0.001	mg/L				4.50	4.56	4.62		
Thallium	0.0001	mg/L				<0.0001	<0.0001	<0.0001		
Titanium	0.01	mg/L						<0.01		
Uranium	0.001	mg/L	0.02			0.001	0.001			
Vanadium	0.001	mg/L				<0.001	<0.001	<0.001		
Zinc	0.01	mg/L	5			<0.01	<0.01	<0.01		
Metals Scan (Water, ICP/OES)										
Calcium	1	mg/L				190	188	188		
Magnesium	1	mg/L				57	57	57		
Potassium	1	mg/L				11	11	11		
Sodium	1	mg/L	200			100	101	101		

					Eurofins Sample No :	**8408304**	**8408306**			
					Matrix :	Groundwater	Groundwater			
					Sampling Date :	2025-03-04	2025-03-04			
					Client Sample Identification :	TW1 - GW1	TW1 - GW2			
Microbiology			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Escherichia coli (DC)	0	CFU/100mL	0			0	0			
Total Coliforms (DC)	0	CFU/100mL	0			4	3			

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Eurofins Sample No :			**8408304**	**8408306**					
Matrix :			Groundwater	Groundwater					
Sampling Date :			2025-03-04	2025-03-04					
Client Sample Identification :			TW1 - GW1	TW1 - GW2					
Nutrients	**RL**	**Unit**							
Ammonia (Total, as Nitrogen)	0.02	mg/L	0.795	0.825					
Total Kjeldahl Nitrogen	0.1	mg/L	1.24	1.10					

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	**8408306**				
					Matrix :	Groundwater				
					Sampling Date :	2025-03-04				
					Client Sample Identification :	TW1 - GW2				
Semivolatile Organic Compounds			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Base Neutrals (Water, GC/MS)										
1,2,4-Trichlorobenzene	0.5	ug/L				<0.5				
1,2-Dichlorobenzene^	0.4	ug/L				<0.4				
1,3-Dichlorobenzene^	0.4	ug/L				<0.4				
1,4-Dichlorobenzene^	0.4	ug/L				<0.4				
2,4 + 2,6-Dinitrotoluene	0.5	ug/L				<0.5				
2,4-Dinitrotoluene	0.3	ug/L				<0.3				
2,6-Dinitrotoluene	0.3	ug/L				<0.3				
2-Chloronaphthalene	0.2	ug/L				<0.2				
3,3'-Dichlorobenzidine	0.5	ug/L				<0.5				
4-Bromophenyl phenyl ether	0.3	ug/L				<0.3				
4-Chloroaniline	0.2	ug/L				<0.2				
4-Chlorophenyl phenyl ether	0.3	ug/L				<0.3				
Azobenzene	0.3	ug/L				<0.3				
Biphenyl	0.6	ug/L				<0.6				
bis(2-chloro-1-methylethyl)ether	0.5	ug/L				<0.5				
Bis(2-chloroethoxy)methane	0.6	ug/L				<0.6				
Bis(2-chloroethyl)ether	0.8	ug/L				<0.8				
Bis(2-ethylhexyl)phthalate	0.4	ug/L				<0.4				
Butyl benzyl phthalate	0.3	ug/L				<0.3				
Camphene^	3.5	ug/L				<3.5				
Diethyl phthalate	0.2	ug/L				<0.2				
Dimethyl phthalate	0.2	ug/L				<0.2				
Di-n-butyl phthalate	1.3	ug/L				<0.3				
Di-n-octyl phthalate	0.9	ug/L				<0.9				
Diphenylamine^	5	ug/L				<1				
Hexachlorobenzene	0.01	ug/L				<0.01				
Hexachlorobutadiene	0.01	ug/L				<0.01				
Hexachlorocyclopentadiene^	0.5	ug/L				<0.5				
Hexachloroethane	0.01	ug/L				<0.01				
Indole^	1.9	ug/L				<1.9				
Isophorone	0.2	ug/L				<0.2				
Nitrobenzene	0.2	ug/L				<0.2				
N-Nitroso-di-n-propylamine	0.3	ug/L				<1.0				
N-Nitrosodiphenylamine & Diphenylamine^	1	ug/L				<1				
Phenyl ether^	0.4	ug/L				<0.4				
Quinoline^	2	ug/L				<2				
5-Nitroacenaphthene^	0.3	ug/L				<0.3				
1-Chloronaphthalene^	4.3	ug/L				<4.3				
p-Terphenyl-d14 (surrogate)	0	%				70				
PAH (Water, GC/MS)										
1-Methylnaphthalene	0.1	ug/L				<0.1				
2-Methylnaphthalene	0.1	ug/L				<0.1				
Acenaphthene	0.1	ug/L				<0.1				
Acenaphthylene	0.1	ug/L				<0.1				

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	**8408306**
					Matrix :	Groundwater
					Sampling Date :	2025-03-04
					Client Sample Identification :	TW1 - GW2
Semivolatile Organic Compounds			**Criteria**			
	RL	**Unit**	**A**	**B**	**C**	
Anthracene	0.1	ug/L				<0.1
Benzo(a)anthracene	0.1	ug/L				<0.1
Benzo(a)pyrene	0.01	ug/L	0.01			<0.01
Benzo(b)fluoranthene	0.05	ug/L				<0.05
Benzo(g,h,i)perylene	0.1	ug/L				<0.1
Benzo(k)fluoranthene	0.05	ug/L				<0.05
Chrysene	0.05	ug/L				<0.05
Dibenzo(a,h)anthracene	0.1	ug/L				<0.1
Fluoranthene	0.1	ug/L				<0.1
Fluorene	0.1	ug/L				<0.1
Indeno(1,2,3-c,d)pyrene	0.1	ug/L				<0.1
Naphthalene	0.1	ug/L				<0.1
Phenanthrene	0.1	ug/L				<0.1
Pyrene	0.1	ug/L				<0.1
p-Terphenyl-d14 (surrogate)	0	%				99
Phenolics (Water, GC/MS)						
2,3,4,6-Tetrachlorophenol	1	ug/L	100			<1.0
2,3,4-Trichlorophenol	1	ug/L				<1.0
2,3,4,5 & 2,3,4,6-Tetrachlorophenol^	1	ug/L				<1.0
2,3,4,5-Tetrachlorophenol^	1	ug/L				<1.0
2,3,5,6-Tetrachlorophenol^	1	ug/L				<1.0
2,3,5-Trichlorophenol	1	ug/L				<1.0
2,4,5-Trichlorophenol	0.2	ug/L				<0.2
2,4,6-Trichlorophenol	0.2	ug/L	5			<0.2
2,4-Dichlorophenol	0.2	ug/L	900			<0.2
2,4-Dimethylphenol	1	ug/L				<1.0
2,4-Dinitrophenol	2.5	ug/L				<2.5
2,6-Dichlorophenol	2	ug/L				<2.0
2-Chlorophenol	1	ug/L				<1.0
2-Methyl-4,6-dinitrophenol	2.2	ug/L				<2.2
2-Methylphenol	1	ug/L				<1.0
2-Nitrophenol	2	ug/L				<2.0
3 & 4-Methylphenol	1	ug/L				<1.0
4-Chloro-3-Methylphenol	1	ug/L				<1.0
4-Nitrophenol	2.5	ug/L				<2.5
Methylphenols (Total Cresols)	2	ug/L				<2.0
Pentachlorophenol	1	ug/L	60			<1.0
Phenol	1	ug/L				<1.0
Tribromophenol (surrogate)	0	%				93

