GEMTEC
www.gemtec.ca

Hydrogeological Investigation & Terrain Analysis
Proposed Residential Severance
930 Smith Road
Ottawa, Ontario

GEMTEC
www.gemtec.ca

Submitted to:

Hierarchy Development and Design Inc.
1836 Maple Grove Road
Ottawa, Ontario
K2S 0M7

Hydrogeological Investigation & Terrain Analysis Proposed Residential Severance 930 Smith Road

Ottawa, Ontario

May 15, 2024 – Rev 1
Project: 100812.001

experience • knowledge • integrity

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists (GEMTEC) Limited was retained by Hierarchy Development and Design Inc. (HDD) to complete a hydrogeological investigation and terrain analysis in support of a residential development located at 930 Smith Road, Ottawa, Ontario. The Site Plan, Figure 1 is provided following the text of this report.

It is understood that the existing site located at 930 Smith Road, herein referred to as the 'Site', has a total area of approximately 5.46 hectares. Based on the Concept Plan provided (Appendix A), a total of seven residential lots are proposed.

The Site consists of agricultural lands and sparse tree and bush cover. The Site is bounded to the east and south by Smith Road, and residential dwelling to the north and west.

The objective of the investigation presented herein is:

- To demonstrate that the construction of any new well on the severed parcels is in accordance with the MECP;
- To demonstrate that the quality of the well water meets the Ontario Drinking Water Standards and maximum treatable limits prescribed in Ontario Ministry of Environment, Conservation and Parks (MECP) Procedure D-5-5;
- To demonstrate that the quantity of water meets the MECP requirements; and,
- To demonstrate the septic impact assessment meets the MECP requirements.

The hydrogeological investigation and terrain analysis was completed in general accordance with the City of Ottawa Hydrogeological and Terrain Analysis Guidelines (City of Ottawa, 2021), technical consultation with City of Ottawa hydrogeologist Michel Kearney on June 21, 2022 and City of Ottawa review comments titled "Phase 3 Pre-Consultation: Review Feedback, Proposed Zoning By-law Amendment and Consent Application – 930 Smith Road" and dated May 10, 2024.

This report is subject to the *Conditions and Limitations of This Report* provided following the text of this report, which are considered an integral part of this report.

2.0 TERRAIN ANALYSIS

2.1 Site Geology

Surficial geology maps (Ontario Geologic Survey, 2010) indicate that the site is split diagonally by a fluvial terrace, which is aligned in the northeast-southwest direction. The northeast section of the site is mapped as coarse-textured glaciomarine deposits of sand, gravel and minor silt and clay. The southwest section of the site is mapped as fine-textured glaciomarine deposits of

silt and clay, and minor sand and gravel. Drift thickness mapping indicate the overburden soils range from 10 to 25 meters thick (Gao et al, 2006).

Paleozoic bedrock geology maps (Armstrong and Dodge 2007) indicate the bedrock geology beneath the subject site consists of shale and minor limestone of the Billings Formation from the Upper Ordovician Period. Underlying the Upper Ordovician Period formations are the Simcoe Group of the of the Middle Ordovician, and the Beekmantown Group of the Lower Ordovician. The Simcoe Formation consists broadly of limestone, dolostone, shale and sandstone units. The Beekmantown Group consists of the Oxford Formation, which is described as a dolostone with shaly and sandy interbeds, which is underlain by the March Formation, an interbedded grey quartz sandstone, dolomitic quartz sandstone, and blue-grey sandy dolostone and dolostone.

Available karst mapping (Brunton and Dodge, 2008), does not indicate any areas of any inferred or potential karstic features.

2.2 Subsurface Conditions

The subsurface conditions at the site were characterized as part of the geotechnical investigation of the site (GEMTEC, 2024). A total of four boreholes (numbered 21-01, 21-02A, 21-02B, and 21-03) were advanced.

The boreholes were advanced to depths ranging from about 6.7 to 8.8 metres below ground surface. Samples of the soils encountered were recovered using a 50-millimetre diameter split barrel sampler. Well screens were sealed in the overburden at all borehole locations (except borehole 20-02B) to measure the groundwater levels and for hydraulic conductivity testing.

Descriptions of the subsurface conditions logged in the boreholes are provided on the Record of Borehole sheets in Appendix B. The approximate locations of the test holes are shown on the Detailed Site Plan, Figure 2.

The groundwater conditions described in this report refer only to those observed at the place and time of observation noted in the report. These conditions may vary seasonally or because of construction activities in the area.

The following presents a summary of the subsurface conditions encountered in the boreholes advanced during the geotechnical investigation (GEMTEC, 2024).

2.2.1 Topsoil

A layer of topsoil was encountered at the ground surface at the borehole locations with a thickness ranging from about 130 to 180 millimetres.

2.2.2 Silty Sand

A native deposit of silty sand was encountered below the topsoil in borehole 21-02A and 21-02B with a thickness of about 150 millimetres.

2.2.3 Silty Clay

Native deposits of silty clay were encountered in all of the boreholes. The silty clay was not fully penetrated in all the boreholes but was proven to depths ranging from about 5.3 to 8.8 metres below ground surface.

The upper part of the silty clay in the boreholes is weathered to a grey-brown crust. The weathered silty clay crust has a thickness ranging from about 2.8 to 5.2 metres and extends to depths ranging from about 3.1 to 5.3 metres below the existing ground surface.

Grain size distribution tests were undertaken on one sample of the weathered silty clay crust from borehole 21-01. The results are provided in Appendix C and are summarized in Table 1.

Table 1 – Summary of Grain Size Distribution Test (Weathered Crust)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
21-01	3	1.5 – 2.1	0	1	21	78

Below the weathered zone, the silty clay is grey in colour. The silty clay was not fully penetrated in all the boreholes but was proven to depths ranging from about 5.3 to 8.8 metres below ground surface.

2.2.4 Glacial Till

A deposit of glacial till was encountered below the silty clay in borehole 21-03. The glacial till was not fully penetrated in the borehole but was proven to depth of about 6.1 metres below ground surface.

The glacial till is a heterogeneous mixture of all grain sizes, which at this site, can be described as grey silty sand with some gravel and clay. Although not encountered in the borehole directly, the glacial till deposits in this area are known to contain cobbles and boulders.

One grain size distribution test was undertaken on a sample of the glacial till from borehole 21-03. The results are provided in Appendix C and are summarized in Table 2.

Table 2 – Summary of Grain Size Distribution Test (Glacial Till)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
21-03	8	5.3 – 5.9	16	44	24	16

2.2.5 Auger Refusal

Auger refusal was encountered in borehole 21-02A at a depth of about 8.2 metres below ground surface (elevation of about 72.7 metres, geodetic).

2.2.6 Groundwater Levels

Well screens were installed in the overburden at boreholes 21-01, 21-02A, and 21-03. The groundwater levels measured in the wells are summarized in Table 3.

Table 3 – Groundwater Depth and Elevation

Borehole No.	Ground Surface Elevation (metres)	Groundwater Depth (metres)	Groundwater Elevation (metres)	Date of Reading
21-01	78.94	3.7	75.2	September 13, 2021
21-02A	80.95	2.1	78.9	September 13, 2021
21-03	80.08	> 6.1	< 74.0	September 13, 2021

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation. Based on the groundwater levels measured on September 13, 2021, the overburden groundwater flow direction is to the south, following topography.

2.2.7 Hydraulic Test Results

The results of the hydraulic testing carried out in select monitoring wells are provided in Appendix D. A summary of the recovery measurements made during the hydraulic testing carried out by introducing/removing a slug into the well screens is provided in Table 4.

Table 4 – Summary of Falling Head and Rising Head Test Results

Borehole	Borehole Depth (metres)	Geological Material Tested	Static Groundwater Depth (metres)	Falling Head Test[1]	Calculated *k* Falling Head (m/s)[2]
21-01	7.32	Silty clay	3.7	73% in 90 minutes	1×10^{-7}
21-02A	8.18	Silty clay	3.0	7% in 60 minutes	3×10^{-8}
21-03	6.10	Silty clay	dry	-	-

Notes:
1. Falling head test were completed by inserting a slug with a known displacement (0.60 metre). The water level was monitored manually using a water level meter and electronically using a VanEssen Diver Datalogger, recording at 0.5 minute intervals.
2. The hydraulic conductivities were calculated using the Hvorslev solution in an unconfined aquifer.
3. The recovery in the monitoring wells was too slow to complete a rising head test.

The falling head tests (i.e. inserting a slug) recorded a recovery of about 73 percent at 21-01 and about 7 percent at 21-02A. Considering this to be slow to very slow recovery of groundwater levels the rising head tests were not performed at these two test locations. Based on the low permeability silty clay at the screened interval at monitoring wells 21-01 and 21-02A, the minimal recovery is reasonable for the encountered soil type.

In areas within the site where a saturated granular soil layer is encountered, higher hydraulic conductivity values should be expected.

2.3 MECP Water Well Records

A search of the Ministry of Environment, Conservation and Parks (MECP) water well records (https://www.ontario.ca/environment-and-energy/map-well-records) returned 55 water well records within 500 metres of the Site, refer to Site Location Plan (Figure 1). A summary of the relevant well construction details from the 55 water well records is provided in Appendix E. The well depths range from 13.7 to 61.1 metres below ground surface, with an average well depth of 23.3 metres. The depth to bedrock ranges from 12.2 to 37.5 meters below ground surface, with an average value of 20.2 metres.

The bedrock lithology is generally classified as shale, slate, and limestone in the MECP well records, with most records indicating shale or slate. It is noted that the MECP well records provide a general description of the bedrock encountered, and given the similarities between some geologic units, e.g. slate and shale, the well records may not be suitable to distinguish between geologic formations of the water supply aquifer.

2.4 Topography and Drainage

Topographic mapping data indicates that elevations across the Site range from approximately 71 to 80 metres above sea level. The Site elevation generally increases from the south to north

and has a topographic low point in the southwest corner of the site. The drainage of the subject is expected to follow topography and drain generally to the south.

3.0 GROUNDWATER QUALITY AND QUANTITY

The hydrogeological investigation was carried out in accordance with MECP Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment, to determine the quantity and quality of groundwater available for domestic water supply. The results of the groundwater supply investigation are summarized in the following sections.

3.1 Homeowner Well Water Quality Sampling

Between 2022 and 2023, GEMTEC completed homeowner questionnaires and water quality sampling from several residential dwellings located within 100 meters of the Site (Figure 1). The wells identified as PW-903 (well tag # 1515221), PW-939 (well tag # 1511704), PW-1014 (well tag # 1512793), and PW-959 (No well tag #) were sampled as part of this assessment based on homeowner availability, relative proximity, comparable surrounding land-use, and comparable geological setting. It should be noted that none of the private wells had well tags affixed to the steel casings and the well tag numbers were obtained from a search of MECP well records. The available water well records for the private wells sampled are provided in Appendix E and a summary of the well construction details are provided in Table 5.

Table 5 – Well Construction Details – Sampled Private Wells

	PW939	PW903	PW1014
Well Tag Number[1]	1515221	1511704	1512793
Date of Drilling	Oct. 26, 1971	Sept. 24, 1975	April 5, 1965
Depth to Bedrock (m)	18.3	13.7	25.9
Length of Well Casing Below Ground Surface (m)	18.3	13.1	25.9
Static Water Level (m btoc)[2]	8.22	0.30	4.57
Depth Water Found[3] (m)	20.4	15.8	26.5
Total Well Depth (m)	20.4	15.8	26.5

	PW939	PW903	PW1014
Open Interval (m)	2.10	2.70	0.61
Bedrock Aquifer Description[4]	Brown Slate	Grey Slate	Brown Slate

Notes:
1. No well tag affixed to steel casing, well ID's based on MECP well record database.
2. 'mbtoc' – Meters below top of casing. Water levels reported on the water well record.
3. Water found depth as reported on MECP water well record. Corresponds to the depth below ground surface of the water bearing fractures encountered at the time of drilling.
4. The bedrock aquifer is defined as the geologic unit corresponding with the major water bearing zones encountered at time of drilling.

The groundwater samples were collected from the pressure tank bypass after running the cold-water tap for a minimum of 10 minutes. Water quality samples were submitted for laboratory analysis of 'subdivision package' parameters on February 2, 2022 and April 7, 2022. The field and laboratory water quality results are provided in Appendix F.

In addition to the sampled wells, homeowner interviews were also completed at three homeowners on private services within 500m of the site were interviewed; relevant interview notes are provided in Table 6 below.

Table 6 – Homeowner Interviews

Test Well ID	Homeowner Water Quality Rating[1]	Water Quantity Comments	Water Quality / Septic Comments
PW-903	Good	No reported groundwater quantity issues	• Sulfur smell • Water filtration system in place
PW-939	Good	No reported groundwater quantity issues	• Sulfur Smell • Water filtration system in place
PW-1014	Poor	No reported groundwater quantity issues	• Water filtration and chlorination system in place. • Sulfur smell
PW-959	Fair	No reported groundwater quantity issues	• Sulfur smell • No treatment systems

Test Well ID	Homeowner Water Quality Rating[1]	Water Quantity Comments	Water Quality / Septic Comments
PW-900	Very Good	No reported groundwater quantity issues	• High sulfur • Aerator and filtration system in place
PW-908	Very Good	No reported groundwater quantity issues	• No treatment systems in place
PW-917	Poor	No reported groundwater quantity issues	• Sulfur and bacteria presence • Chlorination system in place

Notes: Water quality rating based on a scale of 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent).

Two homeowners rated their groundwater quality as 'poor' with one indicate possible bacteria presence, although no justification or additional information was provided. Six of the seven homeowners interviewed reported sulfur smell in their groundwater.

3.2 Test Well Construction

A total of six test wells were utilized in the hydrogeological investigation, consisting of five on-site and one off-site test well. The six test wells can be separated into two categories: three deep test wells completed in the bedrock aquifer (PW21-01, TW22-01 and TW22-02) and three test wells completed in the interface aquifer consisting of gravel overburden and/or upper bedrock (TW22-03, TW22-04 and TW24-05). The MECP water well records for the test wells utilized for the hydrogeological investigation are provided in Appendix E, and the construction details are summarized in Table 7. The locations of the water wells are provided on the Detailed Site Plan (Figure 2).

Table 7 – Well Construction Details – Test Wells

	PW21-01 (A313191)	TW22-01 (A342174)	TW22-02 (A342173)	TW22-03 (-)[1]	TW22-04 (A342479)	TW24-05 (A395575)
Date of Drilling	Jan 7, 2021	Jan 13, 2022	Jan 21, 2022	unknown	Aug 17, 2022	December 07, 2024
Depth to Bedrock (m)	17.7	18.3	17.1	-	13.7	18.6

	PW21-01 (A313191)	TW22-01 (A342174)	TW22-02 (A342173)	TW22-03 (-)[1]	TW22-04 (A342479)	TW24-05 (A395575)
Length of Well Casing Above Ground Surface[2] (m)	0.63	0.66	0.66	0.56	0.76	0.61
Length of Well Casing Below Ground Surface (m)	19.5	21.3	20.1	18.2	13.1	18.9
Static Water Level (m btoc)[3]	8.7	9.5	11.1	9.0	3.4	8.8
Depth Water Found[4] (m)	120	89.6	98.8	-	12.8	19.8
Total Well Depth (m)	122	91.4	101	20.0	14.9	24.4
Open Interval (m)	19.5 – 122	21.3 – 91.4	20.1 - 101	18.2 – 20.0 (slotted screen)	13.1 – 14.9	18.9 – 24.4
Bedrock Aquifer Description[5]	Limestone	Limestone	Limestone	Gravel / Bedrock Aquifer[6]	Gravel / Bedrock Aquifer	Gravel / Black Shale Aquifer[7]

Notes:
1. No Water well record is available for the TW22-3, well construction details based on well camera inspection completed by Air Rock Drilling Ltd.
2. As measured by GEMTEC staff during on site investigations if available.
3. 'mbtoc' – Meters below top of casing.
4. Water found depth as reported on MECP water well record. Corresponds to the depth below ground surface of the water bearing fractures encountered at the time of drilling.
5. The bedrock aquifer is defined as the geologic unit corresponding with the major water bearing zones encountered at time of drilling.
6. TW22-03 assumed to be completed in the gravel/bedrock interface aquifer based on observed slotted screen and geological information from TW22-02 located approximately 50 metres from TW22-03.
7. TW24-05 was hydro fracked is assumed to be receiving water from the gravel/bedrock interface aquifer.

3.3 Groundwater Quantity

3.3.1 Pumping Test Details

Constant rate pumping tests were completed in all six on-site test wells. The three deep test wells (PW21-01, TW22-01, and TW22-02) sustained pumping rates of 44 to 96 litres per minute over a six-hour period with minimal drawdown, i.e., less than 14% of available drawdown. Due to Ontario Drinking Water Quality Standards (ODWQS) maximum acceptable concentration exceedances, discussed in section 3.4 below, the deep-water supply aquifer is not proposed as the preferred water supply aquifer and as such, aquifer properties are not discussed in detail.

Three on-site test wells were completed in the proposed water supply aquifer, TW22-03, TW22-04 and TW22-05, screened across the overburden gravel and / or upper bedrock aquifer.

Constant rate pumping tests were completed in all three test wells. The water from the pumping test was discharged to the ground surface approximately 10 metres away from the test well such that the discharge flow was away from the well head. Water level and flow rate measurements were taken at regular intervals throughout the pumping test. Water levels were also taken during the recovery phase of the pumping test (after the pump was turned off) until the well to reached 95% recovery (compensated for barometric pressure). The pumping test drawdown and recovery graph is provided in Appendix G.

A summary of the pumping test details is provided in Table 8 below.

Table 8 – Pumping Test Details

Parameter	PW21-01 (A313191)	TW22-01 (A342174)	TW22-02 (A342173)	TW22-03 (No Tag #)	TW22-04 (A342479)	TW24-05 (A395575)
Date	Nov 18, 2021	Feb 1, 2021	Feb 2, 2021	April 28, 2022	Sep 1, 2022	Jan 18, 2024
Duration (minutes)	360	360	360	360	450	360
Flow Rate (litres per minute)	45	44	96	23	15	19
Static Water Level (m TOC[1])	9.32	9.45	10.77	8.97	2.76	8.78
Static Water Level (m BGS[2])	8.69	8.79	10.11	8.40	2.00	8.28

Parameter	PW21-01 (A313191)	TW22-01 (A342174)	TW22-02 (A342173)	TW22-03 (No Tag #)	TW22-04 (A342479)	TW24-05 (A395575)
Available Drawdown[3] (m)	109.6	79.6	87.9	11.6	9.2	15.12
Water Level at End of Pumping (m TOC)	14.11	20.59	8.55	18.94	7.11	11.34
Pumping Duration (hours)	6	6	6	6	7.5	6
Observed Drawdown at End of Pumping (m)	4.79	11.14	2.22	9.97	4.35	3.06
Percent Drawdown Utilized (%)	4	14	3	86	47	20

Notes:
1. TOC = top of casing; 2. BGS = below ground surface
3. Available drawdown (water column above pump) assumes pump is set 3 metres above bottom of the well for deep test wells PW21-01, TW22-01 and TW22-2 and 1 metre for test wells TW22-03, TW22-04, and TW24-05.

Test wells TW22-03 and TW22-05 were pumped at rates of at least 18.75 litres per minute, which is the minimum pumping rate to meet peak demands for a four-bedroom dwelling (i.e. 3.75 litres x number of bedrooms plus one = 18.75 litres per minute). Test well TW22-04 was pumped at a rate of 15 litres per minute, which meets peak demand requirements for a 3-bedroom dwelling. To account for the lower pumping rate, the pumping test of TW22-04 was extended to 7.5 hours, such that an equivalent groundwater volume could be pumped when compared to a six hour test at a rate of 18.75 litres per minute.

3.3.2 Pumping Test Analysis

The pumping test for wells completed in the proposed water supply aquifer were analyzed and the transmissivity of the water supply aquifer was estimated from the pumping test drawdown data using Aqtesolv (Version 4.5), a commercially available software program from HydroSOLVE Inc. The results of the Aqtesolv analyses are provided in Appendix G.

The Papadopulous-Cooper and Theis Recovery analyses estimate the transmissivity of the water supply aquifer to be 3.8 and 0.8 m^2/day respectively for TW22-03. The Papadopulous-Cooper methodology accounts for wellbore storage, that was evident at the start of the pumping test. The maximum drawdown of the well was approximately 9.9 meters following 6 hours of

pumping at a flow rate of 27 litres per minute, with 1.0 meters of available drawdown remaining. The well recovered to 95% within 1 hour of pump shut off.

The Theis and Theis Recovery analyses estimate the transmissivity of the water supply aquifer to be 2.8 and 1.9 m^2/day respectively for TW22-04. The maximum drawdown of the well was approximately 4.35 meters following 7.5 hours of pumping at a flow rate of 15 litres per minute, with 4.85 meters of available drawdown remaining. The well recovered to 95% within 11 hours of pump shut off.

The Cooper-Jacob and Theis Recovery analyses indicate that the transmissivity of the water supply aquifer is calculated to be 8.2 m^2/day and 2.4 m^2/day, respectively for TW24-05. The maximum drawdown of the well was approximately 3.06 metres following 6 hours of pumping at a flow rate of 19 litres per minute, with 12 metres of available drawdown remaining. The well recovered to 95% within 30 minutes of pump shut off. Based on these results, the test wells are capable of repeat pumping at pumping rates of at least 15 litres per minute.

It is noted that the pumping test results from both test wells TW22-04 and TW24-05 have decreasing drawdowns towards the end of the pumping tests indicating potential 'recharge' conditions. This is inferred to be groundwater contribution from the overlying gravel layer, of variable thickness, over the upper fractured bedrock. The conceptual model indicates that the upper fractured bedrock is connected to the overburden gravel layer atop the bedrock and given the test wells are completed into the rock, groundwater contribution from the gravel layer is expected and can be observed as 'recharge' during the pumping test.

3.4 Groundwater Quality

In addition to the homeowner water quality sampling discussed in section 3.1, the groundwater quality assessment included sampling from the six test wells: PW21-01, TW22-01, TW22-02, TW22-03, TW22-04 and TW24-05. A summary of the groundwater quality sampling events and parameters analyzed are provided in Table 9 below.

Table 9 – Water Quality Sampling Summary

Test Well ID	Date of Sampling	Exceedances	Aquifer Type
PW21-01	Nov 18, 2021	Hardness, Sulphide	Deep Bedrock
TW22-01	Feb 1, 2021	Hardness, Sulphide, Turbidity, Organic Nitrogen, Color, pH, Fluoride, Aluminum, Iron	Deep Bedrock

Test Well ID	Date of Sampling	Exceedances	Aquifer Type
TW22-02	Feb 2, 2021	Hardness, pH, Sulphide, Fluoride, Aluminum	Deep Bedrock
TW22-03	April 28, 2022	Iron, Sulphide, Hardness, Turbidity, Colour, pH, Aluminum	Gravel
TW22-04	Dec 19, 2023	Hardness, pH, Sulphide	Gravel-Shallow Bedrock Interface
TW24-05	Jan 24, 2024	Hardness, pH, Sulphide	Gravel-Shallow Bedrock Interface

Deep bedrock wells PW21-01, TW22-01 and TW22-02 are not considered representative of the proposed water supply aquifer, which is anticipated to be the shallow bedrock-gravel interface water bearing zone. Furthermore, TW22-03 was not further developed and tested, because the age and construction details of the well is currently unknown and not considered to be representative of future on-site wells. It is noted that excluding exceedances in turbidity and turbidity-related exceedances such as color, aluminum and iron (Table 9), TW22-03 displayed similar water quality when compared to TW22-04 and TW24-05. TW22-03 is not further discussed in the following sections.

The water quality sample for PW21-01, TW22-01, TW22-02 and TW22-04 were collected from the discharge hose at the middle and end of the 6-hour pumping tests and submitted for analysis of subdivision package parameters and unfiltered and filtered trace metals (PW21-01 excepted). TW24-05 was not sampled after 6-hours of pumping due to elevated turbidity levels. TW22-04 was further developed for 1 week and resampled on December 19, 2023, while TW24-05 was further developed for 2 days and resampled on January 24, 2024. For the additional well development, test wells TW22-04 and TW24-05 were pumped at the same rates as during the pumping tests, approx 15 l/min for TW22-04 and 19 l/min for TW24-05.

The Laboratory Certificates of Analysis are provided in Appendix F. Field measurements of temperature, pH, electrical conductivity, total dissolved solids, turbidity, filtered colour, unfiltered colour and total chlorine were measured at the time of sampling. A summary of the measured field parameters is provided in Appendix F.

3.4.1 Summary of Water Quality Exceedances for Deep Bedrock Aquifer

Based on the lab results, elevated fluoride concentrations were identified in two of the three deep bedrock test wells, TW22-01 and TW22-02 with concentrations ranging from 2.6 to 3.3 mg/L (Appendix F). The fluoride concentrations exceed the ODWQS maximum acceptable concentration of 1.5 mg/L and as such, the deep bedrock water supply is not suitable for consumption. The deep aquifer also exceeded the operational guideline for hardness, and esthetic objectives of sulphide, colour, and iron.

These exceedances are not further discussed as the deep aquifer is not considered to be representative of the proposed water supply aquifer for the development.

3.4.2 Summary of Water Quality Exceedances for Gravel/Shallow Bedrock Interface Aquifer

As previously mentioned, the gravel/shallow bedrock interface water bearing unit is the proposed water supply aquifer. The ODWQS exceedances and notable parameters of this aquifer are discussed in detail below, based on water quality samples collected from on-site test wells TW22-04 and TW24-05 and technically representative homeowner wells PW903, PW939 and PW1014.

3.4.3 Bacteriological Results

Total and free chlorine measurements at the time of bacteriological sampling confirmed that total and free chlorine concentrations in the groundwater were non-detectable.

The shallow test wells TW22-04 and TW24-05 had elevated turbidity levels at the time of sampling, which may interfere with bacteriological analyses. Bacteriological testing was not completed on TW22-04 and TW24-05 during the pumping test due to elevated turbidity levels. Following further development and re-sampling, water quality results for TW22-04 reported non-detectable concentrations of E.coli, fecal coliform, and total coliform, while TW24-05 had non-detectable concentrations of E.coli and fecal coliform with total coliform count of 1 CFU/100mL.

Although the total coliform concentrations exceed the ODWWS maximum acceptable concentration of 0 CFU/100mL, the total coliform concentrations detected meet the MECP Procedure D-5-5 limit of less than 6 counts per 100 mL for Total Coliform bacteria, with non-detectable indicator species of e.coli and fecal coliform. Further, testing of neighbouring existing water well users did not identify and bacteriological exceedances through sampling and homeowner interviews.

Based on the bacteriological testing, the water is suitable for consumption.

3.4.4 Chemical Results

The results of the chemical testing on the water samples indicate that hardness is below the operational guideline for hardness and the warning level for persons on sodium restricted diets exceeded the ODWQS but is well within the aesthetic objective.

Aesthetic objective exceedances from private wells and on-site test wells include iron, sulphide, pH, aluminum, turbidity, and colour. The above noted exceedances are discussed in the following sections:

3.4.4.1 Hardness

Hardness exceedances for TW22-04 and TW24-05 were reported to be 6.7 and 31.7 mg/L as $CaCO_3$, respectively, which is below the ODWQS operational guideline of 80 – 100mg/L. Hardness levels between 80 and 100 mg/L as calcium carbonate (CaCO3) are considered to provide an acceptable balance between corrosion and incrustation. Water with hardness below 80 mg/L may cause accelerated corrosion of water pipes.

3.4.4.2 Sulphide

Sulphide concentrations ranged from 0.05 mg/L to 4.61 mg/L in the on-site shallow test wells and private wells sampled. PW-939, PW-1014, TW22-03, TW22-4 and TW24-05 exceed the ODWQS aesthetic guideline of 0.05 mg/L as hydrogen sulphide. Sulphide can be related to an unpleasant odour and taste, and can produce black stains on laundered items, pipes, and fixtures. Although ingestion of large quantities of hydrogen sulphide can produce toxic effects on humans, it is not likely that an individual would ingest a harmful dose in drinking water because of the taste and odour.

Low levels of sulphide can be removed effectively using aeration (oxidation with filtration) or chlorinating the water followed by sand or multimedia filtration. According to the MECP Procedures D-5-5: Private Wells: Water Supply Assessment, there is no maximum treatable limit for sulphide.

3.4.4.3 Turbidity

Turbidity was reported to be 93.9 NTU in TW22-04, after 6 hours of continuous pumping, which exceeds the ODWQS aesthetic guideline of 5 NTU. Field measured turbidity was reported to be 99.6 NTU and 152 NTU in TW22-04 and TW24-05 respectively, after 6 hours of pumping. The elevated turbidity concentrations may be the result of naturally occurring sediments around the interval of the borehole open to the aquifer.

Following further well development, the turbidity concentrations decreased to 0.5 NTU and 1.4 NTU, at TW22-04 and TW24-05 respectively.

3.4.4.4 Colour

Colour was reported to be 11 TCU and 27 TCU in TW22-03 and TW22-04 respectively after 6 hours of pumping, which exceeds the ODWQS aesthetic objective of 5 TCU, and the maximum concentration considered reasonably treatable of 7 TCU. The elevated colour is attributed to the elevated turbidity.

Following further development, color was reported to be 2 TCU at TW22-04 and TW24-05.

3.4.4.5 pH

The pH ranges from 8.4 to 9.4 in the on-site test wells and private wells sampled. TW22-04, T24-05, PW-903 and PW-1014 exceed the ODWQS operational guideline objective of 8.5. The primary objective of controlling pH is to produce water that is not corrosive and does not produce incrustation. At pH levels above 8.5, incrustation and bitter tastes may occur. Additionally, a decrease in efficiency of chlorine disinfection and alum coagulation can occur. Treatment methods for high pH include pH adjustment using sulfuric acid.

Although the MECP Procedure D-5-5 does not have a maximum acceptable concentration or treatability limit for pH, the Guidelines for Canadian Drinking Water Quality indicate an acceptable pH range of 7.0 to 10.5 for drinking water and to control leaching of metals from materials (Health Canada, 2015).

3.4.4.6 Aluminum

Aluminum was reported to be 0.762 mg/L at TW22-04 after 6 hours of pumping, which exceeds the ODWQS operational guideline of 0.1 mg/L. The elevated aluminum can be attributed to elevated turbidity at the time of sampling. Aluminum is commonly found in water as fine particles of alumino-silicate clay, which can be removed in coagulation/filtration.

Following further development and sampling, aluminum was reported to be 0.047 mg/L and 0.05 mg/L at TW22-04 and TW24-05, respectively which is below to aesthetic objective of 0.1 mg/L.

3.4.4.7 Sodium

Sodium concentration of 110 mg/L and 85.5 mg/L was identified at TW22-04 and TW24-05. Sodium exceeds warning level for persons on sodium restricted diets of 20 mg/L. Sodium is well within the aesthetic objective of 200 mg/L. The local medical officer of health should be notified.

4.0 SEPTIC IMPACT ASSESSMENT

The potential risk to groundwater resources on and off the subject site was assessed in accordance with MECP Procedure D-5-4: Technical Guideline for Individual Site Sewage

Systems: Water Quality Impact Risk Assessment. To evaluate the groundwater impacts, the Three-Step Assessment Process outlining in MECP D-5-4 was followed.

4.1 Sewage Disposal Systems

This section discusses the results of the terrain evaluation as they relate to the feasibility of installing sewage disposal systems on the subject site for onsite wastewater treatment and disposal.

It should be noted that the following information is provided for general guidance purposes only and that all septic systems installed on the subject site should be designed on a lot-by-lot basis using a lot specific investigation involving test holes to determine the actual subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to the Ontario Building Code (OBC) requirements.

4.1.1 Class IV Septic Sewage Disposal Systems

This section discusses the results of the terrain evaluation as they relate to the feasibility of installing Class IV septic sewage disposal systems on the subject site.

The septic system envelope area (septic envelope) represents the area on a lot set aside for the construction of the leaching bed and is for the leaching bed only. It does not include that area required for the septic tank or the isolation/separation distances required by the Ontario Building Code (OBC). The size of the septic system envelope is a function of the percolation rate of the native soil in the vicinity of the septic envelope (or the fill used for the construction of a septic bed) and the daily effluent loading to the septic bed.

The maximum expected septic system envelope required to service a single-family dwelling at this site is calculated to be 750 m^2, assuming a design flow of 3,000 litres/day and a loading rate of 4 L/m^2/day (fully raised beds over clay soils).

A 750 m^2 septic envelope corresponds to 16% area cover based on the smallest proposed lot size of 4,613 m^2 (0.46 hectare). Typical septic envelope dimensions would be 30 metres in length by 25 metres in width. The septic system envelope should be readily accommodated on the lot sizes that are proposed. Prior to establishing the actual septic envelope (leaching bed) location on any particular lot, test holes should be excavated to determine the actual subsurface conditions in the area of the proposed leaching bed.

The septic leaching bed design must ensure that the bottom of the absorption trenches is at least 0.9 metres above low permeability soils (such as silty clay), bedrock, and the seasonally high groundwater table. Based on the low permeability clay soils, it is expected that all of the septic leaching beds at this site will be fully raised.

4.2 Three-Step Assessment: Step 1 - Lot Size Considerations

Lot sizes of 1.0 hectares or larger are assumed to be sufficient for attenuative processes to reduce nitrate-nitrogen to acceptable concentrations in groundwater below adjacent properties. The retained land parcel is less than 1.0 hectares in size, and therefore doe does not satisfy the MECP D-5-4 lot size requirements, and as such, GEMTEC has carried on with steps 2 of the MECP process.

4.3 Three-Step Assessment: Step 2 – System Isolation Considerations

Where proposed lot sizes are less than 1.0 hectares, the risk of sewage effluent contamination must be assessed. As per Procedure D-5-4, it is required to:

- Evaluate the most probable groundwater receiver for sewage effluent; and,
- Define the most probable lower hydraulic or physical boundary of the groundwater receiving the sewage effluent.

The groundwater supply aquifer is considered to be isolated if separated from surficial sources by a 10 metres thick, low permeability layer with a hydraulic conductivity less than 1 x 10^{-5} m/s that is laterally continuous for 100 metres from the Site.

The boreholes advanced as part of the geotechnical investigation (GEMTEC, 2023) identified low permeability units of silty clay underlying the Site to depths of up to 8.3 metres below ground surface. Hydraulic testing performed in monitoring wells installed in boreholes 21-01 and 21-02 that are screened through the silty clay, estimated the hydraulic conductivity to be 3x10^{-7} m/s and 3x10^{-8} m/s respectively.

Test wells advanced on-site indicate that the overburden thickness ranged from 12.2 meters to 18.3 meters and MECP water well records within 500 metres of the Site indicate overburden thickness ranges from 12.2 to 37.5 metres. Based on TW22-04 located at the southern end of the Site, the thickness of clay decreases to approximately 5.2 metres and is underlain by “sand and boulders” to a depth of 10.3 metres, which is interpreted to be glacial till based on geotechnical boreholes advanced on-site (GEMTEC, 2023).

The proposed water supply aquifer is considered to be at least partially isolated from surficial impacts based on the presence of 5+ metres of low permeability clay. Given the underlying glacial till at the southern portion of the Site has not been assessed, nitrate dilution calculations were carried out to confirm the acceptability of septic impacts for the proposed severed lots.

4.4 Three-Step Assessment: Step 3 - Nitrate Dilution Calculations

Where it cannot be demonstrated that the effluent is hydrogeologically isolated from the water supply aquifer, the risk of individual septic systems will be assessed using nitrate-nitrogen contaminant loading for commercial/industrial properties. The maximum allowable concentration

of nitrate in the groundwater at the boundaries of the subject property is 10 milligrams per litre as per the Ministry of the Environment, Conservation and Parks guideline D-5-4, dated August 1996.

The nitrate concentration at the Site boundaries was calculated using the following information:

- Site area of 54,592 m^2;
- Hard surface area of 5,459 m^2 (estimated to be 10% of total Site area, which accounts for house and driveway footprint)
- Infiltration factors and water holding capacity of soils (WHC) based on information obtained from Table 3.1 of the Ministry of Environment Stormwater Management Planning and Design Manual, dated March 2003;
- Soil Factor of 0.15, which represents combination of clay and some loam;
- Cover Factor of 0.1 which represents cultivated lands;
- Topography Factor of 0.17, representative of rolling land with an average slope of 10 m/km.
- Water holding capacity: 75 mm for urban lawns / shallow rooted crops, clay;
- An annual water surplus of 0.380 metres/year for soils with a water holding capacity of 75 mm; and,
    - Ottawa International Airport Weather Station (1939-2020). Water surplus datasheet provided in Appendix H.
- Negligible background nitrate concentration in the receiving aquifer.

The predictive assessment is conducted using a mass balance calculation to determine the sewage loading for nitrate at the property boundary (see equation below).

$$C_{Nitrate} = \frac{Mass}{Volume} = \frac{Annual\ Nitrate\ Loading(grams/year)}{Annual\ Dilution\ Volume(cubic\ metres/year)} = \frac{grams}{cubic\ metre} = \frac{mg}{L}$$

The nitrate dilution calculations are provided in Appendix H. The calculated nitrate concentration at the Site boundary, assuming seven residential lots was calculated to be 9.83 mg/L. The Site can support up to seven residential lots. The total site area was considered for the proposed residential lots.

The nitrate impact assessment for the Site meets the acceptable nitrate impact requirement of 10 mg/L established by the MECP. The background nitrate concentration is considered to be negligible based on non-detectable (<0.20 mg/L) nitrate concentrations in the receiving aquifer.

4.5 Background Nitrate Concentrations

The nitrate concentrations were measured in the low permeability overburden soils (MW21-1 and MW21-2), the receiving gravel / upper bedrock aquifer (PW939, PW903, PW1014, TW22-03 and TW22-04) and deep bedrock aquifer (PW21-01, TW21-01 and TW21-02). The nitrate concentrations in the receiving gravel / upper bedrock aquifer and deep bedrock aquifer ranged from non-detectable (<0.1 mg/l) to 0.2 mg/L. The nitrate concentrations in on-site monitoring wells were 5.8 mg/L and 6.6 mg/L in MW21-1 and 0.3 mg/L in MW21-2. The locations of the private wells, test wells and monitoring wells are displayed on Figure 1 - Site Plan.

The elevated nitrate in MW21-1 is likely associated with the historic use of fertilizers, as the Site is crop covered. This is supported by the low nitrate concentrations (0.3 mg/L) in MW21-2, which is located on the upgradient portion of the Site (refer to Figure 2). Further, MW21-2 is located immediately downgradient of multiple residential properties serviced with on-site septic systems and does not have elevated nitrate concentrations.

The elevated nitrate concentrations in MW21-1 are not considered to be representative of the nitrate concentrations in the receiving aquifer, taken to be the gravel / upper bedrock aquifer, as MW21-1 is completed in low permeability silty clay. Down gradient shallow water supply wells TW22-04 (14.9 metres deep) and PW903 (15.8 metres deep), had low nitrate concentrations measured to be 0.2 mg/L and <0.1 mg/L respectively.

4.6 Surface Water Impacts

The discussion provided herein, in relation to surface water impacts to adjacent surface water features, is concerned primarily with septic effluent discharging from on-site septic systems. Phosphorus is known to be the primary contaminant of concern for aquatic systems impacted by septic effluent. As such, the discussion provided below is focused on the potential for phosphorus to impact adjacent surface water features.

Phosphorus attenuation in septic system leaching fields utilizes a combination of biotic and abiotic process including sorption/precipitation reactions, plant uptake, and mineralization/immobilization by microbes, however the dominant attenuation mechanisms are sorption/precipitation mechanisms (Wilhelm, et al., 1996). A 30-metre setback is considered to be sufficient for phosphorous attenuation.

The closest surface water feature to the site is McKinnons Creek, located east of the Site (Figure 1). McKinnons Creek is greater than 30 metres from the proposed septic systems (refer to Concept Plan in Appendix A) and as such, no impacts to surface water features from the proposed on-site septic systems are anticipated.

5.0 CONCLUSIONS

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

5.1 Hydrogeological Conceptual Model

- The soils encountered generally consist of a thin layer of topsoil underlain by low permeability silty clay, glacial till and gravel above shale bedrock. The silty clay was not fully penetrated by the geotechnical boreholes on site but was proven to range from 5.3 to 8.3 metres below ground surface in test wells.

- The proposed water supply aquifer is the overburden – bedrock interface aquifer, consisting of a gravel layer of variable thickness and extent over upper fractured bedrock.
    - The thickness and extent of the gravel layer is expected to vary across the Site, as not all well records indicate the presence of gravel above the bedrock. A review of available water well records indicate that many neighbouring water wells are completed in interface aquifer (i.e., gravel and / or upper fractured bedrock).
    - The deeper bedrock aquifer is not considered suitable due to ODWQS maximum acceptable concentration exceedances of fluoride.

- The proposed water supply aquifer is not considered to be highly vulnerable to contamination from surficial sources, e.g. septic system effluent, agricultural, or road salt.
    - On-site test wells do not display evidence of impacts from surficial sources i.e. low to non-detectable nitrate concentrations, E.coli, fecal coliform, tannins and lignins or organic nitrogen, and low chloride and sodium concentrations.
    - No notable surface impacts (e.g., septic, road salt or softener salt) observed in the two neighbouring private wells within 100 meters of the Site, which have favourable water quality.
    - The gravel / upper bedrock interface aquifer is expected to be overlain by greater than five meters of low permeability silty clay material, based on the conditions logged during the on-site borehole drilling and water well records of the on-site test wells.
    - Slug testing was performed in monitoring wells installed in boreholes 21-01 and 21-02, which are screened through the silty clay overburden unit reported hydraulic conductivity values of $3x10^{-7}$ m/s and $3x10^{-8}$ m/s.
    - Elevated nitrate concentrations in on-site monitoring well MW21-01 are likely related to on-site agricultural activities rather than septic systems, given the low nitrate concentrations in upgradient MW21-02, located immediately downgradient

of existing residential septic systems. Further, downgradient water supply wells TW22-04, TW24-05 and PW903 had low to non-detectable nitrate concentrations (<0.1 mg/L to 0.2 mg/L).

- Off-site groundwater impacts from the proposed seven residential lots are not anticipated, as the calculated nitrate concentration of 9.83 mg/L is within the maximum allowable nitrate concentration of 10 mg/L at the property boundary, as required by MECP Procedure D-5-4.
    - The Site can support a maximum of seven residential lots based on the nitrate dilution calculations.
    - The Site is considered to be partially isolated from surficial sources given the presence of greater than five metres of low permeability (< 10^{-5} m/s) silty clay soils.
    - Proposed septic systems are expected to be fully raised and sized to accommodate sand mantle over clay soils, allowing for treatment of septic effluent.
- Off-site surface water impacts from the proposed on-site septic systems are not anticipated as the closest surface water feature, McKinnons Creek is located greater than 30 metres from the proposed on-site septic systems.

- The quantity of groundwater available from the proposed water supply aquifer (TW22-04 and TW24-05) is sufficient for residential use and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.
    - TW22-05 was initially unable to meet the MECP Procedure D-5-5 minimum required flow rate and was hydrofractured by a licensed well technician. Following hydrofracking, the well yield in TW24-05 was increased to approx. 19 litres per minute. Hydrofracking may be required to enhance the productivity of low-yield wells. Test wells TW22-03 sustained pumping rates of 23 litres per minute and TW22-05 sustained pumping rates of 18.8 litres per minute, both suitable to supply a 4-bedroom dwelling.
    - TW22-04 sustained a constant pumping rate of 15 litres per minute over a 7.5 hour period. The pumping rate of 15 litres per minute is sufficient to meet peak demands for a 3-bedroom dwelling and supplemental storage may be required to meet peak demands in a 4-bedroom home. The pumping test of TW22-04 was extended from 6 to 7.5 hours such that the total water withdrawal was equivalent to a pumping test completed at 18.8 litres per minute, confirming that all on-site wells meet the minimum daily water demand requirements to support a 4-bedroom dwelling.

- TW22-03 was able to sustain pumping rates of 23 litres per minute over a six hour period; however, the well may not be sustainable at the pumping rate over the long term due to the limited available drawdown of approx. one metre at the end of the pumping test. Nonetheless, TW22-03 is not considered to be technically representative of future water supply wells, as the previously constructed well is likely screened solely across the gravel layer.
- Based on homeowner interviews of seven neighbouring properties, no water quantity issues were reported. It should be noted that neighbouring properties are developed at a higher density than the proposed development and as such, unacceptable groundwater interference between on-site or neighbouring well users is not anticipated.
- Where future well yields are only 15 litres per minute, supplemental storage may be required to meet peak demands in houses greater than 3 bedrooms.

- The well yields determined in the course of the investigation are representative of the yields which residents of the development are likely to obtain from their wells in the long term.
- Interference between drinking water wells is expected to be acceptable under typical usage for residential developments.
  - Maximum drawdown of 0.2 metres observed in observations well during pumping (0.2 metre drawdown in TW22-03 and negligible drawdown in TW22-04 during pumping of TW24-05). Negligible interference between on-site and neighbouring test wells is anticipated.
  - Homeowner interviews of neighbouring lot owners, which are developed at a higher density of 0.14 hectares per lot did not report any water quantity issues. In comparison, the smallest proposed lot size is 0.46 hectares.

5.2 Water Quality

- The results of the physical, chemical and bacteriological groundwater indicate that the water quality in the proposed water supply aquifer (gravel / upper bedrock) meets the ODWQS maximum acceptable concentrations and maximum concentrations considered to be reasonably treatable.
  - Aesthetic objective and operational guideline exceedances of: pH, hardness, and sulphide. Unpleasant odour and taste, and black stains on laundered items, pipes, and fixtures may be encountered due to the sulphide and pH exceedances.
  - Turbidity, colour and aluminum aesthetic objective and operational guideline exceedances were encountered following well drilling; however, it was

demonstrated that through extended well development, turbidity and associated colour and aluminum could be reduced to within ODWQS aesthetic objective and operational guideline limits.

- Homeowner interviews of 7 neighbouring well owners did not indicate any water quality issues attributed to elevated turbidity suggesting that newly constructed wells, once fully developed, will meet aesthetic objectives for turbidity.

6.0 RECOMMENDATIONS

The following recommendations regarding well construction specifications and water quality treatment are provided below.

6.1 Water Supply Recommendation

- Any new water well should be constructed in accordance with local and MECP regulations (O.Reg 903).
- Test wells TW22-04 and TW24-05 are considered technically representative of future water supply wells.
  - Different methodologies were used in the construction of TW22-04 and TW22-05, both of which straddle the bedrock interface. A local well driller should be retained who has experience drilling and grouting wells within the bedrock interface. Future well casings should straddle the bedrock interface, ranging from approximately 0.6 metres above to 0.3 metres below the bedrock surface.
  - Hydrofracking may be required to increase well production.
  - Extended well development will be required to reduce turbidity and associated colour and aluminum to acceptable levels.
  - Future wells should not extend greater than six metres into bedrock, as wells completed at greater depths may encounter fluoride concentrations above the ODWQS maximum acceptable concentrations.
  - Where lower well yields are encountered (i.e., yields of approx 15 litres per minute), supplemental storage may be required for houses that are greater than 3-bedrooms.
- As per the City of Ottawa review comments (May 10, 2024), in order to ensure compliance with the report recommendations, 0.3 m reserves are required in front of each lot. A **Well Inspection Report** will be required for each lot prepared by a Qualified Professional and should include the following information:

- The well grouting inspection should be conducted under the supervision and sealed by a licensed professional engineer or professional geoscientist, qualified to practice geoscience.
- Confirm that the well construction meets O.Reg 903 requirements and recommendations within this report, specifically that the well casing straddles the bedrock interface, ranging from approximately 0.6 meres above to 0.3 metres below the bedrock interface and that the well is not drilled more than six metres into bedrock.
- Confirm that the well yield is at least 18.75 litres per minute, and if not, demonstrate that adequate supplemental storage can be accommodated based on the size of the proposed dwelling. The determination of well yield should also indicate whether hydrofracking was completed.
- Extended well development should be anticipated to reduce turbidity and associated colour concentrations to acceptable levels. Newly drilled wells should be pumped until a Qualified Professional has confirmed that the field measured turbidity and colour are below their respective ODWQS aesthetic objectives of 5 NTU and 7 TCU respectively. The instruments used shall be described and calibration records provided.

- The separation distance between drinking water wells and on site or neighbouring septic systems should be at least 15 metres and up to 18 metres to account for fully raised septic beds. Future water supply wells should be located upgradient from septic beds.
- Any unused on-site test wells should be abandoned by a licensed well technician in accordance with O.Reg 903. Test wells not used for future residential use should be abandoned, including TW22-01 (tag # A342174), TW22-02 (tag # A342173) and TW22-03 (no tag #). If test wells TW22-04 (tag # A342479) and TW22-05 (tag # A395575) are not utilized by future lot owners, they should be abandoned.
- A water quality treatment specialist should be consulted by future owners for the implementation of any treatment systems. The following treatment systems may be considered for future property owners:
  - Sulphide can be treated at low concentrations via aeration (oxidation with filtration) or chlorination followed by sand or multimedia filtration.
  - pH levels over 8.5 may be treated through pH adjustment using sulfuric acid.
  - No treatment is recommended for hardness as the water is naturally soft. To note, water with hardness below 80 mg/L may cause accelerated corrosion of water pipes.

- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change document “Water Supply Wells - Requirements and Best Management Practices, Revised April 2015”.

The following recommendations are provided regarding septic system design:

Septic System Recommendations

- The proposed lots will be serviced by individual Class IV septic sewage disposal systems designed according to the Ontario Building Code. A site-specific visit should be conducted on the lot for septic system design requirements.
- The septic system should be designed and installed by a licensed contractor in accordance with Ontario Building Code (Part 8) specifications. It is recommended that septic systems be located a minimum of 15 metres (or up to 18 metres for fully raised septic beds) from any on-site or neighbouring water supply wells.

- It is recommended that the property owners construct, maintain and check their onsite septic system in accordance with the Ontario Building Code and best management practices (Ministry of Municipal Affairs and Housing, 2021). The homeowner shall consult the following guides available at: https://www.oowa.org/homeowner-resources/.

7.0 CLOSURE

We trust this report provides sufficient information for your present purposes. The report is subject to the *Conditions and Limitations of This Report*, provided following the text of this report. If you have any questions concerning this report, please do not hesitate to contact our office.

Samuel Esenwa, B.Sc., G.I.T.
Environmental Scientist

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

8.0 REFERENCES

Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219

Brunton, F.R. and Dodge, J.E.P. 2008. Karst of southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5.

City of Ottawa, 2021. Hydrogeological and Terrain Analysis Guidelines.

Gao, C., Shirota, J., Kelly, R.I., Brunton, F.R. and van Haaften, S. 2006. Bedrock topography and overburden thickness mapping, southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 207.

GEMTEC. 2024. Geotechnical Investigation, Residential Development, 930 Smith Road, Ottawa, Ontario. Project reference 100812.001, dated March 14, 2024.

Ontario Geological Survey. 2010. Surficial geology of Southern Ontario. Ontario Geological Survey, Miscellaneous Release-Data 128-Revision 1.

Ontario Geological Survey. 2011. 1:250 000 scale bedrock geology of Ontario. Ontario Geological Survey, Miscellaneous Release-Data 126-Revision 1.

Ontario Ministry of the Environment and Climate Change. 1996. Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment. August 1996.

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

Health Canada. 2015. Guideline Technical Document – pH. *Guidelines for Canadian Drinking Water Quality*. Health Canada. Retrieved from https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-ph.html.

GEMTEC
Consulting Engineers and Scientists

Conditions and Limitations of This Report

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC can not be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions, misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of of the subsurface descriptions.

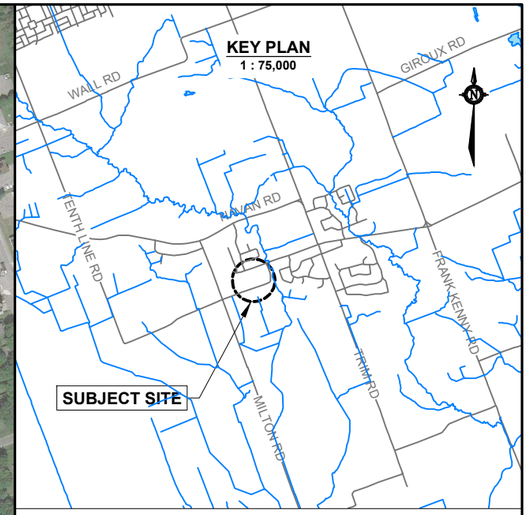
    Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination-or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.
11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.
12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

    During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not

materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.
14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



LEGEND

- BH # / XX.XX — BOREHOLE ID; GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- BOREHOLE
- TEST WELL
- SAMPLED HOMEOWNER WELL
- MECP WELL
- APPROXIMATE SITE BOUNDARY
- STUDY AREA (500 mRADIUS AROUND THE SITE BOUNDARY)

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18N.
2. Geographic dataset source: Ontario GeoHub.
3. Contains information licensed under the Open Government Licence – Ontario.

SCALE 1:5000

0 100 200 300m

DRAWING: SITE PLAN

CLIENT: HIERARCHY DEVELOPMENT AND DESIGN

PROJECT: HYDROGEOLOGICAL INVESTIGATION
930 SMITH ROAD
NAVAN, ONTARIO

DRAWN BY	CHECKED BY
S.L.	A.P.
PROJECT NO.	REVISION NO.
100812.001	1
DATE	FIGURE NO.
MARCH 2024	**FIGURE 1**

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

N:\PROJECTS\100800\100812.001\06_DRAFTING\1_DRAWINGS\HYDRO 2024\100812.001_HYDROSP_R1_2024_02.DWG

LEGEND

- BH # — BOREHOLE ID
- XX.XX — GROUND SURFACE ELEVATION, IN METRES GEODETIC DATUM
- BOREHOLE
- TEST WELL
- SAMPLED HOMEOWNER WELL
- APPROXIMATE SITE BOUNDARY
- STUDY AREA (1 km RADIUS AROUND THE SITE BOUNDARY)

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18N.
2. Geographic dataset source: Ontario GeoHub.
3. Contains information licensed under the Open Government Licence – Ontario.

SCALE 1:3000

0 100 200m

DRAWING

DETAILED SITE PLAN

CLIENT

HIERARCHY DEVELOPMENT AND DESIGN

PROJECT

HYDROGEOLOGICAL INVESTIGATION
930 SMITH ROAD
NAVAN, ONTARIO

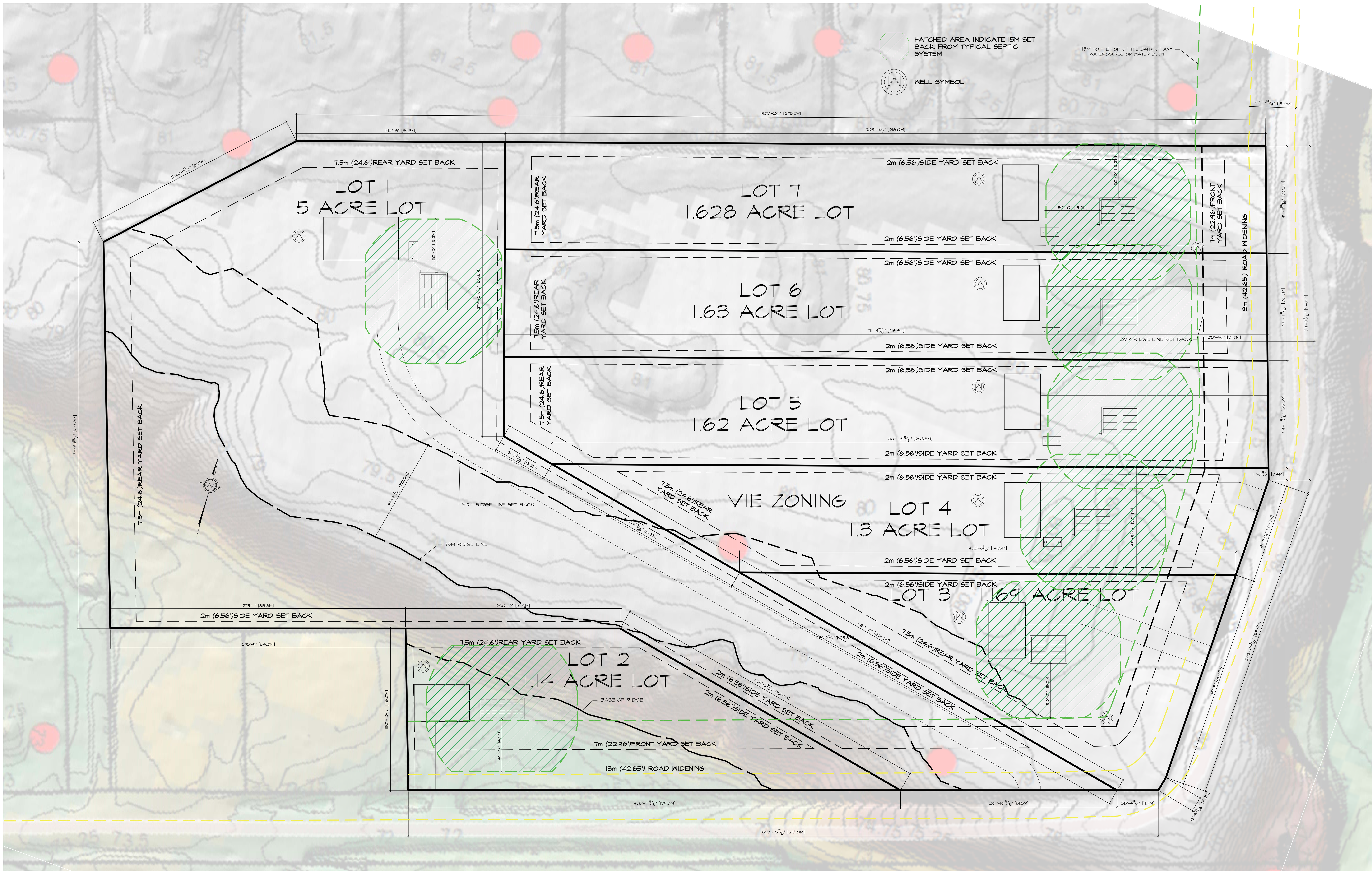
DRAWN BY	CHECKED BY
S.L.	A.P.
PROJECT NO.	REVISION NO.
100812.001	1
DATE	FIGURE NO.
MARCH 2024	**FIGURE 2**

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

N:\PROJECTS\100800\100812.001\06_DRAFTING\1. DRAWINGS\HYDRO 2024\100812.001_HYDROSP_R1_2024_02.DWG

APPENDIX A

Concept Plan



1 / A0 SITE PLAN
NOT TO SCALE

HIERARCHY
DESIGN | BUILD
613 ~ 863 ~ 3735
John Paul S Boisvert
www.HDDottawa.com

GENERAL NOTES:

1. DO NOT SCALE DRAWINGS.

2. VERIFY ALL DIMENSIONS ON SITE. REPORT ANY ERRORS IN ORDER TO HAVE THE DRAWINGS CORRECTED AND RESUBMITTED ACCORDINGLY.

3. ALL MATERIALS AND CONSTRUCTION TO CONFORM TO THE LATEST EDITION OF THE O.C.B. AND SUBSEQUENT EDITIONS.

4. DOORS AND WINDOWS TO CONFORM TO RESISTANCE TO FORCED ENTRY SECTIONS 9.6.6. AND 9.7.6.

5. LOCATION OF VENTS FOR HVAC UNITS TO BE LOCATED BY SITE FOREMAN.

6. REFER TO MECHANICAL AND ELECTRICAL SETS FOR LOCATION OF DUCTS, ELECTRICAL OUTLETS, LIGHTING AND FLOOR DRAINS. MECHANICAL AND ELECTRICAL SHALL CONFORM TO PROVINCIAL AND MUNICIPAL CODES AND BYLAWS. VERIFY AND CHECK ON SITE. CO-ORDINATE WITH SITE FOREMAN.

7. SUPPLY DRAINAGE PAN FOR HWT AND WASHER/DRYER UNITS.

8. ENSURE 5" IS LEFT @ EITHER SIDE OF DOORS AS MINIMUM UNLESS NOTES OTHERWISE

CONSULTANTS STAMP

INFO | STAMP

INFO | STAMP

NORTH ARROW

NO 1	REVISION	02/21/23
NO 8	REVISION	03/29/23

CONSULTANTS

PROJECT
930 SMITH RD
NAVAN, ON
OTTAWA

DRAWING TITLE
SITE PLAN

SCALE
NOT TO SCALE

DATE
03/29/23

SHEET
A0 OF 1

FILE NUMBER
20-0777

APPENDIX B

Borehole Logs

RECORD OF BOREHOLE 21-01

CLIENT: Hierarchy Development & Design Inc.
PROJECT: Geotechnical Investigation, Proposed Lot Severances, 830 Smith Road, Ottawa, Ontario
JOB#: 100812.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 12 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		78.94					
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		78.76 / 0.18					
		Very stiff to stiff, grey brown SILTY CLAY (WEATHERED CRUST)			1	SS	200	12	
1					2	SS	610	12	
					3	SS	610	12	MH
2					4	SS	610	12	
3					5	SS	610	10	
					6	SS	610	7	
4					7	SS	610	5	
5		Stiff, grey SILTY CLAY		73.61 / 5.33	8	SS	610	2	
6					9	TO	580	PH	
7		End of borehole		71.62 / 7.32					
8									
9									
10									

SHEAR STRENGTH (Cu), kPA
PENETRATION RESISTANCE (N), BLOWS/0.3m — NATURAL — REMOULDED
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
WATER CONTENT, %
W_P — W — W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION

Bentonite
Native backfill silty clay
Bentonite
Silicia sand
1.5m, 50mm diameter screen
Silicia sand

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
21/09/13	3.7 ▽	75.2

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: W.A.M.

GEO - BOREHOLE LOG 100812.001_BH LOGS_R0_2021-08-17.GPJ GEMTEC 2018.GDT 2/17/23

RECORD OF BOREHOLE 21-02A

CLIENT: Hierarchy Development & Design Inc.
PROJECT: Geotechnical Investigation, Proposed Lot Severances, 830 Smith Road, Ottawa, Ontario
JOB#: 100812.001
LOCATION: See Site Plan, Figure 1

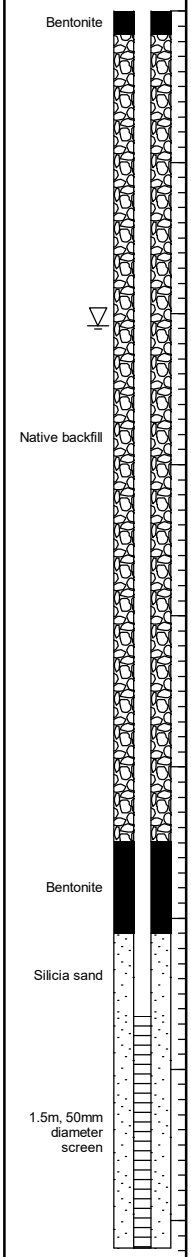
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 12 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		80.95				
0		TOPSOIL		80.82				
		Very loose to loose, brown SILTY SAND		0.13	1	SS	560	4
				0.28				
		Very stiff to stiff, grey brown SILTY CLAY (WEATHERED CRUST)			2	SS	610	8
1								
					3	SS	610	6
2								
					4	SS	610	4
3				77.90				
				3.05				
	Power Auger	Firm grey SILTY CLAY to CLAYEY SILT			5	SS	610	2
4	Hollow Stem Auger (210mm OD)							
					6	SS	610	WH
5								
					7	SS	610	WH
6								
					8	SS	560	WH
7				72.77				
		End of borehole Auger refusal		8.18				
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL, ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING: MH

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
21/09/13	2.1 ▽	78.9

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: W.A.M.

GEO - BOREHOLE LOG 100812.001_BH LOGS_R0_2021-08-17.GPJ GEMTEC 2018.GDT 2/17/23

RECORD OF BOREHOLE 21-02B

CLIENT: Hierarchy Development & Design Inc.
PROJECT: Geotechnical Investigation, Proposed Lot Severances, 830 Smith Road, Ottawa, Ontario
JOB#: 100812.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 12 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY, mm	SAMPLES: BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger Hollow Stem Auger (210mm OD)	Ground Surface		80.95						Backfilled with auger cuttings
		TOPSOIL		80.82 / 0.13						
		Very loose to loose, brown SILTY SAND		80.67 / 0.28						
1		Very stiff to stiff, grey brown silty clay (WEATHERED CRUST)								
2										
3				77.90 / 3.05						
4		Firm grey SILTY CLAY								
5										
6					1	TO	550	PH		
7		End of borehole Note: Soil statigraphy inferred from Borehole 21-02A		74.30 / 6.65						
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: W.A.M.