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	**8408306**
					Matrix :	Groundwater
					Sampling Date :	2025-03-04
					Client Sample Identification :	TW1 - GW2
Volatile Organic Compounds			**Criteria**			
	RL	**Unit**	**A**	**B**	**C**	
VOCs (Water, GC/MS)						
1,1,1,2-Tetrachloroethane	0.5	ug/L				<0.5
1,1,1-Trichloroethane	0.4	ug/L				<0.4
1,1,2,2-Tetrachloroethane	0.5	ug/L				<0.5
1,1,2-Trichloroethane	0.4	ug/L				<0.4
1,1-Dichloroethane	0.4	ug/L				<0.4
1,1-Dichloroethene	0.5	ug/L	14			<0.5
1,2-Dibromoethane	0.2	ug/L				<0.2
1,2-Dichlorobenzene	0.4	ug/L	200			<0.4
1,2-Dichloroethane	0.2	ug/L	5			<0.2
1,2-Dichloropropane	0.5	ug/L				<0.5
1,3,5-Trimethylbenzene	0.3	ug/L				<0.3
1,3-Dichlorobenzene	0.4	ug/L				<0.4
1,4-Dichlorobenzene	0.4	ug/L	5			<0.4
Acetone	5	ug/L				<5.0
Benzene	0.5	ug/L	1			<0.5
Bromodichloromethane	0.3	ug/L				<0.3
Bromoform	0.4	ug/L				<0.4
Bromomethane	0.5	ug/L				<0.5
Carbon tetrachloride	0.2	ug/L	2			<0.2
Chloroethane	0.5	ug/L				<0.5
Chloroform	0.5	ug/L				<0.5
Chloromethane	0.2	ug/L				<0.2
cis-1,2-Dichloroethene	0.4	ug/L				<0.4
cis-1,3-Dichloropropene	0.5	ug/L				<0.5
Dibromochloromethane	0.3	ug/L				<0.3
Dichloromethane	4	ug/L	50			<4.0
Diethyl ether	5	ug/L				<5.0
Ethylbenzene	0.5	ug/L	140			<0.5
m/p-Xylene	0.4	ug/L				<0.4
Methyl ethyl ketone (MEK)	2	ug/L				<2.0
Methyl isobutyl ketone (MIBK)	5	ug/L				<5.0
Methyl tert-butyl ether (MTBE)	2	ug/L				<2.0
Monochlorobenzene	0.5	ug/L	80			<0.5
o-Xylene	0.4	ug/L				<0.4
Styrene	0.5	ug/L				<0.5
Tetrachloroethylene (PCE)	0.3	ug/L	10			<0.3
Toluene	0.4	ug/L	60			<0.4
trans-1,2-dichloroethene	0.4	ug/L				<0.4
trans-1,3-dichloropropene	0.5	ug/L				<0.5
Trichloroethylene (TCE)	0.3	ug/L	5			<0.3
Trichlorofluoromethane	0.5	ug/L				<0.5
Vinyl chloride	0.2	ug/L	1			<0.2
Xylene (Total)	0.5	ug/L	90			<0.5
1,2-dichloroethane-d4 (surrogate)	0	%				102
4-bromofluorobenzene (surrogate)	0	%				64

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OFFICIAL CERTIFICATE OF ANALYSIS - RESULTS

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

					Eurofins Sample No :	**8408306**				
					Matrix :	Groundwater				
					Sampling Date :	2025-03-04				
					Client Sample Identification :	TW1 - GW2				
Volatile Organic Compounds			**Criteria**							
	RL	**Unit**	**A**	**B**	**C**					
Toluene-d8 (surrogate)	0	%				86				

Approved by : Addrine Thomas,
Inorganic supervisor, Ottawa

Approved by : Patrick Jacques,
Ottawa, Environmental Chemist,

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
Alkalinity (Water, Automated)									
Method : Alkalinity (water, titration to pH 4.5, automated). Internal method: OTT-I-AT-WI45398.									
Alkalinity (as CaCO3)	mg/L	5	<5	97	95-105			1	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-07	
Ammonia, Total (Water, Colorimetry)									
Method : Ammonia (Water, Colorimetry). Internal method: OTT-I-NUT-WI46201.									
Ammonia (Total, as Nitrogen)	mg/L	0.02	<0.020	95	80-120	99	80-120	6	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-06	
Base Neutrals (Water, GC/MS)									
Method : Semi-volatile organic compounds (Water, GC/MS). Internal method: OTT-O-SEMI-WI45239.									
1,2,4-Trichlorobenzene	ug/L	0.5	<0.5	60	50-140				
1,2-Dichlorobenzene^	ug/L	0.4	<0.4		50-140				
1,3-Dichlorobenzene^	ug/L	0.4	<0.4		50-140				
1,4-Dichlorobenzene^	ug/L	0.4	<0.4		50-140				
2,4 + 2,6-Dinitrotoluene	ug/L	0.5	<0.5	87	50-140				
2,4-Dinitrotoluene	ug/L	0.3	<0.3	52	50-140				
2,6-Dinitrotoluene	ug/L	0.3	<0.3	122	50-140				
2-Chloronaphthalene	ug/L	0.2	<0.2	64	50-140				
3,3'-Dichlorobenzidine	ug/L	0.5	<0.5	34	30-130				
4-Bromophenyl phenyl ether	ug/L	0.3	<0.3	58	50-140				
4-Chloroaniline	ug/L	0.2	<0.2	46	30-130				
4-Chlorophenyl phenyl ether	ug/L	0.3	<0.3	58	50-140				
Azobenzene	ug/L	0.3	<0.3	70	50-140				
Biphenyl	ug/L	0.6	<0.6	64	50-140				
bis(2-chloro-1-methylethyl)ether	ug/L	0.5	<0.5	60	50-140				
Bis(2-chloroethoxy)methane	ug/L	0.6	<0.6	62	50-140				
Bis(2-chloroethyl)ether	ug/L	0.8	<0.8	60	50-140				
Bis(2-ethylhexyl)phthalate	ug/L	0.4	<0.4	86	50-140				
Butyl benzyl phthalate	ug/L	0.3	<0.3	68	50-140				
Camphene^	ug/L	3.5	<3.5		50-140				
Diethyl phthalate	ug/L	0.2	<0.2	62	50-140				
Dimethyl phthalate	ug/L	0.2	<0.2	58	50-140				
Di-n-butyl phthalate	ug/L	1.3	<0.3	66	50-140				
Di-n-octyl phthalate	ug/L	0.9	<0.9	64	50-140				
Diphenylamine^	ug/L	5	<1		50-140				
Hexachlorobenzene	ug/L	0.01	<0.01	58	50-140				
Hexachlorobutadiene	ug/L	0.01	<0.01	56	50-140				
Hexachlorocyclopentadiene^	ug/L	0.5	<0.5	54	50-140				
Hexachloroethane	ug/L	0.01	<0.01	65	50-140				
Indole^	ug/L	1.9	<1.9	50	50-140				
Isophorone	ug/L	0.2	<0.2	64	50-140				
Nitrobenzene	ug/L	0.2	<0.2	68	50-140				
N-Nitroso-di-n-propylamine	ug/L	0.3	<1.0	60	50-140				
N-Nitrosodiphenylamine & Diphenylamine^	ug/L	1	<1	30	50-140				
Phenyl ether^	ug/L	0.4	<0.4	62	50-140				
Quinoline^	ug/L	2	<2						
5-Nitroacenaphthene^	ug/L	0.3	<0.3						