GEO - BOREHOLE LOG 100812.001_BH LOGS_R0_2021-08-17.GPJ GEMTEC 2018.GDT 2/17/23

RECORD OF BOREHOLE 21-03

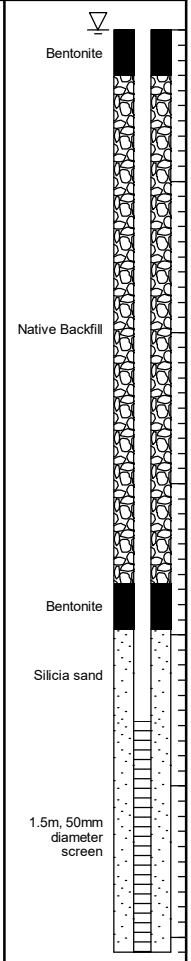
CLIENT: Hierarchy Development & Design Inc.
PROJECT: Geotechnical Investigation, Proposed Lot Severances, 830 Smith Road, Ottawa, Ontario
JOB#: 100812.001
LOCATION: See Site Plan, Figure 1

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Aug 12 2021

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		Ground Surface		80.08					
0	Power Auger Hollow Stem Auger (210mm OD)	TOPSOIL		79.90 / 0.18					
		Very stiff to stiff, grey brown SILTY CLAY (WEATHERED CRUST)			1	SS	400	14	
1					2	SS	610	16	
					3	SS	610	12	
2					4	SS	610	9	
3					5	SS	610	9	
4					6	SS	610	5	
					7	SS	610	2	
5		Stiff to firm, grey SILTY CLAY		75.20 / 4.88					
		Compact, grey SILTY SAND, some gravel, some clay, with cobbles and boulders (GLACIAL TILL)		74.75 / 5.33	8	SS	225	28	MH
6		End of borehole		73.98 / 6.10					
7									
8									
9									
10									

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
21/09/13	0.0 ▽	80.1

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.N.
CHECKED: W.A.M.

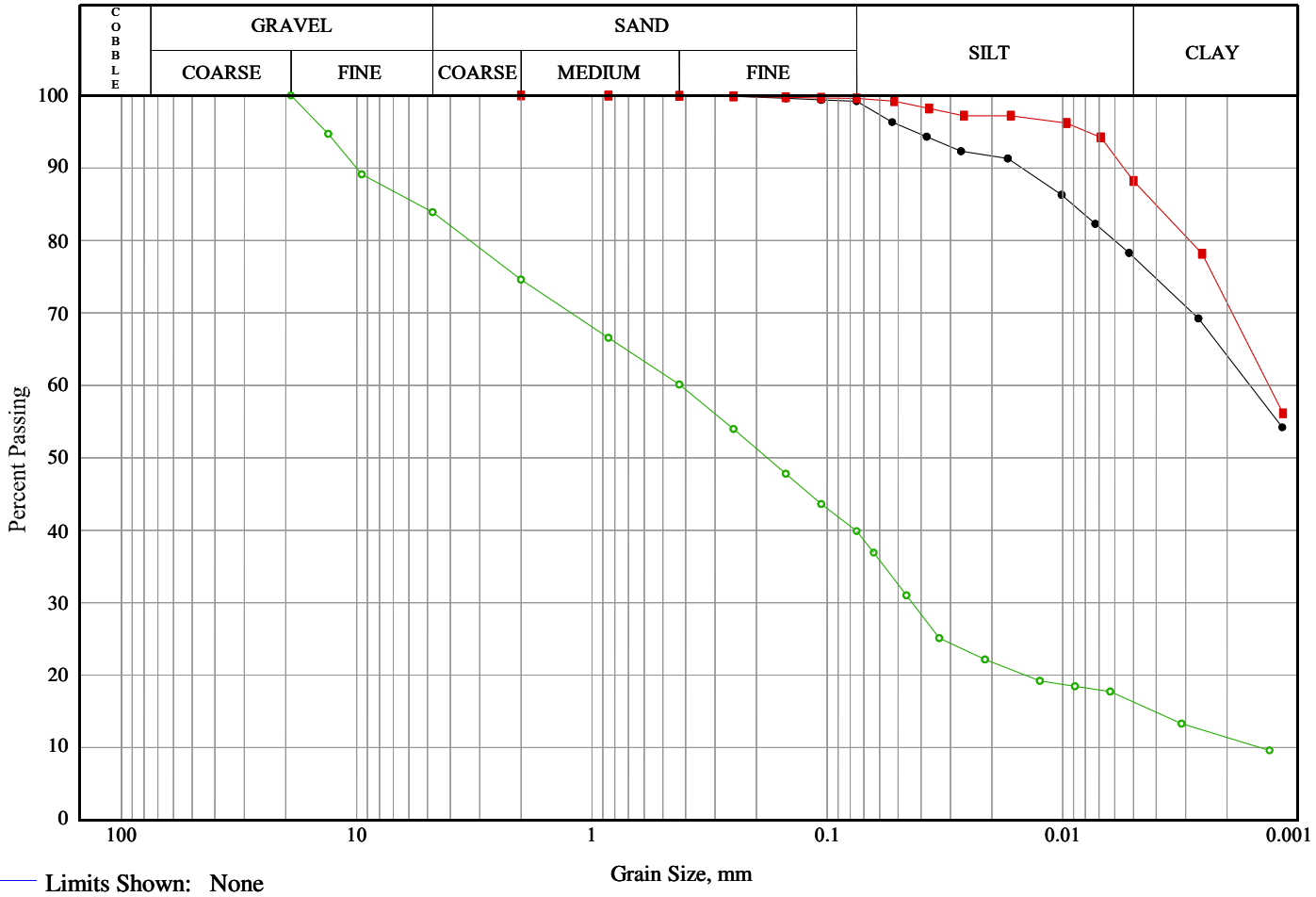
APPENDIX C

Grain Size Curves

GEMTEC
Consulting Engineers and Scientists

Client:	Hierarchy Development & Design
Project:	Geotechnical, Hydrogeological, and Erosion and Sedime
Project #:	100812001

Soils Grading Chart (T88)



Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt	% Clay
●	SILT CLAY (WEATHERED CRUST)	21-01	SA 3	1.52-2.13	0.0	0.8	21.5	77.7
■	SILTY CLAY	21-02A	SA 7	6.09-6.71	0.0	0.4	11.4	88.2
○	GLACIAL TILL	21-03	SA 8	5.33-5.94	16.1	44.0	23.6	16.3

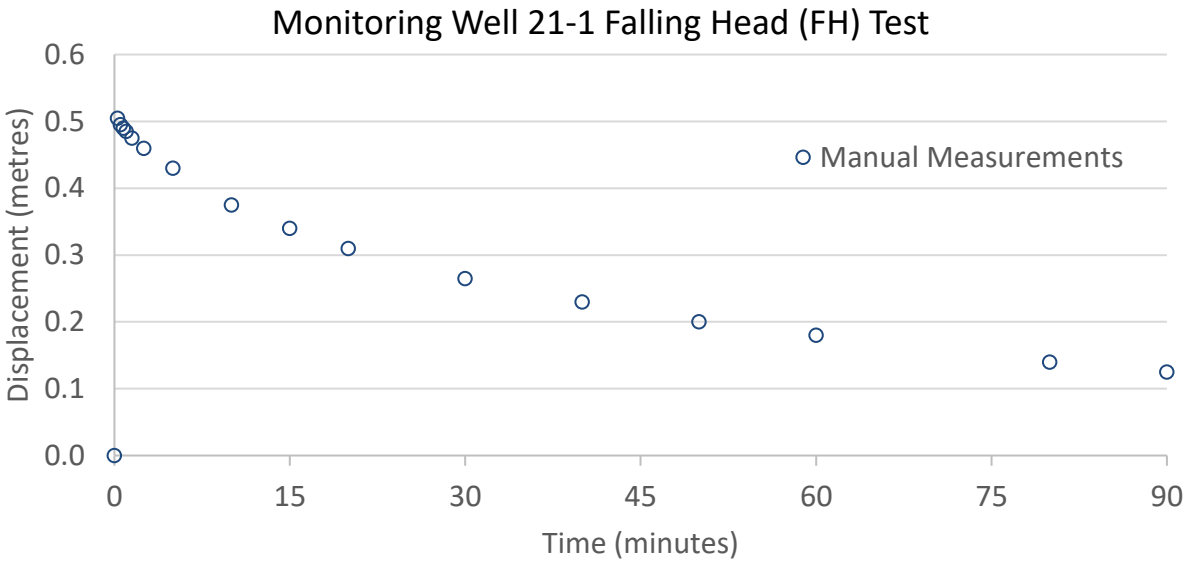
Line Symbol	CanFEM Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
●	Silty clay , trace sand	N/A	---	---	---	---	0.00	0.01	20.9
■	Clay , some silt , trace sand	N/A	---	---	---	---	0.00	0.00	11.4
○	Silty sand , some gravel, some clay	N/A	0.00	0.00	0.04	0.18	0.42	5.51	23.6

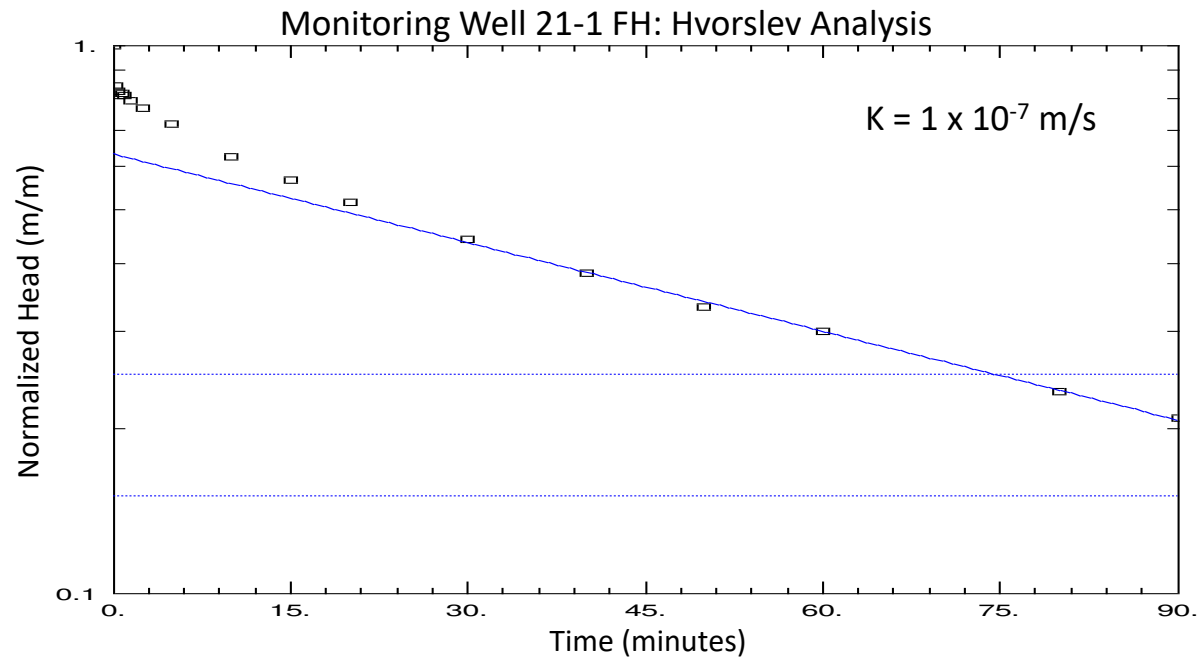
APPENDIX D

Hydraulic Conductivity Testing

Slug Test Results

FIGURE D1





<u>Well Data:</u>

Displacement observed (slug size): 0.51 metres (0.60 m)
Well Depth: 7.32 metres
Screen Length: 3.05 metres
Well Radius: 0.0255 metres

<u>Aquifer Data</u>

Saturated Thickness: 3.59 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 3.73 metres bgs

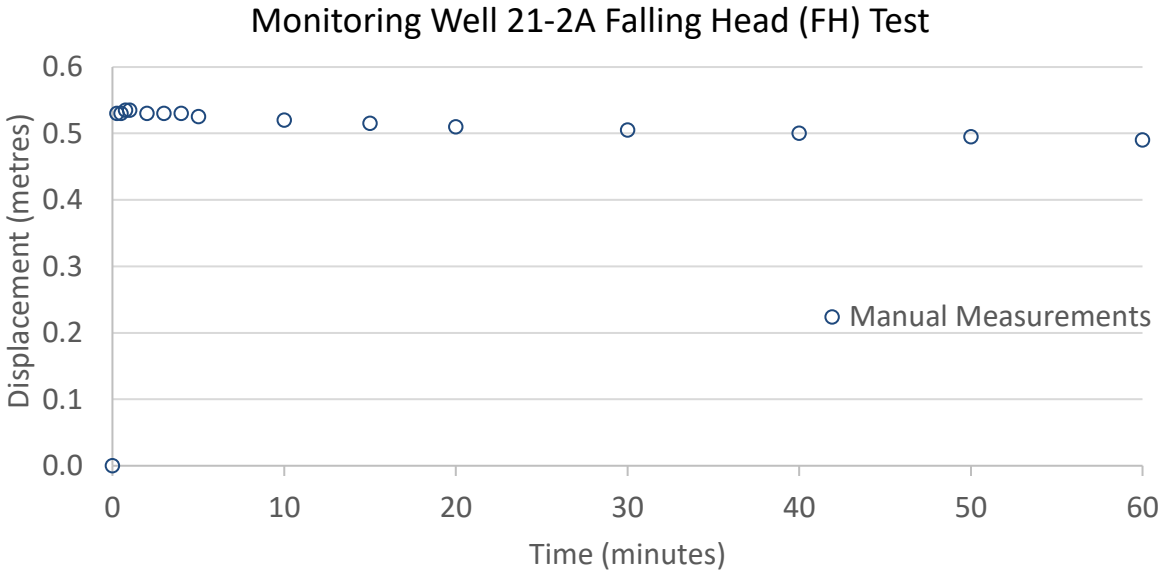
GEMTEC
Consulting Engineers and Scientists

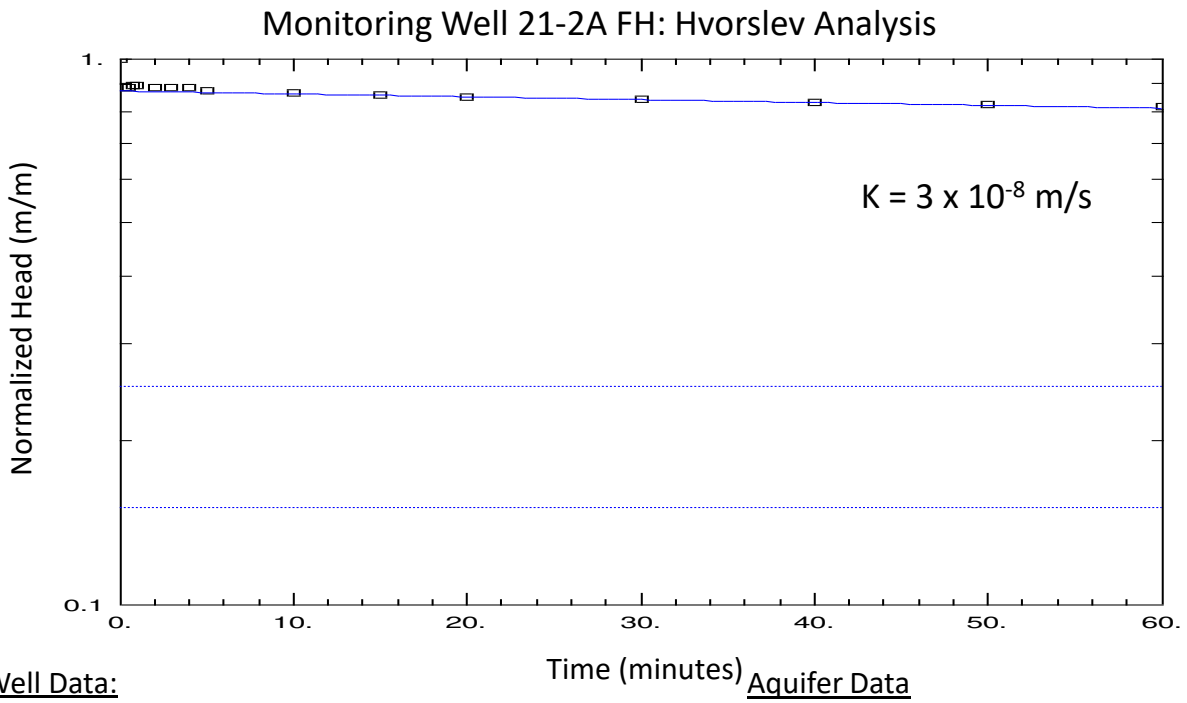
Date: Jan. 31, 2023

Project: 100812.001

Slug Test Results

FIGURE D2





<u>Well Data:</u>

Displacement observed (slug size): 0.53 metres (0.60 m)
Well Depth: 8.18 metres
Screen Length: 1.52 metres
Well Radius: 0.0255 metres

<u>Aquifer Data</u>

Saturated Thickness: 6.10 metres
Anisotropy Ratio (Kz/Kr): 0.1
Aquifer Model: Unconfined, Hvorslev
Static Water Level: 2.08 metres bgs

GEMTEC
Consulting Engineers and Scientists

Date: Jan. 31, 2023

Project: 100812.001

APPENDIX E

MECP Water Well Records

MECP Water Well Record Compilation
(930 Smith Road- 500 m search radius)

WELL ID	Completed	Depth (m)	Depth to Bedrock (m)	Static Water Level (m bgs)	Water Found (m bgs)	Water Detail	Well Use
1511160	3/4/1971	29	20.1	7.9	29	FR	DO
1511703	12/7/1971	19.8	17.7	8.5	19.8	FR	DO
1511704	10/28/1971	20.4	18.3	8.2	20.4	FR	DO
1511705	10/26/1971	20.4	18.3	8.2	20.4	FR	DO
1511706	10/6/1971	18.6	16.8	8.2	18.6	UK	DO
1512324	5/17/1972	24.4	20.4	6.1	24.4	FR	DO
1512338	5/9/1972	20.4	18.3	6.1	18.3	FR	DO
1512340	5/3/1972	21.3	18.3	6.1	19.8	FR	DO
1512345	10/17/1972	20.1	19.8	6.1	20.1	FR	DO
1512410	11/15/1972	20.7	19.2	6.1	20.7	FR	DO
1512423	2/11/1972	21.3	20.1	7.6	21.3	UK	DO
1512424	12/19/1972	18	16.8	6.1	18	FR	DO
1512425	12/12/1972	19.8	19.2	6.1	19.8	FR	DO
1512426	12/14/1972	20.4	-	6.1	20.4	FR	DO
1512427	11/1/1972	21.3	18	7.6	21.3	FR	DO
1512428	10/26/1972	21.3	18.9	6.1	21.3	FR	DO
1512429	7/19/1972	18.9	18.3	7.6	18.9	FR	DO
1512430	2/10/1972	22.9	20.7	7.6	21.3	UK	DO
1512431	2/7/1972	22.9	20.4	7.6	22.9	FR	DO
1512432	10/20/1972	20.7	20.1	6.1	20.7	FR	DO
1512433	7/20/1972	18.6	18.3	7.6	18.3	FR	DO
1512793	4/5/1965	26.5	25.9	4.6	26.5	FR	DO
1512794	9/2/1965	28.3	12.2	0.9	28.3	FR	DO
1512795	8/27/1968	18.3	-	9.4	18.3	FR	DO
1514500	3/29/1974	13.7	12.2	0.9	13.7	FR	DO
1515205	7/17/1975	15.8	14.6	2.4	15.8	FR	DO
1515221	11/24/1975	15.8	13.7	0.3	15.8	FR	DO
1515471	3/18/1976	21.9	17.4	7.3	21.9	FR	DO
1517593	8/18/1981	16.8	-	10.4	16.5	FR	DO
1517830	6/10/1982	26.2	25.6	19.8	25.9	FR	DO
1517832	6/30/1982	24.1	-	11.9	-	#N/A	DO
1517833	7/2/1982	21.9	-	8.8	21.9	FR	DO
1517916	8/13/1982	25	-	10.7	25	FR	DO
1518048	10/27/1982	22.9	-	7.6	22.9	FR	DO
1518052	10/27/1982	25.9	-	12.2	25.9	FR	DO
1518054	10/21/1982	26.8	-	16.8	26.8	FR	DO
1519284	8/7/1984	19.5	17.4	8.5	19.2	SU	DO
1519631	10/14/1980	22.6	19.8	6.7	21.6	SU	DO
1519988	12/12/1984	24.4	23.8	10.7	23.8	FR	DO
1522522	6/30/1988	22.6	-	9.8	22.6	SU	DO
1522998	10/27/1988	15.2	-	7.6	15.2	FR	DO
1524312	1/23/1990	29.3	19.2	8.5	27.4	FR	DO
1525585	8/1/1991	30.5	22.9	7.6	29.6	FR	DO
1525782	8/19/1991	29.9	19.5	13.7	20.4	FR	DO
1526061	11/28/1991	22.9	22.3	8.5	22.9	SU	DO
1527019	11/20/1992	21.9	21.9	10.7	21.9	SU	DO
1527222	7/8/1993	18.3	18.3	9.1	16.5	UK	DO
1528725	3/17/1995	29.6	29.6	13.7	-	SU	DO
1529701	10/2/1997	32	32	13.7	21.6	SU	DO
1529702	9/25/1997	61.6	61.6	12.2	39.6, 53.3	FR	DO
1534079	8/21/2003	37.5	37.5	12.2	34.4, 35.1	UK	DO
1536075	11/7/2005	22.7	22.7	10.1	18.9	FR	DO
7294262	8/31/2017	-	-	-	-	-	-
7311540	5/17/2018	-	-	-	-	-	-
7363368	7/10/2020	-	-	-	-	-	-

https://www.ontario.ca/page/map-well-records

LEGEND

-' Not Available

"Well Use"

DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling and A/C
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring Test

"Water Detail"

FR
SA
SU
MN
UK
GS
IR

GEMTEC
Consulting Engineers and Scientists

Project: 100227.023
Date: November 2022

PRIVATE WELL RECORDS

Ontario — Ministry of the Environment, Conservation and Parks

We Tag#:A313191 nt Below)

A313191

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
	John Boisvert		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1836 Maple Grove Road	Stittsville	ON	K2S 0M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
865 Meteor Ave	Cumberland	10	9

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465471	5029431		S/L 21

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 & Blue	Clay			0	45
Blue	Clay	& Gravel		45	58
Black	Limestone			58	165
Grey & Black	Limestone			165	394
Grey & Black	Limestone			394	400

* H/O - JASON MOORE *

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
64	54	Neat cement	10.9
54	0	Bentonite slurry	25.2

Method of Construction

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

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	64
6"	Open Hole		64	400

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: ☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify	Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify	Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify
394					

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	64	9 3/4"
64	400	6"

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	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138382170	Hanna, Jeremy	T3632		2021 01 31

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): 300

Pumping rate (l/min / GPM): 10

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 65

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

Recommended pump depth (m/ft): 250

Recommended pump rate (l/min/GPM): 10

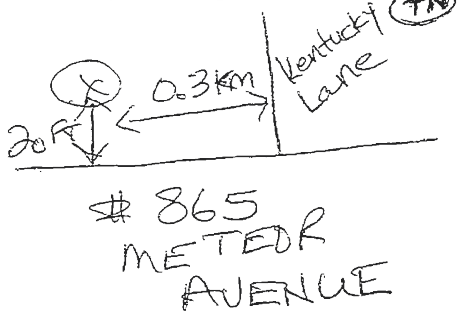
Well production (l/min/GPM): 10

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	28.8		65
1	36.5	1	55
2	40.3	2	45.4
3	43	3	41.2
4	45.1	4	37.9
5	46.9	5	35.5
10	52.4	10	28.8
15	55.4	15	28.8
20	57.5	20	28.8
25	59	25	28.8
30	60.1	30	28.8
40	62.3	40	28.8
50	64.4	50	28.8
60	65	60	28.8

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 HP @ 10 GPM set at 250 Feet

Well owner's information package delivered	Date Package Delivered	Date Work Completed	Ministry Use Only
☒ Yes ☐ No	2021 01 07	2021 01 04	Audit No. Z355241 Received

3166e

The Ontario Water Resources Commission Act

WATER WELL RECORD

1511704

Water management in Ontario

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

11

1511704 ~~5601513~~

MUNICIP. 15011 CON. 9 CON 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Carleton	Cumberland	9	010 ~~11~~

[redacted]leans, Ont.

DATE COMPLETED: DAY 28 MO. 10 YR. 71

[redacted]29250 4 ELEVATION 0268 4 BASIN CODE 25

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
blue	clay			0	55
grey	quick sand			55	60
bbown slate				60	67

31 | 0055305 | 0060207 | 0067619

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0067	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	250	0	0062
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0067
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

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.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0008 GPM.

DURATION OF PUMPING: 02 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
027 FEET	050 ~~032~~ FEET	040 FEET	050 FEET	050 FEET	050 FEET

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: 50 FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 050 FEET

RECOMMENDED PUMPING RATE: 0006 GPM.

0003 GPM./FT. SPECIFIC CAPACITY

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

WATER USE 01

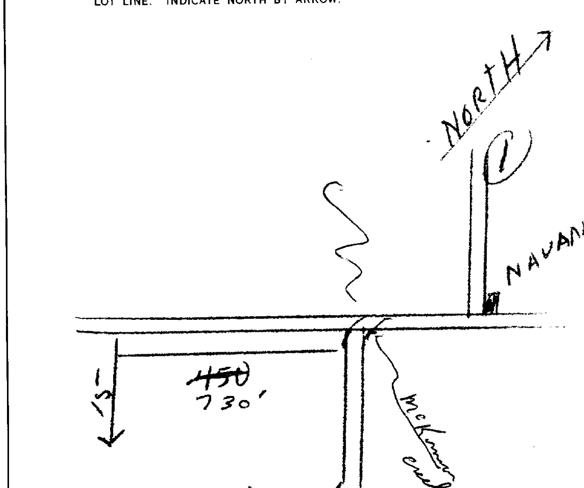
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL

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



DRILLERS REMARKS: STATION

CONTRACTOR

NAME OF WELL CONTRACTOR: G. Charbonneau, Diamond & Cable Drilling, 1504

LICENCE NUMBER:

ADDRESS: R. R. 2, Box 194, Orleans, Ont.

NAME OF DRILLER OR BORER: Leo Bourgeois

LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: [signature]

SUBMISSION DATE: DAY 26 MO. 10 YR. 71

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1504 | DATE RECEIVED: 070472

DATE OF INSPECTION | INSPECTOR

REMARKS:

P K

WI

OWRC COPY

31G/6e

UTM 1 8 Z 4 6 5 9 2 0 E

05 R 5 0 2 9 3 4 2 N

Elev. 5 R 0 2 8 2

Basin 2 5

1512793

3 9

WATER RESOURCES DIVISION 56 № 547 MAY 17 ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Russell Township, Village, Town or City Twp. of Cumberland

Con. 9 Lot 10 Date completed April 5, 1965 (day month year)

[redacted] dress Navan, Ont.

Casing and Screen Record		Pumping Test	
Inside diameter of casing	5¼	Static level	15'
Total length of casing	85'	Test-pumping rate	15 G.P.M.
Type of screen		Pumping level	25'
Length of screen		Duration of test pumping	3 hrs.
Depth to top of screen		Water clear or cloudy at end of test	Clear
Diameter of finished hole	5¼	Recommended pumping rate	6 G.P.M.
		with pump setting of	25' feet below ground surface

Well Log: Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Yellow sand	0	2		
Blue clay	2	40		
Boulder & sand	40	85		
Brown slate	85	87	87	Fresh

For what purpose(s) is the water to be used? Domestic

Is well on upland, in valley, or on hillside? Upland

Drilling or Boring Firm G. Charbonneau, Diamond & Cable Drilling,

Address RR #1, Box 194, Orleans, Ont.

Licence Number 1331

Name of Driller or Borer Bruck Stacey

Address RR #1, Jasper, Ont.

Date April 5, 1965

Gerard Charbonneau

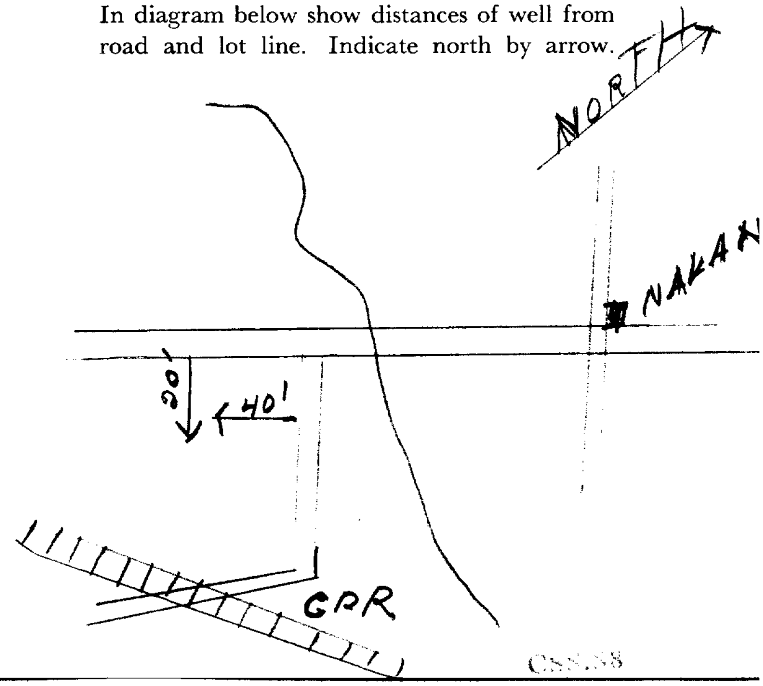
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

Ontario

31 6/6e

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

(11) 1515221 MUNICIP. 15011 CON. CON 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
Carleton	Cumberland	IX	011

DATE COMPLETED 48-53: DAY 24 MO. 11 YR. 75

[redacted] avan, Ontario

[redacted] 028981 RC 4 ELEVATION 0242 RC 4 BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
brown	hardpan			0	40
grey	gravel			40	45
grey	slate			45	52

(31) 0040614 0045211 0052219

32

(41) WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0052	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

(51) CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0043
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

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.)

(71) PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP (air) 2 ☐ BAILER
PUMPING RATE: 0020 GPM
DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL: 001 6 FEET
WATER LEVEL END OF PUMPING: 030 FEET
WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY
15 MINUTES: 012 FEET
30 MINUTES: 001 6 FEET
45 MINUTES: 001 6 FEET
60 MINUTES: 001 6 FEET

IF FLOWING, GIVE RATE: GPM
PUMP INTAKE SET AT: 30 FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP
RECOMMENDED PUMP SETTING: 030 FEET
RECOMMENDED PUMPING RATE: 0015 GPM
GPM./FT. SPECIFIC CAPACITY

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

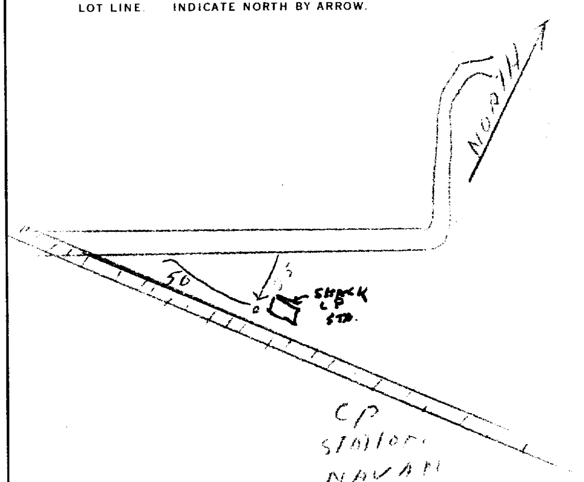
1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING 4

1 ☐ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☒ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

LOCATION OF WELL 6528

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



DRILLERS REMARKS:

CONTRACTOR

NAME OF WELL CONTRACTOR: G. Charbonneau + Son Drilling Ltd.
LICENCE NUMBER: 1504
ADDRESS: R.R. 2, Box 194, Orleans, Ont. K1G 1T1
NAME OF DRILLER OR BORER: L. Bourgeois
LICENCE NUMBER:
SIGNATURE OF CONTRACTOR: [signature]
SUBMISSION DATE: DAY 24 MO. 11 YR. 75

OFFICE USE ONLY

DATA SOURCE: 1
CONTRACTOR: 1504
DATE RECEIVED: 030376
DATE OF INSPECTION:
INSPECTOR: P/R.D.
REMARKS:
P
WI
CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 MOE 07-091

31G6e

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 — 1518052 — MUNICIP. 15011 — CON. CON 09

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
[redacted]	ERLAND		011 ~~30~~

[redacted] VAN/

DATE COMPLETED: DAY 27 MO 10 YR 82

ING 028999 — RC. 4 — ELEVATION 0240 — RC. 4 — BASIN CODE 26

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
YELLOW	SAND			0	14
BLUE	CLAY			14	59
BLACK	SAND	BOULDERS		59	84
BLACK	GRAVEL			84	85

31 — 0014528 — 0059305 — 008482813 — 0085811

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0085	1 ☑ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
~~6¼~~ 06	1 ☑ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	1.88	0	085
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

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.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☑ BAILER

PUMPING RATE: 0008 ~~9½~~ GPM — DURATION OF PUMPING: 01 HOURS 45 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
040 FEET	080 FEET	071 FEET	074 FEET	080 FEET	080 FEET

1 ☑ PUMPING 2 ☐ RECOVERY

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: 82 FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☑ CLOUDY

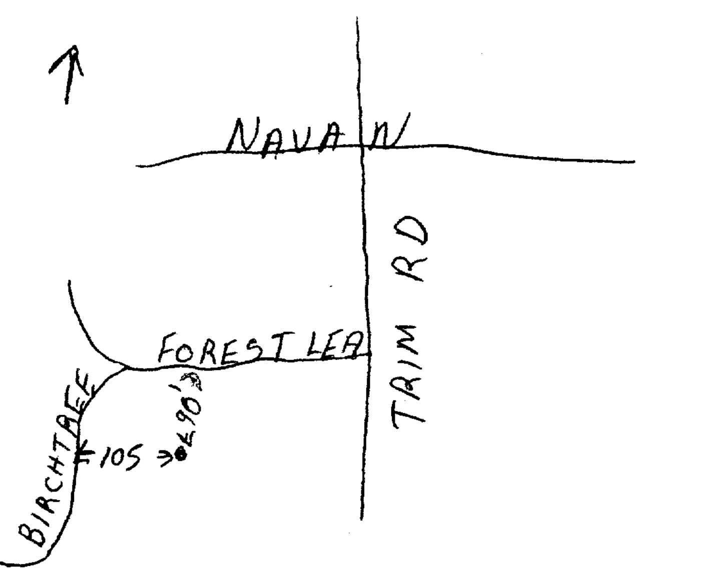
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☑ DEEP

RECOMMENDED PUMP SETTING: 082 FEET

RECOMMENDED PUMPING RATE: 0006 GPM

LOCATION OF WELL

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



DRILLERS REMARKS

FINAL STATUS OF WELL 1

1 ☑ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

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 DRILLING 1

1 ☑ CABLE TOOL
2 ☐ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: YVON GENIER WELL DRILLING — LICENCE NUMBER: 2351

ADDRESS: RR4 CASSELMAN KOA-1MO

NAME OF DRILLER OR BORER: YVON GENIER — LICENCE NUMBER: 2351

SIGNATURE OF CONTRACTOR: Yvon Genier — SUBMISSION DATE: DAY 27 MO 10 YR 82

OFFICE USE ONLY

DATA SOURCE: 1 — CONTRACTOR: 2351 — DATE RECEIVED: 170183

DATE OF INSPECTION — INSPECTOR — OP/LM

REMARKS

CSS.ES

FORM NO. 0506-4-77 FORM 7

MINISTRY OF THE ENVIRONMENT COPY

ON-SITE DEEP BEDROCK TEST WELL RECORDS

Ontario — Ministry of the Environment, Conservation and Parks

Tag#: A342173 (Print Below)

A342173

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
	John Boisvert		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1836 Maple Grove Road	Stittsville	ON	K2S 0M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Smith Road (No civic)	Cumberland	9	10/11

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465939	5029334		

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
Yellow	Sand			0	6
Blue	Clay			6	50
	Gravel			50	60
Black	Limestone			60	220
Grey & Black	Limestone			220	294
Grey & Black	Limestone			294	300

Well # 1 82

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
70	60	Neat cement	15.6
60	0	Bentonite slurry	21

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2	70
6"	Open Hole		70	300

Construction Record - Screen

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

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

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, specify
294		

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	70	9 3/4"
70	300	6"

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	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hanna, Jeremy	T3632		2022 02 28

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): 280

Pumping rate (l/min / GPM): 12

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 118

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

Recommended pump depth (m/ft): 200

Recommended pump rate (l/min/GPM): 10

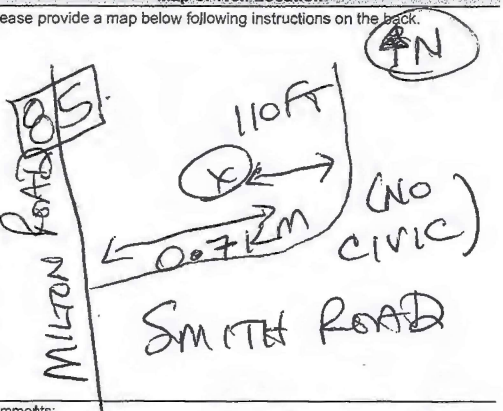
Well production (l/min/GPM): 12

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	31'4"		118
1	42	1	103
2	47.8	2	96.1
3	52.7	3	88.4
4	56.8	4	83.6
5	60.5	5	77.8
10	73.9	10	56.3
15	83.1	15	42.8
20	90.1	20	38.6
25	96.7	25	35.9
30	101	30	33
40	108	40	31.4
50	114	50	31.4
60	118'	60	31.4"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP 10GPM Set @ 200 FT

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☒ Yes ☐ No	2022 01 21	2022 01 13

Ministry Use Only

Audit No. Z 378976

Received

0506E (2020/06) © Queen's Printer for Ontario, 2020

Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Tag#:A342174

A342174

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
	John Boisvert		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1836 Maple Grove Road	Stittsville	ON	K2S 0M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Smith Road (No civic)	Cumberland	9	10/11

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465956	5029490		

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
	Clay	& Boulders	& Gravel (Soft)	0	56
Black	Limestone			56	220
Grey & Black	Limestone			220	324
Grey & Black	Limestone			324	330

well 2022

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
66	56	Neat cement	15.6
56	0	Bentonite slurry	25.2

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2	66
6 1/8"	Open Hole		66	330

Construction Record - Screen

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

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	66	9 3/4"
66	330	6 1/8"

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	Province	Postal Code	Business E-mail Address
6592 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hanna, Jeremy	13632		2022 02 28

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): 280

Pumping rate (l/min / GPM): 20 +

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 43'4"

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

Recommended pump depth (m/ft): 100'

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

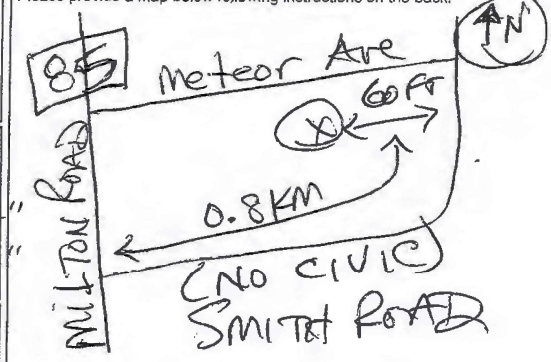
Well production (l/min/GPM): 20+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	36'4"		43'4"
1	40.6	1	40.6
2	41.7	2	38.8
3	42.2	3	37.6
4	42.5	4	36.8
5	42.6	5	36.4
10	43	10	36.4
15	43.1	15	36.4
20	43.2	20	36.4
25	43.2	25	36.4
30	43.3	30	36.4
40	43.3	40	36.4
50	43.3	50	36.4
60	43'4"	60	36.4"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1 HP - 20 GPM Set @ 100 FT

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Date Work Completed (Y Y Y Y M M D D)
☒ Yes ☐ No	2022 01 21	2022 01 18

Ministry Use Only

Audit No. Z 378977

Received

0506E (2020/06) © Queen's Printer for Ontario, 2020

Ministry's Copy

PROPOSED AQUIFER (SHALLOW BEDROCK-GRAVEL) TEST WELL RECORDS

Ontario — Ministry of the Environment, Conservation and Parks

Well Record

Regulation 903 Ontario Water Resources Act

Tag#: A342479 (Print Below)

A342479

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	John Boisvert		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1836 Maple Grove Road	Stittsville	ON	K2S 0M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Smith Road (No Civic)	Cumberland	9	10/11

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465784	5029292		

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
	Clay			0'	17'
	Sand	&	Boulders	17'	34'
	[redacted]	[redacted]		[redacted]	
	Gravel			34'	45'
Grey & Brown	Shale			45'	49'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
43'	33'	Neat cement	10.92
33'	0'	Bentonite slurry	4.2

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	43'
6"	Open Hole		43'	45'

Construction Record - Screen

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

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
42 ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	0'	43'	9 1/4"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	43'	49'	6"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

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): 35

Pumping rate (l/min / GPM): 4

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 26.3"

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

Recommended pump depth (m/ft): 40'

Recommended pump rate (l/min/GPM): 5

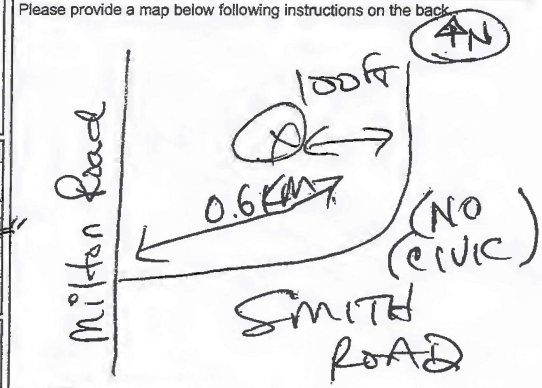
Well production (l/min/GPM): 4

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	11'4"			26.3"
1	15.5	1		23.8
2	17.1	2		21.9
3	18.4	3		20.6
4	19.4	4		19.5
5	20.2	5		18.6
10	22.8	10		16
15	24.1	15		14.9
20	25	20		13.9
25	25.3	25		12.8
30	25.8	30		11.9
40	26.3	40		11.4
50	26.3	50		11.4
60	26.3	60		11.4

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1/2HP-56PMSet@40FT

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	Province	Postal Code	Business E-mail Address
6659 Franktown Road	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138382170	Hanna, Jeremy	T3632		2022 10 31

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2022 08 18

Date Work Completed: 2022 08 17

Ministry Use Only

Audit No. Z394962

Received

Ministry's Copy

Ontario Ministry of the Environment, Conservation and Parks

Tag#:A395575

A395575

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	John Boisvert		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
1836 Maple Grove Road	Stittsville	ON	K2S 0M7	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
Smith Road (No Civic)	Cumberland	9	10&11

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	465940	5029489		TW# 5

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
	Clay			0'	20'
	Clay	+ Gravel	+ Boulders	20'	61'
Black	Shale			61'	65'
Black	Shale			65'	80'

* TW# 5 * HYDROFRACTURED

* DO NOT SET PUMP BELOW 70 FT *

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20	0	Neat cement	10.92

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): 60

Pumping rate (l/min / GPM): 6

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 64'

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

Recommended pump depth (m/ft): 70

Recommended pump rate (l/min/GPM): 5

Well production (l/min/GPM): 6

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	28.9'		64.
1	34.4	1	57.
2	39.	2	53.
3	43.	3	49.
4	46.2	4	45.4
5	61.	5	31.2
10	64.	10	24.3
15	64.	15	22.4
20		20	22.4
25		25	
30		30	
40		40	
50		50	
60		60	

Method of Construction

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

Well Use

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

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'	20'
6 1/4	Steel	.188"	20'	62'
6"	Open Hole		62'	80'

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

Map of Well Location

Please provide a map below following instructions on the back.

Test Well # 5

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	20'	9 3/4"
20'	62'	6 1/4"
62'	80'	6"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	C7681

Business Address (Street Number/Name)	Municipality
5539 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	Hanna, Jeremy

Well Technician's Licence No.: T3632 Signature of Technician and/or Contractor [redacted] Date Submitted: 2024 01 31

Comments: 1/2HP - 5 GPM Set @ 70 FT

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 20240110 [redacted]

Date Work Completed: 20231207

Ministry Use Only — Audit No. Z408326 — Received

0506E (2020/06)

Ministry's Copy

APPENDIX F

Water Quality Results and Laboratory Certificate Forms

Summary of Measured Field Parameters
Private Wells

Well ID	Date of Sampling	Time Since Initiation of Pumping (hours)	Temp (°C)	pH (-)	EC[1] (mS/cm)	Turbidity[2] (NTU)	TDS[3] (ppm)	Chlorine (mg/L)	Colour (ACU[4])	Colour (TCU[5])
PW-939	2-Feb-22	0.16	10.2	8.71	373	1.14	242	<0.02	<5	-
PW-1014	2-Feb-22	0.16	9.34	8.92	609	3.19	390	<0.02	<5	-
PW-903	7-Apr-22	0.25	8.6	9.19	520	0.82	260	<0.02	<5	-
PW-959	13-Oct-23	0.25	12.8	9.27	456	1.39	227	-	<5	-
PW-900	13-Oct-23	0.25	11.8	9.75	463	0.8	231	-	<5	-
PW-969	13-Oct-23	0.25	12.2	7.95	301	0.79	152	-	<5	-
PW-908	13-Oct-23	0.25	11.1	9.45	476	0.82	234	-	<5	-

Notes:
1. EC: Electrical Conductivity
2. Turbidity is taken to be the average of three consecutive measurements.
3. TDS: Total Dissolved Solids (Calculated as 0.5 × EC)
4. ACU: Actual Colour Units (unfiltered)
5. TCU: True Colour Units (field-filtered using 0.45-micron filter)
6. '-': Not Measured
7. TW22-04 pumped at a rate of approx 15 litres per minute
8. TW24-05 pumped at a rate of approx 19 litres per minute

Summary of Measured Field Parameters
Test Wells

Well ID	Date of Sampling	Time Since Initiation of Pumping (hours)	Temp (°C)	pH (-)	EC[1] (mS/cm)	Turbidity[2] (NTU)	TDS[3] (ppm)	Chlorine (mg/L)	Colour (ACU[4])	Colour (TCU[5])
TW21-01	18-Nov-21	1	4.2	8.78	476	9.92	238	-	-	-
		2	9.4	8.69	478	4.62	238	-	-	-
		3	9.8	8.56	475	4.82	237	<0.02	<5	<5
		4	9.6	8.52	476	4.63	236	-	-	-
		5	9.5	8.54	476	4.96	237	-	-	-
		6	9.4	8.55	474	3.9	235	<0.02	<5	<5
TW22-01	2-Feb-22	1	12.44	8.81	636	-	406	-	-	-
		2	9.07	9.08	671	-	429	-	-	-
		3	8.24	9.07	662	-	424	<0.02	-	-
		4	7.92	9.07	763	-	488	-	-	-
		5	8.33	9.12	793	-	508	-	-	-
		6	8.18	9.08	818	-	524	-	-	-
TW22-02	1-Feb-22	1	6.38	9.3	766	6.92	491	-	-	-
		2	-	-	-	-	-	-	-	-
		3	6.83	9.58	781	4.65	502	<0.02	24	<5
		4	7.8	9.75	818	6.61	524	-	-	-
		5	6.83	9.75	838	3.74	536	-	-	-
		6	6.77	9.68	871	3.71	555	<0.02	51	<5
TW22-03	28-Apr-22	1	8.8	9.68	610	39.7	300	-	-	-
		2	10.2	9.57	580	43.6	300	-	-	-
		3	10	9.51	580	50.9	290	<0.02	371	<5
		4	-	-	-	-	-	-	-	-
		5	9.7	9.6	580	71.5	290	-	-	-
		6	9.7	9.47	570	58.9	280	<0.02	<5	<5
	7-Apr-22	1	9.3	9.76	0.67	15.3	0.4	<0.02	0	<5
TW22-04	28-Apr-22	1	11.9	9.71	560	1000	280	-	-	-
		2	13.4	8.44	540	377	270	-	-	-
		3	12.3	9.27	540	242	270	<0.02	>500	<5
		4	13	9.21	530	157	270	-	-	-
		5	14	9.1	540	134	270	-	-	-
		6	13.5	9.23	540	99.6	270	<0.02	>500	<5
	19-Dec-23	168 [7]	10	9.34	482	2.33	241	<0.02	<5	<5
TW24-05	18-Jan-24	1	11.9	9.71	560	1000	280	-	-	-
		2	13.4	8.44	540	377	270	-	-	-
		3	12.3	9.27	540	242	270	<0.02	>500	<5
		4	13	9.21	530	157	270	-	-	-
		5	14	9.1	540	134	270	-	-	-
		6	13.5	9.23	540	99.6	270	<0.02	>500	<5
	24-Jan-24	48 [8]	11.59	8.14	459	0.38	298	<0.02	<5	<5

Notes:
1. EC: Electrical Conductivity
2. Turbidity is taken to be the average of three consecutive measurements.
3. TDS: Total Dissolved Solids (Calculated as 0.5 × EC)
4. ACU: Actual Colour Units (unfiltered)
5. TCU: True Colour Units (field-filtered using 0.45-micron filter)
6. '-': Not Measured
7. TW22-04 pumped at a rate of approx 15 litres per minute
8. TW24-05 pumped at a rate of approx 19 litres per minute

Water Quality Summary
Private Wells

Parameters	Units	PW-939 Lab ID: 2206338-01	PW-1014 Lab ID: 2206338-02	PW 903 Lab ID: 2215531-02	959 Smith Road 2341381-01	900 Smith Road 2341381-02	969 Meteor Ave 2341381-03	908 Smith Ave 2341381-04
		02/02/2022 12:00 PM	02/02/2022 12:00 PM	04/07/2022 12:20 PM	10/13/2023 09:30 AM	10/13/2023 10:20 AM	10/13/2023 11:20 AM	10/13/2023 12:20 PM
GEMTEC ASSIGNED WELL ID		PW-939	PW-1014	PW-903	PW-959	PW-900	PW-969	PW-908
Microbiological Parameters								
E. Coli	FU/100m	ND (1)	ND (1)	ND (1)	-	-	-	-
Fecal Coliforms	FU/100m	ND (1)	ND (1)	ND (1)	-	-	-	-
Total Coliforms	FU/100m	ND (1)	ND (1)	**1**	-	-	-	-
Heterotrophic Plate C	CFU/mL	ND (10)	ND (10)	-	-	-	-	-
General Inorganics								
Alkalinity, total	mg/L	172	241	224	-	-	-	-
Ammonia as N	mg/L	0.53	0.31	0.47	-	-	-	-
Dissolved Organic Car	mg/L	1.1	ND (0.5)	1.6	-	-	-	-
Colour	TCU	3	5	6	2	ND (2)	3	ND (2)
Colour, apparent	ACU	5	13	9	7	3	18	8
Conductivity	uS/cm	384	572	462	-	-	-	-
Hardness	mg/L	**39.2**	**6.33**	**27.7**	-	-	-	-
pH	pH Units	8.4	**9.0**	**8.6**	-	-	-	-
Phenolics	mg/L	ND (0.001)	ND (0.001)	ND (0.001)	-	-	-	-
Total Dissolved Solids	mg/L	208	324	250	-	-	-	-
Sulphide	mg/L	**1.12**	**4.61**	**0.90**	-	-	-	-
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	-	-	-	-
Total Kjeldahl Nitroge	mg/L	0.6	0.3	0.5	-	-	-	-
Organic Nitrogen	mg/L	0.07	0	0.03	-	-	-	-
Turbidity	NTU	1.2	2.0	0.8	0.8	0.4	0.9	1.0
Anions								
Chloride	mg/L	13	39	18	40	14	11	22
Fluoride	mg/L	0.6	1.1	0.7	0.8	0.5	0.3	0.8
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	ND (0.05)	-	-	-	-
Sulphate	mg/L	ND (1)	3	3	-	-	-	-
Metals								
Aluminum	mg/L	-	-	-	-	-	-	-
Antimony	mg/L	-	-	-	-	-	-	-
Arsenic	mg/L	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-
Beryllium	mg/L	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-
Cadmium	mg/L	-	-	-	-	-	-	-
Calcium	mg/L	7.0	1.8	7.5	-	-	-	-
Chromium	mg/L	-	-	-	-	-	-	-
Cobalt	mg/L	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-
Iron	mg/L	ND (0.1)	0.2	0.2	0.1	ND (0.1)	0.4	ND (0.1)
Lead	mg/L	-	-	-	-	-	-	-
Magnesium	mg/L	5.3	0.4	2.1	-	-	-	-
Manganese	mg/L	ND (0.005)	ND (0.005)	0.017	-	-	-	-
Molybdenum	mg/L	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-
Potassium	mg/L	5.2	1.5	3.2	-	-	-	-
Selenium	mg/L	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-
Sodium	mg/L	64.8	124	86.0	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-
Thallium	mg/L	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-
Tungsten	mg/L	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-

Project: 100812.001
Date: March 2024

Water Quality Summary
Deep Test Wells

Parameter	Units	TW21-01 3hr Lab ID: 2147532-01	TW21-01 3hr (Filtered) Lab ID: 2147532-01	TW21-01 6hr Lab ID: 2147532-02	TW21-01 6hr (Filtered) Lab ID: 2147532-02	TW22-1 3hr Lab ID: 2206352-01	TW22-1 6hr Lab ID: 2206352-02	TW22-1 6hr (Filtered) Lab ID: 2206352-03	TW22-1 Lab ID: 2208183-01	TW22-2 3hr Lab ID: 2206260-01	TW22-2 6hr Lab ID: 2206260-02	TW22-2 6 hr (Filtered) Lab ID: 2206260-03
Sample Date (m/d/y)		11/18/2021 11:40 AM	11/18/2021 11:40 AM	11/18/2021 02:40 PM	11/18/2021 02:40 PM	02/02/2022 11:20 AM	02/02/2022 02:20 PM	02/02/2022 02:20 PM	02/14/2022 03:30 PM	02/01/2022 11:30 AM	02/01/2022 02:30 PM	02/01/2022 02:30 PM
GEMTEC ASSIGNED WELL ID		**PW21-1**				**TW22-1**				**TW22-2**		
Microbiological Parameters												
E. Coli	CFU/100mL	ND (1)	-	ND (1)	ND (1)	ND (10)	ND (10)	-	-	ND (1)	ND (1)	-
Fecal Coliforms	CFU/100mL	ND (1)	-	ND (1)	ND (1)	ND (10)	ND (10)	-	-	ND (1)	ND (1)	-
Total Coliforms	CFU/100mL	ND (1)	-	ND (1)	ND (1)	ND (10)	ND (10)	-	-	ND (1)	ND (1)	-
Heterotrophic Pla	CFU/mL	-	-	-	-	10	ND (10)	-	-	ND (10)	ND (10)	-
General Inorganics												
Alkalinity, total	mg/L	224	-	223	223	327	353	-	-	319	348	-
Ammonia as N	mg/L	0.55	-	0.57	0.57	0.37	0.38	-	-	0.29	0.30	-
Dissolved Organi	mg/L	1.8	-	1.4	1.4	1.5	1.5	-	-	1.3	0.7	-
Colour	TCU	5	-	4	4	**9**	**14**	-	-	3	3	-
Colour, apparent	ACU	**14**	-	**11**	**11**	**764**	**1000**	-	-	**24**	**26**	-
Conductivity	uS/cm	508	-	476	476	706	828	-	-	816	855	-
Hardness	mg/L	**45.7**	-	**45.6**	**45.6**	**10.8**	**13.6**	-	-	**10.7**	**12.1**	-
pH	pH Units	8.4	-	8.3	8.3	**9.2**	**9.1**	-	-	**9.0**	**8.9**	-
Phenolics	mg/L	ND (0.001)	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)	-
Total Dissolved S	mg/L	264	-	250	250	436	472	-	-	452	468	-
Sulphide	mg/L	0.29	-	0.31	0.31	1.77	3.75	-	-	2.78	3.08	-
Tannin & Lignin	mg/L	0.2	-	0.2	0.2	0.3	0.3	-	-	ND (0.1)	ND (0.1)	-
Total Kjeldahl Nit	mg/L	0.6	-	0.6	0.6	0.5	0.6	-	-	0.4	0.4	-
Organic Nitrogen	mg/L	0.05	-	0.03	0.03	0.13	**0.22**	-	-	0.11	0.1	-
Turbidity	NTU	1.5	-	0.8	0.8	**140**	**190**	-	-	4.0	4.2	-
Anions												
Chloride	mg/L	19	-	17	17	28	41	-	-	53	55	-
Fluoride	mg/L	0.6	-	0.6	0.6	**2.6**	**3.0**	-	3	**2.7**	**3.3**	-
Nitrate as N	mg/L	ND (0.1)	-	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	-	-	ND (0.1)	ND (0.1)	-
Nitrite as N	mg/L	ND (0.05)	-	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	-	-	ND (0.05)	ND (0.05)	-
Sulphate	mg/L	5	-	4	4	ND (1)	1	-	-	5	7	-
Metals												
Mercury	mg/L	-	-	-	-	-	-	-	-	-	ND (0.0001)	ND (0.0001)
Aluminum	mg/L	-	-	-	0.023	-	**1.59**	**0.282**	-	-	**0.194**	0.003
Antimony	mg/L	-	-	-	ND (0.0005)	-	ND (0.0005)	0.0006	-	-	ND (0.0005)	**0.0012**
Arsenic	mg/L	-	-	-	ND (0.001)	-	ND (0.001)	ND (0.001)	-	-	0.002	0.002
Barium	mg/L	-	-	-	0.241	-	0.277	0.142	-	-	0.184	0.169
Beryllium	mg/L	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.0005)	ND (0.0005)
Boron	mg/L	-	-	-	0.31	-	0.45	0.53	-	-	0.44	0.53
Cadmium	mg/L	-	-	-	ND (0.0001)	-	ND (0.0001)	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)
Calcium	mg/L	-	-	-	-	2.7	3.3	2.0	-	2.7	3.0	2.9
Chromium	mg/L	-	-	-	ND (0.001)	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)
Cobalt	mg/L	-	-	-	-	-	ND (0.0005)	ND (0.0005)	-	-	ND (0.0005)	ND (0.0005)
Copper	mg/L	-	-	-	ND (0.0005)	-	ND (0.0005)	0.0005	-	-	ND (0.0005)	ND (0.0005)
Iron	mg/L	-	ND (0.1)	-	ND (0.1)	**1.3**	**0.9**	ND (0.1)	-	0.2	0.2	ND (0.1)
Lead	mg/L	-	-	-	ND (0.0001)	-	0.0005	ND (0.0001)	-	-	ND (0.0001)	ND (0.0001)
Magnesium	mg/L	-	7.1	-	7.0	1.0	1.3	0.6	-	1.0	1.1	0.9
Manganese	mg/L	-	0.007	-	0.006	0.015	0.017	ND (0.005)	-	ND (0.005)	ND (0.005)	ND (0.005)
Molybdenum	mg/L	-	-	-	-	-	0.0014	0.0019	-	-	0.0014	0.0018
Nickel	mg/L	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)
Potassium	mg/L	-	7.8	-	7.5	2.8	3.1	1.9	-	2.3	2.6	2.2
Selenium	mg/L	-	-	-	ND (0.001)	-	ND (0.001)	ND (0.001)	-	-	0.001	ND (0.001)
Silver	mg/L	-	80.4	-	79.9	-	ND (0.0001)	0.0003	-	-	ND (0.0001)	ND (0.0001)
Sodium	mg/L	-	-	-	-	160	173	146	-	163	184	162
Strontium	mg/L	-	-	-	-	-	0.21	0.17	-	-	0.26	0.28
Thallium	mg/L	-	-	-	-	-	ND (0.001)	ND (0.001)	-	-	ND (0.001)	ND (0.001)
Tin	mg/L	-	-	-	-	-	ND (0.01)	ND (0.01)	-	-	ND (0.01)	ND (0.01)
Titanium	mg/L	-	-	-	-	-	0.083	ND (0.005)	-	-	0.008	ND (0.005)
Tungsten	mg/L	-	-	-	-	-	ND (0.01)	ND (0.01)	-	-	ND (0.01)	ND (0.01)
Uranium	mg/L	-	-	-	ND (0.0001)	-	0.0003	0.0002	-	-	0.0003	0.0004
Vanadium	mg/L	-	-	-	-	-	0.0022	0.0005	-	-	ND (0.0005)	ND (0.0005)
Zinc	mg/L	-	-	-	ND (0.005)	-	0.006	ND (0.005)	-	-	ND (0.005)	ND (0.005)

Water Quality Summary
Proposed Water Supply Wells

Parameter	Units	TW22-03 Lab ID: 2209298-01	TW22-03 Lab ID: 2215531-01	TW22-03 6hr Lab ID: 2218541-02	TW22-03 6hr (Filtered)	TW22-04 6hr Lab ID: 2236417-02	TW22-04 6hr (Filtered)	TW22-4 Lab ID: 2351202-01	TW24-5 Lab ID: 2404291-01	TW24-5 (Filtered) Lab ID: 2404291-02
Sample Date (m/d/y)		02/24/2022 10:55 AM	04/07/2022 01:00 PM	04/28/2022 03:15 PM	04/28/2022 03:15 PM	09/01/2022 04:00 PM	09/01/2022 04:00 PM	12/19/2023 02:30 PM	01/24/2024 02:25 PM	01/24/2024 02:25 PM
GEMTEC ASSIGNED WELL ID		**TW22-3**				**TW22-4**			**TW24-5**	
Microbiological Parameters										
E. Coli	CFU/100mL	-	ND (1)	ND (1)	-	-	-	ND (1)	ND (1)	N/A
Fecal Coliforms	CFU/100mL	-	ND (1)	ND (1)	-	-	-	ND (1)	**1**	N/A
Total Coliforms	CFU/100mL	-	ND (1)	ND (1)	-	-	-	ND (1)	ND (1)	N/A
Heterotrophic P	CFU/mL	-	-	-	-	-	-	10	ND (10)	N/A
General Inorganics										
Alkalinity, total	mg/L	-	227	218	-	239	-	252	189	N/A
Ammonia as N	mg/L	-	0.31	0.34	-	0.37	-	0.36	0.45	N/A
Dissolved Orgar	mg/L	-	1.3	1.8	-	1.6	-	0.8	1.7	N/A
Colour	TCU	-	**7**	**11**	-	**29**	-	2	2	N/A
Colour, apparer	ACU	-	**100**	**289**	-	**474**	-	5	**12**	N/A
Conductivity	uS/cm	-	516	544	-	481	-	516	480	N/A
Hardness	mg/L	-	**11.4**	**15.6**	-	**12.6**	-	**6.69**	**31.7**	N/A
pH	pH Units	-	**9.2**	**9.2**	-	**8.9**	-	**9.4**	**8.8**	N/A
Phenolics	mg/L	-	ND (0.001)	ND (0.001)	-	ND (0.001)	-	ND (0.001)	ND (0.001)	N/A
Total Dissolved	mg/L	-	304	306	-	308	-	268	248	N/A
Sulphide	mg/L	-	1.48	2.31	-	0.05	-	0.23	2.34	N/A
Tannin & Lignin	mg/L	-	ND (0.1)	1.5	-	0.2	-	ND (0.1)	0.4	N/A
Total Kjeldahl N	mg/L	-	0.4	0.4	-	0.4	-	0.3	0.4	N/A
Organic Nitroge	mg/L	-	0.09	0.06	-	0.03	-	0	0	-
Turbidity	NTU	-	**18.1**	**54.6**	-	**93.9**	-	0.5	1.4	N/A
Anions										
Chloride	mg/L	22	35	39	-	8	-	15	29	N/A
Fluoride	mg/L	1.3	1.4	1.3	-	1.3	-	1.1	0.8	N/A
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	-	0.2	-	ND (0.1)	ND (0.1)	N/A
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	ND (0.05)	-	ND (0.10)	-	ND (0.05)	ND (0.05)	N/A
Sulphate	mg/L	-	2	2	-	ND (1)	-	ND (1)	8	N/A
Metals										
Mercury	mg/L	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Aluminum	mg/L	-	-	**0.573**	0.007	**0.762**	0.028	0.047	0.050	0.023
Antimony	mg/L	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Arsenic	mg/L	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Barium	mg/L	-	-	0.044	0.027	0.077	0.053	0.052	0.151	0.137
Beryllium	mg/L	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Boron	mg/L	-	-	0.33	0.33	0.44	0.46	0.36	0.27	0.24
Cadmium	mg/L	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Calcium	mg/L	-	3.3	4.5	1.7	3.2	1.4	1.7	8.2	7.4
Chromium	mg/L	-	-	0.001	ND (0.001)	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Cobalt	mg/L	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Copper	mg/L	-	-	ND (0.0005)	ND (0.0005)	0.0009	0.0013	ND (0.0005)	ND (0.0005)	ND (0.0005)
Iron	mg/L	-	0.3	**0.9**	ND (0.1)	**1.1**	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Lead	mg/L	-	-	0.0001	ND (0.0001)	0.0005	ND (0.0001)	0.0002	ND (0.0001)	ND (0.0001)
Magnesium	mg/L	-	0.8	1.1	0.5	1.1	0.5	0.6	2.8	2.7
Manganese	mg/L	-	0.012	0.027	ND (0.005)	0.026	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)
Molybdenum	mg/L	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)	0.0005	ND (0.0005)
Nickel	mg/L	-	-	ND (0.001)	ND (0.001)	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Potassium	mg/L	-	1.3	1.4	1.2	1.6	1.4	1.6	3.3	3.3
Selenium	mg/L	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Silver	mg/L	-	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Sodium	mg/L	109	106	98.7	97.0	93.9	95.8	110	85.5	85.4
Strontium	mg/L	-	-	0.12	0.11	0.08	0.07	0.09	0.45	0.41
Thallium	mg/L	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Tin	mg/L	-	-	ND (0.01)	ND (0.01)	-	-	-		
Titanium	mg/L	-	-	0.040	ND (0.005)	-	-	-		
Tungsten	mg/L	-	-	ND (0.01)	ND (0.01)	-	-	-		
Uranium	mg/L	-	-	ND (0.0001)	ND (0.0001)	0.0001	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Vanadium	mg/L	-	-	0.0016	ND (0.0005)	0.0019	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Zinc	mg/L	-	-	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)	ND (0.005)