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
Base Neutrals (Water, GC/MS)									
Method : Semi-volatile organic compounds (Water, GC/MS). Internal method: OTT-O-SEMI-WI45239.									
1-Chloronaphthalene^	ug/L	4.3	<4.3						
Associated Samples : 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-07	
Chloride (Water, IC)									
Method : Anions (Water, Ion Chromatography). Internal method: OTT-I-IC-WI45985.									
Chloride	mg/L	0.5	<0.5	99	80-120	107	80-120	-	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	
Colour, Apparent (Water, Spectrophotometry)									
Method : Colour (Water, Spectrophotometric). Internal method: OTT-I-SPEC-WI45980.									
Colour (Apparent)	TCU	2	<2	108	78-116			0	0-40
Associated Samples : 8408304, 8408306, 8408308								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	
Conductivity (Water, Automated)									
Method : Conductivity (Water, Autotitrator). Internal Method: OTT-I-AT-WI45398.									
Conductivity @ 25°C	uS/cm	5	<5	99	98-102				
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-07	
DOC (Water, IR)									
Method : Organic carbon (water, IR, combustion). Internal method: OTT-I-DEM-WI46148.									
Dissolved Organic Carbon	mg/L	0.5	<0.5	97	84-116	111	80-120	8	0-15
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-07	
Escherichia coli (DC Plate)									
Method : Total Coliforms and E.Coli by MF (Water, DC plate). Internal method: OTT-M-BAC-WI45296.									
Escherichia coli (DC)	CFU/100mL	0	0					-	0-30
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-05 Analysis Date: 2025-03-06	
Fluoride (Water, Auto/ISE)									
Method : Fluoride by autotitrator, ion selective electrode. Internal method: OTT-I-AT-WI45398.									
Fluoride	mg/L	0.1	<0.10	97	90-110				
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-07	

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
Metals Scan (Water, ICP/MS)									
Method : Metals (Water, ICP/MS). Internal method: AMMTFQE1.									
Aluminum	mg/L	0.01	<0.01	100	80-120	95	70-130	1	0-20
Antimony	mg/L	0.0005	<0.0005	82	80-120	84	70-130	-	0-20
Arsenic	mg/L	0.001	<0.001	99	80-120	98	70-130	-	0-20
Barium	mg/L	0.001	<0.001	100	80-120	94	70-130	1	0-20
Beryllium	mg/L	0.0005	<0.0005	106	80-120	108	70-130	-	0-20
Boron	mg/L	0.01	<0.01	100	80-120	104	70-130	-	0-20
Cadmium	mg/L	0.0001	<0.0001	101	80-120	99	70-130	-	0-20
Chromium	mg/L	0.001	<0.001	100	80-120	94	70-130	-	0-20
Cobalt	mg/L	0.0002	<0.0002	101	80-120	96	70-130	-	0-20
Copper	mg/L	0.001	<0.001	110	80-120	99	70-130	-	0-20
Iron	mg/L	0.03	<0.03	100	80-120	95	70-130	0	0-20
Lead	mg/L	0.001	<0.001	110	80-120	97	70-130	-	0-20
Manganese	mg/L	0.01	<0.01	100	80-120	96	70-130	-	0-20
Mercury	mg/L	0.0001	<0.0001	107	80-120	97	70-130	-	0-20
Molybdenum	mg/L	0.005	<0.005	90	80-120	91	70-130	-	0-20
Nickel	mg/L	0.005	<0.005	100	80-120	100	70-130	-	0-20
Selenium	mg/L	0.001	<0.001	97	80-120	97	70-130	-	0-20
Silicon	mg/L	0.1	<0.1	100	80-120			0	0-20
Silver	mg/L	0.0001	<0.0001	111	80-120	96	70-130	-	0-20
Strontium	mg/L	0.001	<0.001	100	80-120	90	70-130	1	0-20
Thallium	mg/L	0.0001	<0.0001	106	80-120	96	70-130	-	0-20
Titanium	mg/L	0.01	<0.01	102	80-120	97	70-130	-	0-20
Uranium	mg/L	0.001	<0.001	100	80-120	98	70-130	-	0-20
Vanadium	mg/L	0.001	<0.001	90	80-120	91	70-130	-	0-20
Zinc	mg/L	0.01	<0.01	110	80-120	102	70-130	-	0-20
Associated Samples : 8408304, 8408306, 8408308								Prep Date: 2025-03-06 Analysis Date: 2025-03-06	
Metals Scan (Water, ICP/OES)									
Method : Metals (Water, ICP/OES). Internal method: OTT-I-MET-WI48491.									
Calcium	mg/L	1	<1	101	86-115	98	70-130	0	0-20
Magnesium	mg/L	1	<1	98	91-109	98	70-130	0	0-20
Potassium	mg/L	1	<1	104	87-113	103	70-130	-	0-20
Sodium	mg/L	1	<1	103	85-115	103	70-130	0	0-20
Associated Samples : 8408304, 8408306, 8408308								Prep Date: 2025-03-06 Analysis Date: 2025-03-05	
Nitrate (Water, IC)									
Method : Anions (Water, Ion Chromatography). Internal method: OTT-I-IC-WI45985.									
Nitrate (as Nitrogen)	mg/L	0.1	<0.1	97	80-120	111	80-120	-	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	
Nitrite (Water, IC)									
Method : Anions (Water, Ion Chromatography). Internal method: OTT-I-IC-WI45985.									
Nitrite (as Nitrogen)	mg/L	0.1	<0.1	106	80-120				
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
PAH (Water, GC/MS)									
Method : Semi-volatile organic compounds (Water, GC/MS). Internal method: OTT-O-SEMI-WI45239.									
1-Methylnaphthalene	ug/L	0.1	<0.1	72	50-140				
2-Methylnaphthalene	ug/L	0.1	<0.1	72	50-140				
Acenaphthene	ug/L	0.1	<0.1	72	50-140				
Acenaphthylene	ug/L	0.1	<0.1	72	50-140				
Anthracene	ug/L	0.1	<0.1	84	50-140				
Benzo(a)anthracene	ug/L	0.1	<0.1	78	50-140				
Benzo(a)pyrene	ug/L	0.01	<0.01	67	50-140				
Benzo(b)fluoranthene	ug/L	0.05	<0.05	59	50-140				
Benzo(g,h,i)perylene	ug/L	0.1	<0.1	76	50-140				
Benzo(k)fluoranthene	ug/L	0.05	<0.05	82	50-140				
Chrysene	ug/L	0.05	<0.05	81	50-140				
Dibenzo(a,h)anthracene	ug/L	0.1	<0.1	64	50-140				
Fluoranthene	ug/L	0.1	<0.1	72	50-140				
Fluorene	ug/L	0.1	<0.1	74	50-140				
Indeno(1,2,3-c,d)pyrene	ug/L	0.1	<0.1	62	50-140				
Naphthalene	ug/L	0.1	<0.1	70	50-140				
Phenanthrene	ug/L	0.1	<0.1	78	50-140				
Pyrene	ug/L	0.1	<0.1	74	50-140				
Associated Samples : 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-07	
pH (25°C) (Water, Automated)									
Method : pH (Water, Automated Meter). Internal method: OTT-I-AT-WI45398.									
pH @ 25°C		1	6.56	100	97-103			1	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-07	