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 13240

Report Date: 24-Nov-2021
Order Date: 19-Nov-2021

Order #: 2147532

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

Paracel ID	Client ID
2147532-01	TW21-01 3hr
2147532-02	TW21-01 6hr

Comment: TW21-01 in this COC is identified PW21-01 in the report

Approved By:

Dale Robertson, BSc
Laboratory Director

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

Report Date: 24-Nov-2021
Order Date: 19-Nov-2021
Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-Nov-21	22-Nov-21
Ammonia, as N	EPA 351.2 - Auto Colour	23-Nov-21	23-Nov-21
Anions	EPA 300.1 - IC	19-Nov-21	19-Nov-21
Colour	SM2120 - Spectrophotometric	19-Nov-21	19-Nov-21
Colour, apparent	SM2120 - Spectrophotometric	19-Nov-21	19-Nov-21
Conductivity	EPA 9050A- probe @25 °C	22-Nov-21	22-Nov-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	22-Nov-21	22-Nov-21
E. coli	MOE E3407	19-Nov-21	19-Nov-21
Fecal Coliform	SM 9222D	19-Nov-21	19-Nov-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	19-Nov-21	19-Nov-21
pH	EPA 150.1 - pH probe @25 °C	22-Nov-21	22-Nov-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	22-Nov-21	22-Nov-21
Hardness	Hardness as CaCO3	19-Nov-21	19-Nov-21
Sulphide	SM 4500SE - Colourimetric	22-Nov-21	22-Nov-21
Tannin/Lignin	SM 5550B - Colourimetric	22-Nov-21	22-Nov-21
Total Coliform	MOE E3407	19-Nov-21	19-Nov-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-Nov-21	23-Nov-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	22-Nov-21	22-Nov-21
Turbidity	SM 2130B - Turbidity meter	19-Nov-21	19-Nov-21

Certificate of Analysis

Report Date: 24-Nov-2021

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

Order Date: 19-Nov-2021

Client PO:

Project Description: 100812.001

	Client ID:	TW21-01 3hr	TW21-01 6hr	-	-
	Sample Date:	18-Nov-21 11:40	18-Nov-21 14:40	-	-
	Sample ID:	2147532-01	2147532-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND [1]	ND [1]	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND [1]	ND [1]	-	-
General Inorganics					
Alkalinity, total	5 mg/L	224	223	-	-
Ammonia as N	0.01 mg/L	0.55	0.57	-	-
Dissolved Organic Carbon	0.5 mg/L	1.8	1.4	-	-
Colour	2 TCU	5	4	-	-
Colour, apparent	2 ACU	14	11	-	-
Conductivity	5 uS/cm	508	476	-	-
Hardness	mg/L	45.7	45.6	-	-
pH	0.1 pH Units	8.4	8.3	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	264	250	-	-
Sulphide	0.02 mg/L	0.29	0.31	-	-
Tannin & Lignin	0.1 mg/L	0.2	0.2	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.6	0.6	-	-
Turbidity	0.1 NTU	1.5	0.8	-	-
Anions					
Chloride	1 mg/L	19	17	-	-
Fluoride	0.1 mg/L	0.6	0.6	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	5	4	-	-
Metals					
Aluminum	0.001 mg/L	-	0.023	-	-
Antimony	0.0005 mg/L	-	<0.0005	-	-
Arsenic	0.001 mg/L	-	<0.001	-	-
Barium	0.001 mg/L	-	0.241	-	-
Boron	0.01 mg/L	-	0.31	-	-
Cadmium	0.0001 mg/L	-	<0.0001	-	-
Calcium	0.1 mg/L	6.7	6.7	-	-
Chromium	0.001 mg/L	-	<0.001	-	-
Copper	0.0005 mg/L	-	<0.0005	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-

Certificate of Analysis

Report Date: 24-Nov-2021

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

Order Date: 19-Nov-2021

Client PO:

Project Description: 100812.001

	Client ID:	TW21-01 3hr	TW21-01 6hr	-	-
	Sample Date:	18-Nov-21 11:40	18-Nov-21 14:40	-	-
	Sample ID:	2147532-01	2147532-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Lead	0.0001 mg/L	-	<0.0001	-	-
Magnesium	0.2 mg/L	7.1	7.0	-	-
Manganese	0.005 mg/L	0.007	0.006	-	-
Potassium	0.1 mg/L	7.8	7.5	-	-
Selenium	0.001 mg/L	-	<0.001	-	-
Sodium	0.2 mg/L	80.4	79.9	-	-
Uranium	0.0001 mg/L	-	<0.0001	-	-
Zinc	0.005 mg/L	-	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	618	5	mg/L	614			0.7	10	
Fluoride	0.16	0.1	mg/L	0.17			4.5	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	158	1	mg/L	153			3.3	10	
General Inorganics									
Alkalinity, total	290	5	mg/L	293			1.1	14	
Ammonia as N	0.070	0.01	mg/L	0.052			NC	17.7	
Dissolved Organic Carbon	ND	0.5	mg/L	ND			NC	37	
Colour	4	2	TCU	4			0.0	12	
Colour, apparent	14	2	ACU	14			0.0	12	
Conductivity	2680	5	uS/cm	2760			2.8	5	
pH	7.0	0.1	pH Units	7.2			2.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	74.0	10	mg/L	72.0			2.7	10	
Sulphide	0.29	0.02	mg/L	0.29			2.4	10	
Tannin & Lignin	0.1	0.1	mg/L	0.1			8.6	11	
Total Kjeldahl Nitrogen	0.60	0.1	mg/L	0.63			5.0	16	
Turbidity	1.6	0.1	NTU	1.5			3.9	10	
Metals									
Aluminum	0.044	0.001	mg/L	0.043			1.5	20	
Antimony	0.0008	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.008	0.001	mg/L	0.008			2.0	20	
Boron	0.34	0.01	mg/L	0.34			0.3	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	0.3	0.1	mg/L	0.3			0.0	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0059	0.0005	mg/L	0.0062			5.6	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0004	0.0001	mg/L	0.0003			10.1	20	
Magnesium	ND	0.2	mg/L	ND			NC	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	0.1	0.1	mg/L	ND			NC	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	97.8	0.2	mg/L	102			4.4	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Zinc	0.009	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC14
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC14

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.71	1	mg/L	ND	97.1	85-115			
Fluoride	1.01	0.1	mg/L	0.17	84.6	79-121			
Nitrate as N	1.08	0.1	mg/L	ND	108	79-120			
Nitrite as N	1.02	0.05	mg/L	ND	102	84-117			
Sulphate	161	1	mg/L	153	85.5	74-126			
General Inorganics									
Ammonia as N	0.308	0.01	mg/L	0.052	102	81-124			
Dissolved Organic Carbon	9.5	0.5	mg/L	ND	94.5	60-133			
Phenolics	0.024	0.001	mg/L	ND	94.3	69-132			
Total Dissolved Solids	90.0	10	mg/L	ND	90.0	75-125			
Sulphide	0.77	0.02	mg/L	0.29	95.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	0.1	85.5	71-113			
Total Kjeldahl Nitrogen	2.78	0.1	mg/L	0.63	107	81-126			
Metals									
Aluminum	85.9	0.001	mg/L	43.2	85.4	80-120			
Antimony	41.4	0.0005	mg/L	0.353	82.1	80-120			
Arsenic	48.5	0.001	mg/L	0.468	96.1	80-120			
Barium	51.0	0.001	mg/L	8.29	85.5	80-120			
Boron	43.1	0.01	mg/L	ND	86.2	80-120			
Cadmium	40.3	0.0001	mg/L	0.0012	80.7	80-120			
Calcium	8370	0.1	mg/L	312	80.5	80-120			
Chromium	43.8	0.001	mg/L	0.186	87.1	80-120			
Copper	47.2	0.0005	mg/L	6.23	82.0	80-120			
Iron	2310	0.1	mg/L	41.4	90.5	80-120			
Lead	41.7	0.0001	mg/L	0.332	82.7	80-120			
Magnesium	8470	0.2	mg/L	37.0	84.3	80-120			
Manganese	43.4	0.005	mg/L	1.09	84.5	80-120			
Potassium	9220	0.1	mg/L	94.7	91.3	80-120			
Selenium	44.1	0.001	mg/L	0.069	88.1	80-120			
Sodium	8670	0.2	mg/L	ND	86.7	80-120			
Uranium	41.6	0.0001	mg/L	0.0207	83.2	80-120			
Zinc	43.8	0.005	mg/L	3.80	80.1	80-120			

Qualifier Notes:

Sample Qualifiers :

1 : A2C - Background counts greater than 200

QC Qualifiers :

BAC14 : A2C - Background counts greater than 200

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 15384

Report Date: 10-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206260

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

Paracel ID	Client ID
2206260-01	TW22-02 3hr
2206260-02	TW22-02 6hr
2206260-03	TW22-02 6 hr (Filtered)

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 10-Feb-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	3-Feb-22	3-Feb-22
Ammonia, as N	EPA 351.2 - Auto Colour	3-Feb-22	3-Feb-22
Anions	EPA 300.1 - IC	2-Feb-22	2-Feb-22
Colour	SM2120 - Spectrophotometric	2-Feb-22	3-Feb-22
Colour, apparent	SM2120 - Spectrophotometric	2-Feb-22	3-Feb-22
Conductivity	EPA 9050A- probe @25 °C	3-Feb-22	3-Feb-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	3-Feb-22	3-Feb-22
E. coli	MOE E3407	2-Feb-22	2-Feb-22
Fecal Coliform	SM 9222D	2-Feb-22	2-Feb-22
Heterotrophic Plate Count	SM 9215C	2-Feb-22	2-Feb-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Feb-22	7-Feb-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	3-Feb-22	3-Feb-22
pH	EPA 150.1 - pH probe @25 °C	3-Feb-22	3-Feb-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	3-Feb-22	3-Feb-22
Hardness	Hardness as CaCO3	3-Feb-22	3-Feb-22
Sulphide	SM 4500SE - Colourimetric	3-Feb-22	3-Feb-22
Tannin/Lignin	SM 5550B - Colourimetric	7-Feb-22	7-Feb-22
Total Coliform	MOE E3407	2-Feb-22	2-Feb-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Feb-22	7-Feb-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	3-Feb-22	4-Feb-22
Turbidity	SM 2130B - Turbidity meter	3-Feb-22	3-Feb-22

Certificate of Analysis

Report Date: 10-Feb-2022

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

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-02 3hr	TW22-02 6hr	TW22-02 6 hr (Filtered)	-
	Sample Date:	01-Feb-22 11:30	01-Feb-22 14:30	01-Feb-22 14:30	-
	Sample ID:	2206260-01	2206260-02	2206260-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	319	348	-	-
Ammonia as N	0.01 mg/L	0.29	0.30	-	-
Dissolved Organic Carbon	0.5 mg/L	1.3	0.7	-	-
Colour	2 TCU	3	3	-	-
Colour, apparent	2 ACU	24	26	-	-
Conductivity	5 uS/cm	816	855	-	-
Hardness	mg/L	10.7	12.1	-	-
pH	0.1 pH Units	9.0	8.9	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	452	468	-	-
Sulphide	0.02 mg/L	2.78	3.08	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	0.4	-	-
Turbidity	0.1 NTU	4.0	4.2	-	-
Anions					
Chloride	1 mg/L	53	55	-	-
Fluoride	0.1 mg/L	2.7	3.3	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	5	7	-	-
Metals					
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-
Aluminum	0.001 mg/L	-	0.194	0.003	-
Antimony	0.0005 mg/L	-	<0.0005	0.0012	-
Arsenic	0.001 mg/L	-	0.002	0.002	-
Barium	0.001 mg/L	-	0.184	0.169	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-
Boron	0.01 mg/L	-	0.44	0.53	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-

Certificate of Analysis

Report Date: 10-Feb-2022

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

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-02 3hr	TW22-02 6hr	TW22-02 6 hr (Filtered)	-
	Sample Date:	01-Feb-22 11:30	01-Feb-22 14:30	01-Feb-22 14:30	-
	Sample ID:	2206260-01	2206260-02	2206260-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Calcium	0.1 mg/L	2.7	3.0	2.9	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-
Copper	0.0005 mg/L	-	<0.0005	<0.0005	-
Iron	0.1 mg/L	0.2	0.2	<0.1	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-
Magnesium	0.2 mg/L	1.0	1.1	0.9	-
Manganese	0.005 mg/L	<0.005	<0.005	<0.005	-
Molybdenum	0.0005 mg/L	-	0.0014	0.0018	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-
Potassium	0.1 mg/L	2.3	2.6	2.2	-
Selenium	0.001 mg/L	-	0.001	<0.001	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-
Sodium	0.2 mg/L	163	184	162	-
Strontium	0.01 mg/L	-	0.26	0.28	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-
Tin	0.01 mg/L	-	<0.01	<0.01	-
Titanium	0.005 mg/L	-	0.008	<0.005	-
Tungsten	0.01 mg/L	-	<0.01	<0.01	-
Uranium	0.0001 mg/L	-	0.0003	0.0004	-
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	55.3	1	mg/L	55.2			0.2	10	
Fluoride	3.33	0.1	mg/L	3.30			0.9	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	7.40	1	mg/L	7.40			0.1	10	
General Inorganics									
Alkalinity, total	315	5	mg/L	319			1.2	14	
Ammonia as N	0.301	0.01	mg/L	0.315			4.4	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.3			36.1	37	
Colour	3	2	TCU	3			0.0	12	
Colour, apparent	27	2	ACU	26			3.8	12	
Conductivity	806	5	uS/cm	816			1.1	5	
pH	9.0	0.1	pH Units	9.0			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	648	10	mg/L	664			2.4	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.34	0.1	mg/L	0.37			8.6	16	
Turbidity	4.0	0.1	NTU	4.0			0.5	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.219	0.001	mg/L	0.291			28.5	20	QR-05
Antimony	0.0007	0.0005	mg/L	ND			NC	20	
Arsenic	0.003	0.001	mg/L	0.002			1.9	20	
Barium	0.159	0.001	mg/L	0.160			0.4	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.44	0.01	mg/L	0.44			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			2.9	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	ND	0.0005	mg/L	ND			NC	20	
Iron	0.1	0.1	mg/L	0.2			9.0	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	0.9	0.2	mg/L	1.0			5.9	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0014	0.0005	mg/L	0.0015			7.7	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	2.3	0.1	mg/L	2.3			0.3	20	
Selenium	ND	0.001	mg/L	0.002			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	168	0.2	mg/L	163			3.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Tin	ND	0.01	mg/L	ND			NC	20	
Titanium	0.008	0.005	mg/L	0.010			18.3	50	
Tungsten	ND	0.01	mg/L	ND			NC	20	
Uranium	0.0004	0.0001	mg/L	0.0005			1.9	20	
Vanadium	0.0005	0.0005	mg/L	0.0006			19.5	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	63.1	1	mg/L	55.2	79.0	77-123			
Fluoride	4.18	0.1	mg/L	3.30	87.5	79-121			
Nitrate as N	0.97	0.1	mg/L	ND	96.9	79-120			
Nitrite as N	0.835	0.05	mg/L	ND	83.5	84-117			QM-07
Sulphate	17.1	1	mg/L	7.40	97.1	74-126			
General Inorganics									
Ammonia as N	0.570	0.01	mg/L	0.315	102	81-124			
Dissolved Organic Carbon	12.4	0.5	mg/L	1.3	111	60-133			
Phenolics	0.027	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.50	0.02	mg/L	ND	100	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	96.8	71-113			
Total Kjeldahl Nitrogen	2.22	0.1	mg/L	0.37	92.3	81-126			
Metals									
Mercury	0.0033	0.0001	mg/L	ND	109	70-130			
Aluminum	44.6	0.001	mg/L	ND	89.2	80-120			
Antimony	48.8	0.0005	mg/L	0.306	97.0	80-120			
Arsenic	50.0	0.001	mg/L	2.46	95.1	80-120			
Barium	192	0.001	mg/L	160	63.8	80-120			QM-07
Beryllium	39.8	0.0005	mg/L	0.0242	79.6	80-120			QM-07
Boron	41.5	0.01	mg/L	ND	83.1	80-120			
Cadmium	44.7	0.0001	mg/L	0.0026	89.4	80-120			
Calcium	12500	0.1	mg/L	2700	97.7	80-120			
Chromium	46.1	0.001	mg/L	0.439	91.4	80-120			
Cobalt	44.8	0.0005	mg/L	0.0399	89.4	80-120			
Copper	39.6	0.0005	mg/L	0.422	78.4	80-120			QM-07
Iron	2440	0.1	mg/L	152	91.6	80-120			
Lead	39.1	0.0001	mg/L	0.0874	78.0	80-120			QM-07
Magnesium	10700	0.2	mg/L	951	97.6	80-120			
Manganese	47.0	0.005	mg/L	2.30	89.4	80-120			
Molybdenum	42.3	0.0005	mg/L	1.50	81.7	80-120			
Nickel	42.2	0.001	mg/L	0.217	84.0	80-120			
Potassium	12400	0.1	mg/L	2330	100	80-120			
Selenium	37.7	0.001	mg/L	1.94	71.6	80-120			QM-07
Silver	37.0	0.0001	mg/L	0.0945	73.7	80-120			QM-07
Sodium	9320	0.2	mg/L	ND	93.2	80-120			
Thallium	41.3	0.001	mg/L	0.016	82.5	80-120			
Tin	42.2	0.01	mg/L	0.22	84.1	80-120			
Titanium	46.8	0.005	mg/L	ND	93.6	70-130			
Tungsten	42.6	0.01	mg/L	0.55	84.1	80-120			
Uranium	42.4	0.0001	mg/L	0.454	83.9	80-120			
Vanadium	48.2	0.0005	mg/L	0.619	95.2	80-120			
Zinc	41.9	0.005	mg/L	1.96	79.8	80-120			QM-07

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

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

QR-05 : Duplicate RPDs higher than normally accepted. Remaining batch QA\QC was acceptable. May be sample effect.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 15387

Report Date: 8-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206338

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

Paracel ID	Client ID
2206338-01	PW-939
2206338-02	PW-1014

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 08-Feb-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	3-Feb-22	3-Feb-22
Ammonia, as N	EPA 351.2 - Auto Colour	3-Feb-22	3-Feb-22
Anions	EPA 300.1 - IC	3-Feb-22	3-Feb-22
Colour	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Colour, apparent	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Conductivity	EPA 9050A- probe @25 °C	3-Feb-22	3-Feb-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	3-Feb-22	3-Feb-22
E. coli	MOE E3407	3-Feb-22	3-Feb-22
Fecal Coliform	SM 9222D	3-Feb-22	3-Feb-22
Heterotrophic Plate Count	SM 9215C	3-Feb-22	3-Feb-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	3-Feb-22	3-Feb-22
pH	EPA 150.1 - pH probe @25 °C	3-Feb-22	3-Feb-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	3-Feb-22	3-Feb-22
Hardness	Hardness as CaCO3	3-Feb-22	3-Feb-22
Sulphide	SM 4500SE - Colourimetric	3-Feb-22	3-Feb-22
Tannin/Lignin	SM 5550B - Colourimetric	7-Feb-22	7-Feb-22
Total Coliform	MOE E3407	3-Feb-22	3-Feb-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Feb-22	7-Feb-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	3-Feb-22	4-Feb-22
Turbidity	SM 2130B - Turbidity meter	3-Feb-22	3-Feb-22

Certificate of Analysis

Report Date: 08-Feb-2022

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

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	PW-939	PW-1014	-	-
	Sample Date:	02-Feb-22 12:00	02-Feb-22 12:00	-	-
	Sample ID:	2206338-01	2206338-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND [1]	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND [1]	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	172	241	-	-
Ammonia as N	0.01 mg/L	0.53	0.31	-	-
Dissolved Organic Carbon	0.5 mg/L	1.1	<0.5	-	-
Colour	2 TCU	3	5	-	-
Colour, apparent	2 ACU	5	13	-	-
Conductivity	5 uS/cm	384	572	-	-
Hardness	mg/L	39.2	6.33	-	-
pH	0.1 pH Units	8.4	9.0	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	208	324	-	-
Sulphide	0.02 mg/L	1.12	4.61	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.6	0.3	-	-
Turbidity	0.1 NTU	1.2	2.0	-	-
Anions					
Chloride	1 mg/L	13	39	-	-
Fluoride	0.1 mg/L	0.6	1.1	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	<1	3	-	-
Metals					
Calcium	0.1 mg/L	7.0	1.8	-	-
Iron	0.1 mg/L	<0.1	0.2	-	-
Magnesium	0.2 mg/L	5.3	0.4	-	-
Manganese	0.005 mg/L	<0.005	<0.005	-	-
Potassium	0.1 mg/L	5.2	1.5	-	-
Sodium	0.2 mg/L	64.8	124	-	-

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	38.9	1	mg/L	38.7			0.6	10	
Fluoride	1.16	0.1	mg/L	1.08			7.7	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	3.33	1	mg/L	3.28			1.6	10	
General Inorganics									
Alkalinity, total	315	5	mg/L	319			1.2	14	
Ammonia as N	0.301	0.01	mg/L	0.315			4.4	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.3			36.1	37	
Colour	3	2	TCU	3			0.0	12	
Colour, apparent	5	2	ACU	5			0.0	12	
Conductivity	806	5	uS/cm	816			1.1	5	
pH	9.0	0.1	pH Units	9.0			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	648	10	mg/L	664			2.4	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.34	0.1	mg/L	0.37			8.6	16	
Turbidity	4.0	0.1	NTU	4.0			0.5	10	
Metals									
Calcium	2.6	0.1	mg/L	2.7			2.9	20	
Iron	0.1	0.1	mg/L	0.2			9.0	20	
Magnesium	0.9	0.2	mg/L	1.0			5.9	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	2.3	0.1	mg/L	2.3			0.3	20	
Sodium	168	0.2	mg/L	163			3.0	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	47.9	1	mg/L	38.7	91.8	77-123			
Fluoride	1.93	0.1	mg/L	1.08	84.9	79-121			
Nitrate as N	1.09	0.1	mg/L	ND	109	79-120			
Nitrite as N	0.956	0.05	mg/L	ND	95.6	84-117			
Sulphate	13.2	1	mg/L	3.28	98.7	74-126			
General Inorganics									
Ammonia as N	0.570	0.01	mg/L	0.315	102	81-124			
Dissolved Organic Carbon	12.4	0.5	mg/L	1.3	111	60-133			
Phenolics	0.027	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.50	0.02	mg/L	ND	100	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	96.8	71-113			
Total Kjeldahl Nitrogen	2.22	0.1	mg/L	0.37	92.3	81-126			
Metals									
Calcium	12500	0.1	mg/L	2700	97.7	80-120			
Iron	2440	0.1	mg/L	152	91.6	80-120			
Magnesium	10700	0.2	mg/L	951	97.6	80-120			
Manganese	47.0	0.005	mg/L	2.30	89.4	80-120			
Potassium	12400	0.1	mg/L	2330	100	80-120			
Sodium	9320	0.2	mg/L	ND	93.2	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - No project/sample time on bottles.

Applies to samples: PW-939, PW-1014

Sample Qualifiers :

1 : A2C - Background counts greater than 200

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 15383

Report Date: 10-Feb-2022
Order Date: 2-Feb-2022

Order #: 2206352

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

Paracel ID	Client ID
2206352-01	TW22-01 3hr
2206352-02	TW22-01 6hr
2206352-03	TW22-01 6hr (Filtered)

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 10-Feb-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	3-Feb-22	3-Feb-22
Ammonia, as N	EPA 351.2 - Auto Colour	3-Feb-22	3-Feb-22
Anions	EPA 300.1 - IC	3-Feb-22	4-Feb-22
Colour	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Colour, apparent	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Conductivity	EPA 9050A- probe @25 °C	3-Feb-22	3-Feb-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	3-Feb-22	3-Feb-22
E. coli	MOE E3407	3-Feb-22	3-Feb-22
Fecal Coliform	SM 9222D	3-Feb-22	3-Feb-22
Heterotrophic Plate Count	SM 9215C	3-Feb-22	3-Feb-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	3-Feb-22	3-Feb-22
pH	EPA 150.1 - pH probe @25 °C	3-Feb-22	3-Feb-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	3-Feb-22	3-Feb-22
Hardness	Hardness as CaCO3	3-Feb-22	3-Feb-22
Sulphide	SM 4500SE - Colourimetric	3-Feb-22	3-Feb-22
Tannin/Lignin	SM 5550B - Colourimetric	7-Feb-22	7-Feb-22
Total Coliform	MOE E3407	3-Feb-22	3-Feb-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Feb-22	7-Feb-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	7-Feb-22	8-Feb-22
Turbidity	SM 2130B - Turbidity meter	3-Feb-22	3-Feb-22

Certificate of Analysis

Report Date: 10-Feb-2022

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

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-01 3hr	TW22-01 6hr	TW22-01 6hr (Filtered)	-
	Sample Date:	02-Feb-22 11:20	02-Feb-22 14:20	02-Feb-22 14:20	-
	Sample ID:	2206352-01	2206352-02	2206352-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Microbiological Parameters					
E. coli	1 CFU/100mL	<10 [1]	<10 [1]	-	-
Fecal Coliforms	1 CFU/100mL	<10 [1]	<10 [1]	-	-
Total Coliforms	1 CFU/100mL	<10 [1]	<10 [1]	-	-
Heterotrophic Plate Count	10 CFU/mL	10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	327	353	-	-
Ammonia as N	0.01 mg/L	0.37	0.38	-	-
Dissolved Organic Carbon	0.5 mg/L	1.5	1.5	-	-
Colour	2 TCU	9	14	-	-
Colour, apparent	2 ACU	764	1000	-	-
Conductivity	5 uS/cm	706	828	-	-
Hardness	mg/L	10.8	13.6	-	-
pH	0.1 pH Units	9.2	9.1	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	436	472	-	-
Sulphide	0.02 mg/L	1.77	3.75	-	-
Tannin & Lignin	0.1 mg/L	0.3	0.3	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.5	0.6	-	-
Turbidity	0.1 NTU	140	190	-	-
Anions					
Chloride	1 mg/L	28	41	-	-
Fluoride	0.1 mg/L	2.6	3.0	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	<1	1	-	-
Metals					
Aluminum	0.001 mg/L	-	1.59	0.282	-
Antimony	0.0005 mg/L	-	<0.0005	0.0006	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-
Barium	0.001 mg/L	-	0.277	0.142	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-
Boron	0.01 mg/L	-	0.45	0.53	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-
Calcium	0.1 mg/L	2.7	3.3	2.0	-

Certificate of Analysis

Report Date: 10-Feb-2022

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

Order Date: 2-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-01 3hr	TW22-01 6hr	TW22-01 6hr (Filtered)	-
	Sample Date:	02-Feb-22 11:20	02-Feb-22 14:20	02-Feb-22 14:20	-
	Sample ID:	2206352-01	2206352-02	2206352-03	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-
Copper	0.0005 mg/L	-	<0.0005	0.0005	-
Iron	0.1 mg/L	1.3	0.9	<0.1	-
Lead	0.0001 mg/L	-	0.0005	<0.0001	-
Magnesium	0.2 mg/L	1.0	1.3	0.6	-
Manganese	0.005 mg/L	0.015	0.017	<0.005	-
Molybdenum	0.0005 mg/L	-	0.0014	0.0019	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-
Potassium	0.1 mg/L	2.8	3.1	1.9	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-
Silver	0.0001 mg/L	-	<0.0001	0.0003	-
Sodium	0.2 mg/L	160	173	146	-
Strontium	0.01 mg/L	-	0.21	0.17	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-
Tin	0.01 mg/L	-	<0.01	<0.01	-
Titanium	0.005 mg/L	-	0.083	<0.005	-
Tungsten	0.01 mg/L	-	<0.01	<0.01	-
Uranium	0.0001 mg/L	-	0.0003	0.0002	-
Vanadium	0.0005 mg/L	-	0.0022	0.0005	-
Zinc	0.005 mg/L	-	0.006	<0.005	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	38.9	1	mg/L	38.7			0.6	10	
Fluoride	1.16	0.1	mg/L	1.08			7.7	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	3.33	1	mg/L	3.28			1.6	10	
General Inorganics									
Alkalinity, total	315	5	mg/L	319			1.2	14	
Ammonia as N	0.301	0.01	mg/L	0.315			4.4	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.3			36.1	37	
Colour	3	2	TCU	3			0.0	12	
Colour, apparent	5	2	ACU	5			0.0	12	
Conductivity	806	5	uS/cm	816			1.1	5	
pH	9.0	0.1	pH Units	9.0			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	648	10	mg/L	664			2.4	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.49	0.1	mg/L	0.55			11.4	16	
Turbidity	4.0	0.1	NTU	4.0			0.5	10	
Metals									
Aluminum	0.219	0.001	mg/L	0.291			28.5	20	QR-05
Antimony	0.0007	0.0005	mg/L	ND			NC	20	
Arsenic	0.003	0.001	mg/L	0.002			1.9	20	
Barium	0.159	0.001	mg/L	0.160			0.4	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.44	0.01	mg/L	0.44			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			2.9	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	ND	0.0005	mg/L	ND			NC	20	
Iron	0.1	0.1	mg/L	0.2			9.0	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	0.9	0.2	mg/L	1.0			5.9	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0014	0.0005	mg/L	0.0015			7.7	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	2.3	0.1	mg/L	2.3			0.3	20	
Selenium	ND	0.001	mg/L	0.002			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	168	0.2	mg/L	163			3.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Tin	ND	0.01	mg/L	ND			NC	20	
Titanium	0.008	0.005	mg/L	0.010			18.3	50	
Tungsten	ND	0.01	mg/L	ND			NC	20	
Uranium	0.0004	0.0001	mg/L	0.0005			1.9	20	
Vanadium	0.0005	0.0005	mg/L	0.0006			19.5	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	10	CFU/100mL	ND			NC	30	BAC09
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	10			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	47.9	1	mg/L	38.7	91.8	77-123			
Fluoride	1.93	0.1	mg/L	1.08	84.9	79-121			
Nitrate as N	1.09	0.1	mg/L	ND	109	79-120			
Nitrite as N	0.956	0.05	mg/L	ND	95.6	84-117			
Sulphate	13.2	1	mg/L	3.28	98.7	74-126			
General Inorganics									
Ammonia as N	0.570	0.01	mg/L	0.315	102	81-124			
Dissolved Organic Carbon	12.4	0.5	mg/L	1.3	111	60-133			
Phenolics	0.027	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.50	0.02	mg/L	ND	100	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	96.8	71-113			
Total Kjeldahl Nitrogen	2.46	0.1	mg/L	0.55	95.7	81-126			
Metals									
Aluminum	44.6	0.001	mg/L	ND	89.2	80-120			
Antimony	48.8	0.0005	mg/L	0.306	97.0	80-120			
Arsenic	50.0	0.001	mg/L	2.46	95.1	80-120			
Barium	192	0.001	mg/L	160	63.8	80-120			QM-07
Beryllium	39.8	0.0005	mg/L	0.0242	79.6	80-120			QM-07
Boron	41.5	0.01	mg/L	ND	83.1	80-120			
Cadmium	44.7	0.0001	mg/L	0.0026	89.4	80-120			
Calcium	12500	0.1	mg/L	2700	97.7	80-120			
Chromium	46.1	0.001	mg/L	0.439	91.4	80-120			
Cobalt	44.8	0.0005	mg/L	0.0399	89.4	80-120			
Copper	39.6	0.0005	mg/L	0.422	78.4	80-120			QM-07
Iron	2440	0.1	mg/L	152	91.6	80-120			
Lead	39.1	0.0001	mg/L	0.0874	78.0	80-120			QM-07
Magnesium	10700	0.2	mg/L	951	97.6	80-120			
Manganese	47.0	0.005	mg/L	2.30	89.4	80-120			
Molybdenum	42.3	0.0005	mg/L	1.50	81.7	80-120			
Nickel	42.2	0.001	mg/L	0.217	84.0	80-120			
Potassium	12400	0.1	mg/L	2330	100	80-120			
Selenium	37.7	0.001	mg/L	1.94	71.6	80-120			QM-07
Silver	37.0	0.0001	mg/L	0.0945	73.7	80-120			QM-07
Sodium	9320	0.2	mg/L	ND	93.2	80-120			
Thallium	41.3	0.001	mg/L	0.016	82.5	80-120			
Tin	42.2	0.01	mg/L	0.22	84.1	80-120			
Titanium	46.8	0.005	mg/L	ND	93.6	70-130			
Tungsten	42.6	0.01	mg/L	0.55	84.1	80-120			
Uranium	42.4	0.0001	mg/L	0.454	83.9	80-120			
Vanadium	48.2	0.0005	mg/L	0.619	95.2	80-120			
Zinc	41.9	0.005	mg/L	1.96	79.8	80-120			QM-07

Qualifier Notes:

Login Qualifiers :

Sample - Filtered and preserved by Paracel upon receipt at the laboratory -
Applies to samples: TW22-1 6hr (Filtered)

Sample Qualifiers :

1 : Bacteria sample was diluted due to suspended particulate matter.