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
Phenolics (Water, GC/MS)									
Method : Semi-volatile organic compounds (Water, GC/MS). Internal method: OTT-O-SEMI-WI45239.									
2,3,4,6-Tetrachlorophenol	ug/L	1	<1.0	73	50-140				
2,3,4-Trichlorophenol	ug/L	1	<1.0	108	50-140				
2,3,4,5 & 2,3,4,6-Tetrachlorophenol^	ug/L	1	<1.0		50-140				
2,3,4,5-Tetrachlorophenol^	ug/L	1	<1.0	79	50-140				
2,3,5,6-Tetrachlorophenol^	ug/L	1	<1.0	98	50-140				
2,3,5-Trichlorophenol	ug/L	1	<1.0	108	50-140				
2,4,5-Trichlorophenol	ug/L	0.2	<0.2	126	50-140				
2,4,6-Trichlorophenol	ug/L	0.2	<0.2	107	50-140				
2,4-Dichlorophenol	ug/L	0.2	<0.2	106	50-140				
2,4-Dimethylphenol	ug/L	1	<1.0	76	30-130				
2,4-Dinitrophenol	ug/L	2.5	<2.5	101	30-130				
2,6-Dichlorophenol	ug/L	2	<2.0	106	50-140				
2-Chlorophenol	ug/L	1	<1.0	82	50-140				
2-Methyl-4,6-dinitrophenol	ug/L	2.2	<2.2		50-140				
2-Methylphenol	ug/L	1	<1.0	56	50-140				
2-Nitrophenol	ug/L	2	<2.0	69	30-130				
3 & 4-Methylphenol	ug/L	1	<1.0	57	50-140				
4-Chloro-3-Methylphenol	ug/L	1	<1.0		50-140				
4-Nitrophenol	ug/L	2.5	<2.5	58	30-130				
Methylphenols (Total Cresols)	ug/L	2	<2.0	57	50-140				
Pentachlorophenol	ug/L	1	<1.0	121	50-140				
Phenol	ug/L	1	<1.0	67	30-130				
Associated Samples : 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-07	
Phenols (Water, Colorimetry)									
Method : Phenols (Water, Colorimetry). Internal method: OTT-I-4AAP-WI46150.									
Phenols-4AAP	mg/L	0.001	<0.001	110	75-125	106	70-130	-	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-07	
Sulphate (Water, IC)									
Method : Anions (Water, Ion Chromatography). Internal method: OTT-I-IC-WI45985.									
Sulphate	mg/L	1	<1	95	90-110	108	80-120	0	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	
Sulphide (Water, Colorimetry)									
Method : Sulphide, S2- (Water, Colorimetry). Internal method: OTT-I-SPEC-WI45931.									
Sulphide (S2-)	mg/L	0.01	<0.01	87	80-120			-	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-07 Analysis Date: 2025-03-10	
Tannin and Lignin (Water, Spec)									
Method : Tannin and Lignin (Water, Spec), Internal method: OTT-I-SPEC-WI57693.									
Tannin and Lignin	mg/L	0.1	<0.1	106	80-120			-	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-06	

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
Total Coliforms (DC Plate)									
Method : Total Coliforms and E.Coli by MF (Water, DC plate). Internal method: OTT-M-BAC-WI45296.									
Total Coliforms (DC)	CFU/100mL	0	0					-	0-30
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-05 Analysis Date: 2025-03-06	
Total Kjeldahl Nitrogen (Water, Colorimetry)									
Method : TKN (Water, colorimetry). Internal method: OTT-I-NUT-WI46201.									
Total Kjeldahl Nitrogen	mg/L	0.1	<0.100	90	70-130	112	70-130	2	0-20
Associated Samples : 8408304, 8408306								Prep Date: 2025-03-06 Analysis Date: 2025-03-06	
Turbidity (Water, Turbidimeter)									
Method : Turbidity (Water, Turbidimeter). Internal method: OTT-I-TUR-WI46288.									
Turbidity	NTU	0.1	<0.1	105	80-120			2	0-30
Associated Samples : 8408304, 8408306, 8408308								Prep Date: 2025-03-06 Analysis Date: 2025-03-06	

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OFFICIAL CERTIFICATE OF ANALYSIS - QUALITY CONTROL

Client : Paterson Group
Project : PH4991

Reception Date: 2025-03-05

Parameter	Unit	RL	Blank	QC		Matrix Spike		Duplicate	
				Recovery %	Range %	Recovery %	Range %	RPD %	Range %
VOCs (Water, GC/MS)									
Method : Volatile Organic Compounds (Water, GC/MS). Internal method: AMVOMSE8.									
1,1,1,2-Tetrachloroethane	ug/L	0.5	<0.5	105	70-130	73	70-130	-	0-30
1,1,1-Trichloroethane	ug/L	0.4	<0.4	113	70-130	74	70-130	-	0-30
1,1,2,2-Tetrachloroethane	ug/L	0.5	<0.5	109	70-130	78	70-130	-	0-30
1,1,2-Trichloroethane	ug/L	0.4	<0.4	106	70-130	74	70-130	-	0-30
1,1-Dichloroethane	ug/L	0.4	<0.4	115	70-130	75	70-130	-	0-30
1,1-Dichloroethene	ug/L	0.5	<0.5	119	70-130	128	70-130	-	0-30
1,2-Dibromoethane	ug/L	0.2	<0.2	95	70-130	104	70-130	-	0-30
1,2-Dichlorobenzene	ug/L	0.4	<0.4	103	70-130	92	70-130	-	0-30
1,2-Dichloroethane	ug/L	0.2	<0.2	111	70-130	106	70-130	-	0-30
1,2-Dichloropropane	ug/L	0.5	<0.5	105	70-130	112	70-130	-	0-30
1,3,5-Trimethylbenzene	ug/L	0.3	<0.3	86	70-130	114	70-130	-	0-30
1,3-Dichlorobenzene	ug/L	0.4	<0.4	89	70-130	83	70-130	-	0-30
1,4-Dichlorobenzene	ug/L	0.4	<0.4	89	70-130	89	70-130	-	0-30
Acetone	ug/L	5	<5.0	107	70-130	78	70-130	-	0-30
Benzene	ug/L	0.5	<0.5	95	70-130	77	70-130	-	0-30
Bromodichloromethane	ug/L	0.3	<0.3	118	70-130	79	70-130	-	0-30
Bromoform	ug/L	0.4	<0.4	112	70-130	78	70-130	-	0-30
Bromomethane	ug/L	0.5	<0.5	126	70-130	117	70-130	-	0-30
Carbon tetrachloride	ug/L	0.2	<0.2	122	70-130	78	70-130	-	0-30
Chloroethane	ug/L	0.5	<0.5	116	70-130	116	70-130	-	0-30
Chloroform	ug/L	0.5	<0.5	123	70-130	81	70-130	-	0-30
Chloromethane	ug/L	0.2	<0.2	108	70-130	105	70-130	-	0-30
cis-1,2-Dichloroethene	ug/L	0.4	<0.4	118	70-130	78	70-130	-	0-30
cis-1,3-Dichloropropene	ug/L	0.5	<0.5	83	70-130	88	70-130	-	0-30
Dibromochloromethane	ug/L	0.3	<0.3	100	70-130	98	70-130	-	0-30
Dichloromethane	ug/L	4	<4.0	106	70-130	76	70-130	-	0-30
Diethyl ether	ug/L	5	<5.0	120	70-130	112	70-130	-	0-30
Ethylbenzene	ug/L	0.5	<0.5	96	70-130	78	70-130	-	0-30
m/p-Xylene	ug/L	0.4	<0.4	109	70-130	96	70-130	-	0-30
Methyl ethyl ketone (MEK)	ug/L	2	<2.0	94	70-130	76	70-130	-	0-30
Methyl isobutyl ketone (MIBK)	ug/L	5	<5.0	124	70-130	90	70-130	-	0-30
Methyl tert-butyl ether (MTBE)	ug/L	2	<2.0	140	70-130	82	70-130	-	0-30
Monochlorobenzene	ug/L	0.5	<0.5	89	70-130	108	70-130	-	0-30
o-Xylene	ug/L	0.4	<0.4	100	70-130	108	70-130	-	0-30
Styrene	ug/L	0.5	<0.5	99	70-130	124	70-130	-	0-30
Tetrachloroethylene (PCE)	ug/L	0.3	<0.3	92	70-130	82	70-130	-	0-30
Toluene	ug/L	0.4	<0.4	94	70-130	98	70-130	-	0-30
trans-1,2-dichloroethene	ug/L	0.4	<0.4	122	70-130	77	70-130	-	0-30
trans-1,3-dichloropropene	ug/L	0.5	<0.5	100	70-130	103	70-130	-	0-30
Trichloroethylene (TCE)	ug/L	0.3	<0.3	95	70-130	113	70-130	-	0-30
Trichlorofluoromethane	ug/L	0.5	<0.5	126	70-130	122	70-130	-	0-30
Vinyl chloride	ug/L	0.2	<0.2	128	70-130	94	70-130	-	0-30
Xylene (Total)	ug/L	0.5	<0.5				-		-

Associated Samples : 8408306

Prep Date: 2025-03-07
Analysis Date: 2025-03-11

Where RPD % is reported as "-" the calculation is not available because one or both of the duplicates is within 5 times the RL.

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STANDARD CHAIN-OF-CUSTODY

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100341628

Printed On : 2025-03-05 12:02:16

#: _____

CLIENT INFORMATION

Company:	Paterson Group
Contact:	Alex Schopf
Address:	9 Auriga Drive
Telephone:	613-218-3444
Cell:	
Email: #1:	eardley@patersongroup.ca, mlaflamme@patersongroup.ca;
Email: #2:	aschopf@patersongroup.ca;
Project:	PH4991
Quote #:	

INVOICE INFORMATION (SAME AS CLIENT YES ✓ NO ☐)

Company:	
Contact:	
Address:	
Email: #2:	
Telephone:	
PO #:	62526

TURN-AROUND TIME (Business Days)

☐ 1 Day* (100%) ☐ 2 Day** (50%) ☐ 3-5 Days (25%) ✓ 5-7 Days (Standard)

Please contact Lab in advance to determine rush availability.
*For results reported after rush due date, surcharges will apply: before 12:00 - 100%, after 12:00 - 50%.
**For results reported after rush due date, surcharges will apply: before 12:00 - 50%, after 12:00 - 25%.

REGULATION/GUIDELINE REQUIRED

☐ Sanitary Sewer, City: Ottawa
☐ Storm Sewer, City: Ottawa
✓ ODWSOG
☐ PWQO
☐ O. Reg 347/558
☐ Other: _____
☐ None

☐ O. Reg 153
Table # ____, Course / Fine, Surface / subsurface.
Type: Com-Ind / Res-Park / Agri / GW / All Other / Sediment
☐ Excess Soil, Table: _____ Type: _____

The sample results from this submission will form part of a formal Record of Site Condition (RSC) under O.Reg. 153/04
☐ Yes ☐ No

The optimal temperature conditions during transport should be less than 10°C. Sample(s) cannot be frozen, unless otherwise indicated or agreed upon with the Laboratory. Note that this COC is not to be used for drinking water samples. The COC must be complete upon submission of the samples, there will be a $25 surcharge if required information is missing (required fields are shaded in grey).

Sample Details / Sample Analysis Required

Sample ID	Date/Time Collected	Sample Matrix	# of Containers	PHC F1 - F4	BTEX	VOCs	PAHs	PCBs	Metals + Inorganics	Metals only	See attached paper	Subdivision Supply Bach 2 (Ec/TC only)	TSS	pH	Total Metals	Hg	Colour	Turbidity		RN# (Lab Use Only)
		Field Filtered -->		O.Reg.153 parameters																
TW1 - GW1	March 4, 2025	GW	6	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	✓	☐	☐	☐	☐	8408304
TW1 - GW2	March 4, 2025	GW	10	☐	☐	✓	✓	☐	☐	☐	☐	✓	☐	☐	✓	☐	☐	☐	☐	06
TW1 - GW3	March 4, 2025	GW	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	✓	✓	☐	08
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
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	PRINT	SIGN	DATE/TIME	TEMP (°C)
Sampled By:	Alex Schopf		March 4, 2025	
Relinquished By:	Alex Schopf		March 5, 2025	9.3
Received By:	S. Situ		March 5 2025	

COMMENTS: Total and Trace metals, VOC, PAH

CUSTODY SEAL: ☐ YES ☐ NO Ice packs submitted: ☐ Yes ☐ No

401 Magnetic Drive, Unit #1, North York, ON, M3J 3H9 - Telephone: 416-661-5287 • 380 Vansickle Road, Unit #630, St. Catharines, ON, L2S 0B5 - Telephone: 905-680-8887 • 608 Norris Court, Kingston, ON, K7P 2R9 - Telephone: 613-634-9307

AFSTDCOC.5

Copies: White - Laboratory, Yellow - Sampler

Manganese in Drinking Water Fact Sheet

WHAT IS MANGANESE?

Manganese is a naturally occurring element that is an essential nutrient for humans and animals. It is found in many foods, as well as in air, water, soil, and rocks.[1] Manganese makes up 0.1% of the Earth's crust, and can be found as a component of other minerals like sulfides, oxides, carbonates, and silicates.[2] Manganese is used in the manufacture of various products including iron and steel alloys, batteries, glass, fireworks, fertilizers, cosmetics, paints, and cleaning and disinfection products.[1,2] Manganese can also be purchased as a nutritional supplement.[2]

HOW DOES MANGANESE GET INTO DRINKING WATER?

Manganese is naturally occurring in many surface and ground waters. Manganese can also be dissolved from soils, sand and rocks to enter surface and ground waters.[1] Human activities like mining, industrial discharges, or landfills may also contribute to manganese in surface and ground waters.[1,2] In general, manganese can be found at higher concentrations in groundwater compared to surface water.[2] Some lakes and reservoirs can also have higher levels of manganese due to natural water chemistry.[2]

Permanganate, a compound that contains manganese, may also be added to water during the treatment of drinking water to remove other chemicals (e.g., for the removal of iron).[2,3]

HOW DOES MANGANESE INTAKE AFFECT MY HEALTH?

Too much or too little manganese in your body can lead to health problems.

Manganese deficiency: Manganese deficiency is rare and symptoms are not well defined. Health effects observed in individuals with diets very low in manganese include skin rashes, slow nail growth, reduced bone density, loss of pigmentation in hair, and low cholesterol levels.[2]

Manganese excess: There are few reports of adverse health effects from people who ingest too much manganese from food and water.[1] Recent evidence reviewed by Health Canada indicates that high levels of manganese in drinking water may impact memory and learning, behaviour, and fine motor control in infants and young children.[2,4] Formula-fed infants may be more susceptible to health risks if water with high concentrations of manganese is used to prepare formula. This is because infant brains are rapidly developing, they drink more water in proportion to their body weight, and they absorb more manganese and are less able to remove

it from their bodies compared to other age groups.[3] For adults and older children, short term exposure to manganese in drinking water at levels slightly above the guideline is unlikely to cause negative health effects.[3]

Health Canada notes that exposure to manganese while showering (either through breathing in water vapour or absorption through skin) is likely to be negligible.[2]

WHAT ARE THE LEVELS OF MANGANESE FOUND IN CANADIANS?