QC Qualifiers :

BAC09 : Bacteria sample was diluted due to suspended particulate matter.

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

QR-05 : Duplicate RPDs higher than normally accepted. Remaining batch QA\QC was acceptable. May be sample effect.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

subsampled from the generals bottle

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 15388

Report Date: 8-Feb-2022
Order Date: 3-Feb-2022

Order #: 2206385

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

Paracel ID	Client ID
2206385-01	MW21-01
2206385-02	MW21-02

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 08-Feb-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 3-Feb-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	4-Feb-22	4-Feb-22

Certificate of Analysis

Report Date: 08-Feb-2022

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

Order Date: 3-Feb-2022

Client PO:

Project Description: 100812.001

	Client ID:	MW21-01	MW21-02	-	-
	Sample Date:	03-Feb-22 08:59	03-Feb-22 09:40	-	-
	Sample ID:	2206385-01	2206385-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Anions					
Nitrate as N	0.1 mg/L	5.8	0.3	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	0.21	0.1	mg/L	0.21			1.4	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.37	0.1	mg/L	0.21	116	79-120			
Nitrite as N	0.876	0.05	mg/L	ND	87.6	84-117			

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody:

Report Date: 17-Feb-2022
Order Date: 15-Feb-2022

Order #: 2208183

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

Paracel ID	Client ID
2208183-01	TW1

Comment: TW1 in this COC is identified as TW22-1 in the report

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 17-Feb-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 15-Feb-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	16-Feb-22	17-Feb-22

Qualifier Notes:

None

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

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

Certificate of Analysis

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

Client PO:

Report Date: 17-Feb-2022

Order Date: 15-Feb-2022

Project Description: 100812.001

Sample Results

Fluoride

Matrix: Drinking Water

Paracel ID	Client ID	Sample Date	Units	MDL	Result
2208183-01	TW1	14-Feb-22	mg/L	0.1	3.0

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Fluoride	**ND**	**0.1**	**mg/L**						
Matrix Duplicate									
Fluoride	**ND**	**0.1**	**mg/L**	**ND**			**NC**	**10**	
Matrix Spike									
Fluoride	0.97	0.1	mg/L	ND	97.5	83-117			

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100817.001
Custody: 15630

Report Date: 13-Apr-2022
Order Date: 7-Apr-2022

Order #: 2215531

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

Paracel ID	Client ID
2215531-01	TW21-03
2215531-02	PW-903

Comment: TW21-03 in this COC is identified as TW22-3 in the report

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 13-Apr-2022

Order Date: 7-Apr-2022

Project Description: 100817.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	8-Apr-22	8-Apr-22
Ammonia, as N	EPA 351.2 - Auto Colour	13-Apr-22	13-Apr-22
Anions	EPA 300.1 - IC	11-Apr-22	11-Apr-22
Colour	SM2120 - Spectrophotometric	8-Apr-22	8-Apr-22
Colour, apparent	SM2120 - Spectrophotometric	8-Apr-22	8-Apr-22
Conductivity	EPA 9050A- probe @25 °C	8-Apr-22	8-Apr-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	8-Apr-22	8-Apr-22
E. coli	MOE E3407	8-Apr-22	8-Apr-22
Fecal Coliform	SM 9222D	8-Apr-22	8-Apr-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	11-Apr-22	11-Apr-22
pH	EPA 150.1 - pH probe @25 °C	8-Apr-22	8-Apr-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	12-Apr-22	12-Apr-22
Hardness	Hardness as CaCO3	11-Apr-22	11-Apr-22
Sulphide	SM 4500SE - Colourimetric	12-Apr-22	13-Apr-22
Tannin/Lignin	SM 5550B - Colourimetric	12-Apr-22	13-Apr-22
Total Coliform	MOE E3407	8-Apr-22	8-Apr-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	8-Apr-22	8-Apr-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	11-Apr-22	12-Apr-22
Turbidity	SM 2130B - Turbidity meter	8-Apr-22	8-Apr-22

PARACEL LABORATORIES LTD.

Order #: 2215531

Certificate of Analysis

Report Date: 13-Apr-2022

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

Order Date: 7-Apr-2022

Client PO:

Project Description: 100817.001

	Client ID:	TW21-03	PW-903	-	-
	Sample Date:	07-Apr-22 13:00	07-Apr-22 12:20	-	-
	Sample ID:	2215531-01	2215531-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	1	-	-
General Inorganics					
Alkalinity, total	5 mg/L	227	224	-	-
Ammonia as N	0.01 mg/L	0.31	0.47	-	-
Dissolved Organic Carbon	0.5 mg/L	1.3	1.6	-	-
Colour	2 TCU	7	6	-	-
Colour, apparent	2 ACU	100	9	-	-
Conductivity	5 uS/cm	516	462	-	-
Hardness	mg/L	11.4	27.7	-	-
pH	0.1 pH Units	9.2	8.6	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	304	250	-	-
Sulphide	0.02 mg/L	1.48	0.90	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	0.5	-	-
Turbidity	0.1 NTU	18.1	0.8	-	-
Anions					
Chloride	1 mg/L	35	18	-	-
Fluoride	0.1 mg/L	1.4	0.7	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	2	3	-	-
Metals					
Calcium	0.1 mg/L	3.3	7.5	-	-
Iron	0.1 mg/L	0.3	0.2	-	-
Magnesium	0.2 mg/L	0.8	2.1	-	-
Manganese	0.005 mg/L	0.012	0.017	-	-
Potassium	0.1 mg/L	1.3	3.2	-	-
Sodium	0.2 mg/L	106	86.0	-	-

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	34.9	1	mg/L	35.1			0.6	10	
Fluoride	1.30	0.1	mg/L	1.37			4.6	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	1.68	1	mg/L	1.63			3.3	10	
General Inorganics									
Alkalinity, total	224	5	mg/L	227			1.1	14	
Ammonia as N	0.056	0.01	mg/L	0.053			5.3	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.3			34.9	37	
Colour	7	2	TCU	7			0.0	12	
Colour, apparent	100	2	ACU	100			0.0	12	
Conductivity	524	5	uS/cm	516			1.5	5	
pH	9.2	0.1	pH Units	9.2			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	254	10	mg/L	250			1.6	10	
Sulphide	0.04	0.02	mg/L	0.04			5.4	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.34	0.1	mg/L	0.36			5.2	16	
Turbidity	0.3	0.1	NTU	0.3			3.3	10	
Metals									
Calcium	10.5	0.1	mg/L	10.5			0.2	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium	2.6	0.2	mg/L	2.6			1.8	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	0.9	0.1	mg/L	0.9			4.1	20	
Sodium	20.7	0.2	mg/L	21.1			2.1	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	45.2	1	mg/L	35.1	101	77-123			
Fluoride	2.29	0.1	mg/L	1.37	92.0	79-121			
Nitrate as N	1.15	0.1	mg/L	ND	115	79-120			
Nitrite as N	1.05	0.05	mg/L	ND	105	84-117			
Sulphate	12.9	1	mg/L	1.63	112	74-126			
General Inorganics									
Ammonia as N	0.305	0.01	mg/L	0.053	101	81-124			
Dissolved Organic Carbon	12.6	0.5	mg/L	1.3	112	60-133			
Phenolics	0.026	0.001	mg/L	ND	103	67-133			
Total Dissolved Solids	92.0	10	mg/L	ND	92.0	75-125			
Sulphide	0.52	0.02	mg/L	0.04	96.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	96.8	71-113			
Total Kjeldahl Nitrogen	2.12	0.1	mg/L	0.36	88.1	81-126			
Metals									
Calcium	18500	0.1	mg/L	10500	79.9	80-120			QM-07
Iron	2160	0.1	mg/L	8.7	86.0	80-120			
Magnesium	11800	0.2	mg/L	2590	92.0	80-120			
Manganese	48.6	0.005	mg/L	3.94	89.3	80-120			
Potassium	10200	0.1	mg/L	872	93.6	80-120			
Sodium	8700	0.2	mg/L	ND	87.0	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO:
Project: 100812.001
Custody: 15431, 16849

Report Date: 5-May-2022
Order Date: 29-Apr-2022

Order #: 2218541

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

Paracel ID	Client ID
2218541-02	TW22-01 6hr
2218541-03	TW22-01 6hr (Filtered)
2218541-04	MW21-01

Comment: TW22-01 in this COC is identified as TW22-03 in report

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 05-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Apr-2022

Client PO:

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	3-May-22	3-May-22
Ammonia, as N	EPA 351.2 - Auto Colour	29-Apr-22	29-Apr-22
Anions	EPA 300.1 - IC	29-Apr-22	29-Apr-22
Colour	SM2120 - Spectrophotometric	29-Apr-22	29-Apr-22
Colour, apparent	SM2120 - Spectrophotometric	29-Apr-22	29-Apr-22
Conductivity	EPA 9050A- probe @25 °C	3-May-22	3-May-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	29-Apr-22	29-Apr-22
E. coli	MOE E3407	29-Apr-22	29-Apr-22
Fecal Coliform	SM 9222D	29-Apr-22	29-Apr-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	29-Apr-22	29-Apr-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	2-May-22	2-May-22
pH	EPA 150.1 - pH probe @25 °C	3-May-22	3-May-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	5-May-22	5-May-22
Hardness	Hardness as CaCO3	2-May-22	2-May-22
Sulphide	SM 4500SE - Colourimetric	29-Apr-22	29-Apr-22
Tannin/Lignin	SM 5550B - Colourimetric	29-Apr-22	29-Apr-22
Total Coliform	MOE E3407	29-Apr-22	29-Apr-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	29-Apr-22	2-May-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	2-May-22	2-May-22
Turbidity	SM 2130B - Turbidity meter	29-Apr-22	29-Apr-22

PARACEL LABORATORIES LTD.

Order #: 2218541

Certificate of Analysis

Report Date: 05-May-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 29-Apr-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-01 6hr	TW22-01 6hr (Filtered)	MW21-01	-
	Sample Date:	28-Apr-22 15:15	28-Apr-22 15:15	28-Apr-22 15:58	-
	Sample ID:	2218541-02	2218541-03	2218541-04	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND [1]	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND [1]	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	218	-	-	-
Ammonia as N	0.01 mg/L	0.34	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.8	-	-	-
Colour	2 TCU	11	-	-	-
Colour, apparent	2 ACU	289	-	-	-
Conductivity	5 uS/cm	544	-	-	-
Hardness	mg/L	15.6	-	-	-
pH	0.1 pH Units	9.2	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	306	-	-	-
Sulphide	0.02 mg/L	2.31	-	-	-
Tannin & Lignin	0.1 mg/L	1.5	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	-	-	-
Turbidity	0.1 NTU	54.6	-	-	-
Anions					
Chloride	1 mg/L	39	-	-	-
Fluoride	0.1 mg/L	1.3	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	6.6	-
Nitrite as N	0.05 mg/L	<0.05	-	<0.05	-
Sulphate	1 mg/L	2	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	0.573	0.007	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.044	0.027	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.33	0.33	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	4.5	1.7	-	-

Certificate of Analysis

Report Date: 05-May-2022

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

Order Date: 29-Apr-2022

Client PO:

Project Description: 100812.001

	Client ID:	TW22-01 6hr	TW22-01 6hr (Filtered)	MW21-01	-
	Sample Date:	28-Apr-22 15:15	28-Apr-22 15:15	28-Apr-22 15:58	-
	Sample ID:	2218541-02	2218541-03	2218541-04	-
	MDL/Units	Drinking Water	Drinking Water	Drinking Water	-
Chromium	0.001 mg/L	0.001	<0.001	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-
Copper	0.0005 mg/L	<0.0005	<0.0005	-	-
Iron	0.1 mg/L	0.9	<0.1	-	-
Lead	0.0001 mg/L	0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	1.1	0.5	-	-
Manganese	0.005 mg/L	0.027	<0.005	-	-
Molybdenum	0.0005 mg/L	<0.0005	<0.0005	-	-
Nickel	0.001 mg/L	<0.001	<0.001	-	-
Potassium	0.1 mg/L	1.4	1.2	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	98.7	97.0	-	-
Strontium	0.01 mg/L	0.12	0.11	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Tin	0.01 mg/L	<0.01	<0.01	-	-
Titanium	0.005 mg/L	0.040	<0.005	-	-
Tungsten	0.01 mg/L	<0.01	<0.01	-	-
Uranium	0.0001 mg/L	<0.0001	<0.0001	-	-
Vanadium	0.0005 mg/L	0.0016	<0.0005	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	38.4	1	mg/L	39.0			1.6	10	
Fluoride	1.26	0.1	mg/L	1.28			1.0	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	1.55	1	mg/L	1.55			0.2	10	
General Inorganics									
Alkalinity, total	214	5	mg/L	218			2.1	14	
Ammonia as N	0.330	0.01	mg/L	0.336			1.9	17.7	
Dissolved Organic Carbon	2.1	0.5	mg/L	1.8			11.5	37	
Colour	10	2	TCU	11			9.5	12	
Colour, apparent	288	2	ACU	289			0.3	12	
Conductivity	537	5	uS/cm	544			1.3	5	
pH	9.2	0.1	pH Units	9.2			0.2	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	602	10	mg/L	608			1.0	10	
Sulphide	2.29	0.20	mg/L	2.31			0.9	10	
Tannin & Lignin	0.7	0.1	mg/L	0.7			3.1	11	
Total Kjeldahl Nitrogen	0.32	0.1	mg/L	0.38			NC	16	
Turbidity	54.4	0.1	NTU	54.6			0.4	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.050	0.001	mg/L	0.050			1.3	20	
Antimony	0.0008	0.0005	mg/L	0.0009			13.1	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.110	0.001	mg/L	0.113			2.5	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.46	0.01	mg/L	0.47			2.3	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	9.7	0.1	mg/L	9.8			0.5	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0006	0.0005	mg/L	0.0006			1.4	20	
Iron	0.1	0.1	mg/L	0.1			2.9	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	10.0	0.2	mg/L	10.3			2.2	20	
Manganese	0.010	0.005	mg/L	0.009			11.3	20	
Molybdenum	0.0011	0.0005	mg/L	0.0011			0.2	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	11.2	0.1	mg/L	11.2			0.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	240	0.2	mg/L	235			2.5	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Tin	ND	0.01	mg/L	ND			NC	20	
Titanium	ND	0.005	mg/L	ND			NC	50	
Tungsten	ND	0.01	mg/L	ND			NC	20	
Uranium	0.0002	0.0001	mg/L	0.0002			7.7	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	0.006	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	50.0	1	mg/L	39.0	110	77-123			
Fluoride	2.17	0.1	mg/L	1.28	89.4	79-121			
Nitrate as N	1.07	0.1	mg/L	ND	107	79-120			
Nitrite as N	0.968	0.05	mg/L	ND	96.8	84-117			
Sulphate	12.1	1	mg/L	1.55	105	74-126			
General Inorganics									
Ammonia as N	0.592	0.01	mg/L	0.336	102	81-124			
Dissolved Organic Carbon	11.9	0.5	mg/L	1.8	100	60-133			
Phenolics	0.024	0.001	mg/L	ND	97.7	67-133			
Total Dissolved Solids	106	10	mg/L	ND	106	75-125			
Sulphide	0.51	0.02	mg/L	ND	102	79-115			
Tannin & Lignin	2.6	0.1	mg/L	1.5	110	71-113			
Total Kjeldahl Nitrogen	2.20	0.1	mg/L	0.38	91.0	81-126			
Metals									
Mercury	0.0035	0.0001	mg/L	ND	115	70-130			
Aluminum	91.0	0.001	mg/L	50.3	81.2	80-120			
Antimony	35.4	0.0005	mg/L	0.872	69.1	80-120			QM-07
Arsenic	46.7	0.001	mg/L	0.181	93.1	80-120			
Barium	144	0.001	mg/L	113	63.1	80-120			QM-07
Beryllium	39.8	0.0005	mg/L	0.0271	79.6	80-120			QM-07
Boron	62.2	0.01	mg/L	20.2	84.0	80-120			
Cadmium	37.6	0.0001	mg/L	0.0082	75.2	80-120			QM-07
Calcium	17700	0.1	mg/L	9790	79.6	80-120			QM-07
Chromium	44.9	0.001	mg/L	0.350	89.1	80-120			
Cobalt	42.7	0.0005	mg/L	0.0941	85.1	80-120			
Copper	41.3	0.0005	mg/L	ND	82.7	80-120			
Iron	2280	0.1	mg/L	134	85.7	80-120			
Magnesium	18600	0.2	mg/L	10300	83.8	80-120			
Manganese	54.0	0.005	mg/L	8.90	90.1	80-120			
Molybdenum	42.4	0.0005	mg/L	1.13	82.5	80-120			
Nickel	40.8	0.001	mg/L	0.293	81.0	80-120			
Potassium	19900	0.1	mg/L	11200	86.5	80-120			
Selenium	45.3	0.001	mg/L	0.160	90.2	80-120			
Silver	41.3	0.0001	mg/L	0.0251	82.6	80-120			
Sodium	8560	0.2	mg/L	ND	85.6	80-120			
Thallium	41.6	0.001	mg/L	0.015	83.2	80-120			
Tin	40.3	0.01	mg/L	0.16	80.3	80-120			
Titanium	45.7	0.005	mg/L	ND	91.4	70-130			
Tungsten	42.6	0.01	mg/L	0.38	84.5	80-120			
Uranium	41.6	0.0001	mg/L	0.177	82.8	80-120			
Vanadium	46.1	0.0005	mg/L	0.233	91.7	80-120			
Zinc	42.0	0.005	mg/L	1.88	80.2	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Collection time missing from chain of custody, time on bottle reads 15:58.

Applies to samples: MW21-01

Container and COC sample IDs don't match - Sample labelled as TW22-01, chain of custody reads TW22-01 6hr

Applies to samples: TW22-01 6hr, TW22-01 6hr (Filtered)

Sample Qualifiers :

1 : A2C - Background counts greater than 200

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Brent Redmond

Client PO: Smith Road
Project: 100812.001
Custody: 17037

Report Date: 13-Sep-2022
Order Date: 2-Sep-2022

Order #: 2236417

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

Paracel ID	Client ID
2236417-02	TW22-04 6hr
2236417-03	TW22-04 6hr (Filtered)

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 13-Sep-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Sep-2022

Client PO: Smith Road

Project Description: 100812.001

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	6-Sep-22	6-Sep-22
Ammonia, as N	EPA 351.2 - Auto Colour	7-Sep-22	7-Sep-22
Anions	EPA 300.1 - IC	12-Sep-22	12-Sep-22
Colour	SM2120 - Spectrophotometric	2-Sep-22	2-Sep-22
Colour, apparent	SM2120 - Spectrophotometric	2-Sep-22	2-Sep-22
Conductivity	EPA 9050A- probe @25 °C	6-Sep-22	6-Sep-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	2-Sep-22	2-Sep-22
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	6-Sep-22	6-Sep-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	2-Sep-22	6-Sep-22
pH	EPA 150.1 - pH probe @25 °C	6-Sep-22	6-Sep-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	6-Sep-22	6-Sep-22
Hardness	Hardness as CaCO3	2-Sep-22	6-Sep-22
Sulphide	SM 4500SE - Colourimetric	2-Sep-22	2-Sep-22
Tannin/Lignin	SM 5550B - Colourimetric	2-Sep-22	6-Sep-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	2-Sep-22	6-Sep-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	2-Sep-22	6-Sep-22
Turbidity	SM 2130B - Turbidity meter	2-Sep-22	2-Sep-22

Certificate of Analysis

Report Date: 13-Sep-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 2-Sep-2022

Client PO: Smith Road

Project Description: 100812.001

	Client ID:	TW22-04 6hr	TW22-04 6hr (Filtered)	-	-
	Sample Date:	01-Sep-22 16:00	01-Sep-22 16:00	-	-
	Sample ID:	2236417-02	2236417-03	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
General Inorganics					
Alkalinity, total	5 mg/L	239	-	-	-
Ammonia as N	0.01 mg/L	0.37	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.6	-	-	-
Colour	2 TCU	29	-	-	-
Colour, apparent	2 ACU	474	-	-	-
Conductivity	5 uS/cm	481	-	-	-
Hardness	mg/L	12.6	-	-	-
pH	0.1 pH Units	8.9	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	308	-	-	-
Sulphide	0.02 mg/L	0.05	-	-	-
Tannin & Lignin	0.1 mg/L	0.2	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	-	-	-
Turbidity	0.1 NTU	93.9	-	-	-
Anions					
Chloride	1 mg/L	8 [2]	-	-	-
Fluoride	0.1 mg/L	1.3 [2]	-	-	-
Nitrate as N	0.1 mg/L	0.2 [2]	-	-	-
Nitrite as N	0.10 mg/L	<0.10 [2]	-	-	-
Sulphate	1 mg/L	<1 [2]	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-
Aluminum	0.001 mg/L	0.762	0.028	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.077	0.053	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.44	0.46	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	3.2	1.4	-	-
Chromium	0.001 mg/L	0.001	<0.001	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-
Copper	0.0005 mg/L	0.0009	0.0013	-	-
Iron	0.1 mg/L	1.1	<0.1	-	-

Certificate of Analysis

Report Date: 13-Sep-2022

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

Order Date: 2-Sep-2022

Client PO: **Smith Road**

Project Description: 100812.001

	Client ID:	TW22-04 6hr	TW22-04 6hr (Filtered)	-	-
	Sample Date:	01-Sep-22 16:00	01-Sep-22 16:00	-	-
	Sample ID:	2236417-02	2236417-03	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Lead	0.0001 mg/L	0.0005	<0.0001	-	-
Magnesium	0.2 mg/L	1.1	0.5	-	-
Manganese	0.005 mg/L	0.026	<0.005	-	-
Molybdenum	0.0005 mg/L	<0.0005	<0.0005	-	-
Nickel	0.001 mg/L	0.001	<0.001	-	-
Potassium	0.1 mg/L	1.6	1.4	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	93.9	95.8	-	-
Strontium	0.01 mg/L	0.08	0.07	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Uranium	0.0001 mg/L	0.0001	<0.0001	-	-
Vanadium	0.0005 mg/L	0.0019	<0.0005	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	mg/L						
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Ammonia as N	0.023	0.01	mg/L	0.011			NC	17.7	
Dissolved Organic Carbon	2.0	0.5	mg/L	1.8			11.1	37	
Colour	29	2	TCU	29			0.0	12	
Colour, apparent	472	2	ACU	474			0.4	12	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	462	10	mg/L	468			1.3	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	0.2	0.1	mg/L	0.2			0.0	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	1.48	0.001	mg/L	0.030			192.0	20	
Antimony	0.0005	0.0005	mg/L	0.0018			109.0	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.062	0.001	mg/L	0.058			7.3	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.41	0.01	mg/L	0.31			27.9	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	94.4	0.1	mg/L	46.4			68.1	20	
Chromium	0.015	0.001	mg/L	ND			NC	20	
Cobalt	0.0013	0.0005	mg/L	ND			NC	20	
Copper	0.0026	0.0005	mg/L	0.0015			52.9	20	
Iron	2.3	0.1	mg/L	ND			NC	20	
Lead	0.0004	0.0001	mg/L	0.0001			NC	20	
Magnesium	13.8	0.2	mg/L	16.3			16.4	20	
Manganese	0.044	0.005	mg/L	0.006			149.0	20	
Molybdenum	ND	0.0005	mg/L	0.0032			NC	20	
Nickel	0.011	0.001	mg/L	ND			NC	20	
Potassium	3.5	0.1	mg/L	7.4			70.0	20	
Selenium	ND	0.001	mg/L	0.001			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	233	0.2	mg/L	103			77.4	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0001	0.0001	mg/L	0.0009			159.0	20	
Vanadium	0.0045	0.0005	mg/L	0.0008			139.0	20	
Zinc	0.008	0.005	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Ammonia as N	0.279	0.01	mg/L	0.011	108	81-124			
Dissolved Organic Carbon	13.3	0.5	mg/L	1.8	115	60-133			
Phenolics	0.026	0.001	mg/L	ND	104	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.8	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	89.9	71-113			
Total Kjeldahl Nitrogen	1.87	0.1	mg/L	ND	93.6	81-126			
Metals									
Mercury	0.0027	0.0001	mg/L	ND	90.3	70-130			
Aluminum	51.2	0.001	mg/L	ND	102	80-120			
Arsenic	48.7	0.001	mg/L	ND	97.4	80-120			
Barium	46.8	0.001	mg/L	ND	93.7	80-120			
Beryllium	52.7	0.0005	mg/L	ND	105	80-120			
Boron	48.6	0.01	mg/L	ND	97.2	80-120			
Cadmium	48.1	0.0001	mg/L	ND	96.3	80-120			
Calcium	9360	0.1	mg/L	ND	93.6	80-120			
Chromium	50.2	0.001	mg/L	ND	100	80-120			
Cobalt	51.8	0.0005	mg/L	ND	104	80-120			
Copper	50.4	0.0005	mg/L	ND	101	80-120			
Iron	2390	0.1	mg/L	ND	95.5	80-120			
Lead	45.5	0.0001	mg/L	ND	91.0	80-120			
Magnesium	10100	0.2	mg/L	ND	101	80-120			
Manganese	49.4	0.005	mg/L	ND	98.8	80-120			
Molybdenum	43.6	0.0005	mg/L	ND	87.1	80-120			
Nickel	50.5	0.001	mg/L	ND	101	80-120			
Potassium	10200	0.1	mg/L	ND	102	80-120			
Selenium	47.0	0.001	mg/L	ND	94.1	80-120			
Silver	50.4	0.0001	mg/L	ND	101	80-120			
Sodium	10200	0.2	mg/L	ND	102	80-120			
Thallium	49.8	0.001	mg/L	ND	99.6	80-120			
Uranium	48.4	0.0001	mg/L	ND	96.8	80-120			
Vanadium	50.5	0.0005	mg/L	ND	101	80-120			
Zinc	49.4	0.005	mg/L	ND	98.8	80-120			

Qualifier Notes:

Sample Qualifiers :

2 : Subcontracted analysis - Eurofins Environment Testing

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Samuel Esenwa

Client PO:
Project: 100812.001
Custody: 19515

Report Date: 18-Oct-2023
Order Date: 13-Oct-2023

Order #: 2341381

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

Paracel ID	Client ID
2341381-01	959 Smith Road
2341381-02	900 Smith Road
2341381-03	969 Meteor Ave
2341381-04	908 Smith Ave

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	16-Oct-23	16-Oct-23
Colour	SM2120 - Spectrophotometric	13-Oct-23	14-Oct-23
Colour, apparent	SM2120 - Spectrophotometric	13-Oct-23	13-Oct-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	13-Oct-23	13-Oct-23
Turbidity	SM 2130B - Turbidity meter	14-Oct-23	14-Oct-23

Certificate of Analysis

Report Date: 18-Oct-2023

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

Order Date: 13-Oct-2023

Client PO:

Project Description: 100812.001

	Client ID:	959 Smith Road	900 Smith Road	969 Meteor Ave	908 Smith Ave	-	-
	Sample Date:	13-Oct-23 09:30	13-Oct-23 10:20	13-Oct-23 11:20	13-Oct-23 12:20		
	Sample ID:	2341381-01	2341381-02	2341381-03	2341381-04		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	Drinking Water		
	MDL/Units						
General Inorganics							
Colour, apparent	2 ACU	7	3	18	8	-	-
Colour	2 TCU	2	<2	3	<2	-	-
Turbidity	0.1 NTU	0.8	0.4	0.9	1.0	-	-
Anions							
Chloride	1 mg/L	40	14	11	22	-	-
Fluoride	0.1 mg/L	0.8	0.5	0.3	0.8	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
Metals							
Iron	0.1 mg/L	0.1	<0.1	0.4	<0.1	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
General Inorganics								
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Turbidity	ND	0.1	NTU					
Metals								
Iron	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	39.5	1	mg/L	39.6			0.3	20	
Fluoride	0.84	0.1	mg/L	0.81			4.5	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
General Inorganics									
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	7	2	ACU	7			0.0	12	
Turbidity	1.0	0.1	NTU	1.0			5.1	10	
Metals									
Iron	ND	0.1	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	48.1	1	mg/L	39.6	84.7	70-124			
Fluoride	1.51	0.1	mg/L	0.81	70.2	70-130			
Nitrate as N	1.10	0.1	mg/L	ND	110	77-126			
Metals									
Iron	2470	0.1	mg/L	36.4	97.2	80-120			

Certificate of Analysis

Report Date: 18-Oct-2023

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

Order Date: 13-Oct-2023

Client PO:

Project Description: 100812.001

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

PARACEL LABORATORIES LTD.