For most Canadians, diet is the main source of manganese. The Canadian Health Measures Survey (CHMS) is a national survey that collects information about the general health of Canadians and includes measurements of chemicals in blood and urine samples.[5] The objective of the chemical measurements in the CHMS survey is to establish baseline levels in the Canadian population. Given that manganese is an essential trace element, its presence in the blood and urine of Canadians is expected. Manganese in blood and urine can be interpreted as an indicator of exposure, but does not necessarily mean that health effects will occur.[5] Data collected from 2007 to 2011 for the CHMS found that the average levels of manganese measured in the blood of people in the Canadian population (aged 3 to 79) ranged from 8.8 – 11 µg/L.[6] More information on the CHMS and the levels of manganese in Canadians can be obtained by visiting the Canadian Biomonitoring Dashboard.[6]

ARE THERE STANDARDS FOR MANGANESE IN DRINKING WATER?

The Ontario Drinking Water Standard (ODWS) published in 2006 sets an aesthetic objective for manganese in drinking water at 0.05 mg/L.[7] The aesthetic objective is not intended to prevent health effects (e.g., not a health-based standard), but instead is intended to prevent the discolouration and staining of fixtures, and the undesirable taste caused by higher levels of manganese in water.

The Canadian Drinking Water Guideline for manganese developed by Health Canada stipulates a maximum acceptable concentration (MAC) in drinking water of 0.12 mg/L and an aesthetic objective of 0.02 mg/L.[2] The MAC is a health-based value intended to be protective of neurological effects in infants, the most sensitive population, and therefore it is also protective for chronic exposure in children and adults.[2]

ARE THERE OTHER STANDARDS OR GUIDELINE VALUES FOR MANGANESE?

The main source of exposure to manganese is via food, with grains, nuts and vegetables contributing the most to a person's daily intake of manganese. The average dietary intakes of manganese across all age groups according to the Canadian Total Diet Study (TDS) were estimated to range between 44.0 to 61.3 µg/kg of bodyweight per day (based on data gathered from different Canadian cities for the TDS).[2] Health Canada has also established Adequate Intake Levels for manganese ranging with age or lifestage from 0.003 to 2.6 mg/day and Tolerable Upper Intake Levels ranging from 2 to 11 mg/day.[8]

Infant formula sold in Canada is regulated to contain a minimum of 5 µg of manganese per 100 available kilocalories (equivalent to 3.33 µg per 100 mL of ready-to-feed formula); a maximum amount of manganese has not been set for infant formula.[9]

HOW CAN I TELL IF MY DRINKING WATER HAS HIGH MANGANESE LEVELS?

Water testing is the only way to know if manganese is present. Although water with elevated levels of manganese may impart a bitter metallic taste, tint water purplish brown or black (water discolouration may occur at concentrations as low as 0.005 to 0.02 mg/L), and stain laundry and plumbing fixtures;[2,10,11] but these issues can also be caused by other chemicals.

WHAT SHOULD I DO IF A HIGH LEVEL OF MANGANESE IS FOUND IN MY WELL WATER?

For households who do not obtain their drinking water from a municipal source, a residential drinking water treatment device may be an option to reduce manganese concentrations in drinking water. Options can be explored with professionals specialized in water treatment, but examples of treatment processes effective at removing manganese include reverse osmosis, ion exchange (including water softeners and other cation exchange systems) and oxidizing filters.[2] As with any water treatment system, it is important to follow the manufacturer's recommendations for operation and maintenance (e.g., replacement of filter media).

REFERENCES

1. United States Environmental Protection Agency (US EPA). Drinking Water Health Advisory for Manganese [Internet]. 2004. Available from: https://www.epa.gov/sites/default/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf

2. Health Canada. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Manganese [Internet]. 2019. Available from: https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-manganese.html

3. Health Canada. Water Talk - Manganese in drinking water [Internet]. 2023. Available from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/water-talk-manganese.html

4. HealthLink British Columbia. Manganese in Drinking Water [Internet]. Available from: https://www.healthlinkbc.ca/healthlinkbc-files/manganese-drinking-water

5. Health Canada. Second Report on Human Biomonitoring of Environmental Chemicals in Canada: Manganese [Internet]. 2013. Available from: https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/environmental-

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

541 Somme Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 379616.40 **NORTHING:** 5018877.07 **ELEVATION:** 89.30

PROJECT: Proposed Commercial Development

BORINGS BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** November 11, 2024

FILE NO. : PG7327

HOLE NO. : BH1-24

SAMPLE DESCRIPTION (GROUND SURFACE)	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80	△ REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80	PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
TOPSOIL 0.10m [89.20m]		0									89
FILL: Compact , grey silty fine sand to sandy silt , trace gravel			SS 1	62	3-8-7-7 15						
0.84m [88.46m] **FILL:** Compact , brown silty fine sand to sandy silt, topsoil, trace gravel 1.12m [88.18m]		1	SS 2	60	6-50-/-/ 50/0.03						88
End of Borehole											
Practical refusal to augering at 1.12 m depth		2									87
		3									86
		4									85
		5									84
		6									

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

541 Somme Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 379637.62 **NORTHING:** 5018860.97 **ELEVATION:** 89.58

PROJECT: Proposed Commercial Development

BORINGS BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** November 11, 2024

FILE NO. : PG7327

HOLE NO. : BH2-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) ▲ PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	MONITORING WELL CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
TOPSOIL and organics 0.10m [89.48m]		0							89
FILL: Loose, grey silty fine sand to sandy silt			SS 1	50	2-3-3-4 6				
		1	SS 2	62	4-4-50-/ 54/0.1				
1.27m [88.31m]									
End of Borehole									88
Practical refusal to augering at 1.27 m depth		2							87
		3							86
		4							85
		5							84
		6							

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

541 Somme Street, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 379649.37 **NORTHING:** 5018891.13 **ELEVATION:** 89.68

PROJECT: Proposed Commercial Development

BORINGS BY: CME-55 Low Clearance Drill

REMARKS: **DATE:** November 11, 2024

FILE NO. : PG7327

HOLE NO. : BH3-24

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE TYPE AND NO.	RECOVERY (%)	N, Nc OR RQD	WATER CONTENT (%)	PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 / REMOULDED SHEAR STRENGTH, Cur (kPa) / PEAK SHEAR STRENGTH, Cu (kPa) 20 40 60 80 / PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)
GROUND SURFACE									
FILL: Compact, brown silty fine sand to sandy silt with gravel, trace topsoil and organics (0.30m [89.38m])		0	SS 1	71	3-7-7-6 14				89
FILL: Compact, grey silty fine sand to sandy silt (0.86m [88.82m])			SS 2	51	50-/-/-/ 50/0.05				
End of Borehole		1							88
Practical refusal to augering at 0.86 m depth		2							87
		3							86
		4							85
		5							84
		6							

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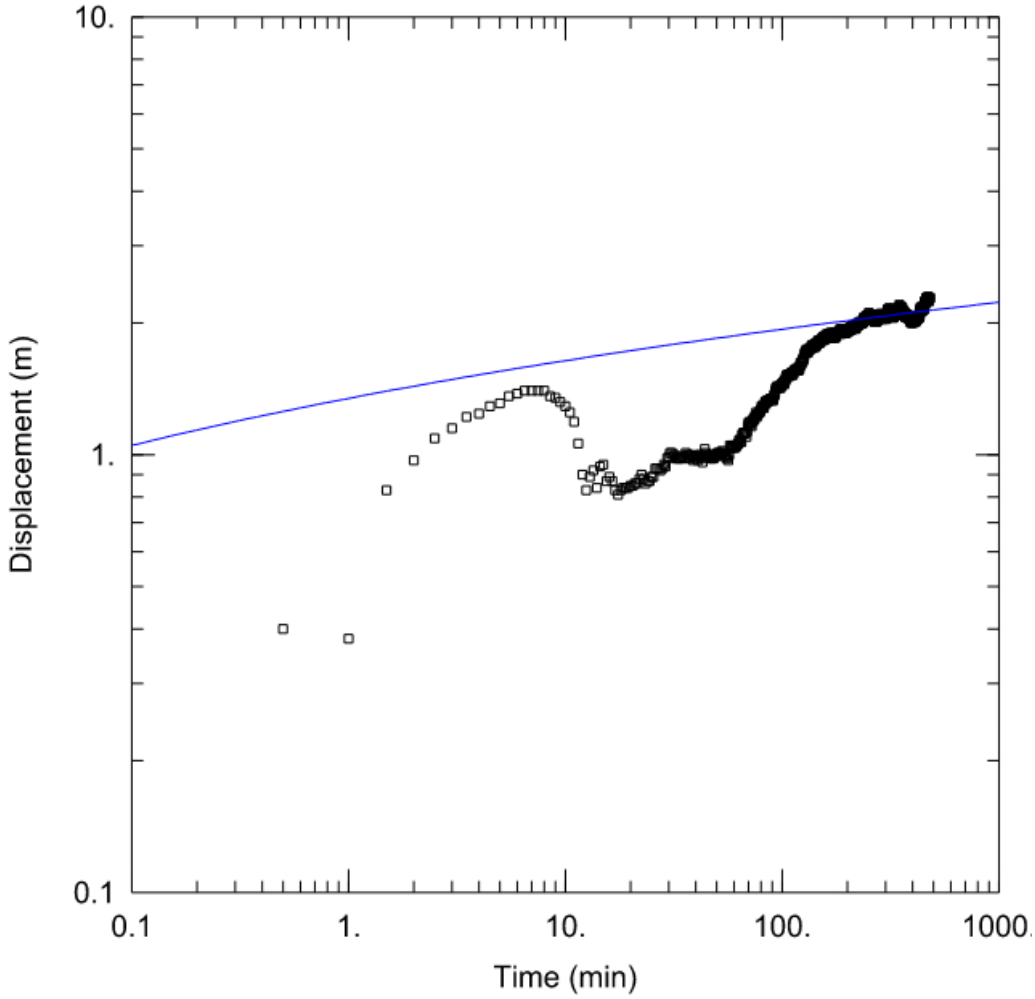
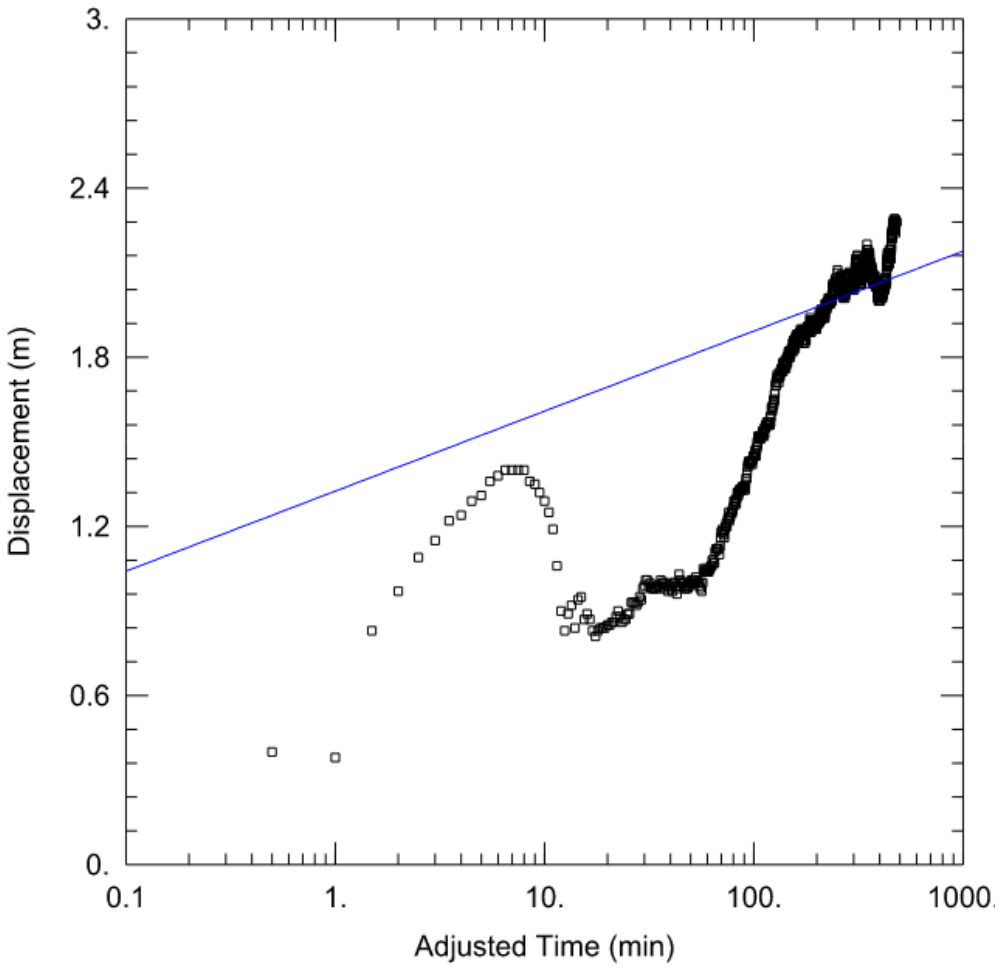
Pumping Test Analysis Report

File No.	PH4991	Well ID:	TW1
Date:	March 4, 2025	Solution Method:	**Theis**
Client:	Titan Environmental	Transmissitivity (m2/day):	51
Site Address:	541 Somme Street	Storativity	0.0003793
Project:	Site Plan Control Application	Discharge Rate (L/min)	57
		Analysis performed by:	AS



Pumping Test Analysis Report

File No.	PH4991	Well ID:	TW1
Date:	March 4, 2025	Solution Method:	**Cooper-Jacob**
Client:	Titan Environmental	Transmissitivity (m2/day):	53
Site Address:	541 Somme Street	Storativity	0.0003083
Project:	Site Plan Control Application	Discharge Rate (L/min)	57
		Analysis performed by:	AS



Pumping Test Analysis Report

File No.	PH4991
Date:	March 4, 2025
Client:	Titan Environmental
Site Address:	541 Somme Street
Project:	Site Plan Control Application

Summary Table:

Solution Method:	Well ID:	Transmissivity (m2/day):
Theis	TW1	51
Cooper-Jacob	TW1	53
Average:		**52.00**

Summary Table:

Solution Method:	Well ID:	Storativity
Theis	TW1	3.79E-04
Cooper-Jacob	TW1	3.08E-04
Average:		**3.44E-04**

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541 Somme Street, Ottawa, ON

PREDICTIVE NITRATE IMPACT ASSESSEMENT

Infiltration Factors		
Topography	0.30	
Soil	0.30	
Cover	0.10	
Total	**0.70**	
Site Characteristics		
Area of Site :	8014	m^2
Total of roof areas:	415	m^2
Total area of paved driveway areas:	4034	m^2
Roof + paved driveway areas	4449	m^2
Impervious Area	4449	m^2
Percent Impervious Area =	56	%
Infiltration Area =	3565	m^2
Septic Effluent		
Concentration of Effluent (Cs) =	20	mg/L
Infiltration Calculation		
Nitrate concentration in precipitation (C_i) =	0	mg/L
Surplus Water (Environment Canada)	378	mm/yr
Factored Water Surplus =	265	mm/yr
Infiltration % due to stormwater management measures	-	%
Infiltration rate from stormwater management measures =	0	mm/yr
Infiltration Flow Entering the System (Q_i) =	3	m^3/day
Mass Balance Model (MOEE, 1995)		
$C_T = (Q_bC_b+Q_eC_e+Q_iC_i)/(Q_b+Q_e+Q_i)$ = Cumulative Nitrate Concentration		
Q_b = flow entering the system across the upgradient area	0	m^3/day
C_b = background nitrate concentration	0	mg/L
Q_e = flow entering the system from the septic drainfield	1.1	m^3/day
C_e = concentration of nitrates in the septic effluent	20	mg/L
Q_i = flow entering the system from infiltration	3	m^3/day
C_i = Concentration of nitrates in the infiltrate	0	mg/L
C_T =	**5.97**	**mg/L**
Maximum Allowable Sewage Flow Volume		
Daily Sewage Flow (Qs)=	**1.1**	**m^3**

Notes: Site characteristic values were measured as approximate values from the available site plans and GeoOttawa.

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541 Somme Street
PH4991

MW1 inputs

pH	7.85	A	0.20
TDS	995	B	2.42
Calcium	188	C	1.87
Alkalinity	570	D	2.76
Temp.	8.1		
		pHs =	7.290695309

Langelier Saturation Index (LSI) Calculation

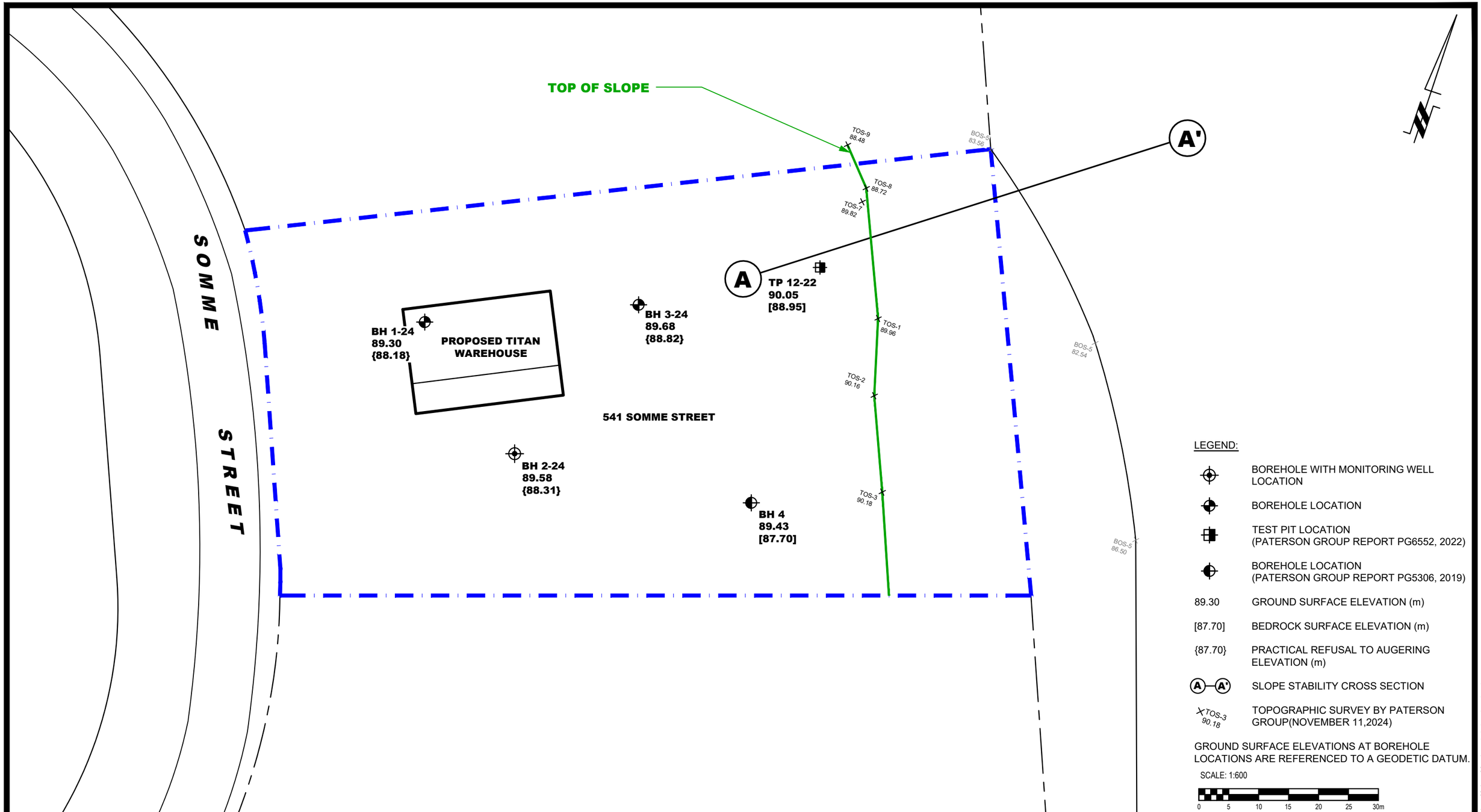
(Langelier, 1936)

LSI = pH - pHs
pHs = (9.3 + A + B) - (C + D)
Where:

A = (Log10 [TDS] - 1) / 10
B = -13.12 x Log10 (oC + 273) + 34.55
C = Log10 [Ca2+ as CaCO3] - 0.4
D = Log10 [alkalinity as CaCO3]

LSI = 0.6

LSI	Effect
0.5 to 2	Water is super saturated and tends to precipitate a scale layer of calcium carbonate (scale forming but non-corrosive)
0 to 0.5	**Water is super saturated and tends to precipitate a scale layer of calcium carbonate (slightly scale forming and corrosive).**
0	Water is saturated (in equilibrium) with calcium carbonate. A scale layer of calcium carbonate is neither precipitated nor dissolved.
0 to -0.5	Water is under saturated and tends to dissolve solid calcium carbonate (slightly corrosivebut non-scale forming).
-0.5 to -2	Water is under saturated and tends to dissolve solid calcium carbonate (seriously corrosive).



PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL

TITAN ENVIRONMENTAL CONTAINMENT
GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
541 SOMME STREET

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale: 1:600	Date: 11/2024
Drawn by: GK	Report No.: PG7327-1
Checked by: PB	Dwg. No.: PG7327-1
Approved by: SD	Revision No.:

11x17

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