Paracel ID: 2341381

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 19515
2341381	

Client Name:	GEMTEC	Project Ref:	100812.001	Waterworks Name:	Samples Taken By:	
Contact Name:	SAMUEL ESENWA	Quote #:		Waterworks Number:	Name:	SIMON MALLORY
Address:		PO #:		Address:	Signature:	
After Hours Contact:		E-mail:	samuel.esenwa@gemtec.ca		Page 1 of 1	
Telephone:	873 688 7770	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ ~~ON REG 153/04~~
☐ Other O.Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	Required Analyses: Fluoride	Nitrate	Iron	Chloride	Colour	Turbidity
1		959 Smith Road	R	G		NO	OCT 13'23	9:30 AM	2				✓	✓	✓	✓	✓	✓
2		900 Smith Road	↓	↓		↓	↓	10:20 AM	↓				✓	✓	✓	✓	✓	✓
3		969 Meteor Ave						11:20 AM					✓	✓	✓	✓	✓	✓
4		908 Smith Ave						12:20 PM					✓	✓	✓	✓	✓	✓
5																		
6																		
7																		
8																		
9																		
10																		

Comments: * Colour in ACU + TCU

Method of Delivery: Walk In

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By: Hisal
Relinquished By (Print): SIMON MALLORY	Date/Time:	Date/Time: Oct 13/23 1340	Date/Time: Oct 13/23 14:10
Date/Time: OCT 13'23 1:30	Temperature: °C	Temperature: 11.5 °C	pH Verified: ☑ By: Hisal

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO: Smith Road
Project: 100812.001
Custody: 18241

Report Date: 27-Dec-2023
Order Date: 20-Dec-2023

Order #: 2351202

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

Paracel ID	Client ID
2351202-01	TW22-4

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	20-Dec-23	20-Dec-23
Ammonia, as N	EPA 351.2 - Auto Colour	21-Dec-23	21-Dec-23
Anions	EPA 300.1 - IC	20-Dec-23	20-Dec-23
Colour	SM2120 - Spectrophotometric	20-Dec-23	20-Dec-23
Colour, apparent	SM2120 - Spectrophotometric	20-Dec-23	20-Dec-23
Conductivity	EPA 9050A- probe @25 °C	20-Dec-23	20-Dec-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	22-Dec-23	22-Dec-23
E. coli	MOE E3407	20-Dec-23	20-Dec-23
Fecal Coliform	SM 9222D	20-Dec-23	20-Dec-23
Heterotrophic Plate Count	SM 9215C	20-Dec-23	20-Dec-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	21-Dec-23	21-Dec-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	21-Dec-23	21-Dec-23
pH	EPA 150.1 - pH probe @25 °C	20-Dec-23	20-Dec-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	20-Dec-23	20-Dec-23
Hardness	Hardness as CaCO3	21-Dec-23	21-Dec-23
Sulphide	SM 4500SE - Colourimetric	20-Dec-23	20-Dec-23
Tannin/Lignin	SM 5550B - Colourimetric	22-Dec-23	22-Dec-23
Total Coliform	MOE E3407	20-Dec-23	20-Dec-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	21-Dec-23	22-Dec-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	21-Dec-23	21-Dec-23
Turbidity	SM 2130B - Turbidity meter	20-Dec-23	20-Dec-23

Certificate of Analysis

Report Date: 27-Dec-2023

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

Order Date: 20-Dec-2023

Client PO: **Smith Road**

Project Description: 100812.001

	Client ID:	TW22-4	-	-	-	-	-
	Sample Date:	19-Dec-23 14:30	-	-	-	-	-
	Sample ID:	2351202-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	10	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	252	-	-	-	-	-
Ammonia as N	0.01 mg/L	0.36	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	0.8	-	-	-	-	-
Colour, apparent	2 ACU	5	-	-	-	-	-
Colour	2 TCU	2	-	-	-	-	-
Conductivity	5 uS/cm	516	-	-	-	-	-
Hardness	1 mg/L	7	-	-	-	-	-
pH	0.1 pH Units	9.4	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	268	-	-	-	-	-
Sulphide	0.02 mg/L	0.23	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	-	-	-	-	-
Turbidity	0.1 NTU	0.5	-	-	-	-	-
Anions							
Chloride	1 mg/L	15	-	-	-	-	-
Fluoride	0.1 mg/L	1.1	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	<1	-	-	-	-	-

	Client ID:	TW22-4	-	-	-	-	-
	Sample Date:	19-Dec-23 14:30	-	-	-		
	Sample ID:	2351202-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	<0.0001	-	-	-	-	-
Aluminum	0.001 mg/L	0.047	-	-	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-	-	-
Arsenic	0.001 mg/L	<0.001	-	-	-	-	-
Barium	0.001 mg/L	0.052	-	-	-	-	-
Beryllium	0.0005 mg/L	<0.0005	-	-	-	-	-
Boron	0.01 mg/L	0.36	-	-	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-	-	-
Calcium	0.1 mg/L	1.7	-	-	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-	-	-
Cobalt	0.0005 mg/L	<0.0005	-	-	-	-	-
Copper	0.0005 mg/L	<0.0005	-	-	-	-	-
Iron	0.1 mg/L	<0.1	-	-	-	-	-
Lead	0.0001 mg/L	0.0002	-	-	-	-	-
Magnesium	0.2 mg/L	0.6	-	-	-	-	-
Manganese	0.005 mg/L	<0.005	-	-	-	-	-
Molybdenum	0.0005 mg/L	<0.0005	-	-	-	-	-
Nickel	0.001 mg/L	<0.001	-	-	-	-	-
Potassium	0.1 mg/L	1.6	-	-	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-	-	-
Silver	0.0001 mg/L	<0.0001	-	-	-	-	-
Sodium	0.2 mg/L	110	-	-	-	-	-
Strontium	0.01 mg/L	0.09	-	-	-	-	-
Thallium	0.001 mg/L	<0.001	-	-	-	-	-
Uranium	0.0001 mg/L	<0.0001	-	-	-	-	-

	Client ID:	TW22-4	-	-	-		
	Sample Date:	19-Dec-23 14:30	-	-	-	-	-
	Sample ID:	2351202-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	<0.0005	-	-	-	-	-
Zinc	0.005 mg/L	<0.005	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					
Lead	ND	0.0001	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
Heterotrophic Plate Count	ND	10	CFU/mL					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	6.10	1	mg/L	5.97			2.3	20	
Fluoride	0.59	0.1	mg/L	0.59			0.4	20	
Nitrate as N	0.18	0.1	mg/L	0.19			1.9	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	27.3	1	mg/L	27.0			0.8	20	
General Inorganics									
Alkalinity, total	281	5	mg/L	282			0.4	14	
Ammonia as N	0.354	0.01	mg/L	0.362			2.1	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.6			51.4	37	QR-07
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	5	2	ACU	5			0.0	12	
Conductivity	657	5	uS/cm	668			1.7	5	
pH	7.8	0.1	pH Units	7.8			0.5	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	52.0	10	mg/L	56.0			7.4	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.24	0.1	mg/L	0.27			10.3	16	
Turbidity	0.5	0.1	NTU	0.5			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.146	0.001	mg/L	0.145			0.7	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	0.009	0.001	mg/L	0.009			0.8	20	
Barium	0.082	0.001	mg/L	0.084			2.7	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.02	0.01	mg/L	0.03			1.9	20	
Cadmium	0.0015	0.0001	mg/L	0.0014			2.5	20	
Calcium	194	0.1	mg/L	195			0.2	20	
Chromium	0.004	0.001	mg/L	0.004			1.7	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0685	0.0005	mg/L	0.0692			1.1	20	
Iron	9.0	0.1	mg/L	9.1			1.6	20	
Lead	0.142	0.0001	mg/L	0.141			0.5	20	
Magnesium	86.0	0.2	mg/L	87.3			1.4	20	
Manganese	0.191	0.005	mg/L	0.194			1.5	20	
Molybdenum	0.0011	0.0005	mg/L	0.0011			0.6	20	
Nickel	0.001	0.001	mg/L	0.001			1.6	20	
Potassium	6.3	0.1	mg/L	6.7			5.8	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	92.9	0.2	mg/L	94.9			2.1	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0015	0.0001	mg/L	0.0015			1.3	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	0.727	0.005	mg/L	0.746			2.6	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	10			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.3	1	mg/L	5.97	103	70-124			
Fluoride	1.54	0.1	mg/L	0.59	94.7	70-130			
Nitrate as N	1.28	0.1	mg/L	0.19	109	77-126			
Nitrite as N	0.922	0.05	mg/L	ND	92.2	82-115			
Sulphate	36.9	1	mg/L	27.0	98.3	70-130			
General Inorganics									
Ammonia as N	1.34	0.01	mg/L	0.362	97.5	81-124			
Dissolved Organic Carbon	10.2	0.5	mg/L	0.9	93.3	60-133			
Phenolics	0.026	0.001	mg/L	ND	106	67-133			
Total Dissolved Solids	80.0	10	mg/L	ND	80.0	75-125			
Sulphide	0.45	0.02	mg/L	ND	89.2	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	101	71-113			
Total Kjeldahl Nitrogen	1.18	0.1	mg/L	0.27	90.9	81-126			
Metals									
Mercury	0.0026	0.0001	mg/L	ND	86.1	70-130			
Aluminum	180	0.001	mg/L	145	71.0	80-120			QM-07
Arsenic	56.2	0.001	mg/L	9.13	94.1	80-120			
Barium	120	0.001	mg/L	84.3	71.8	80-120			QM-07
Beryllium	50.9	0.0005	mg/L	0.0216	102	80-120			
Boron	61.7	0.01	mg/L	25.2	73.0	80-120			QM-07
Cadmium	42.5	0.0001	mg/L	1.43	82.1	80-120			
Calcium	9130	0.1	mg/L	ND	91.3	80-120			
Chromium	54.5	0.001	mg/L	3.56	102	80-120			
Cobalt	50.2	0.0005	mg/L	0.0279	100	80-120			
Copper	111	0.0005	mg/L	69.2	82.6	80-120			
Iron	10700	0.1	mg/L	9100	65.5	80-120			QM-07
Lead	38.5	0.0001	mg/L	ND	77.0	80-120			QS-02
Magnesium	8930	0.2	mg/L	ND	89.3	80-120			
Manganese	230	0.005	mg/L	194	72.7	80-120			QM-07
Molybdenum	47.3	0.0005	mg/L	1.07	92.4	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	50.8	0.001	mg/L	1.01	99.7	80-120			
Potassium	16400	0.1	mg/L	6710	96.5	80-120			
Selenium	45.7	0.001	mg/L	0.522	90.4	80-120			
Silver	48.9	0.0001	mg/L	0.0128	97.8	80-120			
Sodium	8960	0.2	mg/L	ND	89.6	80-120			
Thallium	47.5	0.001	mg/L	0.018	95.0	80-120			
Uranium	43.4	0.0001	mg/L	1.52	83.8	80-120			
Vanadium	53.4	0.0005	mg/L	0.200	106	80-120			
Zinc	42.7	0.005	mg/L	ND	85.4	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.
QR-07	Duplicate result exceeds RPD limits due to non-homogeneity between multiple sample vials. Remainder of QA/QC is acceptable.
QS-02	Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions:

None

Work Order Revisions / Comments:

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

PARACEL LABORATORIES

Paracel ID: 2351202

...nt Blvd. ...G 4J8 ...labs.com ...om

Paracel Order Number: 2351202

Chain Of Custody
Ontario Drinking Water Samples
№ 18241

Client Name:	GemTec	Project Ref:	100812.001/ Smith Road	Waterworks Name:	Samples Taken By:
Contact Name:	Andrius Paznekas	Quote #:		Waterworks Number:	Name: Samuel Ssenus
Address:		PO #:		Address:	Signature:
After Hours Contact:		E-mail:	Andrius.Paznekas@gemtec.ca		Page ___ of ___
Telephone:		Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
❑ ON REG 170/03 ❑ ON REG 319/08 ❑ Private Well
❑ ON REG 243/07 ☑ Other O.Reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☑ N/A

Are these samples for human consumption?: ☐ Yes ☑ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	[illegible]	Turbidity	Bacteria	
1		TW22-4	R	G	N	/	19-12-23	14:30	11							[illegible]	✓	✓	
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Keep unsubmitted samples on hold
Color in HCU & TCU ; ~~[illegible] metals~~

Method of Delivery: Walk Drop Box

Relinquished By (Sign):	Received By Driver/Depot: 8:30	Received at Lab: SO	Verified By: SO
Relinquished By (Print): Samuel Ssenus	Date/Time: Dec 20/23 AM	Date/Time: Dec 20, 2023 11:15am	Date/Time: Dec 20, 2023 11:20am
Date/Time: 19-12-2023 ; 19:00	Temperature: 11.0 °C	Temperature: 5.8 °C	pH Verified: ☑ By: SO

PARACEL LABORATORIES LTD. | TRUSTED. RESPONSIVE. RELIABLE.

1-800-749-1947
www.paracellabs.com

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 100812.001
Custody: 19566

Report Date: 30-Jan-2024
Order Date: 24-Jan-2024

Order #: 2404291

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

Paracel ID	Client ID
2404291-01	TW24-4
2404291-02	TW24-4 (Filtered)

Identified as TW24-5 and TW24-5 (Filtered) in the summary table

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	25-Jan-24	25-Jan-24
Ammonia, as N	EPA 351.2 - Auto Colour	29-Jan-24	29-Jan-24
Anions	EPA 300.1 - IC	25-Jan-24	25-Jan-24
Colour	SM2120 - Spectrophotometric	25-Jan-24	25-Jan-24
Colour, apparent	SM2120 - Spectrophotometric	25-Jan-24	25-Jan-24
Conductivity	EPA 9050A- probe @25 °C	25-Jan-24	25-Jan-24
Dissolved Organic Carbon	MOE 3247B - Combustion IR	30-Jan-24	30-Jan-24
E. coli	MOE E3407	25-Jan-24	25-Jan-24
Fecal Coliform	SM 9222D	25-Jan-24	25-Jan-24
Heterotrophic Plate Count	SM 9215C	25-Jan-24	25-Jan-24
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	26-Jan-24	26-Jan-24
Metals, ICP-MS	EPA 200.8 - ICP-MS	26-Jan-24	26-Jan-24
pH	EPA 150.1 - pH probe @25 °C	25-Jan-24	25-Jan-24
Phenolics	EPA 420.2 - Auto Colour, 4AAP	29-Jan-24	29-Jan-24
Hardness	Hardness as CaCO3	26-Jan-24	26-Jan-24
Sulphide	SM 4500SE - Colourimetric	25-Jan-24	25-Jan-24
Tannin/Lignin	SM 5550B - Colourimetric	25-Jan-24	25-Jan-24
Total Coliform	MOE E3407	25-Jan-24	25-Jan-24
Total Dissolved Solids	SM 2540C - gravimetric, filtration	25-Jan-24	26-Jan-24
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	25-Jan-24	25-Jan-24
Turbidity	SM 2130B - Turbidity meter	25-Jan-24	25-Jan-24

PARACEL LABORATORIES LTD.

Order #: 2404291

Certificate of Analysis

Report Date: 30-Jan-2024

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

Order Date: 24-Jan-2024

Client PO:

Project Description: 100812.001

	Client ID:	TW24-4	TW24-4 (Filtered)	-	-	-	-
	Sample Date:	24-Jan-24 14:25	24-Jan-24 14:25	-	-		
	Sample ID:	2404291-01	2404291-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	1	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	189	-	-	-	-	-
Ammonia as N	0.01 mg/L	0.45	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.7	-	-	-	-	-
Colour, apparent	2 ACU	12	-	-	-	-	-
Colour	2 TCU	2	-	-	-	-	-
Conductivity	5 uS/cm	480	-	-	-	-	-
Hardness	1 mg/L	31.7	-	-	-	-	-
pH	0.1 pH Units	8.8	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	248	-	-	-	-	-
Sulphide	0.02 mg/L	2.34	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	0.4	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.4	-	-	-	-	-
Turbidity	0.1 NTU	1.4	-	-	-	-	-
Anions							
Chloride	1 mg/L	29	-	-	-	-	-
Fluoride	0.1 mg/L	0.8	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	8	-	-	-	-	-

	Client ID:	TW24-4	TW24-4 (Filtered)	-	-	-	-
	Sample Date:	24-Jan-24 14:25	24-Jan-24 14:25	-	-		
	Sample ID:	2404291-01	2404291-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Aluminum	0.001 mg/L	0.050	0.023	-	-	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-	-	-
Barium	0.001 mg/L	0.151	0.137	-	-	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Boron	0.01 mg/L	0.27	0.24	-	-	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Calcium	0.1 mg/L	8.2	7.4	-	-	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Copper	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-	-	-
Lead	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Magnesium	0.2 mg/L	2.8	2.7	-	-	-	-
Manganese	0.005 mg/L	<0.005	<0.005	-	-	-	-
Molybdenum	0.0005 mg/L	0.0005	<0.0005	-	-	-	-
Nickel	0.001 mg/L	<0.001	<0.001	-	-	-	-
Potassium	0.1 mg/L	3.3	3.3	-	-	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Sodium	0.2 mg/L	85.5	85.4	-	-	-	-
Strontium	0.01 mg/L	0.45	0.41	-	-	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Uranium	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-

Certificate of Analysis

Report Date: 30-Jan-2024

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

Order Date: 24-Jan-2024

Client PO:

Project Description: 100812.001

	Client ID:	TW24-4	TW24-4 (Filtered)	-	-		
	Sample Date:	24-Jan-24 14:25	24-Jan-24 14:25	-	-	-	-
	Sample ID:	2404291-01	2404291-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Zinc	0.005 mg/L	<0.005	<0.005	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
Heterotrophic Plate Count	ND	10	CFU/mL					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	5.73	1	mg/L	5.81			1.4	20	
Fluoride	0.72	0.1	mg/L	0.73			1.7	20	
Nitrate as N	0.21	0.1	mg/L	0.21			0.2	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	28.9	1	mg/L	28.8			0.4	20	
General Inorganics									
Alkalinity, total	322	5	mg/L	326			1.1	14	
Ammonia as N	0.234	0.01	mg/L	0.232			1.0	17.7	
Dissolved Organic Carbon	1.3	0.5	mg/L	1.3			1.2	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	42	2	ACU	41			2.4	12	
Conductivity	1220	5	uS/cm	1200			2.0	5	
pH	7.7	0.1	pH Units	7.7			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	64.0	10	mg/L	66.0			3.1	10	
Sulphide	0.31	0.02	mg/L	0.32			3.1	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.15	0.1	mg/L	0.14			7.6	16	
Turbidity	7.0	0.1	NTU	7.2			1.7	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.001	0.001	mg/L	0.001			0.9	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.124	0.001	mg/L	0.118			5.1	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.02	0.01	mg/L	0.02			0.4	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	106	0.1	mg/L	106			0.1	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0538	0.0005	mg/L	0.0547			1.6	20	
Iron	0.6	0.1	mg/L	0.6			1.2	20	
Lead	0.0003	0.0001	mg/L	0.0003			17.8	20	
Magnesium	25.0	0.2	mg/L	25.9			3.7	20	
Manganese	0.160	0.005	mg/L	0.159			0.0	20	
Molybdenum	0.0008	0.0005	mg/L	0.0008			5.2	20	
Nickel	0.002	0.001	mg/L	0.002			0.6	20	
Potassium	2.6	0.1	mg/L	2.7			1.6	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	98.7	0.2	mg/L	103			4.4	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0002	0.0001	mg/L	0.0002			5.2	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	0.020	0.005	mg/L	0.020			0.4	20	
Microbiological Parameters									
E. coli	NDOGT	1	CFU/100mL	ND			NC	30	BAC-NDOGTi
Total Coliforms	NDOGT	1	CFU/100mL	ND			NC	30	BAC-NDOGTi
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	30	10	CFU/mL	70			80.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.2	1	mg/L	5.81	104	70-124			
Fluoride	1.74	0.1	mg/L	0.73	101	70-130			
Nitrate as N	1.28	0.1	mg/L	0.21	107	77-126			
Nitrite as N	0.922	0.05	mg/L	ND	92.2	82-115			
Sulphate	37.8	1	mg/L	28.8	90.5	70-130			
General Inorganics									
Ammonia as N	1.26	0.01	mg/L	0.232	103	81-124			
Dissolved Organic Carbon	11.0	0.5	mg/L	1.4	95.9	60-133			
Phenolics	0.026	0.001	mg/L	ND	106	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.75	0.02	mg/L	0.32	85.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	101	71-113			
Total Kjeldahl Nitrogen	1.12	0.1	mg/L	0.14	98.3	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.8	70-130			
Aluminum	46.5	0.001	mg/L	1.09	90.7	80-120			
Arsenic	53.7	0.001	mg/L	0.177	107	80-120			
Barium	174	0.001	mg/L	118	111	80-120			
Beryllium	45.5	0.0005	mg/L	0.0117	90.9	80-120			
Boron	56.5	0.01	mg/L	15.6	81.7	80-120			
Cadmium	48.0	0.0001	mg/L	0.0046	96.0	80-120			
Calcium	9330	0.1	mg/L	ND	93.3	80-120			
Chromium	49.6	0.001	mg/L	0.047	99.2	80-120			
Cobalt	47.1	0.0005	mg/L	0.0720	94.1	80-120			
Copper	94.8	0.0005	mg/L	54.7	80.2	80-120			
Iron	2850	0.1	mg/L	580	90.9	80-120			
Lead	42.9	0.0001	mg/L	0.284	85.3	80-120			
Magnesium	39300	0.2	mg/L	28800	105	80-120			
Manganese	203	0.005	mg/L	159	87.4	80-120			
Molybdenum	43.4	0.0005	mg/L	0.764	85.2	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	45.9	0.001	mg/L	1.63	88.5	80-120			
Potassium	12000	0.1	mg/L	2680	92.9	80-120			
Selenium	47.2	0.001	mg/L	0.080	94.2	80-120			
Silver	43.9	0.0001	mg/L	0.0191	87.7	80-120			
Sodium	71800	0.2	mg/L	61100	107	80-120			
Thallium	45.3	0.001	mg/L	0.015	90.6	80-120			
Uranium	47.2	0.0001	mg/L	0.150	94.0	80-120			
Vanadium	51.6	0.0005	mg/L	0.0874	103	80-120			
Zinc	44.0	0.005	mg/L	0.899	86.3	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Collection time on the bottles is PM; chain of custody reads as PM; report collection time as 14:25 as confirmed by the client.
Applies to Samples: TW24-4, TW24-4 (Filtered)

Sample Qualifiers :

QC Qualifiers:

BAC04	Duplicate QC data falls within method prescribed 95% confidence limits.
BAC-NDOGTi	NO DATA: Overgrown with Target.

Sample Data Revisions:

None

Work Order Revisions / Comments:

Missing times on all of the bottles

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

PARAC LABORATORIES

Paracel ID: 2404291

rent Blvd.
K1G 4J8
7
ellabs.com
com

Paracel Order Number	Chain Of Custody
2404291	Ontario Drinking Water Samples № 19566

Client Name:	GEMTEC	Project Ref:	100912.001	Waterworks Name:	Samples Taken By:	
Contact Name:	Andrius Paznekas	Quote #:		Waterworks Number:	Name:	Luca Fiorindi
Address:		PO #:		Address:	Signature:	
After Hours Contact:		E-mail:	andrius.paznekas@gemtec.ca		Page ____ of ____	
Telephone:	613-295-8425	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well
☐ ON REG 243/07 ☒ Other O. reg 169/03

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☒ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

Required Analyses

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Sodium, Nitrate & Nitrite	Trace Metals	Chloride & UV	
1		TW24-4	R	G	N	/	2024-01-24	P.M.								✓			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Please include colour in ACU & TCU

Method of Delivery: Walkin

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: BRAMPTON	Verified By: SO
Relinquished By (Print): Luca Fiorindi	Date/Time:	Date/Time: Jan. 24. 24 3:50 pm	Date/Time: Jan 24 2024 4:24pm
Date/Time: 2024-01-24; 15:27	Temperature: °C	Temperature: 25.3 °C	pH Verified: ☑ By: SO

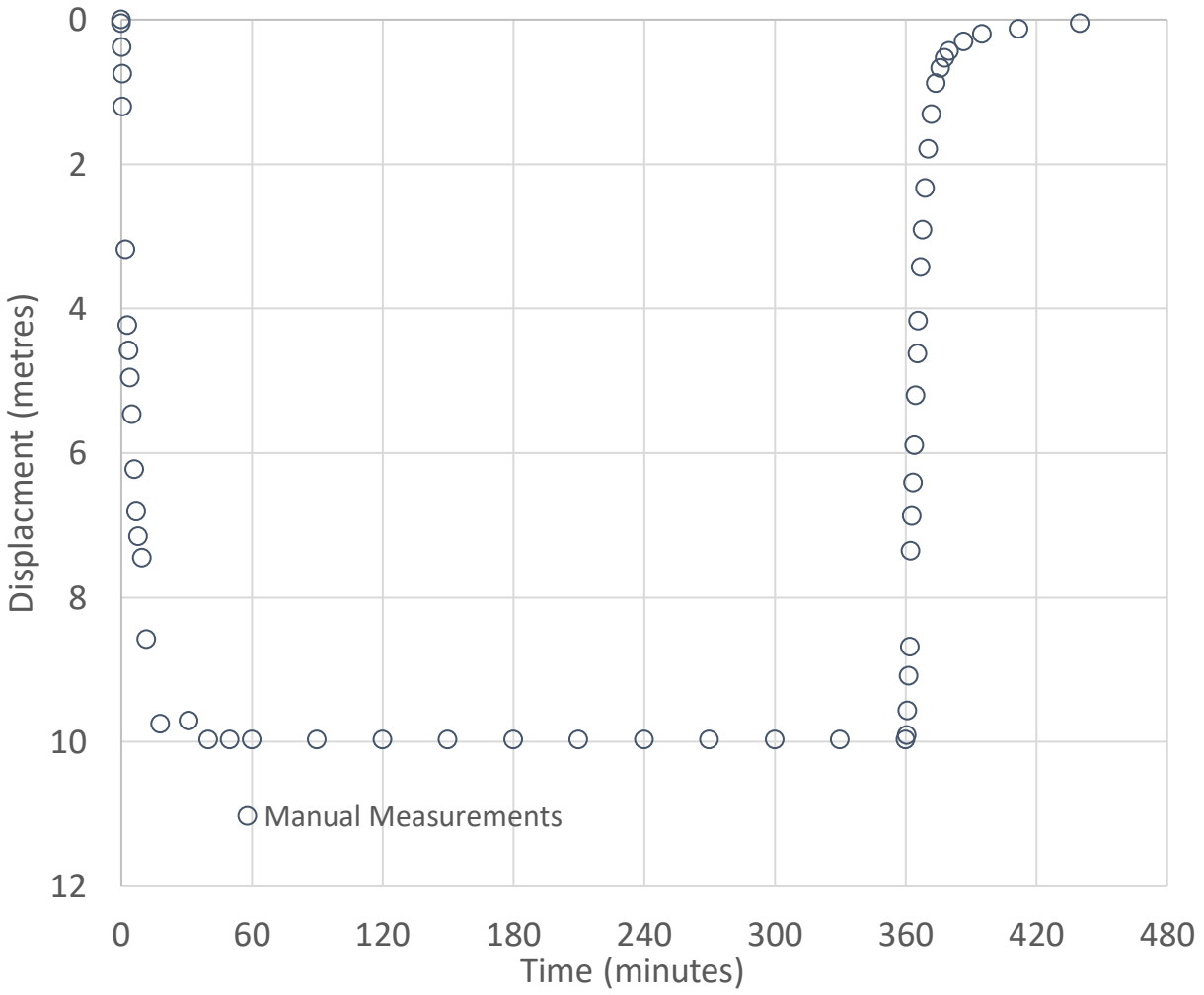
APPENDIX G

Pumping Tests Analysis

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Scoped Hydrogeological Investigation
	Project Number: 100812.001
	Client: Hierarchy Development and Design

Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW22-03	P-Test Date: Apr 28, 2022
Analysis Reviewed by: AP	Method: Manual Measurements	Analysis Date: Mar 14, 2024
Aquifer Thickness: 2.0 m	Discharge: Constant 27 L/min	Duration: 6 hours

Pumping Test Data (TW22-03): Drawdown and Recovery



Water Levels TW22-03

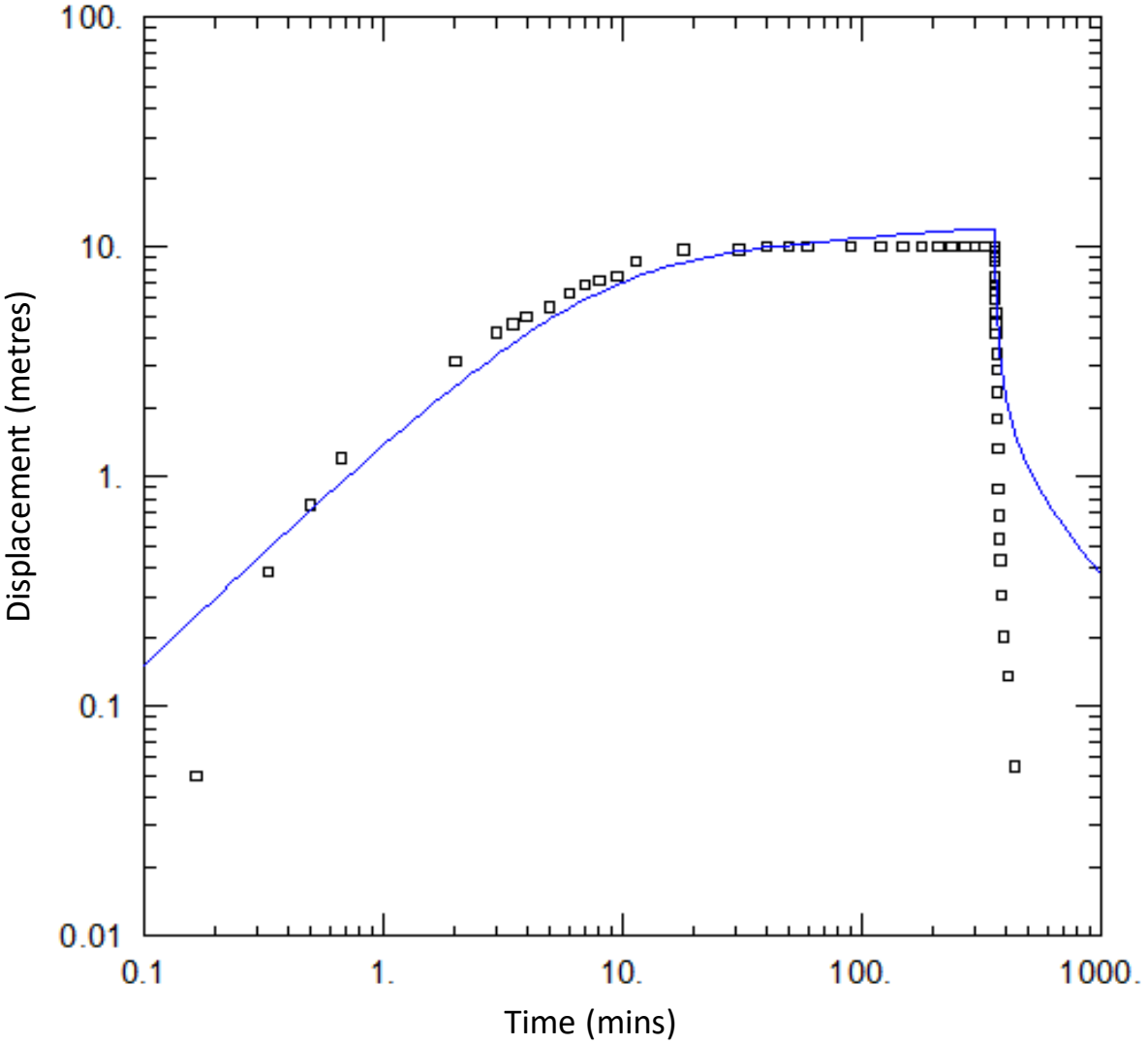
Static : 8.96 m below top of casing (BTOC) TOC = 0.56 m above ground surface

End of pump test (6-hours): 18.9 m BTOC; Following recovery (1 hour): 9.10 m BTOC

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Scoped Hydrogeological Investigation
	Project Number: 100812.001
	Client: Hierarchy Development and Design

Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW22-04	P-Test Date: Apr 28, 2022
Analysis Reviewed by: AP	Method: Manual Measurements	Analysis Date: Mar 14, 2024
Aquifer Thickness: 2.0 m	Discharge: Constant 27 L/min	Duration: 6 hours

Pumping Test Analysis (TW22-03): Papadopulous-Cooper Analysis (Confined Aquifer)

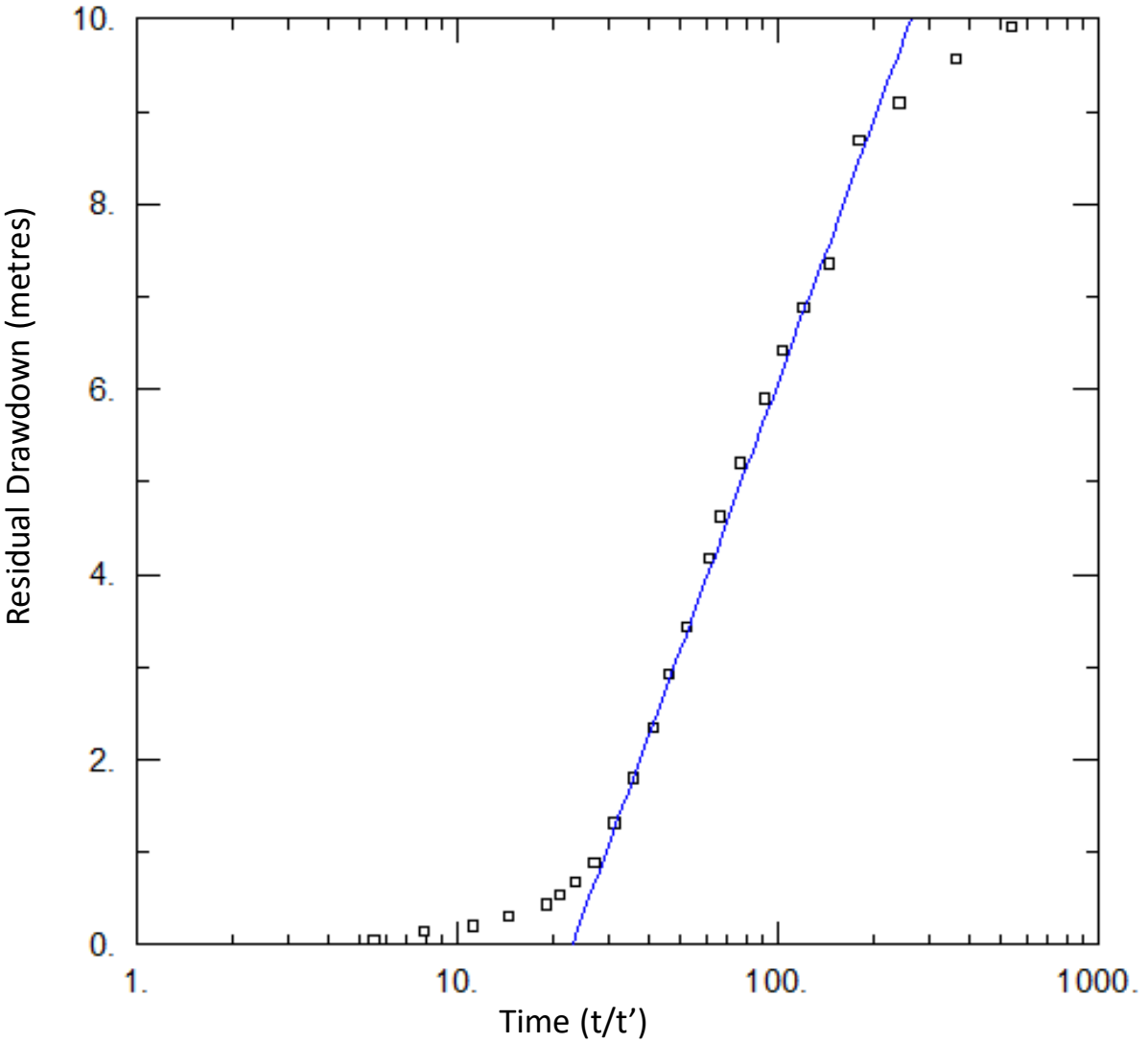


Estimated Transmissivity: 3.8 m^2/day / 4.4 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Scoped Hydrogeological Investigation
	Project Number: 100812.001
	Client: Hierarchy Development and Design

Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW22-04	P-Test Date: Apr 28, 2022
Analysis Reviewed by: AP	Method: Manual Measurements	Analysis Date: Mar 14, 2024
Aquifer Thickness: 2.0 m	Discharge: Constant 27 L/min	Duration: 6 hours

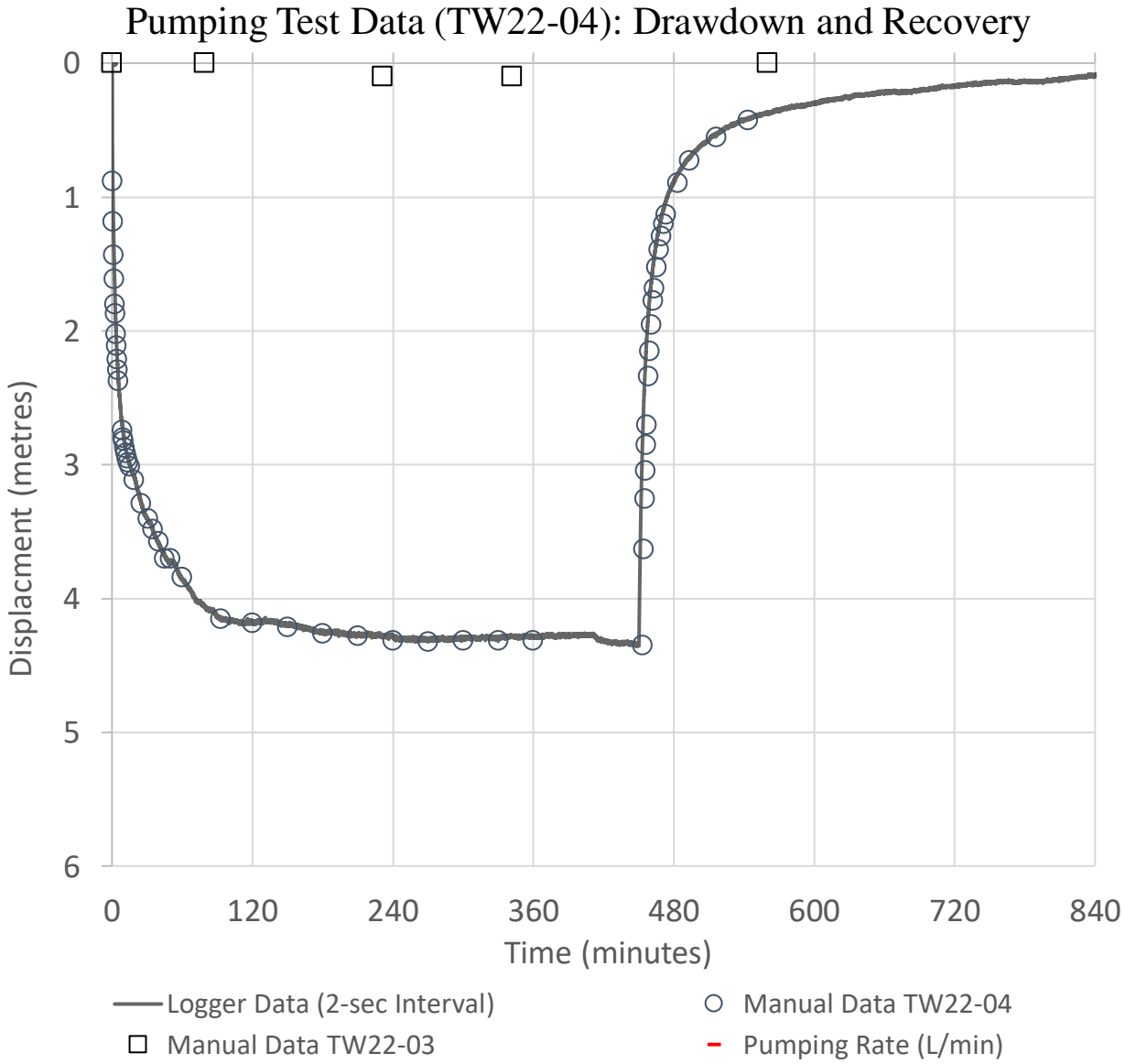
Pumping Test Analysis (TW22-03): Theis-Recovery Analysis (Confined Aquifer)



Estimated Transmissivity: 0.7 m^2/day / 8.1 x 10^{-6} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Scoped Hydrogeological Investigation		
Project Number: 100812.001		
Client: Hierarchy Development and Design		
Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW22-04	P-Test Date: Sep. 1, 2022
Analysis Reviewed by: AP	Method: Logger Measurements	Analysis Date: Sep. 1, 2022
Aquifer Thickness: 4.5 m	Discharge: Constant 15 L/min	Duration: 7.5 hours



Water Levels TW22-04

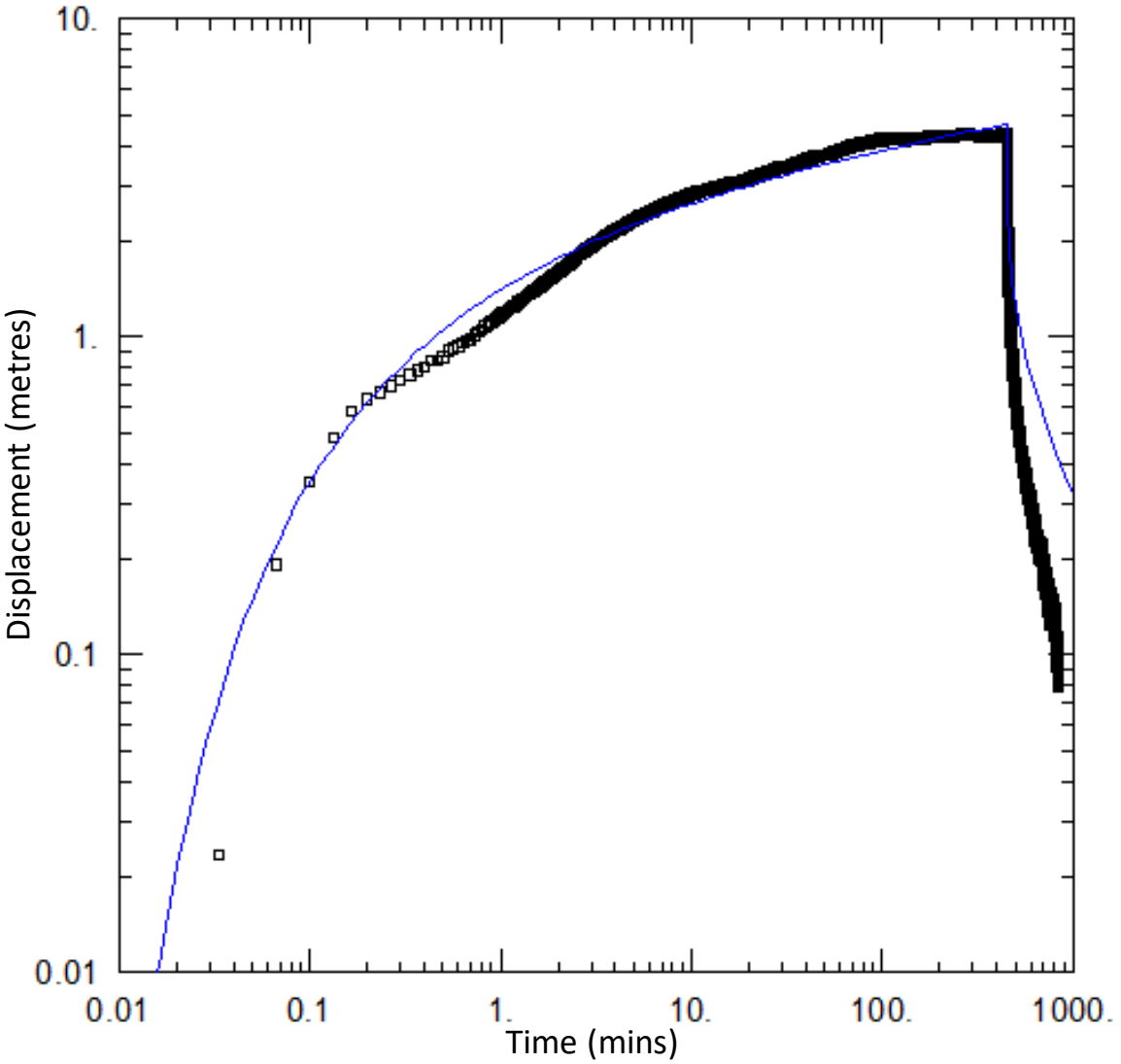
Static : 2.76 m below top of casing (BTOC) TOC = 0.76 m above ground surface

End of pump test (6-hours): 7.11 m BTOC; Following recovery (11-hours): 2.78 m BTOC

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Scoped Hydrogeological Investigation
	Project Number: 100812.001
	Client: Hierarchy Development and Design

Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW22-04	P-Test Date: Sep. 1, 2022
Analysis Reviewed by: AP	Method: Manual / Datalogger	Analysis Date: Feb. 15, 2024
Aquifer Thickness: 4.5 m	Discharge: Constant 15 L/min	Duration: 7.5 hours

Pumping Test Analysis (TW22-04): Theis Analysis (Confined Aquifer)

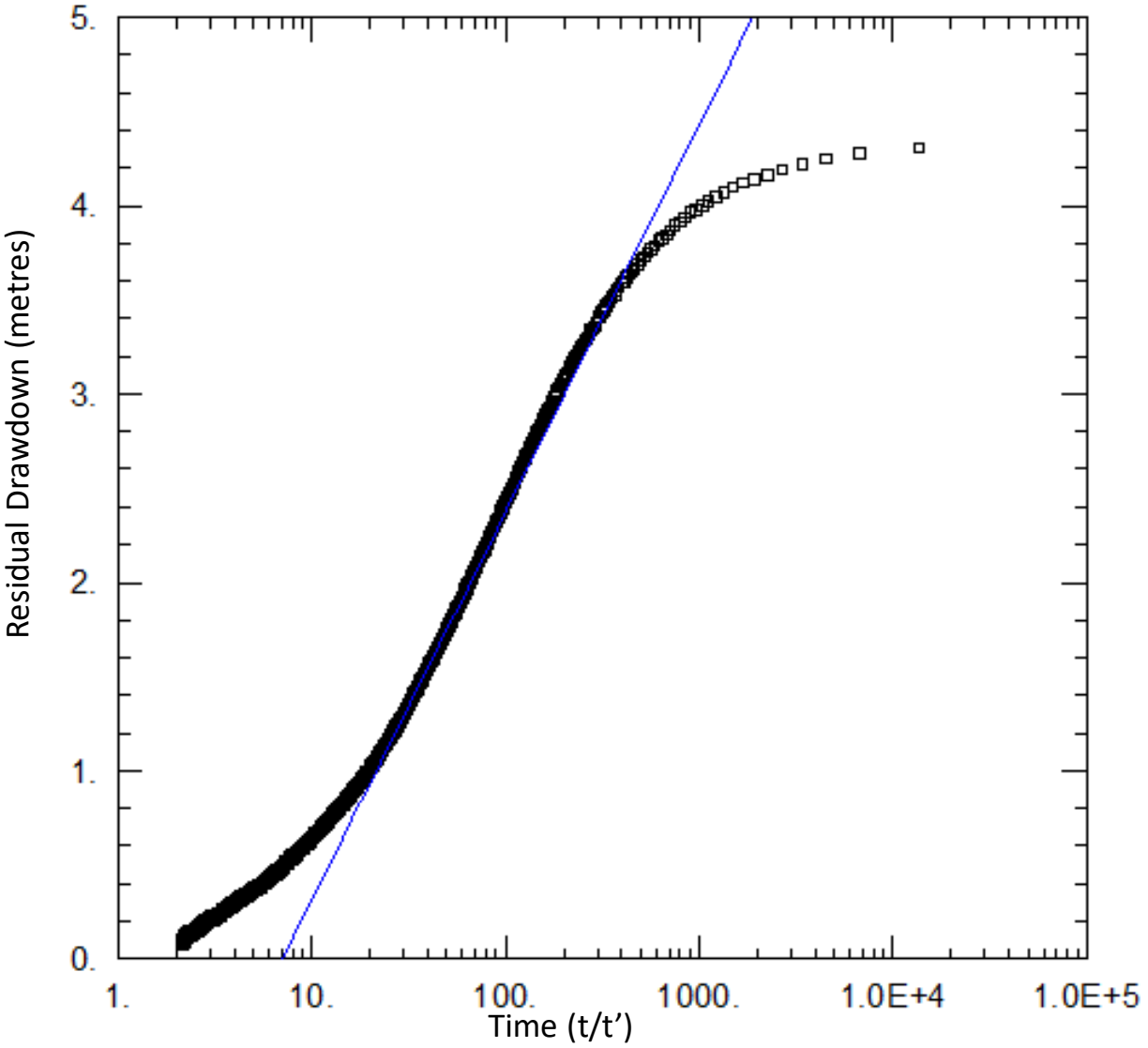


Estimated Transmissivity: 2.8 m^2/day / 3.3 x 10^{-5} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report	
Project: Scoped Hydrogeological Investigation	
Project Number: 100812.001	
Client: Hierarchy Development and Design	
Location: 930 Smith Road, Ottawa, Ontario	
Analysis Performed by: SE	Pumping Well: TW22-04
Analysis Reviewed by: AP	Method: Manual / Datalogger
Aquifer Thickness: 4.5 m	Discharge: Constant 15 L/min
P-Test Date: Sep. 1, 2022	
Analysis Date: Feb. 15, 2024	
Duration: 7.5 hours	

Pumping Test Analysis (TW22-04): Theis-Recovery (Confined Aquifer)

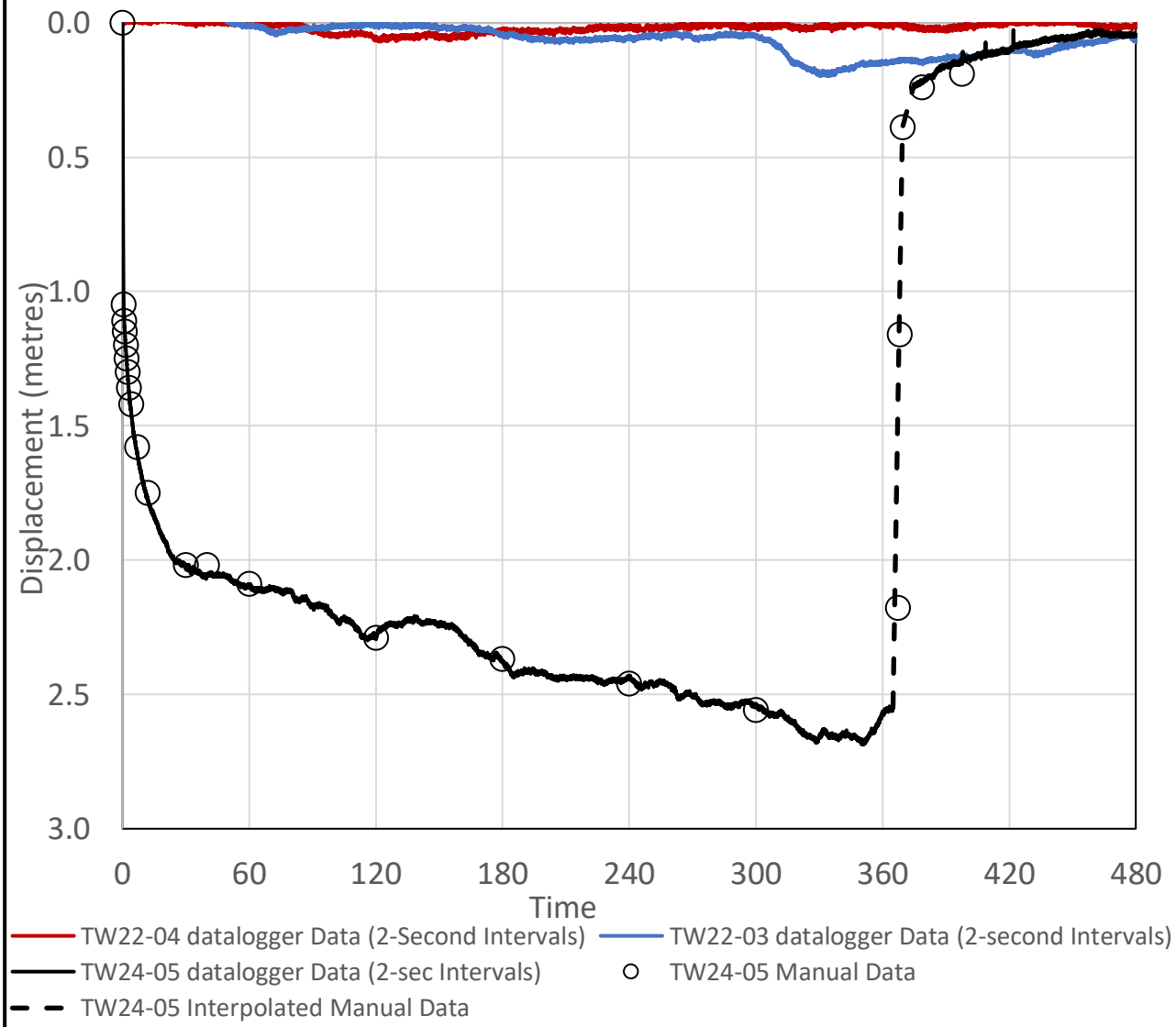


Estimated Transmissivity: 1.9 m^2/day / 2.2 x 10^{-5} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Scoped Hydrogeological Investigation		
Project Number: 100812.001		
Client: Hierarchy Development and Design		
Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW24-05	P-Test Date: Jan 18, 2024
Analysis Reviewed by: AP	Method: Manual / Datalogger	Analysis Date: Feb. 15, 2024
Aquifer Thickness: 18 m	Discharge: Constant 19 L/min	Duration: 6 hours

Pumping Test Data (TW24-05): Drawdown and Recovery



Water Levels TW24-05

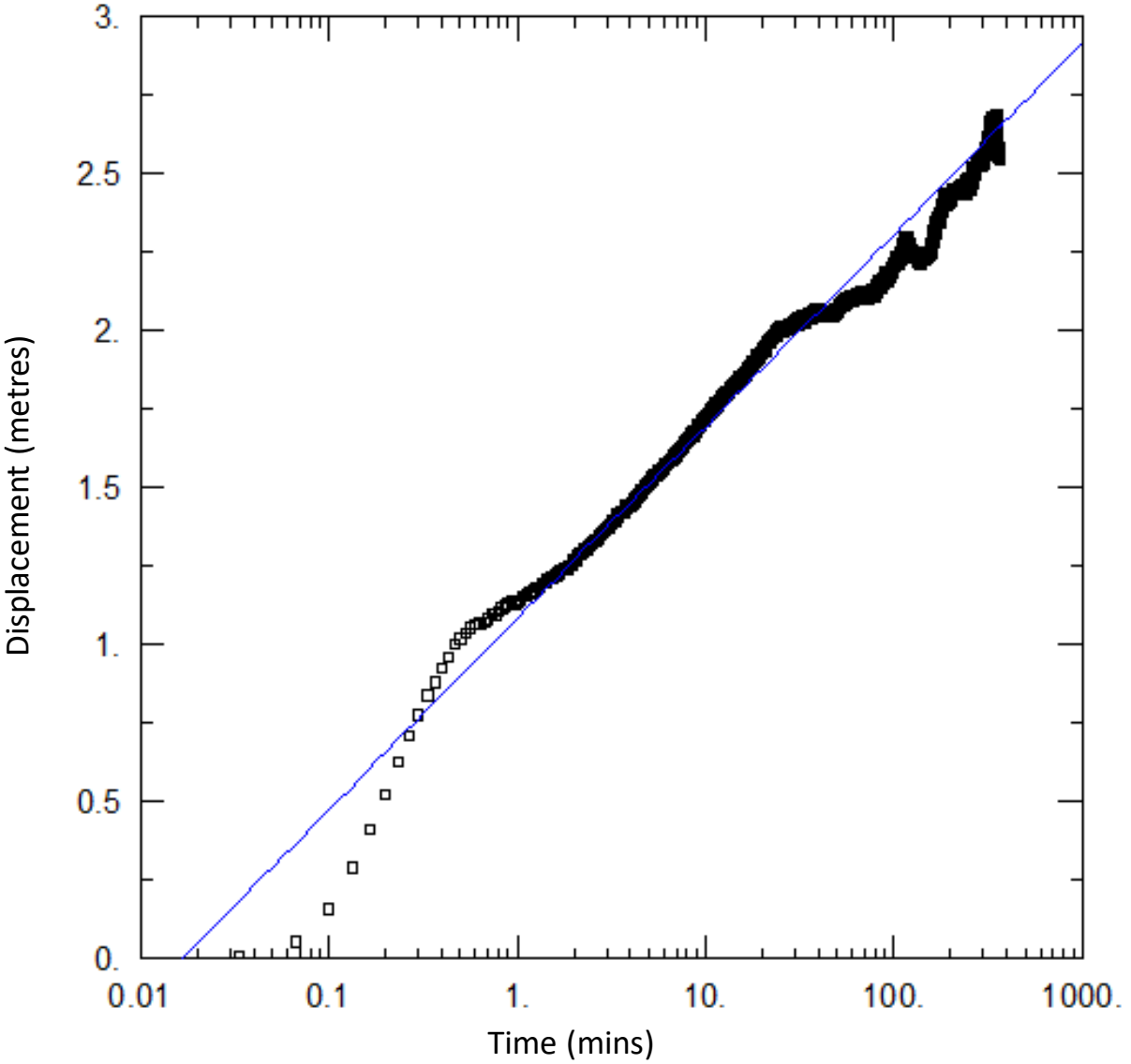
Static : 8.78 m below top of casing (BTOC); TOC = 0.5 m above ground surface

End of pump test (6-hours): 11.34 m BTOC; Following recovery (6.5-hours): 8.91 m BTOC

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Scoped Hydrogeological Investigation
	Project Number: 100812.001
	Client: Hierarchy Development and Design

Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW24-05	P-Test Date: Jan 18, 2024
Analysis Reviewed by: AP	Method: Manual / Datalogger	Analysis Date: Feb. 15, 2024
Aquifer Thickness: 18 m	Discharge: Constant 19 L/min	Duration: 6 hours

Pumping Test Analysis (TW24-05): Cooper-Jacob (Confined Aquifer)

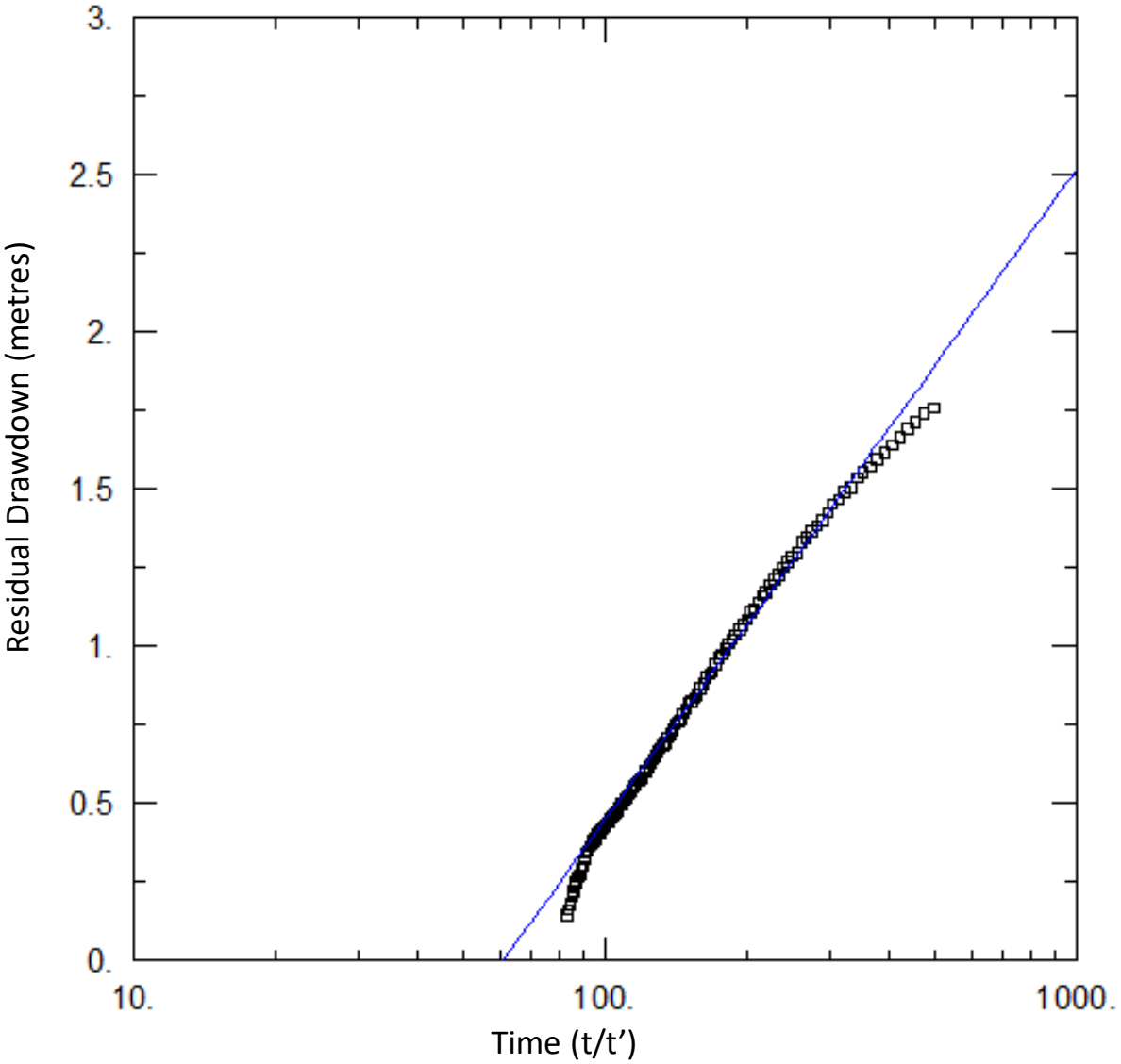


Estimated Transmissivity: 8.2 m^2/day / 9.5 x 10^{-5} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Scoped Hydrogeological Investigation		
Project Number: 100812.001		
Client: Hierarchy Development and Design		
Location: 930 Smith Road, Ottawa, Ontario		
Analysis Performed by: SE	Pumping Well: TW24-05	P-Test Date: Jan 18, 2024
Analysis Reviewed by: AP	Method: Manual / Datalogger	Analysis Date: Feb. 15, 2024
Aquifer Thickness: 18 m	Discharge: Constant 19 L/min	Duration: 6 hours

Pumping Test Analysis (TW24-05): Theis-Recovery (Confined Aquifer)



Estimated Transmissivity: 2.4 m^2/day / 2.8 x 10^{-5} m^2/s

APPENDIX H

Nitrate Dilution Calculations

Nitrate Dilution Calculation Worksheet

Entire Parcel with 7 lots - 13.49 acres

Nitrate Loading

Residential Septic Systems (assumes 1,000 L/day/lot)		
Number of lots with untreated septic systems =	**7**	lots
Nitrate loading from untreated septic system =	40	grams/lot/day
Total annual nitrate loading from untreated systems =	102200	grams/year
Total Annual Nitrate Loading from all Systems =	**102200**	**grams/year**

Dilution Volumes

Infiltration Factors		
Topography factor =	0.17	
Soil factor =	0.15	
Cover factor =	0.1	
Combined infiltration factor =	0.42	
Precipitation Infiltration		
Annual water surplus =	0.380	metres/year
Annual infiltration (Water Surplus x Infiltration Factor) =	0.1596	metres/year
Infiltration Area and Infiltration Volumes		
Area available for infiltration (Site Area) =	54591.67	square metres
Area available for infiltration (Site Area - Hard Surface Area) = *assumes 10%*	49132.5	square metres
Total Annual Volume of Infiltration (Infiltration x Area) =	7842	cubic metres/year
Annual Flow from Residential Lots (assuming 1000 L/day/lot) =	2555	cubic metres/year
Total Annual Volume Available for Dilution =	**10397**	**cubic metres/year**

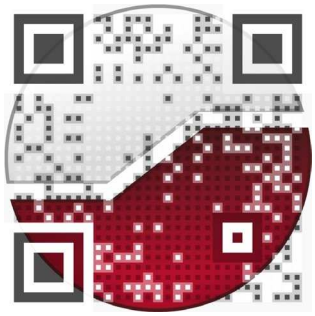
Dilution Calculation

$$C_{Nitrate} = \frac{Mass}{Volume} = \frac{Annual\ Nitrate\ Loading(grams/year)}{Annual\ Dilution\ Volume(cubic\ metres/year)} = \frac{grams}{cubic\ metre} = \frac{mg}{L}$$

$$\mathbf{C_{Nitrate}} = \frac{\mathbf{102200\ grams/year}}{\mathbf{10397\ cubic\ metres/year}} = \mathbf{9.83\ mg/L}$$

GEMTEC
Consulting Engineers and Scientists

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité