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Hydrogeological Investigation & Terrain Analysis
Proposed Residential Subdivision
Cedar Lakes Subdivision, Phase 3 and 4
Greely, Ontario

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Submitted to:

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Greely, Ontario

December 27, 2023
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES (FOLLOWING TEXT OF THE REPORT)

LIST OF APPENDICES

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists (GEMTEC) was retained by ARK Engineering and Development to conduct a hydrogeological investigation and terrain analysis for a proposed 40-hectare residential subdivision (hereafter referred to as 'the Site') in Greely, Ontario. The location of the Site is shown in the attached Detailed Site Plan, Figure 1.

The Site is 41.1-hectares (411,360 m^2) in size, and is located at 1600 Stagecoach Road, Geographic Township of Osgoode, in the City of Ottawa. The Site is bounded by residential properties utilizing private services to the north and west, Stagecoach Road to the east, and undeveloped woodlands to the south.

The proposed development at the Site will consist of 71 residential lots serviced with on-site septic disposal systems and water supply wells. The proposed lots will be accessed by an internal roadway system and will have a minimum lot size of 0.4 hectares. The proposed layout of the development is shown on the Detailed Site Plan, Figure 1. A copy of the proposed Storm Drainage and Macro Grading Plan Cedar Lakes – Phases 3 to 4 prepared by Ark Engineering and Development is provided in Appendix A.

1.1 Objectives of Investigation

The objectives of this investigation are as follows:

- To review available background information to assist in characterization of subsurface conditions in the vicinity of the site and develop a hydrogeological conceptual model.
- To identify and characterize the shallow subsurface conditions on the site as they relate to the suitability of on-site septic sewage disposal systems.
- To assess the potential for impact on the receiving aquifer(s) and any nearby surface water features from on-site septic disposal systems.
- To investigate the potential quantity and quality of groundwater available from drilled test wells on the site for potential domestic supply; and,
- To assess the long-term impacts on groundwater supply from existing developments on drilled water supply wells in the vicinity of the site.

A pre-consultation was held with the City of Ottawa reviewer Dillon Consulting on September 12, 2023. Key points regarding the hydrogeological investigation, terrain and septic impact assessment, and other discussion points were addressed during the pre-consult meeting. A detailed summary of the pre-consultation provided by Dillon Consulting has been included in Appendix J.

The investigation does not include a water balance assessment, which is being completed as part of the stormwater management investigations.

2.0 REVIEW OF BACKGROUND INFORMATION

2.1 Land Use and Land Cover

Site land cover is cleared land, unevaluated wetland and woodlands. Land uses within 500 metres of the Site include vacant undeveloped land, residential properties on private services, agricultural land, and a single commercial property which is located approximately 400 m from the site. Specific land use and land cover with respect to the site boundaries are documented in Table 2.1.

Table 2.1 – Summary of Land Use and Land Cover in Study Area

Site Boundary	Existing Land Use and Land Cover
North	• Residential dwellings
East	• Residential dwellings • Pond
West	• Residential dwellings
South	• Commercial property • Agricultural land • Woodlands

Based on the present land uses potential impacts to groundwater quality from adjacent lands within 500 metres of the Site boundary are not anticipated.

2.1.1 Permit to Take Water Records

A review of the MECP's permit to take water records (https://www.ontario.ca/page/map-permits-take-water) indicates a large-scale water taking permit registered for the Site. PTTW number 7184-BZ5SAE is listed as dewatering construction with allowable surface and groundwater takings of up to 1,500,000 litres per day. Based on information received from Ark Engineering and Development, the PTTW is associated with construction of the stormwater management ponds for Cedar Lakes Phase 1 and 2, which have been constructed at the time of preparing this report.

2.2 Topography and Drainage

Surface elevation across the site slopes gently towards the south, with topography ranging from 101 metres above sea level (masl) to 99 masl level (Figure 2). The surficial drainage of the site is expected to follow topography and is anticipated to be towards the south (Figure 2).

2.3 Raisin-South Nation Source Protection

GEMTEC has reviewed the Raisin-South Nation Source Protection Plan (RSSPP, 2016). The relevant information is noted:

- The Site is located within an area of highly vulnerable aquifer (HVA) with a vulnerability score of 6 (range from 0 least to 10 most sensitive).
    - Most of the Ottawa Region's aquifer system is classified as highly vulnerable.
    - No policy restrictions for the proposed development were identified for HVA zones, based on the source protection plan.
- The Site is within an area of significant groundwater recharge.
- The Site is not within an intake protection zone or a well head protection zone.

2.4 Regional Surficial and Bedrock Geology

Surficial geology maps (Ontario Geologic Survey, 2010) indicate that the Site is underlain by organic rich soils (possibly consisting of peat, muck and marl, sandy silt to silty sand-textured glacial till and coarse textured glaciomarine deposits consisting of sand, gravel, minor silt, and clay. The OGS mapped distribution of these soil types is shown on Figure 3. Soil thickness / bedrock depth mapping (Ontario Geologic Survey, 2010) indicate 1 to 10 metres of soil thickness at the site (Figure 4).

Paleozoic bedrock geology maps (Armstrong and Dodge, 2007) indicate the bedrock underlying the soils consists of a dolostone unit of the Oxford Formation, which is part of the Beekmantown Group. The Oxford Formation is described as a dolostone with shale and sandstone interbeds that are up to 30 cm thick (Williams, 1991). The formation is characterized by light to medium brownish to greenish grey dolostone.

The Oxford Formation is underlain by the March Formation, an interbedded grey quartz sandstone, dolomitic quartz sandstone, and blue-grey sandy dolostone and dolostone. The unit represents a transition zone between the Oxford Formation dolostones above, and the Nepean Formation sandstone below. Dolostones of the March Formation are lithologically similar to the overlying Oxford Formation, making them difficult to distinguish using drill cuttings.

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

2.5 Previous Investigations

2.5.1 Paterson (2011a) Phase 1 Cedar Lakes

A previous hydrogeological investigation and terrain analysis was completed by Paterson Group Inc. (Paterson). The findings were provided in a report titled "Terrain Analysis and Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3,

Geographic Township of Osgoode, Ottawa (Greely), Ontario", and dated March 16, 2011, in support of Phase 1 of the proposed residential subdivision on an 18.4-hectare parcel of land.

Field investigations were conducted from November 2009 to January 2011. These investigations consisted of excavation of 20 test pits, digging of 3 hand auger holes, installation of 7 monitoring wells, drilling of five test wells, background water quality sampling from neighbouring residential wells, test well groundwater pumping tests and water quality sampling; in-situ infiltration testing, soil sample collection and testing, review of available background documents, and data analysis.

Key project findings from Paterson (2011a) are summarized as follows:

- Phase 1 of Cedar Lakes is underlain by four distinct terrain units were established based on test pit investigation: clayey silty sand, medium sand with trace silt, gravelly sand, and glacial till, with varying degrees of permeability.
- Water quantity and quality of the Oxford and March Formations (considered to be a combined water supply aquifer) are suitable for domestic use, based on residential well and site test well testing.
    - Test wells were constructed with casing lengths ranging from approximately 8.5 to 18 meters and drilled to depths ranging from 18 to 79 meters.
    - The upper Oxford formation may be vulnerable to surface impacts based on elevated concentrations of nitrate/bacterial indicator species, observed during sampling of residential wells.
- No negative impacts to the bedrock aquifer were anticipated from the residential subdivision based on the septic impact assessment. It was determined that a protective bedrock aquitard overlays the water supply aquifer.
- Elevated concentrations of nitrates were noted in the overburden within the northeast section of Phase 1 - Cedar Lakes. The elevated nitrate levels were attributed to areas with relatively flat and slow-moving overburden groundwater with poor drainage. After restoring the drainage pattern within the local area, the overburden groundwater was resampled, and nitrate levels had decreased. The rapid decrease in nitrates were stated to be directly related to the improvement in drainage.
- Well interference between neighbouring wells were expected to be minimal, based on the anticipated water demand being within safe yields of the water supply aquifer.

2.5.2 Paterson (2011b) Phases 2 - 6 Cedar Lakes

A previous hydrogeological investigation and terrain analysis investigation was completed by Paterson. The findings were provided in a report titled "Terrain Analysis and Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3, Geographic Township of Osgoode, Ottawa (Greely), Ontario" and dated April 1, 2011, in support of Phases 1-6 of a proposed residential subdivision on a 59.04-hectare parcel of land (note Phases 3-6 are referred to as Phases 3-4 in the GEMTEC report). The previous investigations completed by Paterson pertaining to the Phase 1 of this development were also accounted for in the overall calculations of this investigation.

Field investigations were conducted from November 2009 to January 2011. These investigations consisted of the excavation of 28 test pits, digging of 3 hand auger holes, installation of 8 monitoring wells, drilling of five test wells, background water quality sampling from neighbouring residential wells, test well groundwater pumping tests and water quality sampling, in-situ infiltration testing, soil sample collection and testing, review of available background documents, and data analysis.

Key project findings from Paterson (2011b) are summarized as follows:

- Cedar Lakes Phases 2-6 are underlain by overburden more than 4 meters thick, generally consisting of silty clayey sand to glacial till deposits overlying bedrock.
- Water quantity and quality of the Oxford and March Formations (considered to be a combined water supply aquifer) underlying the site are suitable for domestic use, based on residential well and site test well testing.
    - Test wells were constructed with casing lengths ranging from approximately 8.5 to 18 meters and drilled to depths ranging from 18 to 79 meters.
- No negative impacts to the bedrock aquifer were anticipated from the residential subdivision based on the septic impact assessment. It was determined that a protective bedrock aquitard overlays the water supply aquifer.
- Well interference between neighbouring wells were expected to be minimal, based on the anticipated water demand being within safe yields of the water supply aquifer.

2.6 MECP Water Well Records

2.6.1 Cedar Lakes Phases 1 and 2 Well Records (North)

A search for the Ministry of Environment, Conservation and Parks (MECP) Water Well Records for existing private wells located in Cedar Lakes Phase 1 and 2 Subdivision, north of the Site was completed.

The well construction details for the Cedar Lakes wells were reviewed and compared to the construction recommendations from the hydrogeological investigation report for the Phase 1 and 2 subdivision application (Paterson, 2011a; 2011b). A total of 52 well records were reviewed from the MECP online water well record database (Appendix B). Based on the well record search, 51 of the 52 available well records indicate casing lengths of at least 40 m, while 1 well record indicated a casing length of 37 m. The hydrogeological investigation report for Phase 1 and 2 (Paterson, 2011a; 2011b) indicates that wells should be constructed with minimum casing lengths of 12 metres below ground surface.

2.6.2 Well Records Within Vicinity of Site (East and West)

A search for the Ministry of Environment, Conservation and Parks (MECP) Water Well Records for existing private wells was completed for private wells within 500 metres of the eastern and west site boundaries (refer to Figure 6).

A total of 38 well records were reviewed from the MECP online water well record mapping resource (Appendix B). Of the 38-drinking water well records reviewed, 21 were completed in limestone bedrock and 17 were completed in limestone and/or sandstone. Table 2.2 provides a summary of the well characteristics for the 38 water well records.

Table 2.2 – Summary of Water Well Records Search Results (500-m Radius)

Parameter	10th Percentile	90th Percentile	Geometric Mean
Casing Lengths (m)	6.7	18.7	11.7
Depth to Bedrock (m)	4.8	17.3	10.6
Total Well Depth (m)	14.6	79.3	39.0
Depth Water Found[1] (ft)	11.0	63.4	32.5
Recommended Pump Rate (l/min)	18.9	132.5	43.2

Notes:
1. Depth water found as reported on MECP water well records, representing water bearing fractures encountered at the time of drilling.

3.0 TERRAIN EVALUATION

3.1 Geotechnical Investigation – Paterson (2023)

The subsurface conditions at the Site were characterized as part of the geotechnical investigation completed by Paterson Group. The findings were provided in a report titled "Geotechnical Investigation, Proposed Residential Development, Cedar Lake Subdivision - Part of Lot 8, Concession 3, Phase 3 & 4, Greely, Ontario" dated October 27, 2023.

The field investigation for the geotechnical investigation included the advancement of seven test pits (TP 1-23 to 7-23, inclusive). The Paterson (2023) report includes the results of previous site investigations completed as part of hydrogeological and geotechnical investigation for Cedar Lakes Phases 1 through 6. This includes 12 test pits (TP1 to TP12, inclusive) advanced in 2009; eight test pits (MW1 to MW8, inclusive) and four hand auger holes (AH1 to AH4) advanced in 2010, and 17 test pits (TP 13 to TP 29, inclusive) and two hand auger holes (AH5 and AH6) advanced in 2011. The locations of all the test holes referenced in (Paterson, 2023) are shown on Figure 1.

The subsurface conditions reported by Paterson (2023) for Cedar Lakes Phase 3 and 4 indicate that the site is generally underlain by native deposits of silty sand to sandy silt, overlying glacial till. Occasionally, a layer of clayey silt was identified between the silty sand and glacial till layers.

3.2 Hydrogeological Investigation - GEMTEC

3.2.1 Field Procedure

The field work for the terrain evaluation was conducted on September 21, 2023. On that date 3 boreholes (numbered 23-1, 23-2 and 23-3) were advanced on the site by Limitless Drilling and supervised by GEMTEC.

The boreholes were advanced to depths of about 5.5 to 5.9 metres below the existing ground surface. A licensed well technician (for Limitless Drilling) sealed well screens at all boreholes locations to allow for groundwater levels monitoring and facilitate groundwater quality sampling.

Descriptions of the subsurface conditions encountered in the boreholes are provided on the borehole logs in Appendix C. The locations of the boreholes are shown on the Detailed Site Plan, Figure 1.

3.2.2 Soil Conditions

3.2.2.1 General

The following presents an overview of the subsurface conditions encountered in the boreholes advanced as part of the hydrogeological investigation. These findings are reasonably consistent with Paterson, (2023) and the conditions identified on the geological mapping, with the exception of mapped organic soils, which were not encountered.

3.2.2.2 Silty Sand to Sand

Native deposits of silty sand to sand with some silt, some to trace gravel was encountered below the topsoil in all test hole locations, were encountered at BH23-1 and 23-3. The silty sand to sand deposit extended to depths ranging from about 0 to 3.91 metres below ground surface.

3.2.2.3 Sandy Silt

A deposit of sandy silt was encountered between the silty sand layer in the BH23-3. The sandy silt layer has a thickness of about 1.53 metres and extends to about 2.9 metres below ground surface.

3.2.2.4 Clayey Silt

A native deposit of clayey silt was encountered below the sand layers in boreholes 23-1 and 23-2. The clayey silt layer has a thickness ranging from about 0.5 to 2.9 metres and extends to depths ranging from about 2.3 to 5.2 metres below ground surface.

3.2.2.5 Glacial Till

Glacial till was encountered in all of the boreholes. Glacial till is a heterogeneous mixture of all grain sizes, which at this site, can be described as silty sand to sandy silt, with trace to some gravel and trace silt. Cobbles and boulders are frequently encountered within glacial till. The

glacial till was not fully penetrated in all the test holes but was proven to at least a depth of about 5.9 metres below ground surface.

3.2.3 Overburden Groundwater Conditions

The groundwater level in the monitoring wells were measured between September and October 2023. The groundwater levels are summarized in Table 3.1.

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation. The measured groundwater levels indicate that the overburden groundwater flow is towards the east-southeast, generally consistent with topography which slopes to the southeast.

Table 3.1 – Overburden Groundwater Depth and Elevation

Monitoring Well No.	Date of Reading	Groundwater Depth Below Ground Surface (metres)	Groundwater Elevation (metres, geodetic datum)
23-1	21-09-2023	1.43	98.89
	19-10-2023	1.44	98.88
23-2	21-09-2023	-0.3[1]	102.28
	19-10-2023	-0.3	102.28
23-3	21-09-2023	0.61	103.11
	19-10-2023	0.65	103.07

Note: 1. Artesian conditions

3.3 Stormwater Management Ponds (SWMP)

The specific design details regarding the construction of the proposed stormwater managements ponds (SWMPs) are not known at this time. It is the intention to retain stormwater on site, and the ponds are expected to be constructed in a manner typical of the many SWMPs already constructed and previously approved by both the City and MECP in the Greely area. The site is not considered to be hydrogeologically sensitive and it is not expected that the SWMPs will extend into bedrock. The designs will be required to meet the requirements of the Shields Creek Sub watershed study and treatment and volume detention criteria.

No negative impacts to the bedrock water supply aquifer are expected from SWMP constructed in accordance with MECP requirements. The SWMP is planned to be at least 500 metres from the nearest major roadway (Stagecoach Road). As such, there is minimal risk for contamination

from agricultural fertilizers (e.g., nitrates), road salts or other sources (e.g., commercial or industrial properties).

4.0 GROUNDWATER SUPPLY

A groundwater supply investigation was carried out in accordance with the MECP August 1996 document "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.

4.1 Test Well Construction

The MECP Procedure D-5-5 document indicates that a minimum of five test wells are required for sites more than 25 hectares and up to 40 hectares in area. The total area of the proposed Cedar Lakes Phase 3 – 4 is 40 hectares. A total of five test wells (namely TW A, B, C, D, and E) were utilized to support the groundwater supply investigations.

TW A, B and C were drilled as part of previous investigations by others, refer to Paterson (2011b). TW A and TW C were lined during the current groundwater investigation by GEMTEC to extend the well casing to meet the recommended 40-metre casing length.

TW D and TW E were drilled by Air Rock Drilling Co. Ltd. (Well Contractor License No. 1119) in October 2023. The locations of TW-D and TW-E were chosen to provide representative coverage of the site and with the intent for future use as water supply wells on individual lots (Figure 1). Copies of the MECP Water Well Records for these wells are provided in Appendix B.

The construction details of TW-A to TW-E inclusive, are summarized in Table 4.1.

Table 4.1 – Summary of Test Well Construction Details

Test Well ID	Depth to Bedrock (m BGS[1])	Depth of Well Casing (m BGS)	Depth Water Found[2] (m BGS)	Total Well Depth (m BGS)	Lithology Description (open interval)
TW A (A089354)	11.58	41.1[3]	47.5, 52.4	54.9	Grey and white sandstone
TW B (A209552)	14.48	41.1	59.7	60.6	Grey limestone
TW C (A093609)	10.67	41.1[3]	49.4, 52.1	54.9	Grey and brown limestone

Test Well ID	Depth to Bedrock (m BGS[1])	Depth of Well Casing (m BGS)	Depth Water Found[2] (m BGS)	Total Well Depth (m BGS)	Lithology Description (open interval)
TW D (A378947)	6.10	39.9	56.7, 59.1	61.0	Grey and black limestone with layers of grey sandstone
TW E (A378948)	11.58	41.1	56.1, 59.1	61.0	Grey and black limestone

Notes:
1. m BGS - Metres Below Ground Surface
2. Depth water found as reported by well driller on the MECP water well record.
3. Test well lined with 4" casing.

4.2 Off-Site Private Well Construction (Wells sampled)

The well construction details of the private wells sampled as part of the hydrogeological investigation are summarized in Table 4.2.

Table 4.2 – Offsite Private Domestic Well Construction Details

Well ID	Well Tag #	Depth to Bedrock (m)	Depth of Well Casing (m)	Depth of Water Found (m)	Total Well Depth (m)	Lithology Description (open interval)
PW-1794	A135456	5.2	39.9	64.0	67.1	Sandstone
PW-1826	A305055	4.9	39.9	52.1, 71.3	73.2	Sandstone
PW-1850	A144728	7.9	39.9	57.3, 77.7, 89.3	91.4	Sandstone
PW-1858	A144727	8.8	39.9	54.9, 75.6, 89.6	91.4	Sandstone
PW-1922	A135456	8.8	39.9	55.2, 77.4	85.3	Sandstone
PW-6342	A014478	9.1	10.7	15.2, 21.0, 22.2	24.4	Limestone

4.3 Pumping Test Field Procedure

The pumping tests for the onsite test wells were conducted between October 25 and November 7, 2023. In each test well a six-hour duration constant discharge rate pumping test was conducted. The pump discharge was directed to the ground surface at a distance of at least 10

metres from the test wells and in a manner such that the flow of water on the ground surface was directed away from the test wells.

4.3.1 Water Level Measurements and Bedrock Groundwater Flow

During the pumping tests water level measurements were taken at regular intervals in the well being pumped using an electric water level tape and on a continuous basis using electronic data loggers. After the pump was shut off, water level data was collected to ensure a minimum of 95 percent of the drawdown in water level had recovered in the test wells. The water level measurements for the drawdown and recovery data for the pumping tests are provided in Appendix F.

Water level measurements were also taken from other onsite test wells and monitoring wells (observation wells) prior to, during and after the pumping of each of the test wells to determine potential interference effects, water level fluctuations and influence from precipitation. Continuous water level measurements were recorded at 10-minute intervals in all observation wells from October 17, 2023 to November 22, 2023. Water level measurements taken in the observation wells are provided in Appendix G.

Minimal daily water level fluctuations of less than 0.3 metres were observed in all five test wells. Precipitation data from a nearby weather station (Ottawa Int. Airport, approximately 15 km from site) was compared to the test well water levels during the monitoring period. The major rainfall events did not appear to have direct impacts on the test well water levels (Appendix G). A gradual increase in water levels, up to approximately 0.5 metres was observed in all test wells during the four-week water level monitoring period.

4.3.2 Flow Rate Measurements

The wells were pumped using an electric submersible pump and portable generator supplied by Air Rock Drilling Ltd. The flow rate of the pump discharge hose was constantly monitored using a timed-volume method. Multiple flow measurements were taken within the first hour of the pumping test and then at 60-minute intervals throughout the remainder of the pumping test to ensure that the discharge rate maintained a constant flow rate (i.e., within 5%). The test wells were pumped at a rate of approximately 58 litres per minute, which is three times greater than that required to support a 4-bedroom dwelling with flows of 18.8 litres per minute.

4.3.3 Groundwater Sampling

Total chlorine tests were conducted in the field to ensure that chlorine levels were at non-detectable concentrations prior to bacteriological testing. The temperature, conductivity, total dissolved solids, pH, turbidity, colour, and total chlorine levels of the groundwater were measured at periodic intervals during the pumping tests and are summarized in Appendix D. The field equipment used during the pumping test is calibrated before use and the details of field equipment are provided in Table 4.3.

Table 4.3 – Field Equipment Overview

Field Parameters	Manufacturer	Model No.
Total and Free Chlorine	Hach	DR 900
pH, temperature, Conductivity	Hanna / Horiba[1]	HI 98129 / Horiba U-52[1]
Turbidity	Hanna	HI 98703
Colour	Hach	DR 900

Notes: 1. Rental equipment from Maxim Environmental and Safety Inc.

The groundwater samples were collected after three and six hours of pumping in laboratory supplied bottles and prepared/preserved in the field in accordance with the industry standard sampling, handling and preservation procedures required by the laboratory. The groundwater samples were subsequently submitted to Paracel laboratories in Ottawa, Ontario for analysis of 'subdivision package' and 'trace metals' parameters, as outlined in the City of Ottawa Hydrogeological Guidelines dated March 2021. No other parameters of concern, e.g. volatile organic compounds, were identified based on a review of surrounding land use.

The pre-consultation notes (Appendix J) indicate that radon has been an identified issue in the area and testing of radon is recommended. A technical discussion to discuss radon testing was held on September 20, 2023 between GEMTEC (Andrius Paznekas, M.Sc., P.Geo) and City of Ottawa (Tessa Di Iorio, M.Sc., P.Geo.). It is understood that radon testing has been completed by the Ontario Geologic Survey (OGS) and includes 15 samples in the Greely area. The data collected by OGS is not yet publicly available. There are no Ontario Drinking Water Quality Standards or Canadian Guideline limits for radon in groundwater. In Nova Scotia, where radon is more prevalent, Nova Scotia's Environment and Climate change indicates that "*the amount of radon that goes into the air when you use water is so small that it is generally not thought to cause for worry. It usually makes up only 1 to 2% of radon that can collect in indoor air*" (Government of Nova Scotia, N.D). It is understood that one property located south of the site and outside of Greely is utilizing a radon system; however, the source of radon is unknown. Given the available information, radon in groundwater is not considered to be a parameter of concern that would require testing as part of the Site investigations.

4.4 Test Well Water Quality

A summary of the results from the chemical, physical and bacteriological analyses performed on the water samples obtained from the five test wells and the laboratory results from Paracel are summarized in Appendix D.

4.4.1 Bacteriological Parameters

Total and free chlorine measurements confirmed that total and free chlorine concentrations in the well water was non-detectable (<0.02 mg/L) at the time of bacteriological sampling during the pumping tests (refer to Appendix D).

Based on water samples collected from the on-site test wells, total coliform counts exceeded the Ontario Drinking Water Quality Standards (ODWQS) maximum acceptable concentration of 0 CFU/100mL in three of the five on-site test wells (TW B, TW C and TW E). Low levels of total coliform were detected in the initial 3-hr samples from TW B, with reported total coliform counts of 1 CFU/100mL, but the 6-hr samples indicated non-detectable total coliform. The total coliform levels detected in the initial 3-hr samples were 14 and 3 CFU/100mL, while the 6-hr samples had concentrations of 8 and 10 CFU/100mL, at TW C and TW E, respectively.

Bacteria indicator species such as e. coli and fecal coliform were not detected in any of the water samples.

In GEMTECs professional opinion the detectable total coliform at TW C and TW E is likely attributable to insufficient well chlorination. Follow up water quality sampling is recommended to confirm acceptable bacteriological concentrations.

4.4.2 Other Health Related Parameters

With the exception of total coliforms noted above, no maximum acceptable concentration limits of the ODWQS were exceeded in the three and six-hour water samples collected from the onsite test wells.

4.4.3 Operational Guideline Exceedances

Operational related exceedances of the ODWQS were noted for hardness (all test well samples), aluminum (TW A), organic nitrogen (TW B), and are discussed in the following section:

Hardness

The concentration of hardness in water samples obtained from all five test wells ranged from 300 to 469 mg/L, which exceeds the operational guideline of 80 to 100 mg/L of $CaCO_3$ as specified in the ODWQS.

Water having a hardness level above 80 to 100 mg/L as $CaCO_3$ is often softened for domestic use. The MECP Procedure D-5-5 document states that water having a hardness value more than 300 mg/L is considered "very hard". The Ontario Ministry of the Environment publication entitled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", states that water with hardness in excess of 500 mg/L is considered to be unacceptable for most domestic purposes. There is no upper treatable limit for hardness specified in MECP Procedure D-5-5.

The concentrations of hardness in all the test wells are below the threshold of 500 mg/L as CaCO3 as specified in the Technical Support Document for the ODWQS. The concentration of hardness observed in the test wells is reasonably treatable using a conventional water softener. Based on our experience, most water supply wells within rural eastern Ontario are equipped with water softeners.

Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water that may be of concern to persons on a sodium restricted diet. The use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes (for example, a bypass of the softener to the cold-water kitchen tap).

Organic Nitrogen

The organic nitrogen concentration (calculated as total kjeldahl nitrogen – ammonia) slightly exceeded the operational guideline of 0.15 mg/L for ODWQS in the 3-hr and 6-hr samples from test well TW B with concentrations of 0.2 mg/L.

The ODWQS indicates that levels of organic nitrogen more than 0.15 mg/L may be caused by septic tank or sewage effluent contamination and is typically associated with dissolved organic carbon (DOC) contribution, which was reported to be 1.4 mg/L in the 3-hr and 6-hr samples.

Organic nitrogen can react with chlorine and severely reduce its disinfectant power; in addition, taste and odour problems may also occur. It is not expected that ongoing chlorination will be utilized by homeowners in the residential subdivision and, as such, no concerns with the operational objective exceedance for organic nitrogen were identified.

Aluminum

Total aluminum concentrations of 0.135 mg/L identified in the 6-hr samples for TW A slightly exceeds the ODWQS operational guideline of 0.1 mg/L. Aluminum in untreated water is found in the form of fine particles of alumino-silicate clay, which can be effectively removed in coagulation/filtration. The aluminum concentrations are below the maximum acceptable concentration of 2.9 mg/L (Health Canada, 2021). The total aluminum exceedances are attributed to the turbidity levels, which was 2.3 mg/L at the time of sampling. This is supported by the dissolved aluminum concentration of 0.019 mg/L which was field filtered through 0.45 micron filter.

4.4.4 Aesthetic Objective Exceedances

Aesthetic objective exceedances of the ODWQS included total dissolved solids in TW B and TW D, iron in TW D and TW E, and turbidity in TW E. These exceedances are discussed in the following sections:

Iron

The iron concentrations from all on-site test wells ranged from 0.1 to 0.4 mg/L. The 3-hr samples obtained from TW D, and both the 3-hr and 6-hr samples obtained from TW E exceed the ODWQS aesthetic objective for iron of 0.3 mg/L, with reported iron concentrations of 0.4 mg/L.

Elevated levels of iron may cause staining to plumbing fixtures and laundry. However, the iron level is within the maximum reasonably treatable limits of 5.0 mg/L provided in Table 3 of the Appendix in the MECP Guideline D-5-5.

Turbidity

Turbidity levels at TW E slightly exceed the ODWQS aesthetic objective of 5 NTU, with concentrations 5.2 and 5.5 NTU for the 3-hr and 6-hr samples, respectively. It is noted that the 6-hr field measurement for turbidity indicated a concentration of 4.28 NTU, which is within the aesthetic objective.

Discrepancies between lab and field measurements of turbidity can be caused by the change of conditions the water is subjected to during the period between the time of sampling and time of analysis (I.e., change in temperature, oxidation). Precipitation of substances such as iron and manganese can occur, leading to an increase in turbidity. As such, field measured turbidity is considered more representative of in-situ water conditions, which was measured to be 4.28 NTU, satisfying the ODWQS aesthetic objective of 5 NTU.

Total Dissolved Solids (TDS)

TDS levels in samples obtained from TW B and TW D exceed the ODWQS aesthetic objective of 500 mg/L, with concentrations of 916 mg/L and 900 mg/L at TW B, and 562 mg/L and 520 mg/L at TW D, at the 3-hr and 6-hr, respectively. Elevated levels of TDS can lead to problems associated with encrustation and corrosion.

To determine the corrosive nature of the groundwater, the Langelier Saturation Index (LSI) was calculated for the samples obtained from the test wells. These values are based on the laboratory measured TDS, pH, alkalinity, and calcium following 6-hours of pumping. The LSI was calculated for TW B and TW D to be 0.25 and 0.10 respectively, using an estimated groundwater temperature of 10°C (refer to Appendix I). The test wells have LSI values between 0.0 and 0.5, which indicates the groundwater is slightly scale forming and corrosive.

As per the “Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines”, TDS levels in excess of 500 mg/L may result in excessive hardness, taste, mineral deposition or corrosion. According to the “Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Total Dissolved Solids (TDS)”, published by Health Canada (1991), TDS levels between 600 and 900 mg/L are considered to be ‘fair’. At levels above 1,200 mg/L, the palatability of drinking water is ‘unacceptable’. The palatability of the drinking water is expected to be acceptable, although some taste problems may occur as the palatability is classified as ‘fair’.

4.5 Offsite Water Quality Sampling Program

To characterize the background water quality homeowner water quality sampling in the vicinity of the Site was completed. A total of seven private wells were sampled, five of which are located within Cedar Lakes Phases 1 and 2. The remaining two samples were chosen based on their shallower depths and shorter casing lengths to help characterize bedrock aquifer susceptibility to surface contamination. Refer to Figure 1 for locations of the samples private wells.

4.5.1 Resident Interviews

The participants of the water quality sampling program conducted on November 8, 2023, within Cedar Lakes 1 and 2 were respondents of a general email sent out to homeowners via the Cedar Lakes Homeowners Association. This method gave all homeowners within the subdivision the opportunity to participate in the sampling program. The email yielded five participants.

Further off-site sampling was performed for homes within the adjacent subdivision west of the site. Following a review of available MECP well records, a door-to-door survey was conducted on November 28, 2023. Two further homeowners agreed to participate in the sampling program, giving a total of seven participants.

A summary of the interviews with the residents is provided in the Table 4.4. Homeowners were requested to rate water quality on a scale of 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent).

The private wells owners surveyed had variable water quality ratings, from poor to excellent. Specific water quality comments were for sulfur odours, high iron and colour. All private well owners reported the use of conventional water softeners, UV filters (2 of 7), iron filtration (2 of 7) and reverse osmosis (3 of 7). No groundwater quantity issues were reported.

Table 4.4 – Summary of Homeowner Interview

Test Well ID	Homeowner Water Quality Rating[1]	Water Quantity Comments	Water Quality / Septic Comments
PW-1922	Excellent	No reported groundwater quantity issues	• No reported groundwater quality issues. • UV, Water softener and reverse osmosis (RO) (at sink taps) systems in place.
PW-1826	Good	No reported groundwater quantity issues	• Occasional sulfur smell. • Water softener system in place.
PW-1858	Fair	No reported groundwater quantity issues	• High iron and sulfur • UV, Water softener, iron filter and reverse osmosis (at kitchen tap) systems in place.
PW-1850	Poor	No reported groundwater quantity issues	• Respondent noted no groundwater quality issues. • Water softener and iron filtration systems in place.
PW-1794	Poor	No reported groundwater quantity issues	• High iron, hardness, and colour. • Reverse osmosis treatment system in place.
PW-6342	Fair	No reported groundwater quantity issues	• High iron and sulfur • Water softener system in place.
PW-6266	Good	No reported groundwater quantity issues	• High iron, and presence of sulfur • Water softener system in place.

4.5.2 Private Well Water Quality Results

The seven private well water quality results are provided in Appendix D and the ODWQS exceedances are summarized in Table 4.5.

The groundwater encountered in the on-site test wells is similar to the water quality in off-site test wells and private domestic wells, with operational guideline exceedances of hardness and organic nitrogen and aesthetic objective exceedances of iron and total dissolved solids. With the exception of one test well (TW B) which reported a nitrate concentration of 1.6 mg/L, all other wells sampled reported non-detectable (<0.1 mg/L) nitrate concentrations.

Table 4.5 – Summary of ODWQS Exceedances

ODWQS Exceedance Type	Parameter	Cedar Lakes Phase 1-2	Subdivision West of Site
Health-Related	Total Coliform	-	-
Aesthetic	Iron, total dissolved solids	Iron, total dissolved solids	Colour, iron, total dissolved solids
Operation Guideline	Hardness, organic nitrogen, aluminum	Hardness	Hardness, organic nitrogen

4.6 Test Well Water Quantity

4.6.1 Pump Test Analysis Overview

As per MECP Procedure D-5-5, each test well was pumped at a flow rate greater than 18.9 litres per minute for 6 hours.

The maximum drawdown observed at the end of pumping was 5.4 metres in test well TW E which is equivalent to approximately 9.7 percent of the available drawdown in the test well. The drawdown utilized in the remaining test wells ranged from 0.5 to 8.5 percent. All wells recovered within 24 hours following pump turn off time.

Based on these results, all the on-site test wells are capable of supplying water at a rate significantly greater than 18.9 litres per minute for a period greater than six hours. This is considered more than sufficient for typical domestic use.

4.6.2 Transmissivity and Storativity Analysis

The transmissivity and storativity of the water supply aquifer were estimated from the pump test drawdown data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. Analysis of the pumping test data was carried out using the Cooper-Jacob and Theis recovery methods. The results of the Aqtesolv 4.5 analysis are provided in Appendix F.

4.6.2.1 Pumping Test TW A

Test well TW A was pumped at a constant rate of 57 L/min for 380 minutes. The initial drawdown in the pumped well was approximately 1.2 m within 10 seconds of pumping. It gradually increased to a maximum drawdown of 2.3 m after 380 minutes. The water level in the test well recovered 96 percent approximately 12 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 24.8 L/min/m. An aquifer transmissivity of 86 and 85 m^2/day was estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.6.2.2 Pumping Test TW B

Test well TW B was pumped at a constant rate of 57 L/min for 380 minutes. The initial drawdown in the pumped well was approximately 0.2 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 0.3 m after 380 minutes. The water level in the test well recovered 96 percent approximately 16 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 190 L/min/m. Aquifer transmissivities of 158 m^2/day and 126 m^2/day were estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.6.2.3 Pumping Test TW C

Test well TW C was pumped at a constant rate of 57 L/min for 381 minutes. The initial drawdown in the pumped well was approximately 1.6 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 3.1 m after 380 minutes. The water level in the test well recovered 95 percent approximately 24 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 18.4 L/min/m. An aquifer transmissivity of 26 m^2/day was estimated using both the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.6.2.4 Pumping Test TW D

Test well TW D was pumped at a constant rate of 57 L/min for 374 minutes. The initial drawdown in the pumped well was approximately 0.9 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 4.8 m after 374 minutes. The water level in the test well recovered 97 percent approximately 10 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 10.6 L/min/m. Aquifer transmissivities

of 41 m^2/day and 70 m^2/day was estimated using both the Papadopulos-Cooper method (drawdown) and Theis method (recovery), respectively. The Papadopulous-Copper method was select as it incorporates wellbore storage which provided a better estimate of transmissivity.

4.6.2.5 Pumping Test TW E

Test well TW E was pumped at a constant rate of 57 L/min for 360 minutes. The initial drawdown in the pumped well was approximately 0.9 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 5.4 m after 360 minutes. The water level in the test well recovered 98 percent approximately within 20 hours of pump shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 11.9 L/min/m. Aquifer transmissivities of 13 m^2/day and 15 m^2/day were estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

The drawdown and recovery water level data from the five pumping tests conducted on the onsite test wells TW A to TW E, inclusive, are provided in Appendix F. The details of the pumping tests carried out on the test wells are provided in Table 4.6.

Table 4.6 – Pumping Tests Details

Parameter	TW A	TW B	TW C	TW D	TW E
Pumping Duration (minutes)	380	380	381	374	360
Flow Rate (litres per minute)	57	57	57	57	57
Static Water Level (m BGS)	5.4	7.0	9.2	4.3	5.3
Well Depth (m BGS)	54.9	60.6	54.9	61.0	61.0
Available Drawdown (m)	49.5	53.6	45.7	56.7	55.8
Water Level at End of Pumping (m BGS)	7.7	7.3	12.3	9.1	10.7
Observed Drawdown at End of Pumping (m)	2.3	0.3	3.1	4.8	5.4
Percent Drawdown Utilized (%)	4.6	0.5	6.8	8.5	9.7

Parameter	TW A	TW B	TW C	TW D	TW E
Recovery hours / % recovered	0.2 / 96%	0.3 / 96%	0.4 / 95%	0.2 / 97%	20 / 98%
Specific Capacity (L/min/m)	24.8	190	18.4	11.9	10.6
Estimated Transmissivity (m^2/day)	85	126	26	70	15

4.7 Hydraulic Interference Effects

During the pumping of the onsite test wells, water level measurements were recorded at the remaining four bedrock wells using electric data loggers, recording every 10 minutes. The water level measurements in the observation wells are reported in Appendix G and discussed below.

4.7.1 Bedrock Observation Wells

During the pumping tests for test wells TW A to TW E water levels were measured in bedrock observation wells. The maximum observed water level decrease in bedrock observations wells was 0.15 metres and was observed at TW A during the pumping of TW B. A similar drawdown of 0.12 m was experienced at TW B during pumping of TW A, 0.14 m at TW E during pumping of TW C, 0.12 m and 0.11 m at TW C during pumping of TW D and TW E, respectively. All other wells displayed drawdowns of less than 0.1 m at any given pumping time.

Based on the test well pumping rates (57 litres per minute), which are greater than typical domestic use, little to no hydraulic interference effects are anticipated at the site. This is supported by long-term water level monitoring of the test wells between October 19 and November 17, 2023. The test wells located on proposed lots adjacent to the existing residential development (Figure 2) did not display any significant (less than 0.5 metres) daily water level fluctuations over the 30-day monitoring period.

5.0 HYDROGEOLOGICAL CONCEPTUAL MODEL

5.1 Hydrogeological Conceptual Model

The framework for the hydrogeological conceptual model for the site is summarized in Table 5.1. The table shows the hydrogeological model based on thickness of overburden and bedrock layer identified on utilized private wells and on-site test well records. Ground surface elevations for each of the test wells were measured by GEMTEC staff using a Trimble R10 global positioning system, while ground surface elevations for the private wells were estimated from Google Earth.

The hydrogeological model was developed based on well record information for private and test wells, previous site investigations (Paterson, 2011a, 2011b, 2023), GEMTEC monitoring well and test well drilling, and OGS surficial and bedrock geological mapping.

An east-west hydrogeological cross-section (Figure 1A) across the site was prepared based information from onsite test wells, while a north-south cross section (Figure 1B) was prepared from private wells within approximately 100m (Figure 1). The boundaries between zones indicated on the cross-section have been interpreted based on available information as have conditions between the investigation points and are illustrative only. The actual conditions may differ somewhat from that indicated. The elevations are referenced to geodetic datum.

Table 5.1 – Framework of Hydrogeological Conceptual Model

Stratigraphic Unit	Generalized Composition[1]	Thickness (m)
Overburden	• Topsoil. • Clayey Silt and Sand • Glacial Till	• 6.1 to 14.5 metres
Bedrock	• Dolostone and Sandstone (Lower March Formation) • Sandstone	• 30 to 55 metres • 11 to > 50 metres

Notes:
1. Dolostones may be misidentified as limestone on well record due to similarities.

The test well bedrock elevation ranges from about 89.1 to 94.4 metres Above Mean Sea Level (AMSL) and the ground elevation at test well locations range from 99.7 to 104.6 metres AMSL. The water found elevation ranges from 42.8 to 55.21 and the elevation of bottom of wells ranges from 38.8 to 49.7 metres. The cross-section, based on the onsite test well water well records, indicates that the total thickness of the overburden ranges from approximately 6.1 to 14.5 metres.

5.2 Water Supply Aquifer(s)

The test wells are completed in limestone and/or sandstone of the lower Oxford, March and/or Nepean Formations. The water well records do not provide sufficient geologic descriptions to delineate between aquifer units.

A preliminary assessment of the test well and private well water quality data indicates significant variability in chloride concentrations, ranging from 61 to 246 mg/L. In GEMTEC's professional opinion, the large range of chloride concentrations may highlight the variability within the water supply aquifer, differences between aquifer units, or impacts from surface sources (e.g., road salts, softener discharge, septic systems, etc.).

5.2.1 Computer Model Simulations

A well interference simulation was developed using Aqtesolv Version 4.5. The well simulation output is provided in Appendix H for discussion purposes. Storativity estimates were not calculated from the pumping test data due to minimal water level drawdowns in the observation wells. Literature values of storativity for confined aquifers typically range from 5×10^{-5} to 5×10^{-3} (Todd, 1980).

5.2.1.1 Scenario 1

Scenario 1 is provided to illustrate the maximum drawdown using the geometric mean aquifer parameters identified in Table 4.6. The following parameter values were utilized in the model:

- Number of pumping wells = 71 wells (well locations approximated by taking the central point on each proposed land parcel).
- Individual well pumping rate = 18.75 litres per minute (minimum peak flow estimate as per MECP Procedure D-5-5).
- Duration of pumping = 120 minutes.
- Analysis model = Theis
- Aquifer thickness = 55 m (minimum aquifer thickness; refer to Table 4.6).
- Aquifer transmissivity, Theis = 49 m^2/day (geometric mean; refer to Table 4.6).
- Storativity coefficient = 5×10^{-5} (conservative estimate based of storativity based on literature values; Todd, 1980).
- Available drawdown = 52 m (geometric mean; refer to Table 4.6).

The results of Scenario 1 simulation indicate that the maximum drawdown within the Site is approximately 6 metres representing 10% of available drawdown in on-site wells, and is localized to the pumping wells. To note, the long-term water level monitoring of on-site test wells located adjacent to Cedar Lakes Phases 1 and 2 had daily water level fluctuations less than 0.3 metres and therefore, Scenario 1 is considered to be conservative.

Interference between on-site test wells and private wells in Cedar Lakes Phases 1-2 are not anticipated given the wells are constructed with minimum casing depths of 40 metres and the calculated drawdown represents less than 10% of available drawdown.

Private wells located west of the site are generally shallower, ranging from approximately 14 to 85 metres (10th and 90th percentile) with average well depths of 37 metres. The closest private wells located west of the Site would experience water level drawdown of less than 1.8 metres, assuming the water supply wells are completed in the same aquifer. Given the proposed water supply wells will be cased to 40 metres below ground surface and completed in the March and/or Nepean Formation, shallower wells with smaller available drawdown and completed in the Oxford and/or upper March Formations, would experience less drawdown.

Based on the results of the well interference simulation and on-site water level monitoring, future interference between drinking water wells is estimated to be minimal.

6.0 IMPACT ASSESSMENT

The impact on groundwater and surface water resources due to wastewater treatment and disposal by individual onsite sewage disposal systems on the site are assessed in the following sections.

6.1 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 site for 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 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.

6.1.1 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 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 conservative design flow of 3,000 litres/day and a loading rate of 4 L/m^2/day (high water table).

Typical septic envelope dimensions would be 30 metres in length by 25 metres width. A 750 m^2 septic envelope corresponds to 19% area cover based on a 4,000 m^2 (0.4 hectare) lot. 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.

For comparison, Cedar Lakes Phases 1 and 2 has a total of 61 developed lots which have a minimum lot area of 2,000 m^2 (0.2 hectares) and can accommodate well and septic systems.

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 groundwater levels measured in test pits and boreholes, it is expected that most of the septic leaching beds at this site will be partially or fully raised.

6.2 Groundwater Impacts

The potential risk to groundwater resources on and off the subject site was assessed in accordance with Ministry of Environment Procedure D-5-4: Technical Guideline for Individual On-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. These are described below.

6.2.1 Step 1 of 3 - 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 proposed lot sizes of 0.4 hectares (minimum) do not meet this consideration. Where proposed lot sizes are less than 1.0 hectares the risk of sewage effluent contamination must be assessed for the proposed subdivision, see Step 2.

6.2.2 Step 2 of 3 – Isolation

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.

Based on the hydrogeological conceptual model and as per the isolation requirements of MECP Procedure D-5-4, the groundwater receiver for the septic effluent is the overburden sands and the glacial till layers.

The result of the hydrogeological conceptual model indicates that the overburden sands and till deposits across the site generally do not meet the above requirements for isolation. Where it cannot be demonstrated that the effluent is hydrogeologically isolated from the water supply aquifer and the proposed lot sizes are less than 1.0 hectares, the risk of individual on-site septic systems will be assessed using nitrate-nitrogen contaminant loading, see Step 3.

6.2.3 Step 3 of 3 - Nitrate Dilution Calculations

The maximum allowable concentration of nitrate in the groundwater at the boundaries of a subject property is 10 mg/L as per the Ministry of the Environment and Climate Change's guideline D-5-4, dated August 1996. The nitrate concentration at the boundaries was calculated using the information in Table 6.1.

Table 6.1 – Nitrate Dilution Assumptions

Parameters	Site Descriptions
Site Area	411,360 m^2 (41.1 hectares)
Infiltration Area for 71 lots	275,960 m^2
Water Holding Capacity	75 mm *Sandy Loam (representative of fine sand, silty sand and silty-sand till encountered on-site)*
Annual Water Surplus(1)	Sandy Loam = 380 mm/year *Representative of fine sand, silty-sand till encountered on-site*
Topography Factor (TF)	0.20 *'Rolling lands' with slope between 2.8m to 3.8m/km considered to be representative of post-development topography.*
Soil Factor (SF)	0.4 *Open Sandy Loam*
Cover Factor (CF)	0.165 *Rural Lawns 0.15 (70%) and Woodland 0.2 (30%). Weighted average cover factor of 0.165.*
Site Average Infiltration Factor(2) (TF + SF + CF)	0.765

1. Annual water surplus based on Environment Canada Water Surplus Datasheets (Appendix E) for Ottawa International Airport (1939-2020) weather station.
2. Infiltration factors based on information provided in MOEE, 1995.

As presented in Table 6.1 above, assumptions for the nitrate dilution calculations include:

- Infiltration area of 270,488 m^2
  - Total site area of 411,3608 m^2 (based on Draft Plan provided by J.D. Barnes)
  - Removal of 98,000 m^2 for lands previously used in nitrate dilution assessment for Cedar Lakes Phases 1-2 (Paterson, 2011b).
  - Internal roadway area of 16,100 m^2 (7m wide x 2,300 m length)
  - House and driveway footprint of 300m^2 per lot (representative footprint of larger estate-style lots west of the Site).
- Stormwater management pond areas (two SWMPs located on southern end of the Site – refer to Appendix A) are included in the area available for infiltration. This assumption is based on unlined and naturalized stormwater management ponds. To note, the larger SWMP on the northern portion of the Site is on lands that have been removed from our calculations, as they have been used in previous dilution assessments for Cedar Lakes Phase 2 (Paterson, 2011b).
- Cover factor assumes post-development tree cover of 30% for the Site. The remaining post-development lands will consist of rural lawns (70&) which have a cover factor of 0.15.

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 D and summarized in Table 6.2 below.

Table 6.2 – Nitrate Dilution Calculations

Parameters	Site Descriptions
Number of Lots	71
Annual Nitrate Loading	1,036,600 grams/year *(71 lots x 40 grams/lot/day *365 days/year)*
Annual Dilution Volume	106,137 m^3/year *[(surplus 0.380 m/year * infiltration factor 0.765 * infiltration area 270,488 m^{2-})+ (septic flows of 1 m^3/lot/day * 71 lots * 365 days/year)*
Nitrate Concentration at Property Boundary	9.77 mg/L

Based on the above information, the nitrate concentration at the site boundary was calculated to be 9.77 mg/L (refer to the calculation in Appendix E). The nitrate impact assessment meets the acceptable nitrate impact requirement of 10 mg/L established by the MECP.

6.2.4 Background Overburden Nitrate Concentrations

Groundwater samples were collected from three on-site monitoring wells completed in the overburden. Groundwater samples were submitted to an accredited laboratory for analysis of nitrate and nitrite. The results are summarized in Table 6.3. The Laboratory Certificates of Analyses are provided in Appendix D.

Table 6.3 – Overburden Nitrate Sampling

Monitoring Well ID	Monitoring Well Depth (m)	Sampling Date	Nitrate (mg/L)	Nitrite (mg/L)
MW23-1	5.4	Sep 25/23	3.4	<0.05
		Oct 27/23	2.6	0.09
MW23-2	5.9	Sep 25/23	<0.10	<0.05
		Oct 27/23	<0.10	<0.05
MW23-3	5.9	Sep 25/23	<0.10	<0.05
		Oct 27/23	<0.10	<0.05

Nitrate concentrations were detected in MW23-1 at concentrations of 3.4 and 2.6 mg/L. Previous site investigations (Paterson 2011a, 2011b) also reported detectable nitrate concentrations in the eastern portion of Cedar Lakes Phase 2 at concentrations of up to 4.12 mg/L, which were attributed to septic systems and nitrification of peat layers combined with poor drainage. After the peat layers were removed and drainage improved, Paterson (2011b) reported significant decreases in nitrate concentrations to less than 0.53 mg/L (based on three samples from MW6, TP6 and TP7).

The on-site test wells (TW A, TW C, TW D, and TW E) all reported non-detectable (<0.10 mg/L) nitrate concentrations and the nitrate appears to be limited to the northeastern portion of the Site, outside of residential lots proposed for development. Samples of test well TW B, which is completed in the bedrock and located in Cedar Lakes Phase 2 (City of Ottawa sentinel monitoring well) contained nitrate concentrations of 1.8 and 1.6 mg/L during the November 2, 2023 pumping test. As per the City of Ottawa Hydrogeological Guidelines (March 2021), additional assessment of the potential sources and seasonality of nitrate is recommended.

7.0 CONCLUSIONS

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

- The site is not considered to be hydrogeologically sensitive based on the absence of significant areas of thin soils, highly permeable soils, or karst features.
- The water supply aquifer encountered at the site includes limestone of the Oxford and/or March Formations as well as sandstones of the Nepean Formation.
    - The testing depth of on-site test wells ranges from 42 to 61 metres below ground surface.
- Water quality testing indicates that the water quality meets the ODWQS maximum acceptable concentrations and maximum concentrations considered to be reasonably treatable. Groundwater treatment for aesthetic and operational guideline parameters will be required.
    - Variability in groundwater quality was encountered in the five on-site test wells and aesthetic exceedances and treatment options may vary (all exceedances and treatment options discussed below).
    - To note, at the end of the six-hour pumping tests total coliform exceeded the ODWQS in TW C and E; the total coliform is attributed to insufficient well chlorination and follow up water quality sampling is recommended to confirm acceptable bacteriological concentrations. Low levels of total coliforms are not uncommon in newly constructed wells and no private wells sampled reported any bacteriological exceedances.
    - The levels of hardness, iron and manganese are considered to be reasonably treatable using a conventional water softener and/or manganese greensand filters.
    - Total Dissolved Solids levels are in excess of 500 mg/L in two of the five test wells, but are considered “fair”, according to the “Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Total Dissolved Solids (TDS)”, published by Health Canada (1991), and are well below levels of 1,200 mg/L, above which the palatability of drinking water is considered ‘unacceptable’. LSI values indicate the water is considered is slightly scale forming and corrosive .
- The water quality from Cedar Lakes Phase 1 and 2 and private domestic wells sampled west of the site are similar to the water quality found in the proposed subdivision. No significant impacts have been identified from the available background reports and water quality sampling.
- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.
- Interference between drinking water wells is expected to be minimal under typical usage for residential developments.

- Well interference modelling indicates well interference of up to 4 metres between on-site water supply wells and Cedar Lakes Phase 1-2 wells (10% of available drawdown) and less than 1.8 metres at shallower private wells located west of the site.
- Negligible well interference (<0.3 metres) observed during test well pumping tests and long-term test well water level monitoring.

- No negative impacts to the bedrock aquifer are anticipated from the use of on-site septic systems based on nitrate dilution calculations which demonstrate that offsite nitrate impacts are less than 10 mg/L.
  - The development can support up to 71 lots with a calculated nitrate concentration of 9.77 mg/L at the Site boundary.
  - The nitrate dilution calculations assume the stormwater management ponds are unlined and naturalized, a tree planting covenant will be implemented for the proposed development requiring a minimum 30% tree cover and house / driveway footprints of 300 m^2.
- No negative impacts to the bedrock aquifer are anticipated from on-site stormwater management ponds constructed in accordance with MECP requirements.
- The proposed site is suitable for the development, pending further evaluation to confirm the assumptions made herein and provide appropriate well construction recommendations for future lot owners.
  - Seasonal sampling for nitrates in select monitoring and test wells is recommended to determine seasonality and potential sources in nitrates in the receiving aquifer.
  - Due to the large range of chloride concentrations encountered as part of this investigation, further evaluation of the groundwater chemistry is recommended to determine if the water quality is representative of long-term water.
- Based on the results of this hydrogeological investigation and terrain analysis, in GEMTEC's professional opinion the proposed 71-lot residential development is suitable for development, subject to confirmation of the assumptions made herein. Specifically, the following is to be confirmed / carried out:

1) Evaluation of chloride concentrations in the proposed water supply aquifer, to demonstrate compliance with the Ontario Drinking Water Quality Standards aesthetic objective and groundwater quality expected in the long-term,

2) Bacteriological sampling of test wells to confirm the low levels of total coliform are attributed to insufficient well chlorination and well development; and,

3) Seasonal nitrate sampling in select overburden and bedrock test wells to allow for assessment of potential nitrate sources, which appear to be limited to the northeastern portion of the Site where development is not proposed. A phased development

approach (western portion developed first) would allow for seasonal sampling to be completed prior to development of the eastern portion of the Site.

8.0 RECOMMENDATIONS

The following provides recommendations regarding well construction specifications, water quality and septic systems:

8.1 Well Construction Recommendations

- All wells that are drilled in the subdivision should be constructed in accordance with local and MECP regulations, including, but not limited to, Ontario Reg. 903.
- Well casings should be extended at least 40 metres (131 feet) below ground surface. The entire annular space between the steel casing and the overburden/ bedrock should be filled with a suitable cement or bentonite grout.
- A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.
- It should be noted that the water bearing fractures in the limestone and sandstone bedrock were encountered at depths ranging from 47.5 to 59.7 metres below ground surface in test wells TW A to TW E, inclusive. Water quality below 59.7 metres has not been tested.
- Drinking water wells should be located so that they meet and preferably exceed the minimum setback distances from septic systems, property lines and any other sources of contamination, as required in the Ontario Building Code and/or Ontario Reg. 903. In addition, the well should be situated in a location that allows for future site access for cleaning, treatment, repair, testing or maintenance. Information regarding well access should be included in the subdivision agreement and/or purchase agreement.
    - A minimum 3.5 metre side yard setback is recommended to accommodate accessibility for well service rigs.
    - A minimum of 18 metres separation from water wells and septic systems and 15 metres from wells and on-site stormwater management ponds is recommended.
- To reduce the potential for insufficient setbacks between lots, drinking water wells should be in rear yards and septic systems in the front yards, consistent with Cedar Lakes Phase 1 and 2.
- It is recommended that newly drilled water wells be developed by the well driller for a minimum of one hour of pumping following completion of the well drilling. This well development can be carried in conjunction with the one-hour pumping test that is required for the MECP Water Well Record.
- It is recommended that newly drilled water wells be chlorinated by the well driller following completion of the well drilling and pumping.

- It should be noted that this study does not address the construction of earth energy systems, which may require approval from the MECP.

8.2 Well Ownership Recommendations

- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change document "Water Supply Wells - Requirements and Best Management Practices, Revised April 2015".
- For all newly drilled wells it is recommended that a raw water sample be collected and analyzed for potability requirements (E. Coli. and total coliform bacteria).
    - If any bacteriological exceedances of the Ontario Drinking Water Quality Standards (ODWQS) are noted in the sampling, then it is recommended that the homeowner take remedial actions (such as chlorination of the well to eliminate bacteria) and retest a raw water sample to confirm that the remedial actions were effective.
- It is recommended that homeowners be informed that some wells may exhibit elevated aesthetic parameters (hardness, iron, total dissolved solids, and organic nitrogen) and incrustation, taste, odour, and colour can be expected.
    - Organic nitrogen compounds frequently contain amine groups which can react with chlorine and severely reduce its disinfectant power.
- It is recommended that homeowners be informed that hardness levels may exceed the ODWQS operational guideline for hardness. Conventional water softeners may be desired by homeowners to treat minor aesthetic objective and operational guideline exceedances of the ODWS such as hardness. On heating, hard water has a tendency to form scale deposits and can form excessive scum with regular soaps. Conversely, soft water may result in accelerated corrosion of water pipes.
- It is recommended that homeowners and the Local Medical Officer of Health be informed that sodium concentrations exceed 20 mg/L and exceed the warning level for persons on sodium restricted diets.
- It is recommended that homeowners be informed that water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water which may be of concern to persons on a sodium restricted diet. The use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes.

8.3 Site Phasing and Performance Reviews

- Performance reviews should be conducted in accordance with MECP Procedure D-5-5 Private Wells: Water Supply Assessment, section 4.7 Phased Developments;
- The results of the proposed performance evaluation would be reported prior to the registration of the subsequent phases. The report would include the MECP Water Well Records for the private wells sampled and a site plan showing the sampled well locations as well as any other wells drilled in the subdivision.
- In accordance with the MECP guideline D-5-5, the recommendations and requirements provided in the hydrogeological report and terrain evaluation will be assessed and updated, if required, based on the findings of the investigations for the performance reports and/or a change in the surrounding land use.

8.4 Septic System Construction Recommendations

- To reduce the potential for insufficient setbacks between lots, septic systems should be in front yards of each lot.
- The proposed lots will be serviced by conventional septic sewage disposal systems designed according to the Ontario Building Code. A site-specific investigation should be conducted on each lot for the design of the septic system;
    - Due to the presence of shallow groundwater, septic beds will likely be partially or fully raised.
- Tertiary septic systems could be considered for the proposed development and/or individual property owners. Any tertiary systems should be designed according to the Ontario Building Code. A site-specific investigation should be conducted on each lot for the design of the septic system.
    - It is recommended that if property owners choose to install tertiary treatment septic systems, then it will be required to enter a maintenance agreement with authorized agents of the system manufacturer for the service life of the system.

8.5 Septic Ownership Recommendations

- 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 owner shall consult the following guides available at: https://www.oowa.org/homeowner-resources/ .

9.0 CLOSURE

We trust that this report is sufficient for your requirements. If you have any questions concerning this information or if we can be of further assistance to you on this project, please call.

Samuel Esenwa, G.I.T.
Environmental Scientist

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

SE / DC / AP

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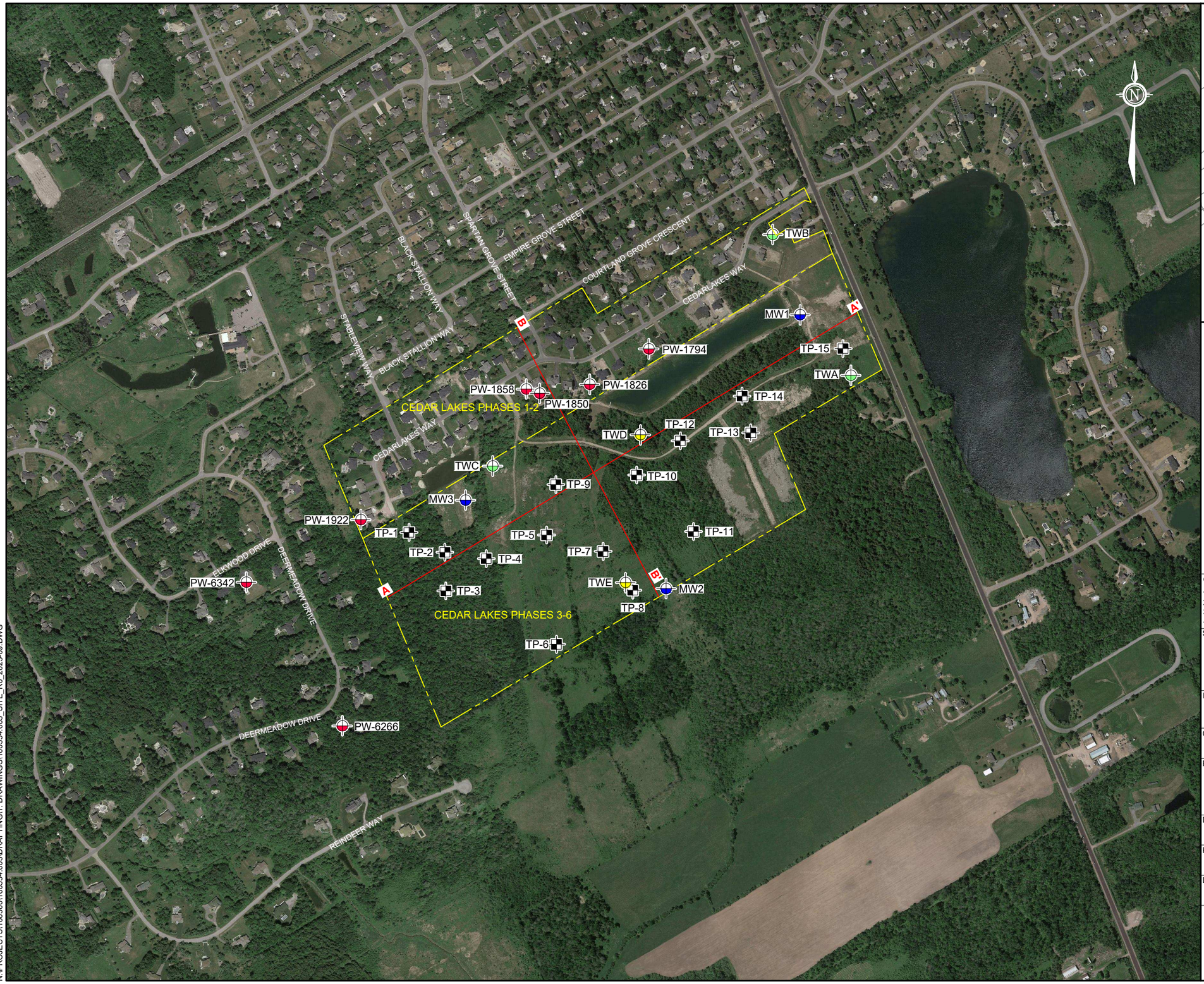

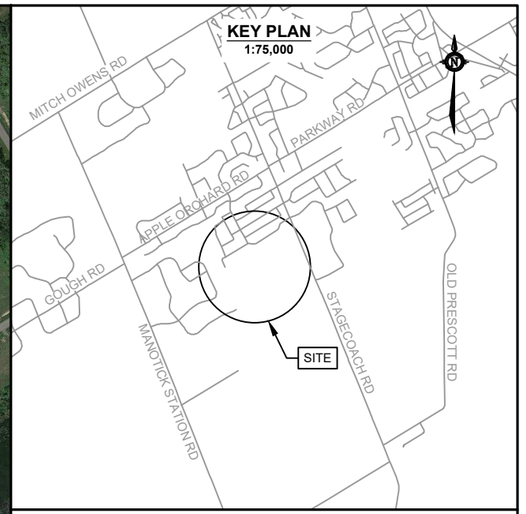

LEGEND

- TP/MW/TW/PW # ← TEST PIT/ MONITORING WELL/ TEST WELL/ PRIVATE WELL ID
- TEST PITS, PREVIOUS INVESTIGATION (Paterson, 2011)
- PROPOSED MONITORING WELL LOCATION
- NEW TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- PRIVATE WELL SAMPLE LOCATION
- PROPERTY BOUNDARY
- A — A' CROSS SECTION LOCATION

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE 1:7500

0 150 300 450m

DRAWING: DETAILED SITE PLAN

CLIENT: ARK ENGINEERING AND DEVELOPMENT

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

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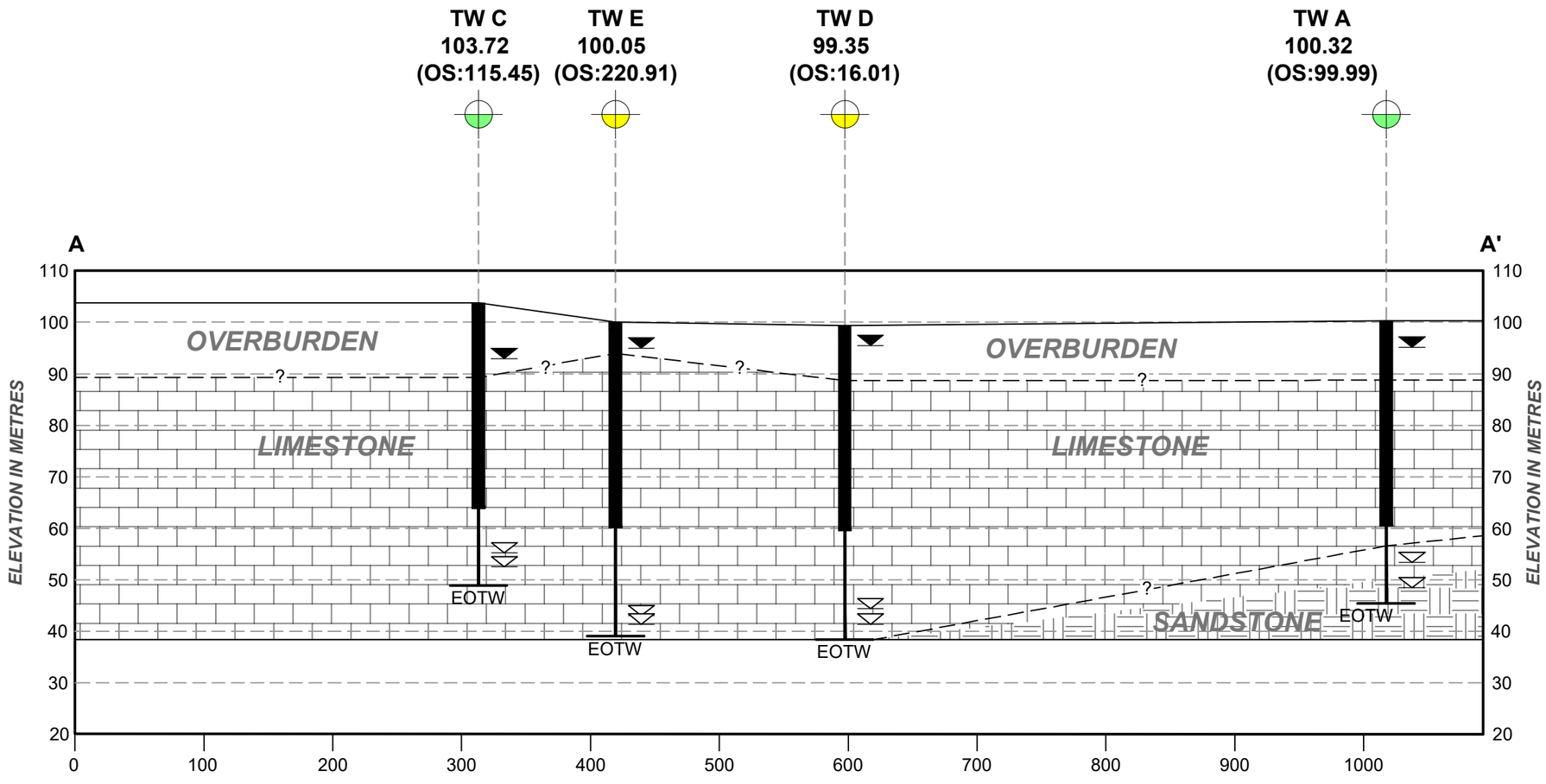
CROSS SECTION A - A'

HORIZTONAL 1:1000
VERTICAL 1:4000



LEGEND

- TW # — TEST WELL ID
- ##.## — GROUND SURFACE ELEVATION (M ASL)
- (OS:##.##) — OFFSET DISTANCE FROM CROSS SECTION LINE
- NEW PROPOSED TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- STATIC WATER LEVEL
- WATER FOUND ELEVATION
- LIMESTONE
- SANDSTONE
- INFERRED GROUND SURFACE
- INFERRED CONTACT

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.
5. M ASL: Metres above sea level
6. EOTW: End of Test Well

HORIZONTAL SCALE
1:4000
0 80 160 240m

VERTICAL SCALE
1:1000
0 20 40 60m

DRAWING
CROSS SECTION A-A'

CLIENT
ARK ENGINEERING AND DEVELOPMENT

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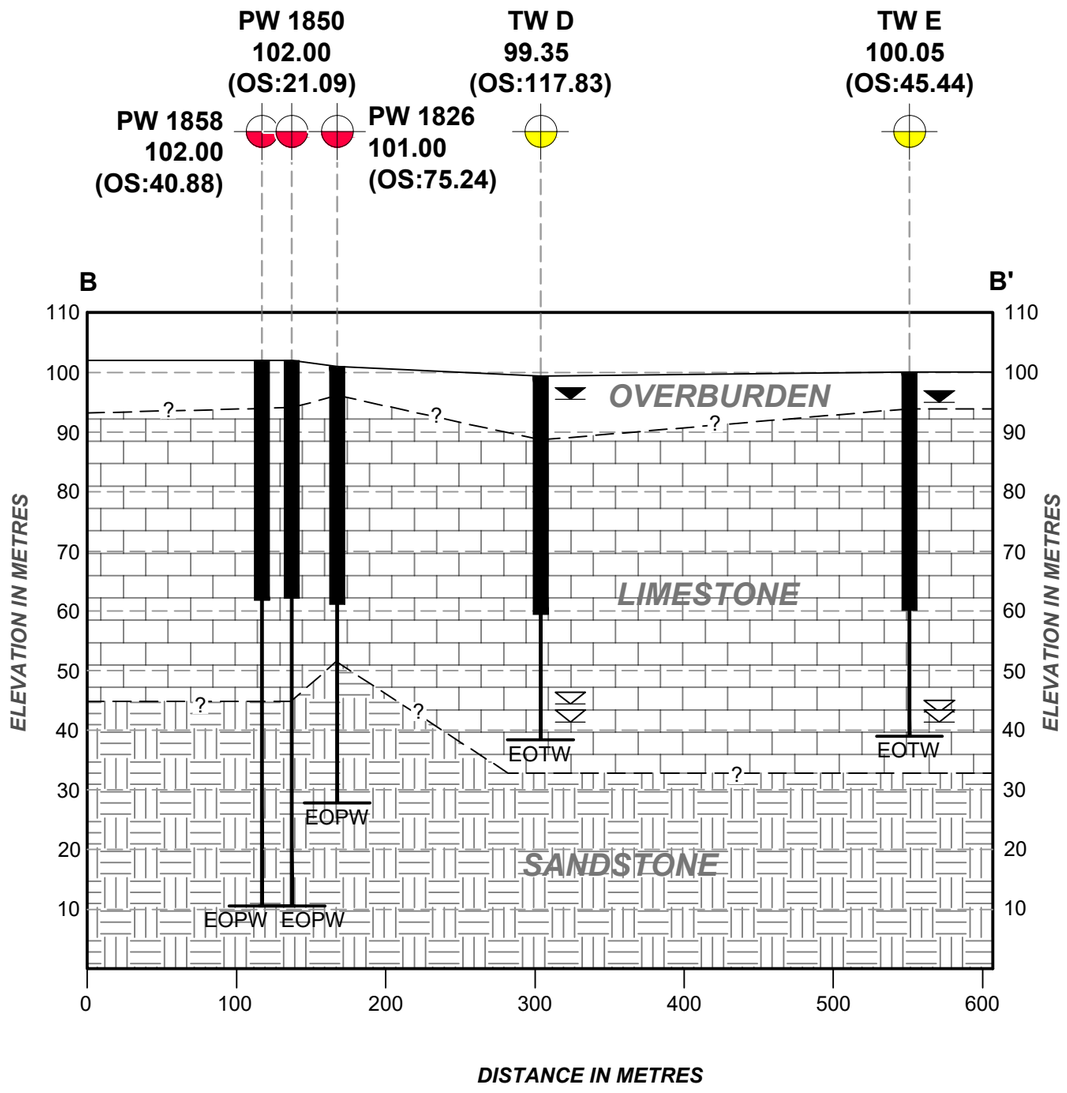
CROSS SECTION B - B'

HORIZTONAL 1:1000
VERTICAL 1:4000



LEGEND

- TW # — TEST WELL ID
- ##.## — GROUND SURFACE ELEVATION (M ASL)
- (OS:##.##) — OFFSET DISTANCE FROM CROSS SECTION LINE
- NEW TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- PRIVATE WELL SAMPLE LOCATION
- STATIC WATER LEVEL
- WATER FOUND ELEVATION
- LIMESTONE
- SANDSTONE
- INFERRED GROUND SURFACE
- INFERRED CONTACT

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.
5. M ASL: Metres above sea level
6. EOTW: End of Test Well
7. EOPW: End of Private Well
8. Private Well elevation data sourced from Google Earth.

HORIZONTAL SCALE
1:4000
0 80 160 240m

VERTICAL SCALE
1:1000
0 20 40 60m

DRAWING
CROSS SECTION B-B'

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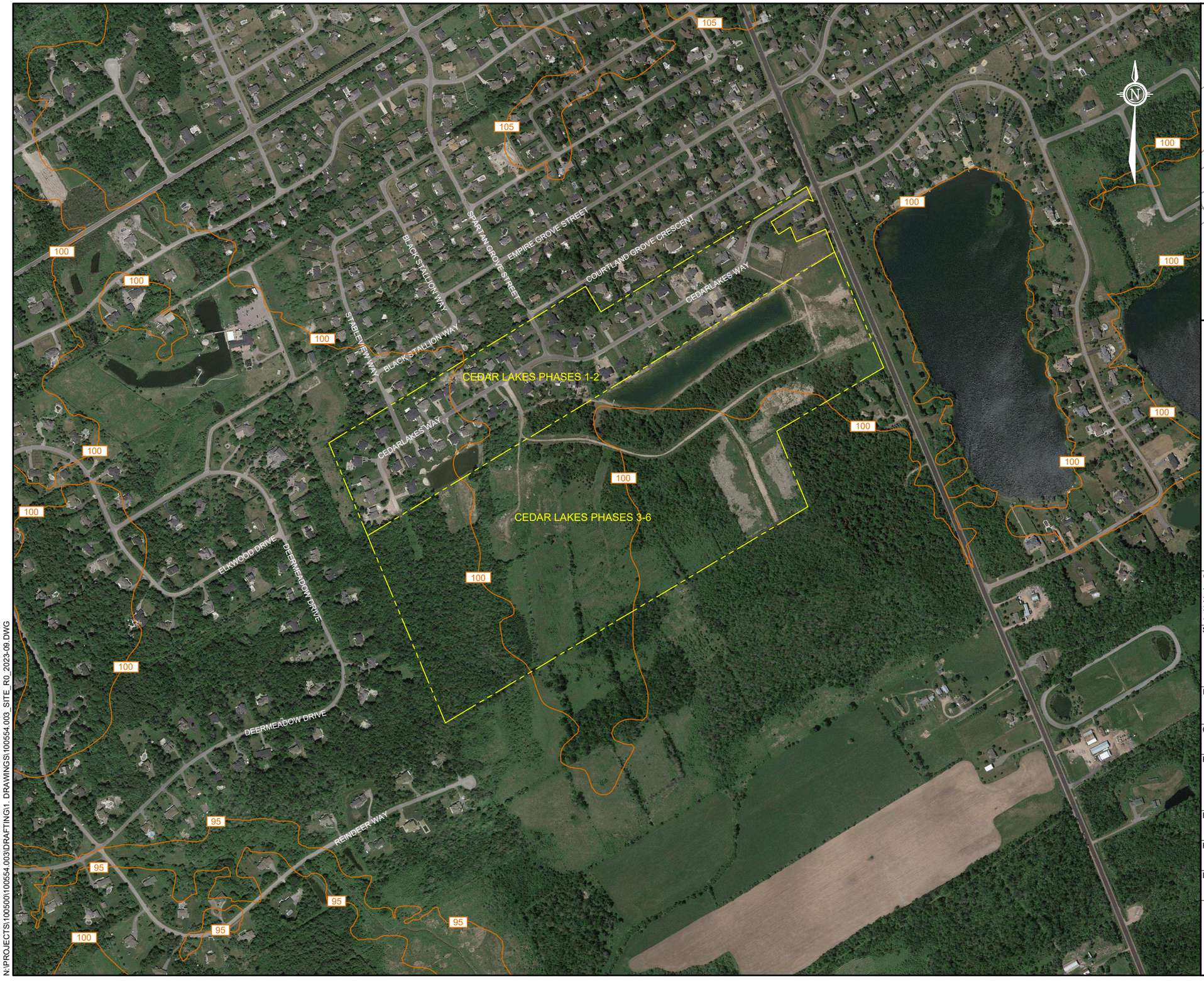

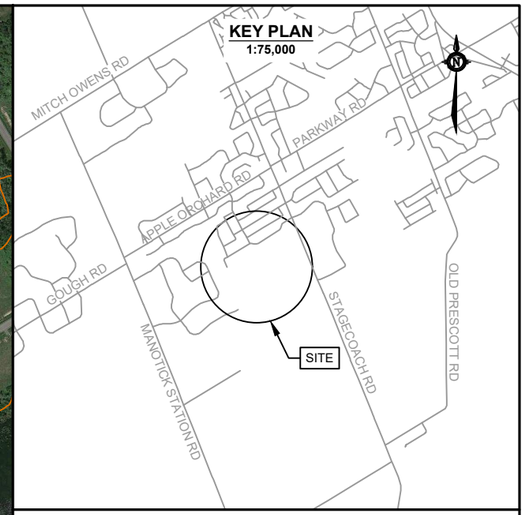

LEGEND

- PROPERTY BOUNDARY
- 100 GROUND SURFACE ELEVATION, METRES

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SCALE 1:7500

0 150 300 450m

DRAWING
TOPOGRAPHY AND DRAINAGE

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PROPOSED RESIDENTIAL SUBDIVISION
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OTTAWA, ONTARIO

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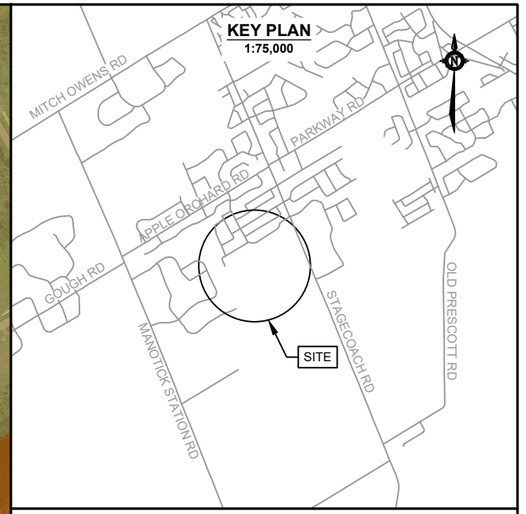

LEGEND

- PROPERTY BOUNDARY
- **5b** TILL
- **7** GLACIOFLUVIAL DEPOSITS
- **11b** COARSE-TEXTURED GLACIOMARINE DEPOSITS
- **11c** COARSE-TEXTURED GLACIOMARINE DEPOSITS
- **20** ORGANIC DEPOSITS

GENERAL NOTE(S)

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SCALE

1:7500

0 150 300 450m

DRAWING
ONTARIO GEOLOGIC SURVEY
SURFICIAL GEOLOGY

CLIENT
ARK ENGINEERING AND DEVELOPMENT

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

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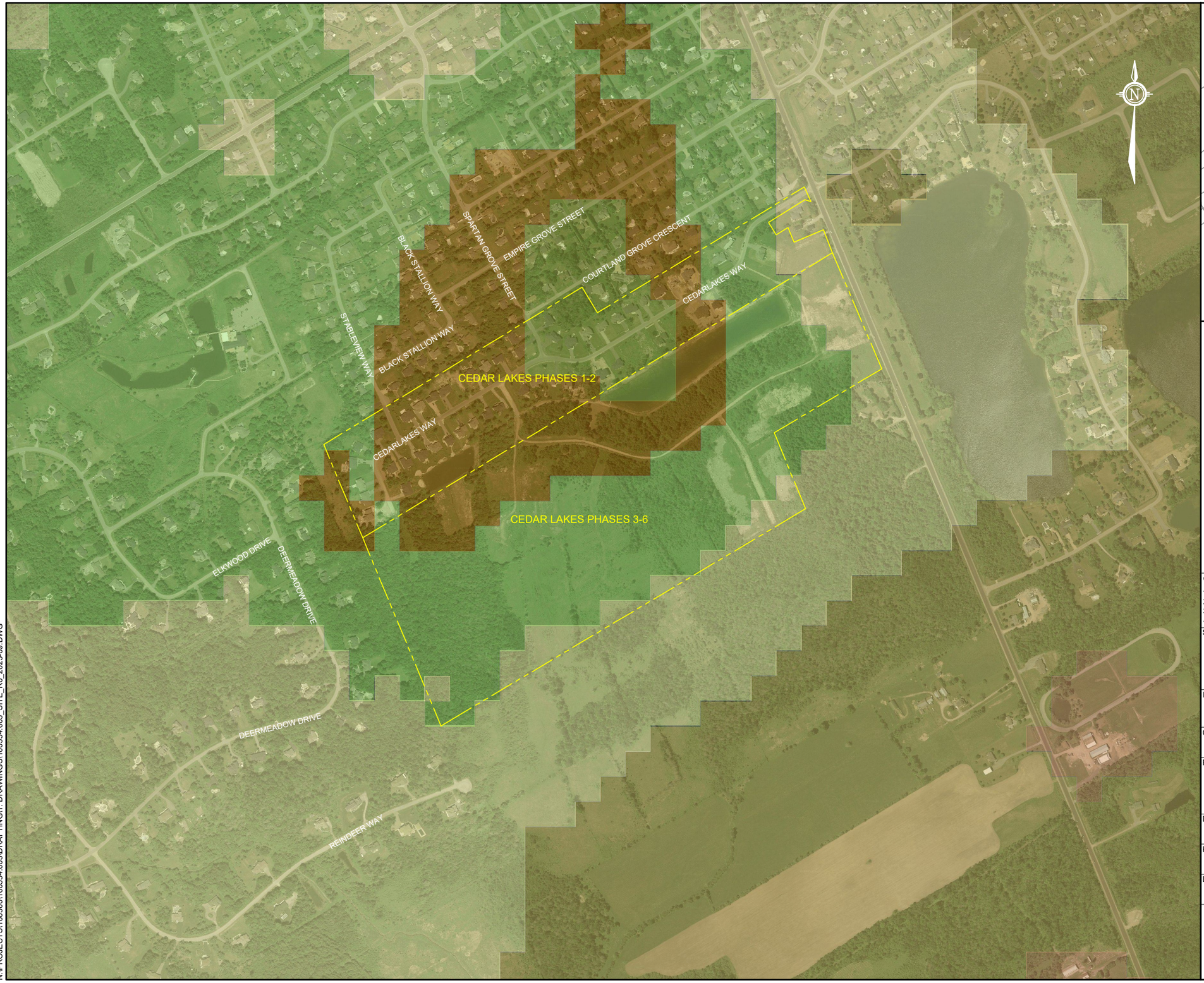

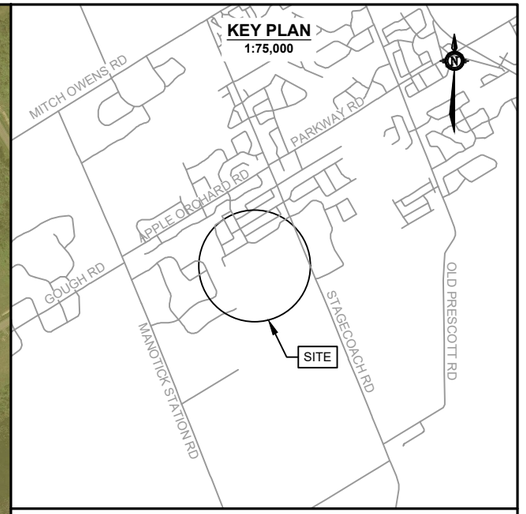

LEGEND

PROPERTY BOUNDARY

OVERBURDEN DRIFT THICKNESS, METRES

- 1 - 2
- 2 - 3
- 3 - 5
- 5 - 10
- 10 - 15
- 15 - 25

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SCALE

1:7500

0 150 300 450m

DRAWING: ONTARIO GEOLOGIC SURVEY OVERBURDEN THICKNESS MAP

CLIENT: ARK ENGINEERING AND DEVELOPMENT

PROJECT: PROPOSED RESIDENTIAL SUBDIVISION
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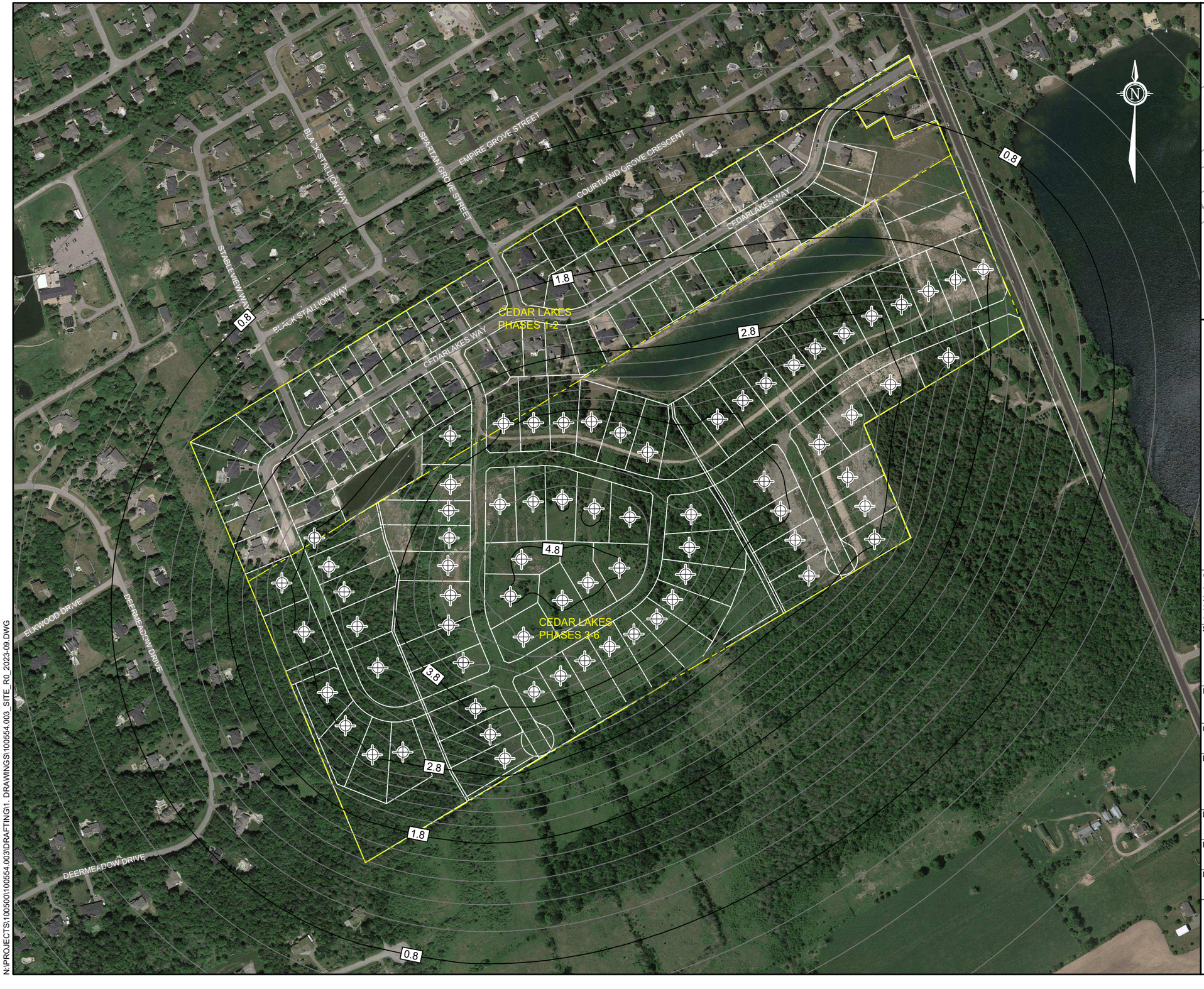

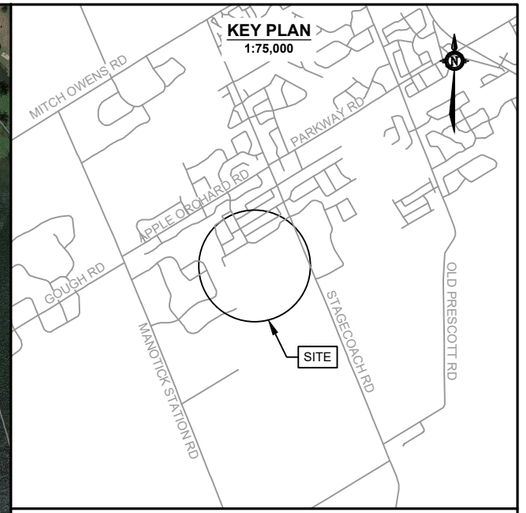

LEGEND

- PROPERTY BOUNDARY
- MINOR WATER TABLE DRAWDOWN CONTOUR, METRES
- 100 MAJOR WATER TABLE DRAWDOWN CONTOUR, METRES
- 71 WELLS IN SIMULATION

GENERAL NOTE(S)

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4. Geographic dataset source: Ontario GeoHub.

SCALE 1:5000

0 100 200 300m

DRAWING: WELL INTERFERENCES SIMULATION

CLIENT: ARK ENGINEERING AND DEVELOPMENT

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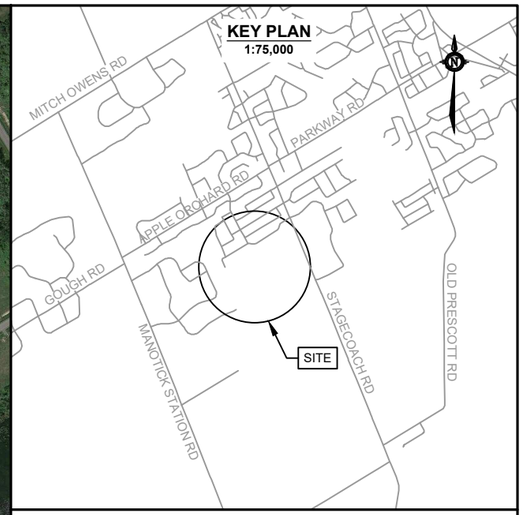

LEGEND

- TP/MW/TW/PW # ← TEST PIT/ MONITORING WELL/ TEST WELL/ PRIVATE WELL ID
- ####### ← MECP WELL ID
- TEST PITS, PREVIOUS INVESTIGATION (Paterson, 2011)
- PROPOSED MONITORING WELL LOCATION
- NEW TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- PRIVATE WELL SAMPLE LOCATION
- MECP WATER WELL RECORD

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies.
4. Geographic dataset source: Ontario GeoHub.
5. MECP Water Well Records in existing Cedar Lakes Phase 1-2 area only include records since 2011.

SCALE

1:7500

0 150 300 450m

DRAWING

MECP WELL SEARCH

CLIENT

ARK ENGINEERING AND DEVELOPMENT

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

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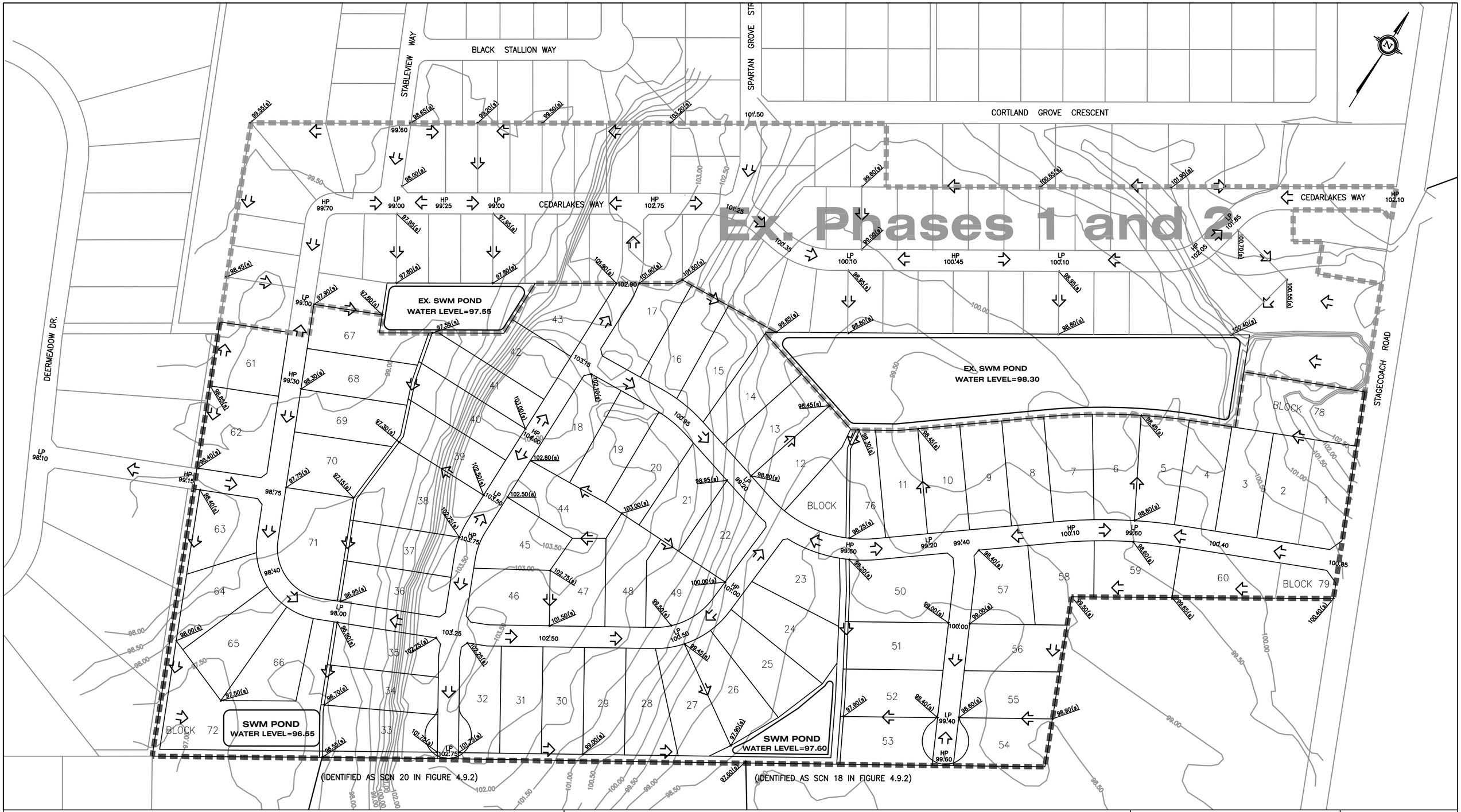
APPENDIX A

Storm Drainage and Macro Grading Plan
(ARK Engineering and Development)



LEGEND:

- RUNOFF FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- 97.55(s) PROPOSED SWALE AND DITCH ELEVATIONS
- 98.55 PROPOSED CENTER LINE OF ROAD ELEVATIONS

STORM DRAINAGE AND MACRO GRADING PLAN
CEDAR LAKES - PHASES 3 to 4

CITY OF OTTAWA - Formerly TOWNSHIP OF OSGOODE

Completed By:
ARK ENGINEERING AND DEVELOPMENT

Scale: NTS

Date: DEC 2023

Drawing No.: SK-2

APPENDIX B

Background MECP Water Well Records

MECP WELL RECORD SEARCH (CEDAR LAKES PHASE 1 and 2)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Recommended Pumping Rate (L/min)	Stratigraphic Layers (ft)
7206677	OSGOODE TOWNSHIP CON 03 007	7/15/2013	DO	84.7	7.01	42.4	5.6	UT 0268 UT 0271	75.71	SAND CLAY BLDR 0023 GREY LMSN 0250 GREY SNDS 0268 GREY SNDS 0271 GREY SNDS 0278
7206688	OSGOODE TOWNSHIP CON 03 007	7/5/2013	DO	61.0	3.96	39.9	6.0	UT 0188 UT 0193	56.78	SAND GRVL BLDR 0013 GREY LMSN 0178 GREY SNDS 0188 GREY SNDS 0193 WHIT SNDS 0200
7206697	OSGOODE TOWNSHIP CON 03 007	6/12/2013	DO	87.2	9.45	39.9	5.6	UT 0183 UT 0280	75.71	SAND 0015 SAND GRVL BLDR 0031 GREY LMSN 0118 GREY LMSN SNDS 0183 GREY LMSN SNDS 0225 WHIT SNDS 0280 WHIT SNDS 0286
7209277	OSGOODE TOWNSHIP CON 03 007	8/26/2013	DO	61.0	4.27	40.5	7.1	UT 0182 UT 0194	75.71	SAND GRVL BLDR 0014 GREY LMSN 0182 GREY LMSN 0194 GREY LMSN 0200
7209287	OSGOODE TOWNSHIP CON 03 007	7/30/2013	DO	85.3	10.97	39.9	5.5	UT 0254 UT 0272	75.71	SAND BLDR GRVL 0036 GREY LMSN 0185 WHIT SNDS 0254 WHIT SNDS 0272 WHIT SNDS 0280
7209290	OSGOODE TOWNSHIP CON 03 007	8/9/2013	DO	74.4	6.40	39.9	7.7	UT 0231 UT 0238	75.71	SAND BLDR 0021 GREY LMSN 0207 GREY LMSN SNDS 0232 WHIT SNDS 0238 WHIT SNDS 0244
7213072	OSGOODE TOWNSHIP CON 03 007	10/23/2013	DO	61.0	6.10	40.2	4.5	UT 0183 UT 0192	64.35	SAND GRVL BLDR 0017 GREY LMSN 0138 GREY LMSN SAND 0183 GREY LMSN SNDS 0192 GREY LMSN SNDS 0200
7213072	OSGOODE TOWNSHIP CON 03 007	11/7/2013	DO	61.0	5.18	40.2	4.6	UT 0183 UT 0192	75.71	SAND GRVL BLDR 0017 GREY LMSN 0138 GREY LMSN SAND 0183 GREY LMSN SNDS 0192 GREY LMSN SNDS 0200
7218731	OSGOODE TOWNSHIP	4/1/2014	DO	83.8	11.89	39.9	4.0	UT 0190 UT 0270	26.50	BRWN LOAM STNS 0010 GREY SAND BLDR LOOS 0024 GREY TILL BLDR PCKD 0038 GREY LMSN SNDS HARD 0275
7222301	OSGOODE TOWNSHIP CON 03 007	4/24/2014	DO	79.2	8.84	39.9	5.5	UT UT 0054	75.71	SAND CLAY BLDR 0029 GREY LMSN 0180 GREY SNDS 0181 GREY SNDS 0220 WHIT SNDS 0254 WHIT SNDS 0260
7222309	OSGOODE TOWNSHIP CON 03 007	5/28/2014	DO	67.1	5.49	40.2	4.7	UT 0150 UT 0214	75.71	SAND GRVL CLAY 0018 GREY LMSN 0150 GREY LMSN 0214 GREY LMSN 0220
7222318	OSGOODE TOWNSHIP CON 03 007	5/6/2014	DO	67.1	8.84	42.4	4.5	UT 0173 UT 0211	75.71	SAND GRVL BLDR 0029 GREY LMSN 0160 WHIT SNDS 0173 WHIT SNDS 0211 WHIT SNDS 0220
7222321	OSGOODE TOWNSHIP CON 03 007	5/20/2014	DO	61.0	8.53	39.9	4.9	UT 0158 UT 0172 UT 0194	75.71	SAND 0022 GRVL BLDR 0028 GREY LMSN 0140 GREY SNDS LMSN 0158 GREY SNDS LMSN 0172 GREY SNDS LMSN 0194 GREY SNDS LMSN 0200
7222329	OSGOODE TOWNSHIP CON 03 007	5/22/2014	DO	73.8	5.18	40.5	7.2	UT 0233	75.71	SAND BLDR 0017 GREY LMSN 0197 WHIT SNDS 0233 WHIT SNDS 0242
7222332	OSGOODE TOWNSHIP CON 03 007	5/23/2014	DO	91.4	7.92	39.9	4.9	UT 0188 UT 0255 UT 0293	75.71	BLDR SAND CLAY 0026 GREY LMSN 0188 GREY LMSN 0190 BRWN SNDS 0255 BRWN SNDS 0260 BRWN SNDS LMSN 0293 BRWN SNDS LMSN 0300
7222334	OSGOODE TOWNSHIP CON 03 007	6/2/2014	DO	73.2	8.53	40.2	8.1	UT 0221 UT 0233	75.71	SAND 0020 GRVL BLDR 0028 GREY LMSN 0169 WHIT SNDS 0221 WHIT SNDS 0233 WHIT SNDS 0240
7226477	OSGOODE TOWNSHIP CON 03 007	5/26/2014	DO	97.5	13.11	39.9	7.8	UT 0288 UT 0299	75.71	SAND GRVL BLDR 0043 GREY LMSN 0201 GREY SNDS 0288 GREY SNDS 0299 GREY SNDS 0320
7226505	OSGOODE TOWNSHIP CON 03 007	7/31/2014	DO	91.4	8.84	40.2	5.9	UT 0180 UT 0248 UT 0294	75.71	SAND CLAY 0011 GRVL BLDR 0029 GREY LMSN 0180 GREY LMSN 0190 GREY SNDS 0248 GREY SNDS 0294 GREY SNDS 0300
7228012	OSGOODE TOWNSHIP CON 03 007	8/27/2014	DO	73.2	10.97	42.7	5.3	UT 0230	75.71	PEAT 0004 GREY SAND GRVL BLDR 0036 GREY LMSN 0180 GREY SNDS LMSN 0230 GREY SNDS LMSN 0240
7230309	OSGOODE TOWNSHIP CON 03 007	9/2/2014	DO	73.2	6.40	39.9	3.6	UT 0232	75.71	SAND GRVL BLDR 0021 GREY LMSN 0119 GREY SNDS LMSN 0232 GREY SNDS LMSN 0240
7230311	OSGOODE TOWNSHIP CON 03 007	9/4/2014	DO	67.1	7.62	40.2	5.2	UT 0213	75.71	SAND GRVL BLDR 0025 GREY LMSN 0125 GREY LMSN SNDS 0150 GREY SNDS 0213 GREY SNDS 0220
7230313	OSGOODE TOWNSHIP CON 03 007	11/13/2014	DO	86.9	9.75	39.9	8.0	UT 0266 UT 0279	75.71	SAND GRVL BLDR 0032 GREY LMSN 0180 GREY SNDS 0266 GREY SNDS 0279 GREY SNDS 0285
7233596	OSGOODE TOWNSHIP	5/1/2015	DO	61.0	4.57	39.9	5.3	UT 0029 UT 0115 UT 0187	45.50	BRWN CLAY STNS PCKD 0008 BRWN SAND STNS LOOS 0015 GREY LMSN HARD 0142 GREY SNDS HARD 0200
7243023	OSGOODE TOWNSHIP CON 03 007	5/27/2015	DO	48.8	9.14	39.9	6.3	UT 0138 UT 0140 UT 0154	75.71	SAND BLDR GRVL 0030 GREY LMSN 0138 GREY LMSN 0140 GREY LMSN 0154 GREY LMSN 0160
7244913	OSGOODE TOWNSHIP CON 03 007	7/7/2015	DO	61.0	5.18	39.9	11.4	UT 0194	75.71	SAND BLDR 0017 GREY LMSN 0140 GREY SNDS 0194 GREY SNDS 0200
7248797	OSGOODE TOWNSHIP CON 03 007	7/10/2015	DO	77.1	9.14	39.9	11.3	UT 0168 UT 0246	75.71	SAND GRVL BLDR 0030 GREY LMSN 0160 WHIT SNDS LMSN 0168 WHIT SNDS LMSN 0246 WHIT SNDS LMSN 0253
7248800	OSGOODE TOWNSHIP CON 03 007	9/9/2015	DO	76.2	8.84	39.9	4.4	UT 0240 UT 0244	75.71	SAND CLAY BLDR 0029 GREY LMSN 0101 GREY SNDS LMSN 0242 GREY SNDS LMSN 0250
7252286	OSGOODE TOWNSHIP CON 03 007	12/9/2015	DO	85.3	7.92	39.9	4.7	UT 0223 UT 0271	75.71	SAND GRVL BLDR 0026 GREY LMSN 0113 GREY SNDS 0223 GREY SNDS 0271 GREY SNDS 0280
7255463	OSGOODE TOWNSHIP CON 03 007	12/21/2015	DO	73.2	5.79	39.9	8.3	UT 0205 UT 0234	75.71	SAND GRVL BLDR 0019 GREY LMSN 0103 GREY SNDS 0205 GREY SNDS 0234 GREY SNDS 0240
7266070	OSGOODE TOWNSHIP	6/1/2016	DO	54.9	12.80	36.6	9.1	FR 0153 FR 0168	37.85	BRWN SAND 0008 BLUE SAND STNS GRVL 0042 GREY LMSN 0160 WHIT SNDS 0180
7268457	OSGOODE TOWNSHIP CON 03 007	6/2/2016	DO	67.4	4.57	39.9	9.2	UT 0212	75.71	SAND GRVL BLDR 0015 GREY LMSN 0110 GREY SNDS 0212 GREY SNDS 0221
7268458	OSGOODE TOWNSHIP CON 03 007	7/4/2016	DO	67.1	5.18	39.9	7.5	UT 0212 UT 0214	75.71	SAND GRVL BLDR 0017 GREY LMSN 0112 GREY SNDS LMSN 0125 GREY SNDS 0212 GREY SNDS 0214 GREY SNDS 0220
7268401	OSGOODE TOWNSHIP CON 03 007	5/30/2016	DO	75.9	9.75	40.2	9.5	UT 0140 UT 0241	75.71	SAND GRVL BLDR 0032 GREY LMSN 0104 GREY SNDS 0140 GREY SNDS 0241 GREY SNDS 0249
7268432	OSGOODE TOWNSHIP CON 03 007	8/11/2016	DO	62.5	11.28	39.9	11.8	UT 0199	75.71	SAND BLDR 0029 GRVL 0037 GREY LMSN 0116 GREY SNDS 0199 GREY SNDS 0205
7272964	OSGOODE TOWNSHIP CON 03 007	12/14/2016	DO	49.4	10.97	39.9	5.9	UT 0135 UT 0153	75.71	SAND GRVL BLDR 0036 GREY LMSN 0111 GREY SNDS LMSN 0135 GREY SNDS LMSN 0153 GREY SNDS LMSN 0162
7279820	OSGOODE TOWNSHIP CON 03 007	6/1/2017	DO	62.8	7.92	39.9	4.9	UT 0197 UT 0200	75.71	SAND BLDR 0023 GREY LMSN 0112 GREY SNDS 0197 GREY SNDS 0200 GREY SNDS 0206
7292119	OSGOODE TOWNSHIP CON 03 007	7/10/2017	DO	67.4	6.10	39.9	4.9	UT 0216	75.71	CLAY GRVL 0020 GREY LMSN 0101 GREY SNDS LMSN 0216 GREY SNDS LMSN 0221
7296288	OSGOODE TOWNSHIP CON 03 007	7/17/2017	DO	61.6	6.40	39.9	5.3	UT 0188 UT 0094	75.71	SAND GRVL 0012 CLAY 0016 GRVL 0021 GREY LMSN 0127 GREY SNDS 0202
7296291	OSGOODE TOWNSHIP CON 03 007	11/13/2017	DO	61.0	6.10	39.9	4.4	UT 0187 UT 0194	75.71	SAND GRVL 0020 GREY LMSN 0169 GREY SNDS 0200
7301334	OSGOODE TOWNSHIP CON 03 007	10/18/2017	DO	67.1	9.45	39.9	3.6	UT 0214	75.71	SAND GRVL 0031 GREY LMSN 0109 GREY SNDS 0220
7301341	OSGOODE TOWNSHIP CON 03 007	12/3/2017	DO	70.4	5.18	39.9	4.8	UT 0197 UT 0225	75.71	SAND GRVL 0017 GREY LMSN 0127 GREY SNDS 0231
7301368	OSGOODE TOWNSHIP CON 03 007	3/1/2018	DO	64.3	6.40	39.9	8.0	UT 0197 UT 0205	75.71	SAND GRVL 0021 GREY LMSN 0101 GREY SNDS 0211
7310006	OSGOODE TOWNSHIP CON 03 007	3/6/2018				39.9	4.8		56.78	
7310019	OSGOODE TOWNSHIP CON 03 007	7/5/2018	DO	61.0	6.10	39.9	9.5	UT 0190 UT 0192	75.71	SAND CLAY 0020 GREY LMSN 0117 GREY SNDS 0200
7318097	OSGOODE TOWNSHIP CON 03 007	7/3/2018	DO	67.1	5.18	39.9	9.0	UT 0210	75.71	SAND GRVL 0017 GREY LMSN 0147 GREY SNDS 0220
7321082	OSGOODE TOWNSHIP CON 03 007	8/23/2018	DO	58.5	5.79	39.9	7.5	UT 0186	75.71	GRVL SAND 0019 GREY LMSN 0083 GREY SNDS LMSN 0107 GREY SNDS 0192
7321156	OSGOODE TOWNSHIP CON 03 007	11/28/2018	DO	61.0	5.18	39.9	4.2	UT 0194	75.71	BLDR SAND 0017 GREY LMSN 0148 GREY SNDS 0200
7325694	OSGOODE TOWNSHIP CON 03 007	4/5/2019	DO	43.0	6.71	39.9	4.2	UT 0135	75.71	SAND GRVL BLDR 0022 GREY LMSN 0103 GREY SNDS LMSN 0135 GREY SNDS LMSN 0141
7336806	OSGOODE TOWNSHIP CON 03 007	10/3/2019	DO	73.5	5.79	39.9	6.5	UT 0173 UT 0231	75.71	SAND GRVL BLDR 0019 GREY LMSN 0116 GREY SNDS 0173 GREY SNDS 0233 GREY SNDS 0241
7346278	OSGOODE TOWNSHIP CON 03 007	7/24/2020	DO	64.6	7.92	39.9	12.2	UT 0206	75.71	SAND CLAY BLDR 0026 GREY LMSN 0124 WHIT LMSN 0206 GREY LMSN 0212
7367011	OSGOODE TOWNSHIP CON 03 007	11/11/2020	DO	59.1	9.75	39.9	12.2	UT 0188	75.71	SAND CLAY BLDR 0027 GRVL 0032 GREY LMSN 0112 GREY SNDS GREY LMSN 0194
7377719	OSGOODE TOWNSHIP CON 03 007	7/13/2021	DO	73.1	4.88	39.9	4.3	UT 0171 UT 0234	68.14	SAND BLDR 0016 GREY LMSN GREY SNDS 0177 GREY SNDS 0240

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

"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	Fresh
SA	Salty
SU	Sulphur
MN	Mineral
UK	Unknown
GS	Gas
IR	Iron

Other

NA

Parameter	10th Percentile	90th Percentile	Geometric Mean
Static Water Level (m)	4.2	10.8	6.2
Depth to Bedrock (m)	4.9	11.0	7.2
Total Well Depth (m)	58.6	86.6	68.4
Recommended Pump Rate (L/min)	59.1	75.7	71.3
Bearing Zone Depth (m)	43.3	82.5	59.5

GEMTEC
Consulting Engineers and Scientists

MECP WELL RECORD SEARCH (East and West)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Recommended Pumping Rate (L/min)	Stratigraphic Layers (ft)
WEST OF SITE (Figure 6)										
1533532	OSGOODE TOWNSHIP CON 04 009	12/18/2002	DO	48.8	12.2	15.8	12.2	UK 0114 UK 0151	45.4	SAND GRVL BLDR 0040 GREY LMSN 0160
7195941	OSGOODE TOWNSHIP CON 03 008	11/29/2012	DO	65.5	13.1	14.9	6.3	UT 0196 UT 0208	75.7	SAND GRVL 0021 SAND CLAY 0043 GREY LMSN 0142 GREY SNDS 0196 GREY SNDS 0208 GREY SNDS 0215
1529970	OSGOODE TOWNSHIP CON 03 008	4/13/1998	DO	14.3	13.4	13.4	4.9	FR 0045	45.4	BRWN SAND 0018 GREY SAND 0025 GREY CLAY QSND 0042 GREY SAND GRVL 0044 GREY LMSN ROCK 0047
1530643	OSGOODE TOWNSHIP CON 03 008	7/6/1999	DO	61.0	38.1	7.9	6.1	UK 0169	18.9	BRWN SAND 0008 GREY SAND 0014 GREY SAND GRVL BLDR 0125 GREY SNDS VERY HARD 0200
1530950	OSGOODE TOWNSHIP CON 03 008	10/25/1999	DO	61.0	6.1	7.9	6.7	UK 0030 UK 0191	18.9	BRWN LOAM STNS 0020 GREY LMSN 0095 GREY SNDS 0200
1530951	OSGOODE TOWNSHIP CON 03 008	10/26/1999	DO	22.9	4.6	7.0	1.5	UK 0035 UK 0062	18.9	BRWN SAND 0009 GREY SAND GRVL BLDR 0015 GREY LMSN 0075
1531517	OSGOODE TOWNSHIP CON 03 008	10/11/2000	DO	16.8	6.4	9.9	1.8	UK 0048	18.9	BRWN LOAM SNDY 0008 GREY SAND STNS 0021 GREY LMSN 0055
1531518	OSGOODE TOWNSHIP CON 03 008	10/11/2000	DO	14.6	4.6	8.1	1.8	UK 0042	18.9	BRWN SAND 0008 GREY SAND STNS 0015 GREY LMSN 0048
1532051	OSGOODE TOWNSHIP CON 03 008	6/19/2001	DO	78.6	9.8	10.7	6.7	UK 0250	18.9	BRWN SAND 0008 GREY SAND 0026 GREY SAND GRVL BLDR 0032 GREY LMSN 0130 GREY SNDS 0258
1532535	OSGOODE TOWNSHIP CON 03 008	11/20/2001	DO	14.6	4.9	7.9	2.1	UK 0037	18.9	BRWN SAND 0005 GREY SAND WBRG 0012 GREY CLAY STNS 0016 GREY LMSN 0048
1532536	OSGOODE TOWNSHIP CON 03 008	11/20/2001	DO	22.3	7.3	10.1	2.7	UK 0066	18.9	BRWN SAND STNS 0005 GREY SAND 0009 GREY SAND GRVL BLDR 0024 GREY LMSN 0073
1532703	OSGOODE TOWNSHIP CON 03 008	3/14/2002	DO	14.3	4.9	8.2	1.5	UK 0035	18.9	BRWN SAND 0007 GREY SAND 0012 GREY SAND GRVL BLDR 0016 GREY LMSN LYRD 0022 GREY LMSN HARD 0047
1533529	OSGOODE TOWNSHIP CON 03 008	11/26/2002	DO	25.6	6.1	9.4	3.4	UK 0060 UK 0073	83.3	SAND BLDR 0020 GREY LMSN 0084
1533781	OSGOODE TOWNSHIP CON 03 007	6/3/2003	DO	79.6	10.1	14.0	4.6	UK 0251	75.7	SAND GRVL 0033 GREY LMSN 0103 GREY SNDS 0261
7118473	OSGOODE TOWNSHIP CON 03 009	12/4/2008	DO	79.2	10.7	13.3	2.4	UT 0246	75.7	CLAY 0015 SAND 0025 GRVL 0035 GREY LMSN 0208 GREY LMSN SNDS 0260
7121811	OSGOODE TOWNSHIP CON 03 009	2/25/2009	DO	85.3	9.1	11.6	2.6	UT 0171 UT 0261 UT 0276	75.7	SAND GRVL BLDR 0030 GREY LMSN 0148 GREY SNDS LMSN 0280
7121812	OSGOODE TOWNSHIP CON 03 009	2/24/2009	DO	85.3	9.1	11.6	2.9	UT 0166 UT 0256 UT 0272	75.7	SAND GRVL BLDR 0030 GREY LMSN 0145 GREY SNDS LMSN 0280
7126823	OSGOODE TOWNSHIP 006	7/13/2009	DO	69.7	8.8	12.1	2.6	FR 0209	170.3	BLUE SAND SOFT 0006 GREY CLAY SAND SOFT 0029 GREY LMSN DLMT HARD 0229
7139849	OSGOODE TOWNSHIP CON 03 009	10/10/2009	DO	22.2	10.1	13.1	2.2	UT 0065	172.2	BRWN LOAM SNDY STNS 0012 GREY CLAY STNS 0033 GREY LMSN 0073
7156837	OSGOODE TOWNSHIP CON 03 009	11/10/2010	DO	42.6	9.7	12.8	3.2	UT 0131	132.5	BRWN CSND HARD 0011 GREY CSND HARD 0025 GREY GRVL STNS PCKD 0032 GREY SNDS LYRD 0140
EAST OF SITE (FIGURE 6)										
1514884	OSGOODE TOWNSHIP CON 04 007	6/26/1975	DO	16.8	12.5	13.1	0.9	FR 0054	18.9	GREY SAND 0008 GREY CLAY STNS 0041 GREY LMSN 0055
1521974	OSGOODE TOWNSHIP CON 04 008	8/6/1987	DO	60.0	18.6	19.2	2.4	FR 0180	37.9	BRWN SAND STNS 0009 GREY SAND GRVL BLDR 0061 GREY LMSN 0178 GREY SNDS ROCK FCRD 0197
1529955	OSGOODE TOWNSHIP CON 04 008	10/24/1997	DO	64.0	14.3	17.1	9.8	FR 0143 FR 0202 FR 0204	132.5	SAND GRVL BLDR 0047 GREY LMSN 0167 GREY SNDS 0210
1531681	OSGOODE TOWNSHIP CON 04 008	11/30/2000	DO	61.0	14.9	18.3	8.5	UK 0187	18.9	BRWN SAND BLDR 0014 GREY HPAN BLDR 0049 GREY LMSN HARD 0143 GREY SNDS HARD 0200
1531733	OSGOODE TOWNSHIP CON 04 010	1/9/2001	DO	18.0	-	16.8	3.7	UK 0055	37.9	BRWN SAND FILL 0018 GREY TILL GRVL SAND 0052 GREY GRVL SAND 0059
1531933	OSGOODE TOWNSHIP CON 04 009	5/29/2001	DO	38.1	16.5	19.5	5.2	UK 0116	18.9	BRWN SAND GRVL BLDR 0032 GREY HPAN BLDR 0054 GREY LMSN 0125
1533235	OSGOODE TOWNSHIP CON 08 013	10/9/2002	DO	42.7	16.5	19.5	7.3	FR 0130	75.7	BRWN SAND PCKD 0010 GREY GRVL SAND PCKD 0054 GREY LMSN ROCK FCRD 0060 GREY LMSN ROCK HARD 0140
1533532	OSGOODE TOWNSHIP CON 04 009	12/18/2002	DO	48.8	12.0	6.7	12.2	UK 0114 UK 0151	45.4	SAND GRVL BLDR 0040 GREY LMSN 0160
1533607	OSGOODE TOWNSHIP CON 04 007	2/27/2003	DO	25.3	-	6.7	7.3	FR 0078	-	BRWN TILL HARD 0008 GREY TILL HARD 0042 GREY LMSN LYRD 0083
1534632	OSGOODE TOWNSHIP CON 04 008	4/7/2004	AC	61.0	12.2	6.7	6	UK 0169 UK 0189	91.0	SAND GRVL 0040 GREY LMSN 0180 GREY SNDS 0200
1534633	NORTH GOWER TOWNSHIP CON 04 008	4/5/2004	DO	61.0	12.3	6.7		UK 0130 UK 0144	91.0	SAND GRVL 0040 GREY LMSN 0165 GREY SNDS 0200
1535992	OSGOODE TOWNSHIP 04 010	9/30/2005	DO	30.5	14.3	18.3	7.1	0082 0094	91.0	SAND BLDR 0047 GREY LMSN 0100
1536208	OSGOODE TOWNSHIP CON 04 007	11/11/2005	DO	57.9	13.7	16.4	5.9	0182	91.0	SAND GRVL BLDR 0045 GREY LMSN 0120 GREY SNDS 0190
7169519	OSGOODE TOWNSHIP CON 04 009	9/16/2011	DO	25.8	18.5	-	6.2	FR 0063	45.0	BRWN SAND BLDR LOOS 0025 GREY GRVL SAND SHLE 0061 GREY LMSN HARD 0084
7195941	OSGOODE TOWNSHIP CON 03 008	11/29/2012	DO	65.5	13.1	14.9	6.3	UT 0196 UT 0208	75.7	SAND GRVL 0021 SAND CLAY 0043 GREY LMSN 0142 GREY SNDS 0196 GREY SNDS 0208 GREY SNDS 0215
7371675	OSGOODE TOWNSHIP CON 04 007	7/3/2020	DO	43.6	14.0	15.8	4.6	UT 0062 UT 0100 UT 0135	75.7	BLDR SAND 0046 GREY SHLE LMSN 0143
7400063	-	8/10/2021	-	-	-	-	-	-	-	-
7418274	-	3/29/2022	-	-	-	-	-	-	-	-

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

"Well Use"

DO	Domestic

"Water Detail"

FR	Fresh
SA	Salty
SU	Sulphur
MN	Mineral
UK	Unknown
GS	Gas
IR	Iron

Parameter	10th Percentile	90th Percentile	Geometric Mean	10th Percentile	90th Percentile	Geometric Mean
	WEST OF SITE			EAST OF SITE		
Static Water Level (m)	1.5	6.7	3.3	1.8	10.8	5.4
Casing Length (m)	7.9	14.8	10.7	6.7	19.5	13.3
Depth to Bedrock (m)	4.6	13.4	8.6	12.1	18.5	14.4
Total Well Depth (m)	14.4	84.8	37.3	17.6	64.5	41.2
Bearing Zone Depth (m)	17.8	61.9	26.2	17.8	61.9	38.5
Recommended Pump Rate (L/min)	18.9	166.6	43.2	18.9	107.6	53.2
Available Drawdown (metres)	9.6	78.9	27.7	12.4	56.8	31.6

GEMTEC
Consulting Engineers and Scientists

TEST WELL RECORDS

A 089354

Ontario Ministry of the Environment

Well Tag No. (Place Sticker and/or Print Below): A089354

Well Record

Regulation 903 Ontario Water Resources Act

Page ___ of ___

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

☐ Well Constructed by Well Owner

Field	Entry
First Name / Last Name / Organization	Sunset Lakes Development
E-mail Address	
Mailing Address (Street Number/Name)	6598 Pebble Trail Way
Municipality	Greely
Province	Ont
Postal Code	K4P 0B6
Telephone No. (inc. area code)	

Well Location

Field	Entry
Address of Well Location (Street Number/Name)	(No Civic) Stage Coach Road
Township	Osgoode
Lot	8
Concession	3
County/District/Municipality	Ottawa-Carleton
City/Town/Village	Greely
Province	Ontario
Postal Code	
UTM Coordinates Zone / Easting / Northing	NAD 8 3 · 18 · 454049 · 5009857
Municipal Plan and Sublot Number	
Other	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
				0'	25'
	Sand & Gravel			25'	32'
	Grey Clay			32'	38'
	Gravel + Boulders			38'	145'
	Grey & Brown Limestone			145'	180'
	Grey & White Sandstone				

Test Well #1

SIATRAS DEVELOPMENT

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
44'	34'	Neat Cement Slurry	1.8
34'	0	Neat Bentonite Slurry	16.8

Method of Construction

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

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"	Steel	.188"	+2'	44'
5 15/16"	Open hole		44'	180'

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	Kind of Water
156 (m/ft)	☐ Gas ☐ Other, specify ☐ Fresh ☒ Untested
172 (m/ft)	☐ Gas ☐ Other, specify ☐ Fresh ☒ Untested
(m/ft)	☐ Gas ☐ Other, specify ☐ Fresh ☐ Untested

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	44'	6"
44'	180'	5 15/16"

Results of Well Yield Testing

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

If pumping discontinued, give reason: —

Pump intake set at (m/ft): 170'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 67' 2"

If flowing give rate (l/min / GPM): —

Recommended pump depth (m/ft): 140'

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

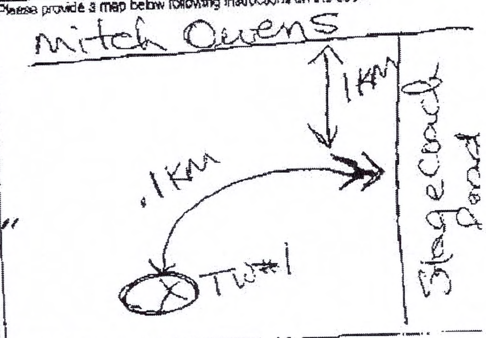
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	14' 1"		
1	24' 4"	1	
2	30' 7"	2	
3	34' 9"	3	
4	39' 5"	4	
5	42' 6"	5	
10	57' 9"	10	
15	61'	15	
20	64' 6"	20	
25	67' 3"	25	
30	67' 3"	30	
40	67' 2"	40	
50	67' 2"	50	
60	67' 2"	60	

Map of Well Location

Please provide a map below following instructions on the back



Well Contractor and Well Technician Information

Field	Entry
Business Name of Well Contractor	Air Rock Drilling Co. Ltd
Well Contractor's Licence No.	1119
Business Address (Street Number/Name)	RR#1
Municipality	Richmond
Province	ONT
Postal Code	K0A 2Z0
Business E-mail Address	
Bus. Telephone No. (inc. area code)	6138382170
Name of Well Technician (Last Name, First Name)	GRAHAM RYAN
Well Technician's Licence No.	T3484
Signature of Technician and/or Contractor / Date Submitted	

Comments: Test Well #1

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2009/12/15	2009/12/14

Ministry Use Only — Audit No. Z 108228 — Received

Ministry's Copy

0506E (10/2007)

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A089354

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
6980848	Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
#105-76 10 Village Centre Place	Greely	Ont	K4P0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	454049	5009857		TW# 1/A

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
	Existing 6" Drilled Well Attached			0'	180'
	4 INCH LINER INSTALLED 135 FEET				
	TW#1 - Diatris Development - Dec 14, 2009 (PRE TW)				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
135'	125'	Pelt Plug	1 Pail
125	50'	Neat Cement Slurry	3.9
50'	10'	Pelt Plug	2 Bails

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
4"	Plastic	.250	135'	10'

Status of Well

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

Construction Record - Screen

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 160'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 31'2"

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min/GPM): 15

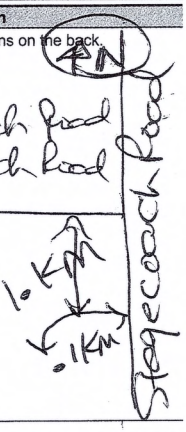
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	18'.0"		31'3"
1	26.6	1	20.2
2	28.	2	18.6
3	28.7	3	18'.0"
4	29.1	4	18'.0"
5	29.4	5	
10	30.1	10	
15	30.4	15	
20	30.7	20	
25	30.9	25	
30	31.1	30	
40	31.3	40	
50	31.3	50	
60	31.3	60	

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
AR Rock Drill Inc Co LTD	7681

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

Province	Postal Code	Business E-mail Address
Ont	K0A2Z0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	HANNA-Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
13638		2010/01/11

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

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

Date Work Completed: 2010/01/11

Ministry Use Only

Audit No. Z408182

Received

Ministry's Copy

7298633

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. A209552

Tag#: A 209552

Well Record

Regulation 903 Ontario Water Resources Act

TW B

Page 1 of 1

6980848 CANADA CORP.

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2 Cedar Lakes, St	Osgoode.		

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA - City	Greely	Ontario	K4P 1M4

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453997	5010146	4M-1479	Block 46

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
Grey	Sand	Gravel	Soft	0	3.03
Grey	Gravel		Soft	3.03	9.09
Grey	Gravel	Boulders	Loose.	9.09	13.03
Grey	Limestone		Hard.	13.03	60.60

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	42.42	Quik Crete	16 Bag

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
15.55	Steel	0.48	+0.60	42.42

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	Other, specify
59.69	☐	☑ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	42.42	25.40
0	60.60	15.55

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 30.30

Pumping rate (l/min / GPM): 45.00

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping (m/ft): 6.75

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

Recommended pump depth (m/ft): 30.30

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

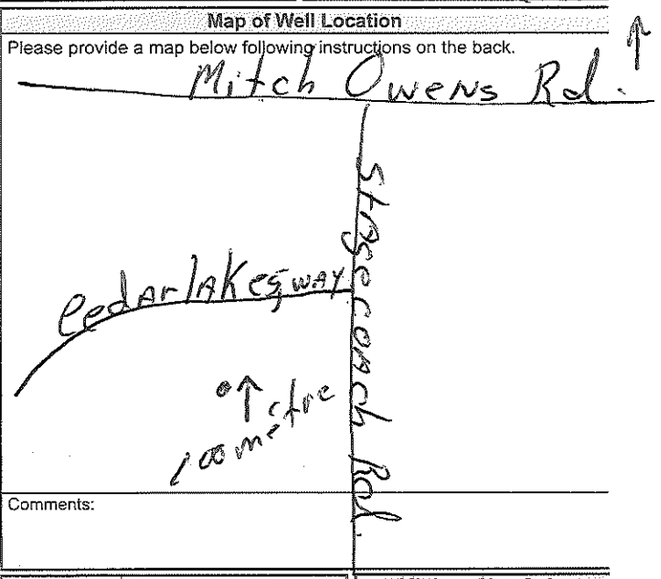
Well production (l/min / GPM): 90.00

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		6.40		6.75
	1	6.71	1	6.55
	2	6.72	2	6.48
	3	6.73	3	6.45
	4	6.73	4	6.43
	5	6.74	5	6.41
	10	6.75	10	6.40
	15	6.75	15	6.40
	20	6.75	20	6.40
	25	6.75	25	6.40
	30	6.75	30	6.40
	40	6.75	40	6.40
	50	6.75	50	6.40
	60	6.75	60	6.60

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

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

Business Address (Street Number/Name)	Municipality
1763 - Route 600 west	Nation

Province	Postal Code	Business E-mail Address
ON	K0A 3G0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
613 9A2 5598	Monette Karl

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3773	Karl Monette	2017 09 19

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2017 09 18	2017 09 18

Ministry Use Only

Audit No. Z252213

Received NOV 07 2017

A 093609

Ontario Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Well T. A093609

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name: Sunset Lakes Development | Last Name / Organization | E-mail Address | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): 6598 Pebble Trail Way | Municipality: Greely | Province: Ont | Postal Code: K4P0B6 | Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name): No Civic) Empire Grove | Township: Osgoode | Lot: 8 | Concession: 3

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Greely | Province: Ontario | Postal Code

Municipal Plan and Subdivision Number | Other

UTM Coordinates NAD 83: Zone 18 | Easting 453338 | Northing 5009666

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
			Sand, Gravel & Boulders	0	47½'
			Grey + brown limestone	47½'	180'

Test Well #5 - STATTRIS DEVELOPMENT

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
58'	48'	Neat Cement Slurry	7.8
48'	0	Neat Bentonite Slurry	16.8

Method of Construction

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☒ Air percussion ☐ Other, specify

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

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"	Steel	.188"	+2'	58'
6 1/8"	Open hole		58'	180'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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: ☐ Fresh ☒ Untested	Other, specify
162		GBO
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☒ Untested	Other, specify
171		Gas
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested	Other, specify
		Gas

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	58'	6"
58'	180'	6 1/8"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear/Sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 170'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 46' 2"

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

Recommended pump depth (m/ft): 40'

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

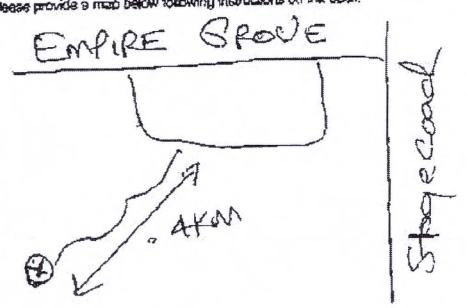
Well production (l/min / GPM): 25

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	27' 7"		46' 2"
1	33'	1	34' 2"
2	38' 1"	2	37' 4"
3	39' 7"	3	
4	40' 5"	4	
5	41' 3"	5	
10	42' 8"	10	
15	44' 1"	15	
20	44' 4"	20	
25	45'	25	
30	45' 5"	30	
40	45' 7"	40	
50	45' 9"	50	
60	46' 2"	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Test Well #5

Well Contractor and Well Technician Information

Business Name of Well Contractor: A1 Rock Drilling Co LTD | Well Contractor's Licence No. 1119

Business Address (Street Number/Name): RR 4 | Municipality: Richmond | Province: ONT | Postal Code: K0A2Z0 | Business E-mail Address

Bus. Telephone No. (inc. area code): 613 838 2170 | Name of Well Technician (Last Name, First Name): GRAHAM RYAN

Well Technician's Licence No.: 13484 | Signature of Technician and/or Contractor | Date Submitted: 2010/01/22

Well owner's information package delivered: ☒ Yes ☐ No | Date Package Delivered: 2010/01/04 | Date Work Completed: 2009/12/23

Ministry Use Only: Audit No. Z 108216 | Received

Ministry's Copy

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0506E (12/2006)

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below) A093609

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
6980848	Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
#105-7610 Village Centre Place	Greely	ONT	K4P0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453333	5009666	TW# 3	C

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
	Existing 6" Drilled Well - Attached			0'	180'
			4 INCH LINER INSTALLED 135 FEET		
			TW#3 - Siatris Development - Dec 23, 2009 (Rev TWS)		

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
135'	125	Pelt Plug	1 Pail
125'	50	Neat Cement Slurry	3.9
50'	10'	Pelt Plug	2 Pails

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
4"	Plastic	.250	135'	10'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 160'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 44'9"

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min/GPM): 15

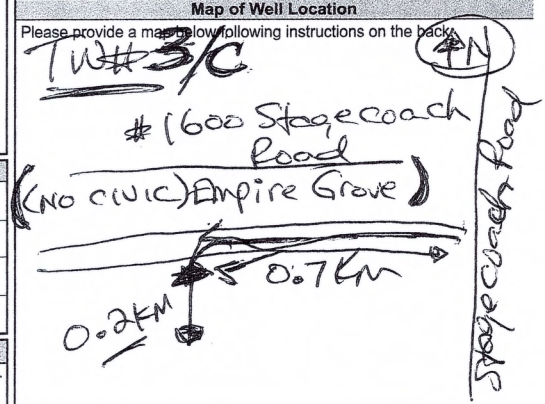
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	33'2"		44'9"
1	37.9	1	33.4
2	39.8	2	33.1
3	40.7	3	32.9
4	41.2	4	32.8
5	41.6	5	32.7
10	42.9	10	32.4
15	43.6	15	32.1
20	44.	20	31.9
25	44.3	25	31.7
30	44.5	30	31.6
40	44.7	40	31.4
50	44.8	50	31.3
60	44.9"	60	31.2

Map of Well Location

Please provide a map below following instructions on the back.



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 Fronktown Road	Richmond	Ont	K0A 2Z0	

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
6138380179	HANNA Jeremy	T3632		2023/10/30

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

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

Date Work Completed: 2023/10/16

Ministry Use Only

Audit No. Z408173

Received

Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

I , Jeremy Hanna (License T3632), **AIR ROCK DRILLING CO. LTD.,** DO HEREBY CERTIFIY, that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of a well on the

PROPERTY OF: 6980848 CANADA CORPORATION

LOCATED AT : # 1600 STAGECOACH ROAD Greely

LOT # 8 **CON #** 3 **PLAN #** ~~S/L #~~ TW#5

Geographical Township Osgoode

of OTTAWA - CARLETON

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

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

Signed this 11 TH day of OCTOBER 2023,

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (C-7681)

The Engineer / Hydrologist on behalf of the Landowner set out above Certifies that He/She has Inspected the well and it was constructed in accordance with the specifications In Ministry of Environment Regulation 903

Signed this _____ day of _____, _____

HYDROLOGIST / ENGINEER
(Signature / STAMP)

2023727
A378947

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

W Tag#:A378947 (Print Below) A378947 TW D

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	6980848 Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
105 - 7610 Village Centre Place	Greely	ON	K4P 0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453604	5009437	(Cedarlakes Phase III)	Test Well #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	Depth (m/ft) To
(Hard Packed →)	Gravel	&	Boulders	0′	35′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	35′	186′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	186′	194′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	194′	200′

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/Imp gal)
131′	121′	Neat cement	12.48
121′	0′	Bentonite slurry	42.00

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′	131′
6"	Open Hole		131′	200′

Status of Well

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

Construction Record - Screen

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0′	131	9 3/4"
131	200	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
6859 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		2023 10 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): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 60.2′′

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

Recommended pump depth (m/ft): 100′

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

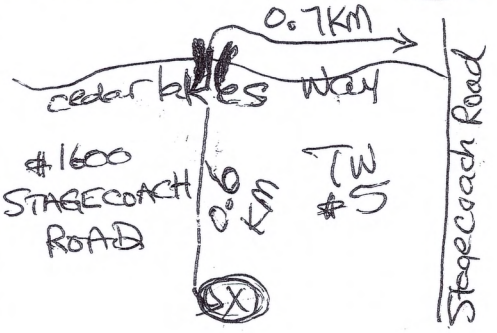
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	18′5′′		60.2′′
1	26.7	1	41.1
2	31.4	2	34.1
3	34.9	3	29.3
4	37.7	4	26.4
5	40	5	24.5
10	48.6	10	21.6
15	50.1	15	18.9
20	52.5	20	18.5
25	54.2	25	18.5
30	55.4	30	18.5
40	57.1	40	18.5
50	58.6	50	18.5
60	60.2′′	60	18′5′′

Map of Well Location

Please provide a map below following instructions on the back. FN.



Comments: HP-20 GPM Set @ 100 Ft

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

Date Package Delivered: 2023 10 17

Ministry Use Only

Audit No. Z407939

Received 2023 / 10 / 17

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

Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

I , Jeremy Hanna (License T3632), **AIR ROCK DRILLING CO. LTD.,** DO HEREBY CERTIFIY, that I am licensed to drill water wells in the Province of Ontario, and that I have supervised the drilling of a well on the

PROPERTY OF: 6980848 CANADA CORPORATION

LOCATED AT : # 1600 STAGECOACH ROAD Greely

LOT # 8 **CON #** 3 **PLAN #** _____ ~~SAL~~ # TW# 6

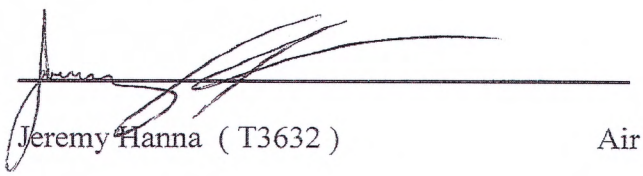
Geographical Township Osgoode

of OTTAWA - CARLETON

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

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

Signed this 12 TH day of OCTOBER 2023,



Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (C-7681)

The Engineer / Hydrologist on behalf of the Landowner set out above Certifies that He/She has Inspected the well and it was constructed in accordance with the specifications In Ministry of Environment Regulation 903

Signed this _____ day of _____, _____

_____

HYDROLOGIST / ENGINEER
(Signature / STAMP)

2023728
A378948

Ontario — Ministry of the Environment, Conservation and Parks

Wel Tag#:A378948 nt Below)

A378948 TW E

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
	6980848 Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
105 - 7610 Village Centre Place	Greely	ON	K4P 0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453683	5009731	(Cedar Lakes Phase III)	Test Well #6

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
	Sand & Gravel	& Boulders		0	20
Grey & Black	Limestone			20	184
Grey & Black	Limestone			184	194
Grey & Black	Limestone			194	200

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/Gal)
131	121	Neat cement	10.92
121	0	Bentonite slurry	54.60

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6 1/4"	Steel	.188"	+2	131
6"	Open Hole		131	200

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	Kind of Water	Hole Diameter Depth (m/ft) From	To	Diameter (cm/in)
184 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	0	131	9 3/4"
194 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	131	200	6"
(m/ft) ☐ Gas	Kind of Water: ☐ 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:

Pump intake set at (m/ft): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 57.6

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

Recommended pump depth (m/ft): 100

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

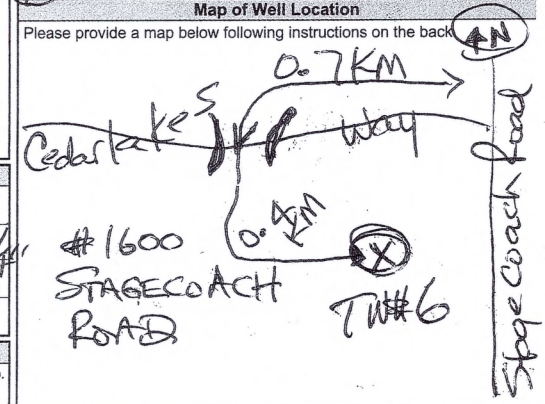
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	143'		57.6'
1	23	1	39.8
2	28.5	2	31.6
3	32.2	3	28
4	35.3	4	22.1
5	37.8	5	19.4
10	45.5	10	15.2
15	49.6	15	14.3
20	51.6	20	14.3
25	53.1	25	14.3
30	54	30	14.3
40	55.2	40	14.3
50	56.1	50	14.3
60	57.6	60	14.3

Map of Well Location

Please provide a map below following instructions on the back.



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	Province	Postal Code	Business E-mail Address
3659 Frankford 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		2023 10 31

Comments: 1HP 20GPM Set @ 100 Ft

Well owner's information package delivered	Date Package Delivered Y Y Y Y M M D D	Ministry Use Only
☒ Yes ☐ No	2023 10 [redacted]	Audit No. Z407940 Received 2023/10/[redacted]

PRIVATE WELL RECORDS

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#: A 229123 (Print Below)

A229123

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	AGL Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
572 Osmond Daley Drive	Carp	ON	K0A 1L0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1778 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453662	5009894	4M-1479	S/L 14-2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand & Gravel			0'	17'
Grey	Limestone			17'	147'
Grey	[redacted]	Sandstone		147'	210'
Grey	[redacted]	Sandstone		210'	220'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131'	121'	Neat cement	12.5
121'	0'	Bentonite slurry	50.4

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'	131'
6 1/8"	Open Hole		131'	220'

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	Hole Diameter Depth From	Depth To	Diameter (cm/in)
210 (m/ft)	☐	☐ Fresh ☐ Untested ☒ Other, *specify*	0'	131'	9 3/4"
(m/ft)	☐	☐ Fresh ☐ Untested ☐ Other, *specify*	131'	220'	6 1/8"
(m/ft)	☐	☐ 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): 150

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 56.1'

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

Recommended pump depth (m/ft): 100'

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

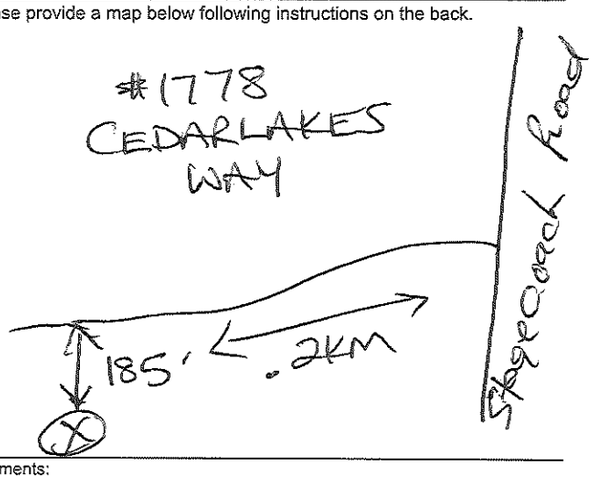
Well production (l/min / GPM): 20+

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	31'1"		56'1"
1	38.3	1	37.8
2	41.9	2	32.7
3	44.6	3	31.1
4	46.5	4	31.1
5	47.9	5	31.1
10	51.7	10	31.1
15	53.3	15	31.1
20	54.1	20	31.1
25	54.9	25	31.1
30	55.3	30	31.1
40	55.6	40	31.1
50	55.9	50	31.1
60	56'1"	60	31'1"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP 15 GPM SET AT 100 FEET

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1118

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	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.	Signature of Technician and/or Contractor	Date Submitted
13632		2018 07 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2018 07 09	2018 07 05

Ministry Use Only

Audit No. 276966

Received SEP 10 2018

506E (2014/11)

Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#:A305055 (Print Below)

A305055

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1826 Cedarlakes Way	Osgoode	[redacted]	P/L 7 3
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
Ottawa Carleton	Greely	Ontario	
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 8 3 18 453527 5009848	4M-1555 (Phase 2)	S/L 20-2	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	& Boulders		0'	16'
Grey	Limestone			16'	115'
Grey	Limestone	w/ Grey Sandstone Mix		115'	171'
Grey	Limestone	w/ Grey Sandstone Mix		171'	177'
Grey	Sandstone			177'	234'
Grey	Sandstone			234'	240'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/Imp gal)
131'	121'	Neat cement	12.4
121'	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	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	131'
5 15/16"	Open Hole		131'	240'

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	Other, specify
171	☐	☐ Fresh ☐ Untested	
234	☐	☐ Fresh ☐ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	131'	9 3/4"
131'	240'	5 15/16"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681
Business Address (Street Number/Name)	**Municipality**
6659 Franktown Road	Richmond

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

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		2020 11 30 (Y Y Y Y M M D D)

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): 220

Pumping rate (l/min / GPM): 18

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 154'.3"

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

Recommended pump depth (m/ft): [redacted] 180'

Recommended pump rate (l/min/GPM): 18

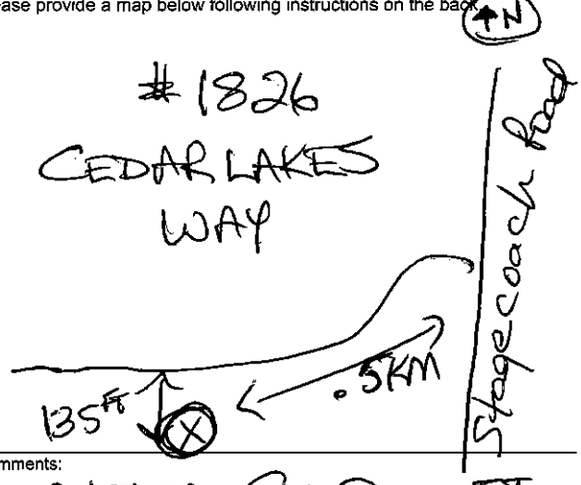
Well production (l/min/GPM): 18

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	14'.3"		154'.3"
1	26.3	1	111
2	36.2	2	101
3	44.8	3	92.6
4	52.5	4	84.4
5	54.3	5	76.5
10	85.3	10	45
15	102	15	25
20	113	20	15.2
25	121	25	14.3
30	126	30	14.3
40	136	40	14.3
50	146	50	14.3
60	154'.3"	60	14'.3"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1 HP-15 GPM Set @ 180 FT

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020 11 11 (Y Y Y Y M M D D)	2020 11 11 (Y Y Y Y M M D D)

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Audit No. Z344113

Received JAN 08 2021

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W (Print Below)

A144728

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
	Trillium Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
519 St. Pierre Road	Vars	ON	K0A 3H0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1850 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453420	5009821	4M-1479	S/L 29

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
	Boulders	& Sand+Clay		0	26
Grey	Limestone			26	188
Grey	Limestone			188	190
Brown	Sandstone			190	255
Brown	Sandstone			255	260
Brown	Sandstone	w/ Grey	Limestone	260	293
Brown	Sandstone	w/ Grey	Limestone	293	300

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131	121	Neat cement	7.8
121	0	Bentonite slurry	29.4

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	131
5 7/8"	Open Hole		131	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	Other, specify
188	☐	☐ Fresh ☒ Untested	
255	☐	☐ Fresh ☒ Untested	
293	☐	☐ Fresh ☒ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	131	9 3/4"
131	300	5 7/8"

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): 48

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

Recommended pump depth (m/ft): 100

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

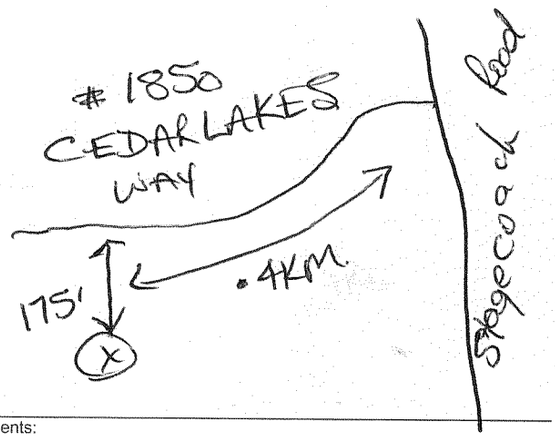
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		23.6		48
1	30.7		1	28.3
2	34.7		2	24.6
3	35.5		3	23.6
4	36.6		4	23.6
5	37.6		5	
10	37.4		10	
15	40.3		15	
20	41.5		20	
25	42.7		25	
30	43.7		30	
40	45.4		40	
50	46.9		50	
60	48		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

[redacted] HP - 15 GPM SET @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6859 Franktown Road, RR#1	Richmond

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

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
T3058		2014 06 30

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	2014 05 27	2014 05 22

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Received JUN 24 2014

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Tag#: A144727

Measurements recorded in: ☐ Metric ☒ Imperial

(Print Below) A144727

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1858 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453401	5009822	4M-1479	S/L 30

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
	Sandy	Clay		0'	11'
	Gravel	& Boulders		11'	29'
Grey	Limestone			29'	180'
Grey	Limestone			180'	190'
Grey & White	Sandstone			190'	248'
Grey & White	Sandstone			248'	294'
Grey & White	Sandstone			294'	300'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3)
132'	122'	Neat cement	7.8
122'	0'	Bentonite slurry	50.4

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'	132'
5 15/16"	Open Hole		132'	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	
180	☐	☐ Fresh ☒ Untested	Other, *specify*
248	☐	☐ Fresh ☒ Untested	Other, *specify*
294	☐	☐ Fresh ☒ Untested	Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	132'	9 3/4"
132'	300'	5 15/16"

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) 29.8'

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

Recommended pump depth (m/ft) 100'

Recommended pump rate (l/min / GPM) 20

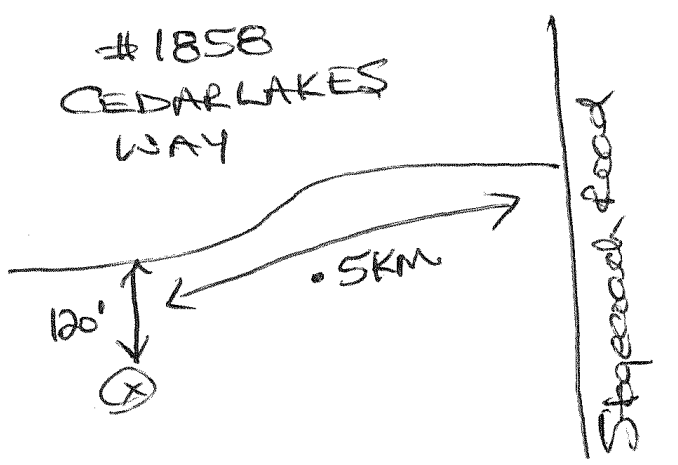
Well production (l/min / GPM) 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	25.5'			29.8'
1	28.7	1		25.5
2	29.1	2		25.5
3	29.3	3		25.5
4	29.4	4		25.5
5	29.4	5		25.5
10	29.5	10		25.5
15	29.5	15		25.5
20	29.6	20		25.5
25	29.6	25		25.5
30	29.6	30		25.5
40	29.7	40		25.5
50	29.8	50		25.5
60	29.8'	60		25.5'

Map of Well Location

Please provide a map below following instructions on the back.



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

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6050 Franktown Road, RR#1	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.	Signature of Technician and/or Contractor	Date Submitted
T3632		2014 06 30

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered: 2014 05 27

Date Work Completed: 2014 05 26

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W[illegible] - A135456 (Print Below)

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
	Patrick & Frances Muldoon		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
c/o 7320 Blue Water Crescent	Greely	ON	K4P 0C5	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1922 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453176	5009664	4M-1479	S/L38

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
	Sand	& Clay &	Boulders	0'	29'
Grey	Limestone			29'	180'
Grey	Sandstone			180'	181'
Grey	Sandstone			181'	220'
White	Sandstone			220'	254'
White	Sandstone			254'	280'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131'	121'	Neat cement	10.9
121'	0'	Bentonite slurry	42

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'	131'
5 15/16"	Open Hole		131'	280'

Status of Well

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

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water
131' 121'	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify _____	254' 280'	☐ Fresh ☒ Untested ☐ Gas ☐ Other, specify _____
			☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify _____

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0'	131'	9 3/4"
131'	260'	5 15/16"

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) 250

Pumping rate (l/min / GPM) 20

Duration of pumping 1 hrs + 0 min

Final water level end of pumping (m/ft) 16.6

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

Recommended pump depth (m/ft) 100'

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

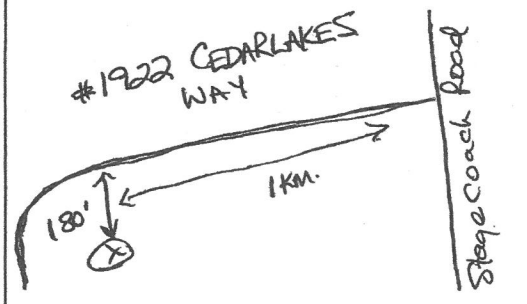
Well production (l/min / GPM) 20+

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		13'		16.6'
1		16.3	1	13
2		16.3	2	13
3		16.3	3	13
4		16.3	4	13
5		16.3	5	13
10		16.4	10	13
15		16.4	15	13
20		16.4	20	13
25		16.5	25	13
30		16.5	30	13
40		16.6	40	13
50		16.6	50	13
60		16.6	60	13

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP 15 GPM SET @ 100 FEET

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6659 Franktown Road, RR#1	Richmond

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

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3058		2014 4 30

T3058 2014 04 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2014 04 07	2014 4 04 06

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Ontario Ministry of the Environment

Well Tag Number: A014478 (A014478)

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 15009 CON CON LOT 04

Well Owner's Information and Location of Well Information

[redacted]

Ottawa Carleton | OSGoode | 67 | 3

RR#/Street Number/Name: 6342 Elkwood | City/Town/Village: Greely | Site/Compartment/Block/Tract etc.: Subdivision 32 Plan 4M787

GPS Reading: NAD 83 | Zone 18 | Easting 452820 | Northing 5005435 | Unit Make/Model: magellan | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
grey	clay	gravel		0	9.14
	Limestone			9.14	24.4

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	24.4	15.55

Water Record

Water found at ___ Metres	Kind of Water
15.2 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: NOT
21.0 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: tested
22.2 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify: NOT tested

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.88	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	10.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☑ Open hole		10.0	24.4

Test of Well Yield

Pumping test method: Submersible

Pump intake set at - (metres): 21.3

Pumping rate - (litres/min): 45.6

Duration of pumping: 1 hrs + — min

Final water level end of pumping: 10.3 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth: 15.2 metres

Recommended pump rate: 45.6 (litres/min)

If flowing give rate - (litres/min): —

If pumping discontinued, give reason.

	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Static Level		2.08		
1	1	3.70	1	8.26
2	2	4.62	2	5.60
3	3	5.60	3	4.65
4	4	6.40	4	3.99
5	5	7.09	5	3.51
10	10	8.55	10	2.51
15	15	9.68	15	2.33
20	20	10.0	20	2.20
25	25	10.17	25	2.16
30	30	10.27	30	2.13
40	40	10.3	40	2.08
50	50	10.3	50	2.08
60	60	10.3	60	2.08

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
10.0	7.0	Cement Slurry	0.1770
7.0	0	bentonite slurry	1.180

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☑ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: A-1 Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

Business Address (street name, number, city etc.): RR#1 Richmond, Ont

Name of Well Technician (last name, first name): Purcell Shannon | Well Technician's Licence No.: TA122

Signature of Technician/Contractor: x [signature] | Date Submitted: 2004 07 16

Location of Well

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

Audit No. Z 14581 | Date Well Completed: 2004 07 13

Was the well owner's information package delivered? ☑ Yes ☐ No | Date Delivered: 2004 07 13

Ministry Use Only

Data Source | Contractor: 1119

Date Received: JUL 21 2004 | Date of Inspection

Remarks | Well Record Number: 1534798

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐ *Cette formule est disponible en français*

APPENDIX C

Borehole Logs

RECORD OF BOREHOLE 23-1

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

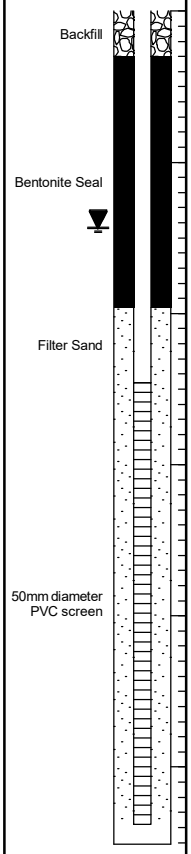
SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Auger Hollow Stem Auger (210mm OD)	Ground Surface		100.23				
		Loose, brown SAND			1	SS	380	8
				98.71 / 1.52				
		Compact, grey brown, SAND, some gravel, trace silt			2	SS	430	18
				97.94 / 2.29				
		Compact, grey brown, SAND, trace gravel, trace silt			3	SS	600	19
					4	SS	380	16
				96.32 / 3.91				
		Stiff, grey brown, SILTY CLAY (WEATHERED CRUST)			5	SS	300	10
				95.81 / 4.42				
		Compact, grey brown, CLAYEY SILT, some gravel, trace sand, with possible cobbles and boulders (GLACIAL TILL)			6	SS	400	11
					7	SS	360	21
				94.29 / 5.94				
		End of Borehole						

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

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	1.4 ▽	98.8
23/10/19	1.4 ▼	98.8

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LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/7/23

RECORD OF BOREHOLE 23-2

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

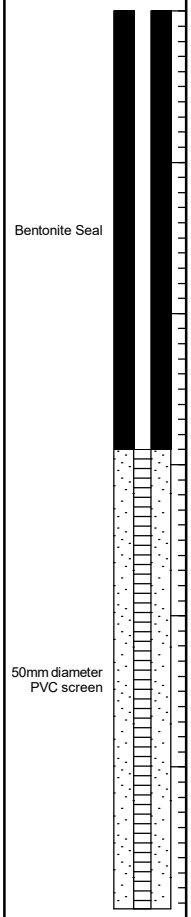
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		98.35				
0	Auger	Loose, grey brown, SAND, trace silt						
1	Hollow Stem Auger (210mm OD)				1	SS	350	5
					2	SS	300	6
2				96.06				
		Stiff, grey brown, SILTY CLAY to CLAYEY SILT (WEATHERED CRUST)		2.29	3	SS	400	1
3					4	SS	550	2
4					5	SS	650	2
					6	SS	600	WH
5				93.17				
		Compact, grey brown, SAND AND GRAVEL, some silt, with possible cobbles and boulders (GLACIAL TILL)		5.18	7	SS	300	16
6				92.41				
		End of Borehole		5.94				
7								
8								
9								
10								

SAMPLES

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

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	-0.3	98.6
23/10/19	-0.3	98.6

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LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/7/23

RECORD OF BOREHOLE 23-3

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

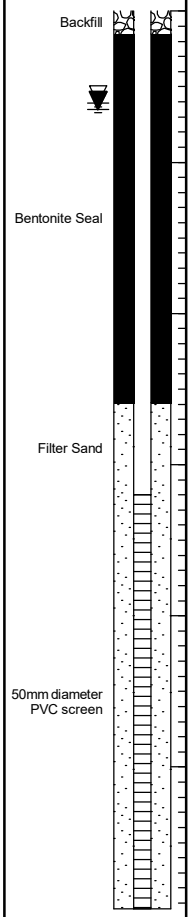
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Auger Hollow Stem Auger (210mm OD)	Ground Surface		98.67				
		Brown SILTY SAND, some gravel		97.91 / 0.76				
1		Compact, grey brown, SILTY SAND, some gravel		97.30 / 1.37	1	SS	320	19
		Compact, grey brown SANDY SILT, trace gravel, trace clay			2	SS	490	
2					3	SS	150	19
				95.77 / 2.90				
3		Loose to dense, grey brown, SILTY SAND, some gravel, trace clay, with possible cobbles and boulders (GLACIAL TILL)			4	SS	320	9
4					5	SS	270	7
					6	SS	300	13
5					7	SS	430	33
				92.73 / 5.94				
6		End of Borehole						
7								
8								
9								
10								

SAMPLES

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

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	0.6 ▽	98.1
23/10/19	0.7 ▼	98.0

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LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/7/23

APPENDIX D

Water Quality Results and Lab Certificates

Correlating Well IDs for Lab Reports

Summary Table ID	Lab Report ID
TW A	TW 1
TW B	TW 2
TW C	TW 3
TW D	TW 4
TW E	TW 5

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100554.003
December 2023

Summary of Test Well Water Quality Measurements

Parameter	Units	TW A			TW B			TW C			TW D			TW E			Ontario Drinking Water Standard	Type of Standard
		TWA-3hr 11/08/2023 10:30 AM	TWA-6hr 11/08/2023 11:30 AM	TWA-6hr 11/08/2023 12:30 PM	TWB-3hr 11/02/2023 11:15 AM	TWB-6hr 11/02/2023 02:15 PM	TWB-6hr 11/02/2023 02:15 PM	TWC-3hr 10/30/2023 01:00 PM	TWC-6hr 10/30/2023 04:00 PM	TWC-6hr 10/30/2023 04:00 PM	TWD-3hr 10/30/2023 01:00 PM	TWD-6hr 10/30/2023 04:00 PM	TWD-6hr 10/30/2023 04:00 PM	TWE-3hr 10/30/2023 01:00 PM	TWE-6hr 10/30/2023 04:00 PM	TWE-6hr 10/30/2023 04:00 PM		
Microbiological Parameters																		
E. Coli	CFU/100mL	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	0	MAC
Total Coliforms	CFU/100mL	ND (1)	ND (1)	NA	**1**	ND (1)	NA	**14**	**8**	NA	ND (1)	ND (1)	NA	**3**	**10**	NA	-	-
Fecal Coliforms	CFU/100mL	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	0	MAC
Heterotrophic Plate Count	CFU/mL	30	ND (10)	NA	ND (10)	ND (10)	NA	10	20	NA	60	30	NA	20	10	NA	-	-
General Inorganics																		
Alkalinity, total	mg/L	218	232	NA	353	352	NA	249	249	NA	267	268	NA	238	238	NA	30-500	OG
Ammonia as N	mg/L	0.27	0.20	NA	ND (0.01)	0.02	NA	0.13	0.11	NA	0.20	0.19	NA	0.12	0.08	NA	-	-
Dissolved Organic Carbon	mg/L	1.4	1.2	NA	1.4	1.4	NA	1.2	1.2	NA	1.5	1.6	NA	1.0	0.7	NA	10	MAC
Colour	TCU	2	ND (2)	NA	ND (2)	ND (2)	NA	2	2	NA	ND (2)	ND (2)	NA	2	ND (2)	NA	5	AO
Colour, apparent	ACU	28	23	NA	17	15	NA	9	9	NA	37	28	NA	**33**	**32**	NA	5	AO
Conductivity	uS/cm	737	826	NA	1540	1480	NA	724	752	NA	1030	1020	NA	758	751	NA	80-100	OG
Hardness	mg/L	300	326	NA	469	465	NA	345	342	NA	373	388	NA	356	362	NA	-	-
pH	pH Units	8.3	8.3	NA	7.9	7.9	NA	8.0	8.0	NA	8.0	8.0	NA	8.1	8.1	NA	6.5-8.5	OG
Phenolics	mg/L	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	500	AO
Total Dissolved Solids	mg/L	432	476	NA	**916**	**900**	NA	422	426	NA	**562**	**588**	NA	416	410	NA	500	AO
Sulphide	mg/L	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	-	-
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	-	-
Total Kjeldahl Nitrogen	mg/L	0.3	0.2	NA	0.2	0.2	NA	0.1	0.2	NA	0.3	0.3	NA	**0.2**	0.1	NA	0.15	MAC
Turbidity	NTU	3.1	2.3	NA	2.2	2.0	NA	1.0	0.8	NA	5.0	3.7	NA	**5.5**	**5.2**	NA	5	AO
Anions																		
Chloride	mg/L	85	99	NA	246	243	NA	61	61	NA	140	143	NA	68	68	NA	250	AO
Fluoride	mg/L	0.2	0.1	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	0.1	0.1	NA	0.1	0.1	NA	1.5	MAC
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	NA	1.8	1.6	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	10(4)	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	1.0(4)	MAC
Sulphate	mg/L	50	60	NA	123	125	NA	68	68	NA	82	83	NA	65	64	NA	500	AO
Metals																		
Mercury	mg/L	NA	NA	ND (0.0001)	NA	NA	ND (0.0001)	NA	NA	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	0.001	
Aluminum	mg/L	NA	**0.135**	0.019	NA	0.006	ND (0.001)	NA	0.003	ND (0.001)	NA	0.062	0.003	NA	0.087	0.002	0.1	OG
Antimony	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	0.006	MAC
Arsenic	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.025	MAC
Barium	mg/L	NA	0.218	0.211	NA	0.143	0.138	NA	0.157	0.155	NA	0.212	0.206	NA	0.152	0.147	1	MAC
Beryllium	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Boron	mg/L	NA	0.09	0.09	NA	0.05	0.04	NA	0.02	0.02	NA	0.07	0.07	NA	0.04	0.04	5	MAC
Cadmium	mg/L	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	0.005	MAC
Calcium	mg/L	62.6	68.3	67.4	121	120	119	71.3	70.9	70.2	82.5	84.9	95.2	75.7	74.3	76.1	-	-
Chromium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.05	MAC
Cobalt	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	0.0049	0.0049	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Copper	mg/L	MA	ND (0.0005)	0.0009	NA	0.0006	0.0006	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	0.0005	NA	ND (0.0005)	ND (0.0005)	1	AO
Iron	mg/L	0.2	0.2	0.1	0.2	0.2	ND (0.1)	0.2	0.2	0.2	0.3	0.4	0.3	**0.4**	**0.4**	0.3	0.3	AO
Lead	mg/L	NA	0.0002	ND (0.0001)	NA	0.0004	0.0003	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	0.0001	ND (0.0001)	0.01	MAC
Magnesium	mg/L	35.0	37.7	36.6	40.7	40.1	40.4	40.6	40.1	38.6	40.6	42.7	46.0	40.5	42.9	41.5	-	-
Manganese	mg/L	0.026	0.028	0.029	0.032	0.032	0.031	0.026	0.027	0.026	0.029	0.029	0.031	0.026	0.025	0.024	0.05	AO
Molybdenum	mg/L	NA	0.0192	0.0192	NA	0.0667	0.0683	NA	0.0041	0.0040	NA	0.0062	0.0072	NA	0.0085	0.0087	-	-
Nickel	mg/L	NA	ND (0.001)	ND (0.001)	NA	0.021	0.021	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	-	-
Potassium	mg/L	5.6	5.9	5.7	4.6	4.6	4.5	2.5	2.5	2.5	6.3	6.3	7.5	3.4	3.5	3.4	-	-
Selenium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.01	MAC
Silver	mg/L	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	-	-
Sodium	mg/L	41.2	47.5	48.2	130	126	128	14.2	14.2	13.7	61.4	61.9	68.4	37.1	37.3	36.2	200 (20)[1]	AO
Strontium	mg/L	NA	1.46	1.44	NA	0.44	0.43	NA	0.53	0.52	NA	1.04	1.11	NA	0.54	0.53	-	-
Thallium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	-	-
Uranium	mg/L	NA	0.0004	0.0004	NA	0.0042	0.0040	NA	0.0002	0.0002	NA	0.0002	0.0002	NA	0.0003	0.0003	0.02	MAC
Vanadium	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Zinc	mg/L	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	0.007	5	AO

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration
AO: Aesthetic Objective
OG: Operational Guideline
1 - The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

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December 2023
100554.003

Summary of Private Well Water Quality Measurements

Parameter	Units	PW-1794 11/08/2023 10:30 AM	PW-1826 11/08/2023 11:30 AM	PW-1850 11/08/2023 12:30 PM	PW-1858 11/08/2023 01:30 PM	PW-1922 11/08/2023 02:30 PM	PW-6266 11/28/2023 10:30 AM	PW-6342 11/28/2023 11:30 AM	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters										
E. Coli	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0	MAC
Total Coliforms	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	-	-
Fecal Coliforms	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0	MAC
Heterotrophic Plate Count	CFU/mL	ND (10)	ND (10)	100	10	220	90	ND (10)	-	-
General Inorganics										
Alkalinity, total	mg/L	299	288	304	281	247	324	295	30-500	OG
Ammonia as N	mg/L	0.05	0.07	0.06	0.06	0.08	0.12	0.18	-	-
Dissolved Organic Carbon	mg/L	1.1	1	1	1.1	1.3	6.2	3.8	10	MAC
Colour	TCU	2	ND (2)	ND (2)	ND (2)	ND (2)	**6**	3	5	AO
Colour, apparent	ACU	**228**	**28**	**159**	**85**	**120**	**167**	**92**	5	AO
Conductivity	uS/cm	1420	1400	916	1380	1230	1090	963	80-100	OG
Hardness	mg/L	474	468	434	458	421	415	359	-	-
pH	pH Units	7.6	7.7	7.8	7.7	7.8	7.7	7.8	6.5-8.5	OG
Phenolics	mg/L	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	500	AO
Total Dissolved Solids	mg/L	**844**	**788**	**534**	**764**	**678**	**672**	**534**	500	AO
Sulphide	mg/L	0.05	ND (0.02)	0.04	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	-	-
Tannin & Lignin	mg/L	0.2	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	0.3	0.1	-	-
Total Kjeldahl Nitrogen	mg/L	0.1	0.1	0.1	**0.2**	0.1	**0.3**	**0.3**	0.15	MAC
Turbidity	NTU	**45.4**	3.8	**26.7**	**13.5**	**19.4**	**19.2**	**11.8**	5	AO
Anions										
Chloride	mg/L	245	237	84	231	205	125	96	250	AO
Fluoride	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	1.5	MAC
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)	10(4)	MAC
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)	1.0(4)	MAC
Sulphate	mg/L	119	118	76	113	105	98	81	500	AO
Metals										
Calcium	mg/L	116	112	93.9	109	99.2	109	95.3	-	-
Iron	mg/L	**2.6**	**0.4**	**2**	**1**	**1.4**	**1.8**	**1.1**	0.3	AO
Magnesium	mg/L	44.5	45.7	48.5	45.1	42	34.6	29.4	-	-
Manganese	mg/L	0.042	0.031	0.039	0.034	0.041	**0.228**	**0.116**	0.05	AO
Potassium	mg/L	4.6	5.1	2.9	4.1	4.2	1.9	2.1	-	-
Sodium	mg/L	128	113	21	117	90	51.4	46.9	200 (20)[1]	AO

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration
AO: Aesthetic Objective
OG: Operational Guideline
1 - The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

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December 2023
100554.003

Summary of Monitoring Well Water Quality Measurements

Parameter	Units	MW1		MW2		MW3		Ontario Drinking Water Standard	Type of Standard
		09/25/2023 01:00 PM	10/27/2023 09:00 AM	09/25/2023 02:13 PM	10/27/2023 09:00 AM	09/25/2023 11:53 AM	10/27/2023 09:00 AM		
General Inorganics									
Ammonia as N	mg/L	ND (0.01)	NA	0.12	NA	0.06	NA	10	MAC
Total Kjeldahl Nitrogen	mg/L	0.2	NA	**1.6**	NA	**1.3**	NA	1	MAC
Anions									
Nitrate as N	mg/L	3.4	2.6	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	10	MAC
Nitrite as N	mg/L	ND (0.05)	0.09	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	1	MAC

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

Summary of Test Well Field Water Quality Measurements

Test Well ID	Date	Time Since Initiaion of Pump (hrs)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
TW A	31-Oct-23	3	7.5	7.78	727	304	4.38	0	-	-	0.05
		6	6.9	7.97	794	396	3.66	0	-	-	0
TW B	2-Nov-23	3	8.5	7.87	1314	655	1.91	2	0	-	0
		6	8.6	7.7	1303	651	1.86	-	-	-	0
TW C	30-Oct-23	3	7.3	7.71	671	336	0.9	3	-	-	0.01
		6	8.1	7.96	647	324	0.75	-	-	-	-
TW D	25-Oct-23	3	10.1	7.44	1006	498	-	1	0	-	0
		6	9.8	7.54	1021	511	318	23	0	-	0
TW E	7-Nov-23	3	8.1	7.78	620	316	5.44	6	0	0	0
		6	8.6	7.89	628	314	4.28	7	0	0	0

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

GEMTEC
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December 2023
100554.003

Summary of Private Well Field Water Quality Measurements

Test Well ID	Date	Time Purging (min)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
PW-1922	8-Nov-23	10	9.62	7.78	1360	872	0	-	-	-	-
		15	9.61	7.81	1350	864	0.3	-	-	-	0
PW-1826	8-Nov-23	10	11.23	8.17	1230	966	1.4	-	-	-	-
		15	11.51	8.01	1510	936	1.4	-	-	-	0
PW-1858	8-Nov-23	10	8.84	7.41	1160	939	1.4	-	-	-	-
		15	8.66	7.33	1460	940	0.7	-	-	-	0
PW-1850	8-Nov-23	10	10.01	7.8	997	651	3.4	-	-	-	-
		15	9.35	7.67	981	629	2.3	0	-	-	0
PW-1794	8-Nov-23	10	11.59	8.62	1620	1041	1.5	-	-	-	-
		15	11.2	8.51	1590	1021	1.2	-	-	-	0
PW-6342	28-Nov-23	10	9.5	7.64	950	474	1.31	0	-	-	0
		15	-	7.67	926	467	1.07	0	-	-	0
PW-6266	28-Nov-23	10	8.8	7.48	1180	571	1.75	0	-	-	0
		15	8.7	7.58	1098	550	1.52	0	-	-	0

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

Summary of Monitoring Well Field Water Quality Measurements

Test Well ID	Date	Time Since Initiaion of Pump (min)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
MW1	25-Sep-23	25	14.8	7.47	2517	1271	-	-	-	-	-
MW2	25-Sep-23	3	13	8.42	530	259	-	-	-	-	-
MW3	25-Sep-23	4.5	12.5	7.63	950	460	-				

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

LAB CERTIFICATES

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 1596

Report Date: 7-Nov-2023
Order Date: 1-Nov-2023

Order #: 2344227

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

Paracel ID	Client ID
2344227-01	TW1-3hr
2344227-02	TW1-6hr
2344227-03	TW1-6hr (Filtered)

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	3-Nov-23	3-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	2-Nov-23	2-Nov-23
Anions	EPA 300.1 - IC	1-Nov-23	1-Nov-23
Colour	SM2120 - Spectrophotometric	2-Nov-23	2-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	2-Nov-23	2-Nov-23
Conductivity	EPA 9050A- probe @25 °C	3-Nov-23	3-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	1-Nov-23	2-Nov-23
E. coli	MOE E3407	1-Nov-23	1-Nov-23
Fecal Coliform	SM 9222D	1-Nov-23	1-Nov-23
Heterotrophic Plate Count	SM 9215C	1-Nov-23	1-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Nov-23	7-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Nov-23	2-Nov-23
pH	EPA 150.1 - pH probe @25 °C	3-Nov-23	3-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	2-Nov-23	2-Nov-23
Hardness	Hardness as CaCO3	1-Nov-23	2-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	1-Nov-23	1-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Nov-23	6-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	2-Nov-23	3-Nov-23
Turbidity	SM 2130B - Turbidity meter	1-Nov-23	1-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344227

Certificate of Analysis

Report Date: 07-Nov-2023

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

Order Date: 1-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-	-	-
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-		
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	30	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	218	232	-	-	-	-
Ammonia as N	0.01 mg/L	0.27	0.20	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.4	1.2	-	-	-	-
Colour, apparent	2 ACU	28	23	-	-	-	-
Colour	2 TCU	2	<2	-	-	-	-
Conductivity	5 uS/cm	737	826	-	-	-	-
Hardness	mg/L	300	326	-	-	-	-
pH	0.1 pH Units	8.3	8.3	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	432	476	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	0.2	-	-	-	-
Turbidity	0.1 NTU	3.1	2.3	-	-	-	-
Anions							
Chloride	1 mg/L	85	99	-	-	-	-
Fluoride	0.1 mg/L	0.2	0.1	-	-	-	-
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	50	60	-	-	-	-

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-	-	-
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-		
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.135	0.019	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.218	0.211	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.09	0.09	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	62.6	68.3	67.4	-	-	-
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	0.0009	-	-	-
Iron	0.1 mg/L	0.2	0.2	0.1	-	-	-
Lead	0.0001 mg/L	-	0.0002	<0.0001	-	-	-
Magnesium	0.2 mg/L	35.0	37.7	36.6	-	-	-
Manganese	0.005 mg/L	0.026	0.028	0.029	-	-	-
Molybdenum	0.0005 mg/L	-	0.0192	0.0192	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	5.6	5.9	5.7	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	41.2	47.5	48.2	-	-	-
Strontium	0.01 mg/L	-	1.46	1.44	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0004	0.0004	-	-	-

Certificate of Analysis

Report Date: 07-Nov-2023

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

Order Date: 1-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-		
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-	-	-
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	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	16.8	1	mg/L	16.9			0.8	20	
Fluoride	0.39	0.1	mg/L	0.38			2.2	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	19.4	1	mg/L	19.3			0.6	20	
General Inorganics									
Alkalinity, total	216	5	mg/L	218			1.0	14	
Ammonia as N	0.033	0.01	mg/L	0.035			5.1	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.2			30.1	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	28	2	ACU	28			0.0	12	
Conductivity	726	5	uS/cm	737			1.5	5	
pH	8.3	0.1	pH Units	8.3			0.4	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	260	10	mg/L	264			1.5	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.21	0.1	mg/L	0.23			6.5	16	
Turbidity	3.1	0.1	NTU	3.1			1.6	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	ND	0.001	mg/L	ND			NC	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			3.8	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	0.0006	0.0005	mg/L	0.0007			5.9	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0001	0.0001	mg/L	ND			NC	20	
Magnesium	0.6	0.2	mg/L	0.7			5.2	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0029	0.0005	mg/L	0.0029			1.3	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	1.4	0.1	mg/L	1.4			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	345	0.5	mg/L	360			4.3	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	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	30			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	26.7	1	mg/L	16.9	97.6	70-124			
Fluoride	1.27	0.1	mg/L	0.38	89.1	70-130			
Nitrate as N	1.06	0.1	mg/L	ND	106	77-126			
Nitrite as N	0.946	0.05	mg/L	ND	94.6	82-115			
Sulphate	28.9	1	mg/L	19.3	96.5	70-130			
General Inorganics									
Ammonia as N	1.06	0.01	mg/L	0.035	103	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	1.2	96.9	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	108	10	mg/L	ND	108	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.15	0.1	mg/L	0.23	92.5	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.1	70-130			
Aluminum	50.4	0.001	mg/L	0.496	99.9	80-120			
Arsenic	53.6	0.001	mg/L	0.105	107	80-120			
Barium	45.9	0.001	mg/L	0.173	91.4	80-120			
Beryllium	44.0	0.0005	mg/L	0.0811	87.9	80-120			
Boron	106	0.01	mg/L	65.1	82.2	80-120			
Cadmium	42.7	0.0001	mg/L	0.0209	85.4	80-120			
Calcium	12200	0.1	mg/L	2680	94.7	80-120			
Chromium	51.6	0.001	mg/L	0.038	103	80-120			
Cobalt	49.1	0.0005	mg/L	0.0411	98.2	80-120			
Copper	45.9	0.0005	mg/L	0.686	90.5	80-120			
Iron	2220	0.1	mg/L	2.0	88.9	80-120			
Lead	43.9	0.0001	mg/L	0.0848	87.5	80-120			
Magnesium	10300	0.2	mg/L	672	96.7	80-120			
Manganese	49.7	0.005	mg/L	0.378	98.5	80-120			
Molybdenum	49.5	0.0005	mg/L	2.94	93.2	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.5	0.001	mg/L	0.241	94.5	80-120			
Potassium	11300	0.1	mg/L	1400	98.9	80-120			
Selenium	45.9	0.001	mg/L	0.079	91.6	80-120			
Silver	40.1	0.0001	mg/L	0.0032	80.3	80-120			
Sodium	17600	0.2	mg/L	9500	81.2	80-120			
Thallium	45.0	0.001	mg/L	0.025	90.0	80-120			
Uranium	50.1	0.0001	mg/L	0.0613	100	80-120			
Vanadium	53.8	0.0005	mg/L	0.0485	107	80-120			
Zinc	43.4	0.005	mg/L	4.54	77.8	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.

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

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Paracel ID: 2344227

Paracel Order Number: 344227

Chain Of Custody
Ontario Drinking Water Samples
No. Nº 1596

Client Name:	GEMTEC	Project Ref:	100554.003	Waterworks Name:	Samples Taken By:
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name: Simon Mallory
Address:	32 Steacie Dr. Kanata ON	PO #:		Address:	Signature:
After Hours Contact:		E-mail:	brent.redmond@gemtec.ca		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day
Telephone:		Fax:		Public Health Unit:	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/08 ☐ ON REG 319/08 ☑ 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	Subdivision Package	trace metals		
1	Cedarlakes	TW1-3hr	R	G	N		OCT 31 '23	1:00PM	9										
2	"	TW1-6hr	R	G	N		OCT 31 '23	3:30PM	12										
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Required Analyses

Comments: Colour in ACW + TCW

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: HP	Verified By:
Relinquished By (Print): Simon Mallory	Date/Time:	Date/Time: Nov 1, 23 | 10:50	Date/Time: Nov 1 23 | 31 23
Date/Time: NOV 1 '23	Temperature: °C	Temperature: 5.9 °C	pH Verified: ☑ By:

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Certificate of Analysis

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

Client PO: Cedar lakes
Project: 100554.003
Custody: 13250

Report Date: 9-Nov-2023
Order Date: 2-Nov-2023

Order #: 2344440

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

Paracel ID	Client ID
2344440-01	TW2-3hr
2344440-02	TW2-6hr
2344440-03	TW2-6hr (Filtered)

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	6-Nov-23	6-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	6-Nov-23	6-Nov-23
Anions	EPA 300.1 - IC	6-Nov-23	6-Nov-23
Colour	SM2120 - Spectrophotometric	3-Nov-23	3-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	3-Nov-23	3-Nov-23
Conductivity	EPA 9050A- probe @25 °C	6-Nov-23	6-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	3-Nov-23	6-Nov-23
E. coli	MOE E3407	3-Nov-23	3-Nov-23
Fecal Coliform	SM 9222D	3-Nov-23	3-Nov-23
Heterotrophic Plate Count	SM 9215C	4-Nov-23	4-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Nov-23	7-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	3-Nov-23	6-Nov-23
pH	EPA 150.1 - pH probe @25 °C	6-Nov-23	6-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	6-Nov-23	6-Nov-23
Hardness	Hardness as CaCO3	3-Nov-23	6-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	3-Nov-23	3-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Nov-23	6-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	6-Nov-23	7-Nov-23
Turbidity	SM 2130B - Turbidity meter	4-Nov-23	4-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344440

Certificate of Analysis

Report Date: 09-Nov-2023

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

Order Date: 2-Nov-2023

Client PO: Cedar lakes

Project Description: 100554.003

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-		
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-	-	-
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	1 [1]	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	353	352	-	-	-	-
Ammonia as N	0.01 mg/L	<0.01	0.02	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.4	1.4	-	-	-	-
Colour, apparent	2 ACU	17	15	-	-	-	-
Colour	2 TCU	<2	<2	-	-	-	-
Conductivity	5 uS/cm	1540	1480	-	-	-	-
Hardness	mg/L	469	465	-	-	-	-
pH	0.1 pH Units	7.9	7.9	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	916	900	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.2	-	-	-	-
Turbidity	0.1 NTU	2.2	2.0	-	-	-	-
Anions							
Chloride	1 mg/L	246	243	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrate as N	0.1 mg/L	1.8	1.6	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	123	125	-	-	-	-

PARACEL LABORATORIES LTD.

Order #: 2344440

Certificate of Analysis

Report Date: 09-Nov-2023

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

Order Date: 2-Nov-2023

Client PO: **Cedar lakes**

Project Description: 100554.003

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-		
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-	-	-
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.006	<0.001	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.143	0.138	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.05	0.04	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	121	120	119	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	0.0049	0.0049	-	-	-
Copper	0.0005 mg/L	-	0.0006	0.0006	-	-	-
Iron	0.1 mg/L	0.2	0.2	<0.1	-	-	-
Lead	0.0001 mg/L	-	0.0004	0.0003	-	-	-
Magnesium	0.2 mg/L	40.7	40.1	40.4	-	-	-
Manganese	0.005 mg/L	0.032	0.032	0.031	-	-	-
Molybdenum	0.0005 mg/L	-	0.0667	0.0683	-	-	-
Nickel	0.001 mg/L	-	0.021	0.021	-	-	-
Potassium	0.1 mg/L	4.6	4.6	4.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	130	126	128	-	-	-
Strontium	0.01 mg/L	-	0.44	0.43	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0042	0.0040	-	-	-

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-		
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-	-	-
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	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	79.4	1	mg/L	79.0			0.5	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	155	1	mg/L	155			0.0	20	
General Inorganics									
Alkalinity, total	349	5	mg/L	353			1.2	14	
Ammonia as N	0.018	0.01	mg/L	0.020			7.8	17.7	
Dissolved Organic Carbon	1.2	0.5	mg/L	1.3			13.2	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	17	2	ACU	17			0.0	12	
Conductivity	1550	5	uS/cm	1540			1.0	5	QR-05
pH	7.9	0.1	pH Units	7.9			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	260	10	mg/L	264			1.5	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.22	0.1	mg/L	0.24			10.2	16	
Turbidity	1.9	0.1	NTU	2.0			1.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.002	0.001	mg/L	0.002			3.1	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.079	0.001	mg/L	0.082			3.2	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	101	0.1	mg/L	101			0.7	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	0.0085	0.0005	mg/L	0.0086			1.4	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0003	0.0001	mg/L	0.0003			9.9	20	
Magnesium	27.9	0.2	mg/L	27.8			0.0	20	
Manganese	0.482	0.005	mg/L	0.481			0.1	20	
Molybdenum	0.0005	0.0005	mg/L	0.0006			16.8	20	
Nickel	0.002	0.001	mg/L	0.002			3.3	20	
Potassium	2.7	0.1	mg/L	2.7			0.3	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	5.3	0.2	mg/L	5.6			7.2	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0014	0.0001	mg/L	0.0014			3.8	20	
Vanadium	0.0017	0.0005	mg/L	0.0017			2.4	20	
Zinc	0.006	0.005	mg/L	0.006			3.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	1			NC	30	
Fecal 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	88.9	1	mg/L	79.0	99.0	70-124			
Fluoride	1.02	0.1	mg/L	ND	102	70-130			
Nitrate as N	1.02	0.1	mg/L	ND	102	77-126			
Nitrite as N	0.904	0.05	mg/L	ND	90.4	82-115			
Sulphate	164	1	mg/L	155	91.9	70-130			
General Inorganics									
Ammonia as N	1.08	0.01	mg/L	0.020	106	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	102	67-133			
Total Dissolved Solids	108	10	mg/L	ND	108	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.24	90.3	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.1	70-130			
Aluminum	44.4	0.001	mg/L	2.05	84.6	80-120			
Arsenic	53.9	0.001	mg/L	0.261	107	80-120			
Barium	52.2	0.001	mg/L	ND	104	80-120			
Beryllium	44.4	0.0005	mg/L	0.0153	88.8	80-120			
Boron	51.4	0.01	mg/L	8.67	85.5	80-120			
Cadmium	45.2	0.0001	mg/L	0.0470	90.3	80-120			
Calcium	10700	0.1	mg/L	ND	107	80-120			
Chromium	52.4	0.001	mg/L	0.459	104	80-120			
Cobalt	47.6	0.0005	mg/L	0.0907	95.1	80-120			
Copper	52.9	0.0005	mg/L	8.61	88.5	80-120			
Iron	2230	0.1	mg/L	2.8	89.0	80-120			
Lead	42.2	0.0001	mg/L	0.312	83.7	80-120			
Magnesium	10800	0.2	mg/L	ND	108	80-120			
Manganese	96.7	0.005	mg/L	49.6	94.1	80-120			
Molybdenum	46.8	0.0005	mg/L	0.649	92.3	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.9	0.001	mg/L	1.61	92.7	80-120			
Potassium	12600	0.1	mg/L	2730	98.4	80-120			
Selenium	49.8	0.001	mg/L	0.158	99.2	80-120			
Silver	51.5	0.0001	mg/L	ND	103	80-120			
Sodium	14300	0.2	mg/L	5640	86.2	80-120			
Thallium	43.5	0.001	mg/L	0.027	87.0	80-120			
Uranium	45.7	0.0001	mg/L	1.41	88.5	80-120			
Vanadium	54.9	0.0005	mg/L	1.72	106	80-120			
Zinc	48.3	0.005	mg/L	6.10	84.3	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - All sample bottles missing the sample collection time.

Applies to Samples: TW2-3hr, TW2-6hr, TW2-6hr (Filtered)

Sample Qualifiers :

1: Duplicate result for this sample analysis was determined to be ND.

QC Qualifiers:

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

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

PARACE LABORATORIES L

Paracel ID: 2344440

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s.com

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 13250
2344440	

Client Name:	GEMTEC	Project Ref:	100554.003 (Cedarlakes)	Waterworks Name:	Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name:	Simon Mallon
Address:	32 Steacie Dr.	PO #:		Address:	Signature:	
After Hours Contact:		E-mail:	brent.redmond@gemtec.ca		Page 1 of 1	
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)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Subdiv. pickup	Trace metals		
1	Cedarlakes	TW2-3hr	R	G	N		NOV 2 '23	11:15AM	9							1	1		
2	"	TW2-6hr	R	G	N		"	2:15PM	12							1	1		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Colour in ACU + TCU

Method of Delivery: Walk

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By: Hisal
Relinquished By (Print): Simon Mallon	Date/Time: NOV 2 '23 3:30 pm	Date/Time: NOV 3 2023 12:24	Date/Time: Nov 3, 23 12:48
Date/Time: NOV 2 '23	Temperature: 1.2 °C	Temperature: 4.8 °C	pH Verified: ☑ By: HP

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 17439

Report Date: 6-Nov-2023
Order Date: 31-Oct-2023

Order #: 2344186

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

Paracel ID	Client ID
2344186-01	TW3-3hr
2344186-02	TW3-6hr
2344186-03	TW3-6hr (Filtered)

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	1-Nov-23	1-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	2-Nov-23	2-Nov-23
Anions	EPA 300.1 - IC	1-Nov-23	1-Nov-23
Colour	SM2120 - Spectrophotometric	1-Nov-23	1-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	1-Nov-23	1-Nov-23
Conductivity	EPA 9050A- probe @25 °C	1-Nov-23	1-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	1-Nov-23	2-Nov-23
E. coli	MOE E3407	1-Nov-23	1-Nov-23
Fecal Coliform	SM 9222D	1-Nov-23	1-Nov-23
Heterotrophic Plate Count	SM 9215C	1-Nov-23	1-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	2-Nov-23	2-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Nov-23	2-Nov-23
pH	EPA 150.1 - pH probe @25 °C	1-Nov-23	1-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	2-Nov-23	2-Nov-23
Hardness	Hardness as CaCO3	1-Nov-23	2-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	1-Nov-23	1-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	2-Nov-23	3-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	1-Nov-23	1-Nov-23
Turbidity	SM 2130B - Turbidity meter	1-Nov-23	1-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344186

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-	-	-
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-		
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	14	8	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	10	20	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	249	249	-	-	-	-
Ammonia as N	0.01 mg/L	0.13	0.11	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.2	1.2	-	-	-	-
Colour, apparent	2 ACU	9	9	-	-	-	-
Colour	2 TCU	2	2	-	-	-	-
Conductivity	5 uS/cm	724	752	-	-	-	-
Hardness	mg/L	345	342	-	-	-	-
pH	0.1 pH Units	8.0	8.0	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	422	426	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.2	-	-	-	-
Turbidity	0.1 NTU	1.0	0.8	-	-	-	-
Anions							
Chloride	1 mg/L	61	61	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
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	68	68	-	-	-	-

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-	-	-
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-		
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.003	<0.001	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.157	0.155	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.02	0.02	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	71.3	70.9	70.2	-	-	-
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	0.2	-	-	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.6	40.1	38.6	-	-	-
Manganese	0.005 mg/L	0.026	0.027	0.026	-	-	-
Molybdenum	0.0005 mg/L	-	0.0041	0.0040	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	2.5	2.5	2.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	14.2	14.2	13.7	-	-	-
Strontium	0.01 mg/L	-	0.53	0.52	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0002	0.0002	-	-	-

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-		
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-	-	-
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	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	16.8	1	mg/L	16.9			0.8	20	
Fluoride	0.39	0.1	mg/L	0.38			2.2	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	19.4	1	mg/L	19.3			0.6	20	
General Inorganics									
Alkalinity, total	247	5	mg/L	249			1.0	14	
Ammonia as N	0.033	0.01	mg/L	0.035			5.1	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.2			30.1	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	9	2	ACU	9			0.0	12	
Conductivity	721	5	uS/cm	724			0.3	5	
pH	8.0	0.1	pH Units	8.0			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	844	10	mg/L	844			0.0	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.11	0.1	mg/L	0.12			8.8	16	
Turbidity	0.1	0.1	NTU	0.1			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	ND	0.001	mg/L	ND			NC	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			3.8	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	0.0006	0.0005	mg/L	0.0007			5.9	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0001	0.0001	mg/L	ND			NC	20	
Magnesium	0.6	0.2	mg/L	0.7			5.2	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0029	0.0005	mg/L	0.0029			1.3	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	1.4	0.1	mg/L	1.4			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	345	0.5	mg/L	360			4.3	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	11	1	CFU/100mL	14			24.0	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	10			0.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	26.7	1	mg/L	16.9	97.6	70-124			
Fluoride	1.27	0.1	mg/L	0.38	89.1	70-130			
Nitrate as N	1.06	0.1	mg/L	ND	106	77-126			
Nitrite as N	0.946	0.05	mg/L	ND	94.6	82-115			
Sulphate	28.9	1	mg/L	19.3	96.5	70-130			
General Inorganics									
Ammonia as N	1.06	0.01	mg/L	0.035	103	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	1.2	96.9	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	90.0	10	mg/L	ND	90.0	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.10	0.1	mg/L	0.12	97.3	81-126			
Metals									
Mercury	0.0027	0.0001	mg/L	ND	89.3	70-130			
Aluminum	50.4	0.001	mg/L	0.496	99.9	80-120			
Arsenic	53.6	0.001	mg/L	0.105	107	80-120			
Barium	45.9	0.001	mg/L	0.173	91.4	80-120			
Beryllium	44.0	0.0005	mg/L	0.0811	87.9	80-120			
Boron	106	0.01	mg/L	65.1	82.2	80-120			
Cadmium	42.7	0.0001	mg/L	0.0209	85.4	80-120			
Calcium	12200	0.1	mg/L	2680	94.7	80-120			
Chromium	51.6	0.001	mg/L	0.038	103	80-120			
Cobalt	49.1	0.0005	mg/L	0.0411	98.2	80-120			
Copper	45.9	0.0005	mg/L	0.686	90.5	80-120			
Iron	2220	0.1	mg/L	2.0	88.9	80-120			
Lead	43.9	0.0001	mg/L	0.0848	87.5	80-120			
Magnesium	10300	0.2	mg/L	672	96.7	80-120			
Manganese	49.7	0.005	mg/L	0.378	98.5	80-120			
Molybdenum	49.5	0.0005	mg/L	2.94	93.2	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.5	0.001	mg/L	0.241	94.5	80-120			
Potassium	11300	0.1	mg/L	1400	98.9	80-120			
Selenium	45.9	0.001	mg/L	0.079	91.6	80-120			
Silver	40.1	0.0001	mg/L	0.0032	80.3	80-120			
Sodium	17600	0.2	mg/L	9500	81.2	80-120			
Thallium	45.0	0.001	mg/L	0.025	90.0	80-120			
Uranium	50.1	0.0001	mg/L	0.0613	100	80-120			
Vanadium	53.8	0.0005	mg/L	0.0485	107	80-120			
Zinc	43.4	0.005	mg/L	4.54	77.8	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.

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: 2344186

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 17439
2344186	

Client Name:	GEMTEC	Project Ref:	100554.003	Waterworks Name:	Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name:	Simon M
Address:		PO #:		Address:	Signature:	
After Hours Contact:		E-mail:	brent.redmond@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: Oreg 164/03

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	Subdivision Pckg	Trace metals		
1		TWB - 3hr	R	G	N		Oct. 30, 23	1PM	6							X			
2		TWB - 6hr	"	"	"	"	"	4PM	"							X	X		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: → colour in ACH & TCL

Method of Delivery: Paracel Courier

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By: SD
Relinquished By (Print): Brent Redmond	Date/Time:	Date/Time: Oct 31 2023 16:25	Date/Time: Oct 31 2023 4:35 pm
Date/Time: Oct. 31, 23 15:00	Temperature: °C	Temperature: 7.5 °C	pH Verified: ☑ By SD

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

Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 19047

Report Date: 2-Nov-2023
Order Date: 26-Oct-2023

Revised Report

Order #: 2343287

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

Paracel ID	Client ID
2343287-01	TW4-3hr
2343287-02	TW4-6hr
2343287-03	TW4-6hr (Filtered)

Approved By:

Mark Foto

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	27-Oct-23	27-Oct-23
Ammonia, as N	EPA 351.2 - Auto Colour	30-Oct-23	30-Oct-23
Anions	EPA 300.1 - IC	26-Oct-23	26-Oct-23
Colour	SM2120 - Spectrophotometric	26-Oct-23	26-Oct-23
Colour, apparent	SM2120 - Spectrophotometric	26-Oct-23	26-Oct-23
Conductivity	EPA 9050A- probe @25 °C	27-Oct-23	27-Oct-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	30-Oct-23	1-Nov-23
E. coli	MOE E3407	26-Oct-23	26-Oct-23
Fecal Coliform	SM 9222D	26-Oct-23	26-Oct-23
Heterotrophic Plate Count	SM 9215C	26-Oct-23	26-Oct-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	30-Oct-23	31-Oct-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	26-Oct-23	26-Oct-23
pH	EPA 150.1 - pH probe @25 °C	27-Oct-23	27-Oct-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	26-Oct-23	26-Oct-23
Hardness	Hardness as CaCO3	26-Oct-23	26-Oct-23
Sulphide	SM 4500SE - Colourimetric	30-Oct-23	31-Oct-23
Tannin/Lignin	SM 5550B - Colourimetric	30-Oct-23	31-Oct-23
Total Coliform	MOE E3407	26-Oct-23	26-Oct-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	30-Oct-23	30-Oct-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	30-Oct-23	31-Oct-23
Turbidity	SM 2130B - Turbidity meter	26-Oct-23	26-Oct-23

PARACEL LABORATORIES LTD.

Order #: 2343287

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-	-	-
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-		
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND [1]	ND [1]	-	-	-	-
Total Coliforms	1 CFU/100mL	ND [1]	ND [1]	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	60	30	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	267	268	-	-	-	-
Ammonia as N	0.01 mg/L	0.20	0.19	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.5	1.6	-	-	-	-
Colour, apparent	2 ACU	37	28	-	-	-	-
Colour	2 TCU	<2	<2	-	-	-	-
Conductivity	5 uS/cm	1030	1020	-	-	-	-
Hardness	mg/L	373	388	-	-	-	-
pH	0.1 pH Units	8.0	8.0	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	562	588	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	0.3	-	-	-	-
Turbidity	0.1 NTU	5.0	3.7	-	-	-	-
Anions							
Chloride	1 mg/L	140	143	-	-	-	-
Fluoride	0.1 mg/L	0.1	0.1	-	-	-	-
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	82	83	-	-	-	-

PARACEL LABORATORIES LTD.

Order #: 2343287

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-	-	-
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-		
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.062	0.003	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.212	0.206	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.07	0.07	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	82.5	84.9	95.2	-	-	-
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	0.3	0.4	0.3	-	-	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.6	42.7	46.0	-	-	-
Manganese	0.005 mg/L	0.029	0.029	0.031	-	-	-
Molybdenum	0.0005 mg/L	-	0.0062	0.0072	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	6.3	6.3	7.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	61.4	61.9	68.4	-	-	-
Strontium	0.01 mg/L	-	1.04	1.11	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0002	0.0002	-	-	-

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-		
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-	-	-
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	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	143	1	mg/L	143			0.2	20	
Fluoride	0.13	0.1	mg/L	0.12			4.1	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	83.9	1	mg/L	83.4			0.6	10	
General Inorganics									
Alkalinity, total	267	5	mg/L	267			0.0	14	
Ammonia as N	ND	0.01	mg/L	0.187			NC	17.7	
Dissolved Organic Carbon	1.4	0.5	mg/L	1.5			10.0	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	36	2	ACU	37			2.7	12	
Conductivity	984	5	uS/cm	1030			4.5	5	
pH	8.0	0.1	pH Units	8.0			0.2	3.3	
Phenolics	0.002	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	572	10	mg/L	588			2.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.25	0.1	mg/L	0.31			NC	16	
Turbidity	5.0	0.1	NTU	5.0			1.8	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.056	0.001	mg/L	0.062			10.5	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.218	0.001	mg/L	0.212			2.7	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			0.8	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	84.6	0.1	mg/L	84.9			0.3	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	ND	0.0005	mg/L	ND			NC	20	
Iron	0.4	0.1	mg/L	0.4			1.0	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	43.3	0.2	mg/L	42.7			1.4	20	
Manganese	0.029	0.005	mg/L	0.029			0.6	20	
Molybdenum	0.0059	0.0005	mg/L	0.0062			4.0	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	6.3	0.1	mg/L	6.3			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	64.1	0.2	mg/L	61.9			3.5	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0001	0.0001	mg/L	0.0002			3.4	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC01
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC01
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	30			100.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	153	1	mg/L	143	101	70-124			
Fluoride	0.96	0.1	mg/L	0.12	83.4	70-130			
Nitrate as N	1.05	0.1	mg/L	ND	105	77-126			
Nitrite as N	0.872	0.05	mg/L	ND	87.2	82-115			
Sulphate	94.8	1	mg/L	83.4	113	74-126			
General Inorganics									
Ammonia as N	1.25	0.01	mg/L	0.187	106	81-124			
Dissolved Organic Carbon	11.1	0.5	mg/L	1.6	95.0	60-133			
Phenolics	0.028	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	100	10	mg/L	ND	100	75-125			
Sulphide	0.50	0.02	mg/L	ND	100	79-115			
Tannin & Lignin	1.1	0.1	mg/L	ND	106	71-113			
Total Kjeldahl Nitrogen	1.30	0.1	mg/L	0.31	99.3	81-126			
Metals									
Mercury	0.0026	0.0001	mg/L	ND	85.8	70-130			
Aluminum	103	0.001	mg/L	62.2	82.1	80-120			
Arsenic	54.5	0.001	mg/L	0.076	109	80-120			
Barium	250	0.001	mg/L	212	75.2	80-120			QM-07
Beryllium	46.5	0.0005	mg/L	0.0228	93.0	80-120			
Boron	108	0.01	mg/L	71.3	72.5	80-120			QM-07
Cadmium	47.3	0.0001	mg/L	0.0022	94.6	80-120			
Calcium	10700	0.1	mg/L	ND	107	80-120			
Chromium	53.3	0.001	mg/L	0.502	106	80-120			
Cobalt	50.0	0.0005	mg/L	0.0342	99.9	80-120			
Copper	46.4	0.0005	mg/L	0.147	92.5	80-120			
Iron	2730	0.1	mg/L	360	94.6	80-120			
Lead	42.0	0.0001	mg/L	0.0343	84.0	80-120			
Magnesium	49200	0.2	mg/L	42700	64.5	80-120			QM-07
Manganese	80.2	0.005	mg/L	29.3	102	80-120			
Molybdenum	53.6	0.0005	mg/L	6.17	94.8	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	49.6	0.001	mg/L	0.858	97.5	80-120			
Potassium	16100	0.1	mg/L	6320	97.5	80-120			
Selenium	47.1	0.001	mg/L	ND	94.1	80-120			
Silver	43.8	0.0001	mg/L	ND	87.5	80-120			
Sodium	10600	0.2	mg/L	ND	106	80-120			
Thallium	45.1	0.001	mg/L	0.006	90.1	80-120			
Uranium	49.8	0.0001	mg/L	0.154	99.4	80-120			
Vanadium	55.0	0.0005	mg/L	0.181	110	80-120			
Zinc	44.9	0.005	mg/L	0.921	88.0	80-120			

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - All bottles, with the exception of 1 x bacteria bottle are labelled as PW4-3hr, chain of custody reads TW4-3hr.
Applies to Samples: TW4-3hr

Sample Qualifiers :

1: Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.

QC Qualifiers:

BAC01	Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.
BAC04	Duplicate QC data falls within method prescribed 95% confidence limits.
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:

All bottles read PW4-3hr. 1 bacteria bottle reads TW-3hr.

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

PARACE LABORATORIES L

Paracel ID: 2343287

Blvd.
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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 19047
2343287	

Client Name:	GEMTEC	Project Ref:	100554.003	Waterworks Name:	Samples Taken By:
Contact Name:	E. Wilson	Quote #:		Waterworks Number:	Name: Ester Wilson
Address:	32 Steacie Dr., Kanata	PO #:		Address:	Signature: Ester Wilson
After Hours Contact:		E-mail:	ester.wilson@gemtec.ca		Page 1 of 1
Telephone:	(613) 585-2041	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 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	trace metals	sub. pkg.		
1	Cedar Lakes P3-6	TW4-3hr	R	G	N	N	10-25-2023	11 AM	8								✓		
2	Cedar Lakes P3-6	TW4-6hr	R	G	N	N	10-25-2023	2 PM	11							✓	✓		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:
Doc vials - unfiltered. / Colour in ACU, TCU. / Trace metals filtered and unfiltered - justification: Required by City of Ottawa Hydrog + Terrain Guidelines.

Method of Delivery: ~~Walk-in~~ Drop-box

Relinquished By (Sign): Ester Wilson	Received By Driver/Depot:	Received at Lab: HP	Verified By: SD
Relinquished By (Print): Ester Wilson	Date/Time:	Date/Time: Oct 26, 23 9:05	Date/Time: Oct 26 2023 9.19am
Date/Time: 10-25-2024 at 5PM	Temperature: °C	Temperature: 7.9 °C	pH Verified: ☒ By: SD

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 19522

Report Date: 13-Nov-2023
Order Date: 7-Nov-2023

Order #: 2345203

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

Paracel ID	Client ID
2345203-01	TW5 3hr
2345203-02	TW5 6hr
2345203-03	TW5 6hr (Filtered)

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	9-Nov-23	9-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	8-Nov-23	8-Nov-23
Anions	EPA 300.1 - IC	8-Nov-23	8-Nov-23
Colour	SM2120 - Spectrophotometric	8-Nov-23	8-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	8-Nov-23	8-Nov-23
Conductivity	EPA 9050A- probe @25 °C	9-Nov-23	9-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	10-Nov-23	13-Nov-23
E. coli	MOE E3407	8-Nov-23	8-Nov-23
Fecal Coliform	SM 9222D	8-Nov-23	8-Nov-23
Heterotrophic Plate Count	SM 9215C	8-Nov-23	8-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	9-Nov-23	9-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	8-Nov-23	8-Nov-23
pH	EPA 150.1 - pH probe @25 °C	9-Nov-23	9-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	8-Nov-23	8-Nov-23
Hardness	Hardness as CaCO3	8-Nov-23	8-Nov-23
Sulphide	SM 4500SE - Colourimetric	9-Nov-23	10-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	9-Nov-23	9-Nov-23
Total Coliform	MOE E3407	8-Nov-23	8-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	8-Nov-23	9-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	8-Nov-23	10-Nov-23
Turbidity	SM 2130B - Turbidity meter	8-Nov-23	8-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2345203

Certificate of Analysis

Report Date: 13-Nov-2023

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

Order Date: 7-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-		
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-	-	-
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	3	10	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	20	10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	238	238	-	-	-	-
Ammonia as N	0.01 mg/L	0.12	0.08	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.0	0.7	-	-	-	-
Colour, apparent	2 ACU	33	32	-	-	-	-
Colour	2 TCU	2	<2	-	-	-	-
Conductivity	5 uS/cm	758	751	-	-	-	-
Hardness	mg/L	356	362	-	-	-	-
pH	0.1 pH Units	8.1	8.1	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	416	410	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.1	-	-	-	-
Turbidity	0.1 NTU	5.5	5.2	-	-	-	-
Anions							
Chloride	1 mg/L	68	68	-	-	-	-
Fluoride	0.1 mg/L	0.1	0.1	-	-	-	-
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	65	64	-	-	-	-

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-	-	-
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-		
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.087	0.002	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.152	0.147	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.04	0.04	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	75.7	74.3	76.1	-	-	-
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	0.4	0.4	0.3	-	-	-
Lead	0.0001 mg/L	-	0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.5	42.9	41.5	-	-	-
Manganese	0.005 mg/L	0.026	0.025	0.024	-	-	-
Molybdenum	0.0005 mg/L	-	0.0085	0.0087	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	3.4	3.5	3.4	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	37.1	37.3	36.2	-	-	-
Strontium	0.01 mg/L	-	0.54	0.53	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0003	0.0003	-	-	-

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-		
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-	-	-
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	0.007	-	-	-

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	ND	1	mg/L	ND			NC	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	0.11	0.1	mg/L	0.11			0.6	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	5.01	1	mg/L	4.96			0.9	20	
General Inorganics									
Alkalinity, total	200	5	mg/L	203			1.7	14	
Ammonia as N	0.118	0.01	mg/L	0.122			3.4	17.7	
Dissolved Organic Carbon	0.6	0.5	mg/L	0.7			19.6	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	33	2	ACU	33			0.0	12	
Conductivity	511	5	uS/cm	516			1.0	5	
pH	8.1	0.1	pH Units	8.0			0.7	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	794	10	mg/L	812			2.2	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	1.8	0.1	NTU	1.8			1.1	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.082	0.001	mg/L	0.087			6.8	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.156	0.001	mg/L	0.152			2.9	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.04	0.01	mg/L	0.04			3.9	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	75.9	0.1	mg/L	74.3			2.2	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	ND	0.0005	mg/L	ND			NC	20	
Iron	0.4	0.1	mg/L	0.4			4.0	20	
Lead	0.0001	0.0001	mg/L	0.0001			17.6	20	
Magnesium	40.8	0.2	mg/L	42.9			5.0	20	
Manganese	0.025	0.005	mg/L	0.025			0.9	20	
Molybdenum	0.0085	0.0005	mg/L	0.0085			1.0	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	3.5	0.1	mg/L	3.5			1.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	35.4	0.2	mg/L	37.3			5.1	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0003	0.0001	mg/L	0.0003			2.9	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	3	1	CFU/100mL	3			0.0	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	20			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	11.5	1	mg/L	ND	115	70-124			
Fluoride	0.98	0.1	mg/L	ND	98.4	70-130			
Nitrate as N	1.13	0.1	mg/L	0.11	102	77-126			
Nitrite as N	1.06	0.05	mg/L	ND	106	82-115			
Sulphate	15.5	1	mg/L	4.96	106	70-130			
General Inorganics									
Ammonia as N	1.13	0.01	mg/L	0.122	100	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	0.7	100	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	80.0	10	mg/L	ND	80.0	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.05	0.1	mg/L	ND	105	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.7	70-130			
Aluminum	134	0.001	mg/L	87.5	93.5	80-120			
Arsenic	55.1	0.001	mg/L	0.092	110	80-120			
Barium	197	0.001	mg/L	152	90.2	80-120			
Beryllium	53.2	0.0005	mg/L	0.0211	106	80-120			
Boron	88.8	0.01	mg/L	41.4	95.0	80-120			
Cadmium	49.3	0.0001	mg/L	0.0056	98.6	80-120			
Calcium	12300	0.1	mg/L	ND	123	80-120			QS-02
Chromium	58.1	0.001	mg/L	0.620	115	80-120			
Cobalt	53.2	0.0005	mg/L	0.0559	106	80-120			
Copper	49.8	0.0005	mg/L	0.174	99.3	80-120			
Iron	3030	0.1	mg/L	426	104	80-120			
Lead	47.1	0.0001	mg/L	0.106	94.1	80-120			
Magnesium	12200	0.2	mg/L	ND	122	80-120			QS-02
Manganese	79.3	0.005	mg/L	25.5	108	80-120			
Molybdenum	58.6	0.0005	mg/L	8.54	100	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	52.7	0.001	mg/L	0.594	104	80-120			
Potassium	14000	0.1	mg/L	3480	105	80-120			
Selenium	49.6	0.001	mg/L	0.017	99.1	80-120			
Silver	50.3	0.0001	mg/L	0.0005	101	80-120			
Sodium	11800	0.2	mg/L	ND	118	80-120			
Thallium	46.8	0.001	mg/L	0.003	93.6	80-120			
Uranium	49.2	0.0001	mg/L	0.261	97.8	80-120			
Vanadium	57.9	0.0005	mg/L	0.233	115	80-120			
Zinc	45.3	0.005	mg/L	0.333	90.0	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

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 ID: 2345203

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 19522
2345203	

Client Name:	GEMTEC	Project Ref:	100554.003	Waterworks Name:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	
Address:		PO #:		Address:	
After Hours Contact:		E-mail:	brent.redmond@gemtec.ca		
Telephone:	343-571-9581	Fax:		Public Health Unit:	

Samples Taken By:
Name: Brent R
Signature: [signature]

Page ____ of ____
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	Subdivision Pkg	Trace Metals	Cfilt + unfilt	
1		TWS 3hr	R	G	N	/	Nov 7.23	11:00	8							X			
2		TWS 6hr	"	"	"	"	"	14:00	"							X	X		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Colour in AC4 + TC4

Method of Delivery: Walkin

Relinquished By (Sign): [signature]	Received By Driver/Depot:	Received at Lab: VRBOOM	Verified By: [signature]
Relinquished By (Print): Brent Redmond	Date/Time:	Date/Time: Nov.7 23 1525	Date/Time: Nov 7 2023 1535
Date/Time: Nov-7, 23 / 15:25	Temperature: °C	Temperature: 6.6 °C	pH Verified: ☐ By:

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Certificate of Analysis

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

Client PO: Cedarlakes
Project: 100554.003
Custody: 12636

Report Date: 14-Nov-2023
Order Date: 8-Nov-2023

Order #: 2345308

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

Paracel ID	Client ID
2345308-01	PW-1794
2345308-02	PW-1826
2345308-03	PW-1850
2345308-04	PW-1858
2345308-05	PW-1922

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	9-Nov-23	9-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	13-Nov-23	13-Nov-23
Anions	EPA 300.1 - IC	9-Nov-23	9-Nov-23
Colour	SM2120 - Spectrophotometric	9-Nov-23	9-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	9-Nov-23	9-Nov-23
Conductivity	EPA 9050A- probe @25 °C	9-Nov-23	9-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	13-Nov-23	13-Nov-23
E. coli	MOE E3407	9-Nov-23	9-Nov-23
Fecal Coliform	SM 9222D	9-Nov-23	9-Nov-23
Heterotrophic Plate Count	SM 9215C	9-Nov-23	9-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	9-Nov-23	10-Nov-23
pH	EPA 150.1 - pH probe @25 °C	9-Nov-23	9-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	10-Nov-23	10-Nov-23
Hardness	Hardness as CaCO3	9-Nov-23	10-Nov-23
Sulphide	SM 4500SE - Colourimetric	9-Nov-23	10-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	9-Nov-23	9-Nov-23
Total Coliform	MOE E3407	9-Nov-23	9-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	9-Nov-23	13-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	9-Nov-23	10-Nov-23
Turbidity	SM 2130B - Turbidity meter	9-Nov-23	9-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2345308

Certificate of Analysis

Report Date: 14-Nov-2023

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

Order Date: 8-Nov-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	PW-1794	PW-1826	PW-1850	PW-1858	-	-
	Sample Date:	08-Nov-23 10:30	08-Nov-23 11:30	08-Nov-23 12:30	08-Nov-23 13:30		
	Sample ID:	2345308-01	2345308-02	2345308-03	2345308-04		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	Drinking Water		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	100	10	-	-
General Inorganics							
Alkalinity, total	5 mg/L	299	288	304	281	-	-
Ammonia as N	0.01 mg/L	0.05	0.07	0.06	0.06	-	-
Dissolved Organic Carbon	0.5 mg/L	1.1	1.0	1.0	1.1	-	-
Colour, apparent	2 ACU	228	28	159	85	-	-
Colour	2 TCU	2	<2	<2	<2	-	-
Conductivity	5 uS/cm	1420	1400	916	1380	-	-
Hardness	mg/L	474	468	434	458	-	-
pH	0.1 pH Units	7.6	7.7	7.8	7.7	-	-
Phenolics	0.001 mg/L	0.001	<0.001	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	844	788	534	764	-	-
Sulphide	0.02 mg/L	0.05	<0.02	0.04	<0.02	-	-
Tannin & Lignin	0.1 mg/L	0.2	<0.1	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.1	0.1	0.2	-	-
Turbidity	0.1 NTU	45.4	3.8	26.7	13.5	-	-
Anions							
Chloride	1 mg/L	245	237	84	231	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05	-	-
Sulphate	1 mg/L	119	118	76	113	-	-

Certificate of Analysis

Report Date: 14-Nov-2023

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

Order Date: 8-Nov-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	PW-1794	PW-1826	PW-1850	PW-1858	-	-
	Sample Date:	08-Nov-23 10:30	08-Nov-23 11:30	08-Nov-23 12:30	08-Nov-23 13:30		
	Sample ID:	2345308-01	2345308-02	2345308-03	2345308-04		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	Drinking Water		
	MDL/Units						
Metals							
Calcium	0.1 mg/L	116	112	93.9	109	-	-
Iron	0.1 mg/L	2.6	0.4	2.0	1.0	-	-
Magnesium	0.2 mg/L	44.5	45.7	48.5	45.1	-	-
Manganese	0.005 mg/L	0.042	0.031	0.039	0.034	-	-
Potassium	0.1 mg/L	4.6	5.1	2.9	4.1	-	-
Sodium	0.2 mg/L	128	113	21.0	117	-	-

Certificate of Analysis

Report Date: 14-Nov-2023

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

Order Date: 8-Nov-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	PW-1922				-	-
	Sample Date:	08-Nov-23 14:30					
	Sample ID:	2345308-05					
	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	220	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	247	-	-	-	-	-
Ammonia as N	0.01 mg/L	0.08	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.3	-	-	-	-	-
Colour, apparent	2 ACU	120	-	-	-	-	-
Colour	2 TCU	<2	-	-	-	-	-
Conductivity	5 uS/cm	1230	-	-	-	-	-
Hardness	mg/L	421	-	-	-	-	-
pH	0.1 pH Units	7.8	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	678	-	-	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	-	-	-	-	-
Turbidity	0.1 NTU	19.4	-	-	-	-	-
Anions							
Chloride	1 mg/L	205	-	-	-	-	-
Fluoride	0.1 mg/L	<0.1	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	105	-	-	-	-	-

	Client ID:	PW-1922				-	-
	Sample Date:	08-Nov-23 14:30					
	Sample ID:	2345308-05					
	Matrix:	Drinking Water					
	MDL/Units						
Metals							
Calcium	0.1 mg/L	99.2	-	-	-	-	-
Iron	0.1 mg/L	1.4	-	-	-	-	-
Magnesium	0.2 mg/L	42.0	-	-	-	-	-
Manganese	0.005 mg/L	0.041	-	-	-	-	-
Potassium	0.1 mg/L	4.2	-	-	-	-	-
Sodium	0.2 mg/L	90.0	-	-	-	-	-

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								
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					
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	205	1	mg/L	205			0.0	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	107	1	mg/L	105			1.2	20	
General Inorganics									
Alkalinity, total	200	5	mg/L	203			1.7	14	
Ammonia as N	0.095	0.01	mg/L	0.077			NC	17.7	
Dissolved Organic Carbon	1.1	0.5	mg/L	1.0			6.9	37	
Colour	ND	2	TCU	2			NC	12	
Colour, apparent	228	2	ACU	228			0.0	12	
Conductivity	511	5	uS/cm	516			1.0	5	
pH	8.1	0.1	pH Units	8.0			0.7	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	ND	10	mg/L	ND			NC	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.13	0.1	mg/L	0.12			7.2	16	
Turbidity	45.0	0.1	NTU	45.4			0.9	10	
Metals									
Calcium	105	0.1	mg/L	104			0.5	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium	32.0	0.2	mg/L	34.2			6.6	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	3.6	0.1	mg/L	3.6			0.5	20	
Sodium	43.9	0.2	mg/L	47.1			7.2	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC01
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC01
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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	214	1	mg/L	205	92.6	70-124			
Fluoride	1.02	0.1	mg/L	ND	102	70-130			
Nitrate as N	1.02	0.1	mg/L	ND	102	77-126			
Nitrite as N	0.958	0.05	mg/L	ND	95.8	82-115			
Sulphate	114	1	mg/L	105	88.2	70-130			
General Inorganics									
Ammonia as N	1.08	0.01	mg/L	0.077	100	81-124			
Dissolved Organic Carbon	11.4	0.5	mg/L	1.3	101	60-133			
Phenolics	0.027	0.001	mg/L	ND	108	67-133			
Total Dissolved Solids	92.0	10	mg/L	ND	92.0	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.12	102	81-126			
Metals									
Calcium	11900	0.1	mg/L	ND	119	80-120			
Iron	2520	0.1	mg/L	11.4	100	80-120			
Magnesium	11400	0.2	mg/L	ND	114	80-120			
Manganese	52.0	0.005	mg/L	1.21	101	80-120			
Potassium	14300	0.1	mg/L	3630	107	80-120			
Sodium	53200	0.2	mg/L	45000	82.1	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - 1 x 40 ml DOC vial is missing the client name, sample collection date/time.

Applies to Samples: PW-1826

Container and COC sample IDs don't match - 500 ml general chemistry bottle reads as PW-1828, and 1 x 40 ml DOC vial is un-labelled, chain of custody reads as PW-1826.

Applies to Samples: PW-1826

Sample Qualifiers :

QC Qualifiers:

BAC01	Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.

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

Paracel ID: 2345308

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 12636
2345308	

Client Name:	GEMTEC	Project Ref:	100554003 (Cedarlakes)	Waterworks Name:	Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name:	Simon Mallory
Address:	32 Stacie Dr.	PO #:		Address:	Signature:	
After Hours Contact:		E-mail:	Brent.redmond@gemtec.ca		Page 1 of 1	
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	Standard sub. Package			
1	Cedarlakes	PW-1794	R	G	N	No	NOV 8 '23	10:30AM	8										
2		PW-1826						11:30AM	9										
3		PW-1850						12:30PM	8										
4		PW-1858						1:30PM	9										
5		PW-1922						2:30PM	9										
6																			
7																			
8																			
9																			
10																			

Comments: Colour in ACU + TCU on labels for PW-1926, 1858 may be mis marked

Method of Delivery: Walk

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Simon Mallory	Date/Time: NOV 8 23 3:05 pm	Date/Time: Nov 8 2023 16:16	Date/Time: Nov 9 2023 8:59
Date/Time: NOV 8	Temperature: 8.7 °C	Temperature: 8.8 °C	pH Verified: ☐ By:

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 72256, 19053

Report Date: 4-Dec-2023
Order Date: 28-Nov-2023

Order #: 2348173

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

Paracel ID	Client ID
2348173-01	PW-6266
2348173-02	PW-6342

Approved By:

Mark Foto

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	30-Nov-23	30-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	30-Nov-23	30-Nov-23
Anions	EPA 300.1 - IC	4-Dec-23	4-Dec-23
Colour	SM2120 - Spectrophotometric	29-Nov-23	29-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	29-Nov-23	29-Nov-23
Conductivity	EPA 9050A- probe @25 °C	30-Nov-23	30-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	29-Nov-23	30-Nov-23
E. coli	MOE E3407	29-Nov-23	29-Nov-23
Fecal Coliform	SM 9222D	29-Nov-23	29-Nov-23
Heterotrophic Plate Count	SM 9215C	29-Nov-23	29-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Nov-23	29-Nov-23
pH	EPA 150.1 - pH probe @25 °C	30-Nov-23	30-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	29-Nov-23	29-Nov-23
Hardness	Hardness as CaCO3	29-Nov-23	29-Nov-23
Sulphide	SM 4500SE - Colourimetric	1-Dec-23	1-Dec-23
Tannin/Lignin	SM 5550B - Colourimetric	1-Dec-23	1-Dec-23
Total Coliform	MOE E3407	29-Nov-23	29-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	1-Dec-23	1-Dec-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	29-Nov-23	29-Nov-23
Turbidity	SM 2130B - Turbidity meter	29-Nov-23	29-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2348173

Certificate of Analysis

Report Date: 04-Dec-2023

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

Order Date: 28-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	PW-6266	PW-6342	-	-	-	-
	Sample Date:	28-Nov-23 10:30	28-Nov-23 11:30	-	-		
	Sample ID:	2348173-01	2348173-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	90	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	324	295	-	-	-	-
Ammonia as N	0.01 mg/L	0.12	0.18	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	6.2	3.8	-	-	-	-
Colour, apparent	2 ACU	167	92	-	-	-	-
Colour	2 TCU	6	3	-	-	-	-
Conductivity	5 uS/cm	1090	963	-	-	-	-
Hardness	mg/L	415	359	-	-	-	-
pH	0.1 pH Units	7.7	7.8	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	672	534	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	0.3	0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	0.3	-	-	-	-
Turbidity	0.1 NTU	19.2	11.8	-	-	-	-
Anions							
Chloride	1 mg/L	125	96	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
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	98	81	-	-	-	-

	Client ID:	PW-6266	PW-6342	-	-		
	Sample Date:	28-Nov-23 10:30	28-Nov-23 11:30	-	-	-	-
	Sample ID:	2348173-01	2348173-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Calcium	0.1 mg/L	109	95.3	-	-	-	-
Iron	0.1 mg/L	1.8	1.1	-	-	-	-
Magnesium	0.2 mg/L	34.6	29.4	-	-	-	-
Manganese	0.005 mg/L	0.228	0.116	-	-	-	-
Potassium	0.1 mg/L	1.9	2.1	-	-	-	-
Sodium	0.2 mg/L	51.4	46.9	-	-	-	-

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								
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					
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	6.00	1	mg/L	5.88			2.1	20	
Fluoride	0.32	0.1	mg/L	0.33			5.1	20	
Nitrate as N	0.11	0.1	mg/L	0.12			3.8	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	25.4	1	mg/L	24.8			2.2	20	
General Inorganics									
Alkalinity, total	316	5	mg/L	324			2.5	14	
Ammonia as N	0.115	0.01	mg/L	0.116			1.2	17.7	
Dissolved Organic Carbon	6.3	0.5	mg/L	6.2			1.7	37	
Colour	7	2	TCU	6			NC	12	
Colour, apparent	166	2	ACU	167			0.6	12	
Conductivity	1110	5	uS/cm	1090			1.5	5	
pH	7.8	0.1	pH Units	7.7			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	666	10	mg/L	672			0.9	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	0.1			NC	11	
Total Kjeldahl Nitrogen	0.30	0.1	mg/L	0.33			10.9	16	
Turbidity	19.1	0.1	NTU	19.2			0.5	10	
Metals									
Calcium	51.0	0.1	mg/L	51.0			0.0	20	
Iron	0.5	0.1	mg/L	0.5			1.8	20	
Magnesium	18.7	0.2	mg/L	18.5			0.9	20	
Manganese	0.016	0.005	mg/L	0.015			9.4	20	
Potassium	2.1	0.1	mg/L	2.0			2.4	20	
Sodium	11.1	0.2	mg/L	11.2			0.8	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	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Heterotrophic Plate Count	80	10	CFU/mL	90			12.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.4	1	mg/L	5.88	105	70-124			
Fluoride	1.20	0.1	mg/L	0.33	86.7	70-130			
Nitrate as N	1.15	0.1	mg/L	0.12	103	77-126			
Nitrite as N	1.08	0.05	mg/L	ND	108	82-115			
Sulphate	34.5	1	mg/L	24.8	97.3	70-130			
General Inorganics									
Ammonia as N	1.12	0.01	mg/L	0.116	100	81-124			
Dissolved Organic Carbon	14.1	0.5	mg/L	3.8	102	60-133			
Phenolics	0.026	0.001	mg/L	ND	106	67-133			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.52	0.02	mg/L	ND	104	79-115			
Tannin & Lignin	1.0	0.1	mg/L	0.1	86.6	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.33	81.3	81-126			
Metals									
Calcium	57200	0.1	mg/L	51000	62.7	80-120			QM-07
Iron	2660	0.1	mg/L	462	88.1	80-120			
Magnesium	25800	0.2	mg/L	18500	73.2	80-120			QM-07
Manganese	62.7	0.005	mg/L	14.5	96.3	80-120			
Potassium	11600	0.1	mg/L	2000	96.1	80-120			
Sodium	19400	0.2	mg/L	11200	82.0	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Sample collection time on the containers read 11:30, chain of custody reads 10:30. Report as 11:30 as per the bottles, as directed by the client.
Applies to Samples: PW-6342

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

PARAC LABORATORIES

Paracel ID: 2348173

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Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2348173	№ 72256

Client Name: GEMTEC
Contact Name: Brent Redmond
Address: 32 Steacie Dr.
Telephone:

Project Ref: 100554.003
Quote #:
PO #:
E-mail: brent.redmond@gemtec.ca

Page 1 of 1

Turnaround Time

☐ 1 day ☐ 3 day
☐ 2 day ☑ Regular
Date Required:

☐ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation

☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☑ Other: O. Reg 169/03

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Standard suite + pkg
1	PW-6266	GW	✓	10	NOV28	10:30AM	✓
2	PW-6342	GW	✓	10	NOV28	10:30AM	✓
3							
4							
5							
6							
7							
8							
9							
10							

Comments: Colour in ACV + TCV
* Nothing was field-filtered

Method of Delivery: Walk

Relinquished By (Sign):	Received at Depot:	Received at Lab: HP	Verified By:
Relinquished By (Print): Simon Mallory	Date/Time: NOV28 2023 12:59 PM	Date/Time: Nov 28, 23 14:30	Date/Time:
Date/Time: NOV28 1:00PM	Temperature: 0.8 °C	Temperature: 7.8 °C	pH Verified: ☐ By:

PARAC LABORATORIES

Paracel ID: 2348173

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 19053
2348173	

Client Name:	GENTEC	Project Ref:	100554.003	Waterworks Name:	Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:	Name:	Simon Mallory
Address:	32 Steacie Dr.	PO #:		Address: [redacted]	Signature:	[redacted]
After Hours Contact:		E-mail:	brent.redmond@gentec.ca		Page 1 of 1 Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day	
Telephone:		Fax:		Public Health Unit:		

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	Std. Subdiv. 2+3			
Required Analyses																			
1	6266 Deermeadow Dr.	PW-6266	R	G	N		NOV 28	10:30 AM	10							1			
2	6342 Elkwood Dr.	PW-6342	R	G	N		NOV 28	10:30 AM	10							1			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Colour in ACU & TCU
NONE [redacted] field-filtered
Revised COC

Method of Delivery:

Relinquished By (Sign): [signature]	Received By Driver/Depot:	Received at Lab: [signature]	Verified By: [signature]
Relinquished By (Print): Simon Mallory	Date/Time:	Date/Time: NOV 29 2013 8:00	Date/Time: NOV 29 2013 8:00
Date/Time: NOV 28	Temperature: °C	Temperature: °C	pH Verified: ☐ By:

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 3404

Report Date: 29-Sep-2023
Order Date: 25-Sep-2023

Order #: 2339122

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

Paracel ID	Client ID
2339122-01	MW1
2339122-02	MW2
2339122-03	MW3

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ammonia, as N	EPA 351.2 - Auto Colour	28-Sep-23	28-Sep-23
Anions	EPA 300.1 - IC	26-Sep-23	26-Sep-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	27-Sep-23	27-Sep-23

Certificate of Analysis

Report Date: 29-Sep-2023

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

Order Date: 25-Sep-2023

Client PO:

Project Description: 100554.003

	Client ID:	MW1	MW2	MW3	-		
	Sample Date:	25-Sep-23 13:00	25-Sep-23 14:13	25-Sep-23 11:53	-	-	-
	Sample ID:	2339122-01	2339122-02	2339122-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
General Inorganics							
Ammonia as N	0.01 mg/L	<0.01	0.12	0.06	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	1.6	1.3	-	-	-
Anions							
Nitrate as N	0.1 mg/L	3.4	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Ammonia as N	ND	0.01	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Ammonia as N	ND	0.01	mg/L	ND			NC	18	
Total Kjeldahl Nitrogen	4.74	0.2	mg/L	4.54			4.3	16	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.07	0.1	mg/L	ND	107	77-126			
Nitrite as N	1.02	0.05	mg/L	ND	102	82-115			
General Inorganics									
Ammonia as N	1.01	0.01	mg/L	ND	101	81-124			
Total Kjeldahl Nitrogen	1.04	0.1	mg/L	ND	104	81-126			

Certificate of Analysis

Report Date: 29-Sep-2023

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

Order Date: 25-Sep-2023

Client PO:

Project Description: 100554.003

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

PARACE LABORATORIES L

Paracel ID: 2339122

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4J8
s.com

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 3404
2339122	

Client Name:	GEMTEC	Project Ref:	100554.003	Waterworks Name:		Samples Taken By:	
Contact Name:	Brent Redmond	Quote #:		Waterworks Number:		Name:	Simon Mallory
Address:		PO #:		Address:		Signature:	
After Hours Contact:		E-mail:	brent.redmond@gemtec.ca			Page 1 of 1	
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 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other: 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	Nitrate	Nitrite	Ammonia	TKN
1		MW1	R	G	N	NO	SEP 25 '23	1:00PM	2							/	/	/	/
2		MW2			N	NO		2:13PM								/	/	/	/
3		MW3			N	NO		11:53AM								/	/	/	/
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab: Sunnyvale Ottawa	Verified By: SO
Relinquished By (Print): Simon Mallory	Date/Time: 09/25/26 3:10pm	Date/Time: Sep 26, 2023 10:36	Date/Time: Sept 26, 2023 11:58am
Date/Time: Sep 25 '23	Temperature: 12.6 °C	Temperature: 6.4 °C	pH Verified: ☑ By: SO

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Certificate of Analysis

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

Client PO: Cedarlakes
Project: 100554.003
Custody: 73780

Report Date: 2-Nov-2023
Order Date: 27-Oct-2023

Order #: 2343470

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

Paracel ID	Client ID
2343470-01	MW1
2343470-02	MW2
2343470-03	MW3

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	30-Oct-23	30-Oct-23

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 27-Oct-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	MW1	MW2	MW3	-		
	Sample Date:	27-Oct-23 09:00	27-Oct-23 09:00	27-Oct-23 09:00	-	-	-
	Sample ID:	2343470-01	2343470-02	2343470-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
Anions							
Nitrate as N	0.1 mg/L	2.6	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	0.09	<0.05	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%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	3.49	0.1	mg/L	3.56			2.0	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	4.56	0.1	mg/L	3.56	100	77-126			
Nitrite as N	0.988	0.05	mg/L	ND	98.8	82-115			

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 27-Oct-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

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: 2343470

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2343478	№ 73780

Client Name: GEMTEC
Contact Name: Brent Redmond
Address:
Telephone:

Project Ref: 100554.003 (Cedarlakes)
Quote #:
PO #:
E-mail: brent.redmond@gemtec.ca
Simon.mallory@gemtec.ca

Page 1 of 1

Turnaround Time
☐ 1 day ☐ 3 day
☐ 2 day ☑ Regular
Date Required:

☐ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

Other Regulation
☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☑ Other: O.Reg 169/03

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analysis: Nitrates	Required Analysis: Nitrites
1	MW1	GW	-	1	OCT 27 '23	AM	/	/
2	MW2		-	1			/	/
3	MW3		-	1			/	/
4								
5								
6								
7								
8								
9								
10								

Comments:

Method of Delivery:

Relinquished By (Sign): Simon Mallory
Relinquished By (Print):
Date/Time: OCT 27 '23

Received at Depot: 3:45pm
Date/Time: Oct 27/23
Temperature: 9.7 °C

Received at Lab: SO
Date/Time: Oct 27, 2023 4:55 pm
Temperature: 7.6 °C

Verified By:
Date/Time: Oct 28 2023 8:58
pH Verified: ☐ By: NA

CALIBRATION SHEETS

CERTIFICATE OF CALIBRATION

The HORIBA Instrument listed below has been inspected and calibrated following the Manufacturer's specifications and methods.

Instrument Model: **HORIBA U-22** *Serial Number:* **UNNOMASS** *Calibration Date:* **November 6, 2023**

2-POINT pH	***CONDUCTIVITY***	***TURBIDITY***	***DISSOLVED OXYGEN***	***OXIDIZATION-REDUCTION POTENTIAL***	***TEMPERATURE***
4.00 pH, 7.00 pH	4.49mS/cm ZERO CHECKED	0 & 100 NTU	9 mg/L @ 20.5 DegC SODIUM SULFITE ZERO	240mV	Fisher Scientific s/n 230606647
AutoCal 4.00 pH Solution LOT # 3GE0924	AutoCal Solution LOT # 3GH0985	AutoCal Solution LOT# 3GH0985	Oakton Zero Solution LOT # 767903	Hanna ORP LOT # 8803	
Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: December 1, 2023	Expiry Date: March 1, 2025	
pH 7.00 LOT # 3GH0684	@25 DegC LOT # 3GH0985	Turb. 100 NTU LOT # A2237A			
Expiry Date: August 1, 2025		Expiry Date: August 1, 2024			

The calibration standard used is considered to be a certified standard and is traceable to the National Institute of Standards and Technology (NIST). Certificate of Analysis is available upon request.

The instrument indicated above is now certified to be operating within the Manufacturer's specifications. This does not eliminate the requirement for regular maintenance and pre-use sensor response checks in order to ensure continued complete and accurate operating condition.

Certified By: Jeff Loney

Maxim **Environmental and Safety Inc.**

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www.maximenvironmental.com

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(905)670-1304 | Toll Free (888)285-2324

Ottawa Office:
9 - 148 Colonnade Rd., Ottawa, ON K2E 7R4
(613)224-4747 | Toll Free (888)285-2324

CERTIFICATE OF CALIBRATION

The HORIBA Instrument listed below has been inspected and calibrated following the Manufacturer's specifications and methods.

Instrument Model: **HORIBA U-22** *Serial Number:* **UNNOMASS** *Calibration Date:* **November 6, 2023**

2-POINT pH	***CONDUCTIVITY***	***TURBIDITY***	***DISSOLVED OXYGEN***	***OXIDIZATION-REDUCTION POTENTIAL***	***TEMPERATURE***
4.00 pH, 7.00 pH	4.49mS/cm ZERO CHECKED	0 & 100 NTU	9 mg/L @ 20.5 DegC SODIUM SULFITE ZERO	240mV	Fisher Scientific s/n 230606647
AutoCal 4.00 pH Solution LOT # 3GE0924	AutoCal Solution LOT # 3GH0985	AutoCal Solution LOT# 3GH0985	Oakton Zero Solution LOT # 767903	Hanna ORP LOT # 8803	
Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: December 1, 2023	Expiry Date: March 1, 2025	
pH 7.00 LOT # 3GH0684	@25 DegC LOT # 3GH0985	Turb. 100 NTU LOT # A2237A			
Expiry Date: August 1, 2025		Expiry Date: August 1, 2024			

The calibration standard used is considered to be a certified standard and is traceable to the National Institute of Standards and Technology (NIST). Certificate of Analysis is available upon request.

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APPENDIX E

Nitrate Dilution Calculations

Nitrate Dilution Calculation Worksheet - Cedar Lakes Phase 3-4

Nitrate Loading

Residential Septic Systems (assumes 1,000 L/day/lot)

Number of lots with untreated septic systems =	71	lots
Nitrate loading from untreated septic system =	40	grams/lot/day
Total annual nitrate loading from untreated systems =	1036600	grams/year
Total Annual Nitrate Loading from all Systems =	**1036600**	**grams/year**

Dilution Volumes

Infiltration Factors

Topography factor =	0.2
Soil factor =	0.4
Cover factor =	0.165
Combined infiltration factor =	0.765

Precipitation Infiltration

Annual water surplus =	0.380	metres/year
Annual infiltration (Water Surplus x Infiltration Factor) =	0.2907	metres/year

Infiltration Area and Infiltration Volumes

Area available for infiltration (Site Area) =	411360	square metres
Area available for infiltration (Site Area - Hard Surface Area) = *Assumes 7 metre wide x 2,300 m long interal roadways, 300m2 for each lot house+driveway and removal of 98,000 m2 for lands previously incorporated into dilution assessments*	275960	square metres
Total Annual Volume of Infiltration (Infiltration x Area) =	80222	cubic metres/year
Annual Flow from Residential Lots (assuming 1000 L/day/lot) =	25915	cubic metres/year
Total Annual Volume Available for Dilution =	**106137**	**cubic metres/year**

Dilution Calculation

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

$$\mathbf{C_{Nitrate} = \frac{1036600\ grams/year}{106137\ cubic\ metres/year} = 9.77\ mg/L}$$

GEMTEC
Consulting Engineers and Scientists

Ottawa Intl A WATER BUDGET MEANS FOR THE PERIOD 1939-2020 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.69
LONG... 75.67 LOWER ZONE..... 45 MM A..... 1.079

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.6	62	12	14	0	0	0	25	83	74	295
28- 2	-9.0	56	10	17	1	1	0	26	112	74	351
31- 3	-2.8	66	31	78	5	5	0	103	69	75	416
30- 4	5.7	73	68	74	31	31	0	111	0	75	490
31- 5	13.1	76	76	0	80	80	0	14	0	56	566
30- 6	18.3	85	85	0	116	107	-9	5	0	30	651
31- 7	20.9	88	88	0	136	103	-33	3	0	11	739
31- 8	19.6	84	84	0	118	84	-34	1	0	11	823
30- 9	14.8	82	82	0	75	65	-10	4	0	24	906
31-10	8.3	77	77	0	37	36	-1	14	0	52	77
30-11	1.3	76	59	8	10	10	0	38	9	71	154
31-12	-6.9	79	27	14	1	1	0	36	47	74	233
AVE	6.0 TTL	904	699	205	610	523	-87	380			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2020 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	17	1	1	0	29	44	3	59
28- 2	2.6	26	14	26	1	1	0	35	59	3	63
31- 3	2.6	28	22	49	5	5	0	55	87	0	71
30- 4	1.8	32	33	88	9	9	0	89	2	2	80
31- 5	1.8	34	34	2	12	12	0	24	0	22	94
30- 6	1.2	38	38	0	8	18	18	16	0	29	105
31- 7	1.2	45	45	0	8	31	33	16	0	22	117
31- 8	1.3	37	37	0	8	29	31	4	0	21	126
30- 9	1.5	39	39	0	8	16	16	15	0	29	132
31-10	1.5	37	37	1	7	7	2	21	0	27	37
30-11	1.8	27	27	8	4	4	0	32	13	12	45
31-12	3.0	30	22	14	1	1	0	30	34	4	55

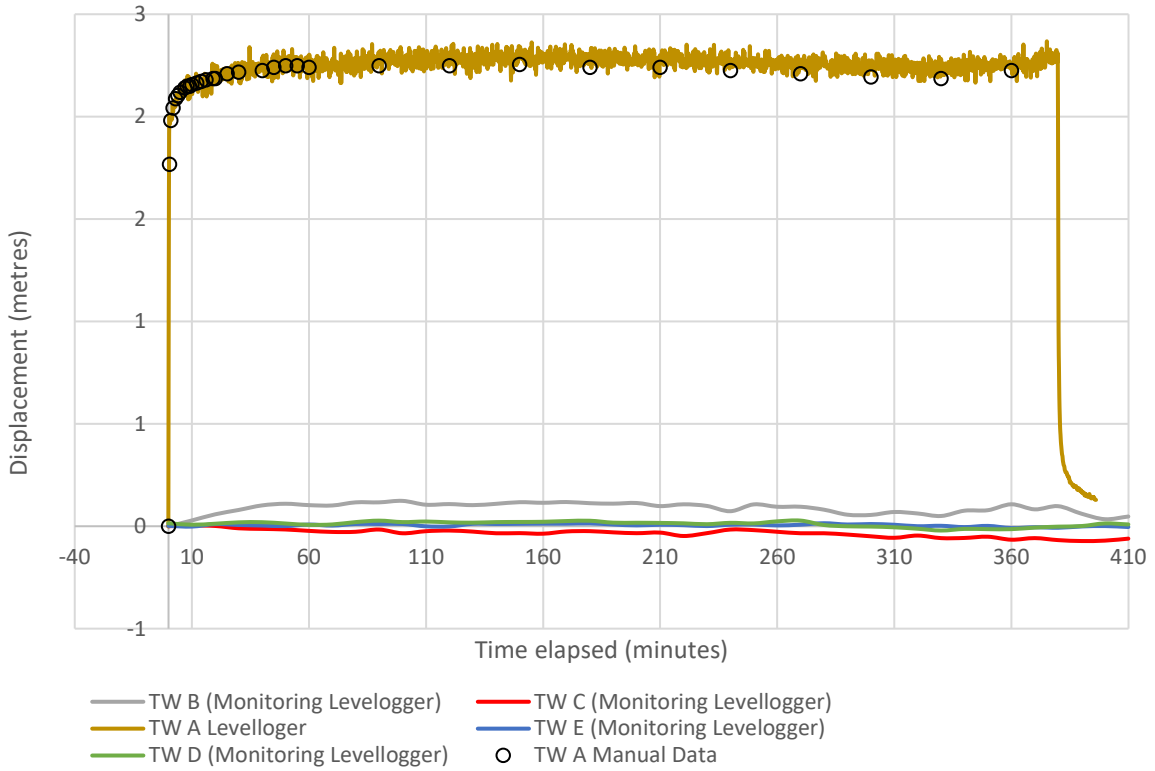
APPENDIX F

Pumping Test Graphs and Analysis

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW A): Drawdown and Recovery



Water Levels TW A

Static : 5.43 m below top of casing

TOC = 0.51 m above ground surface

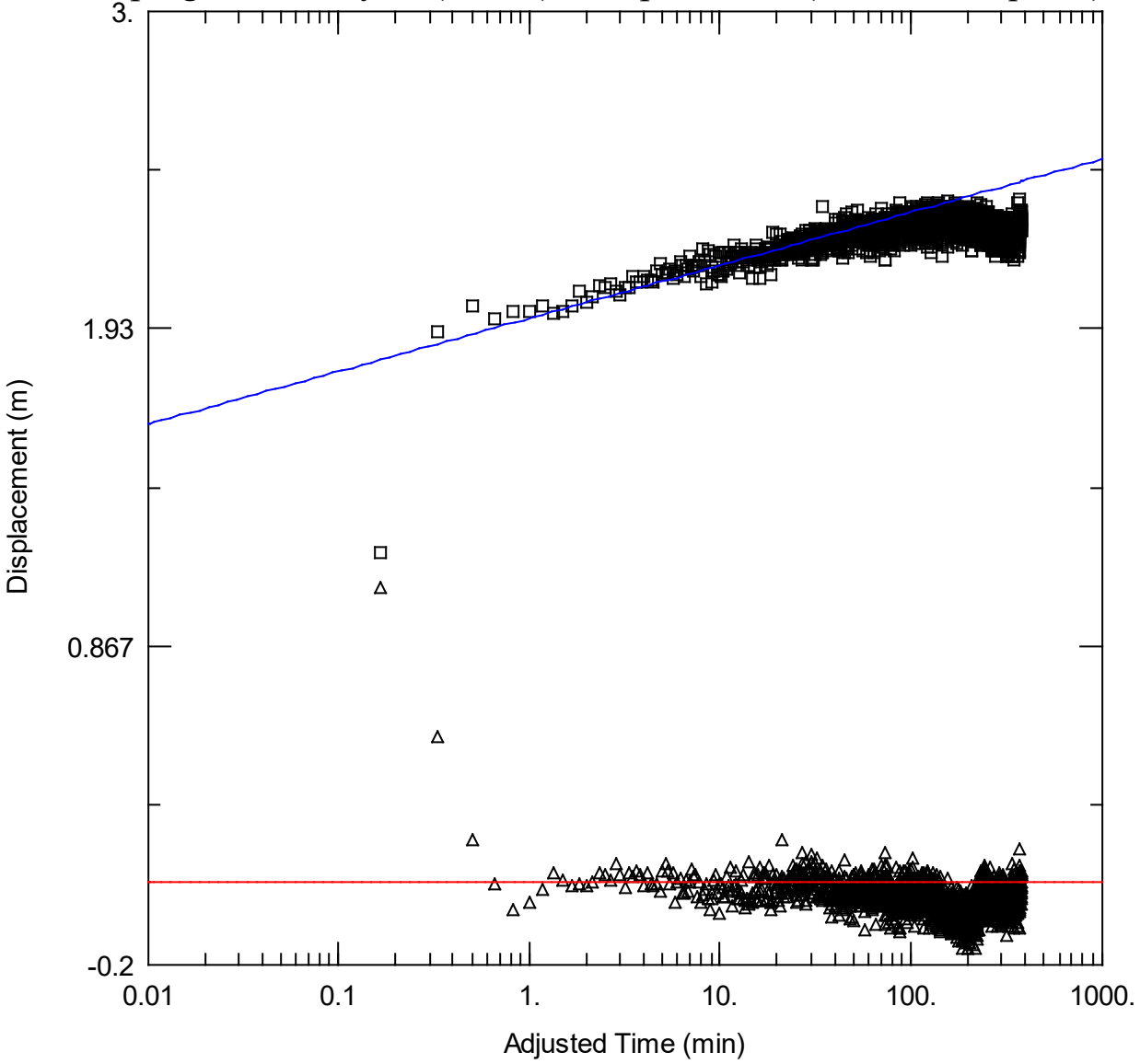
End of pump test (6-hours): 7.65 m below top of casing

Following recovery (2 hours): 5.52 m below top of casing

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW A): Cooper-Jacob (Confined Aquifer)

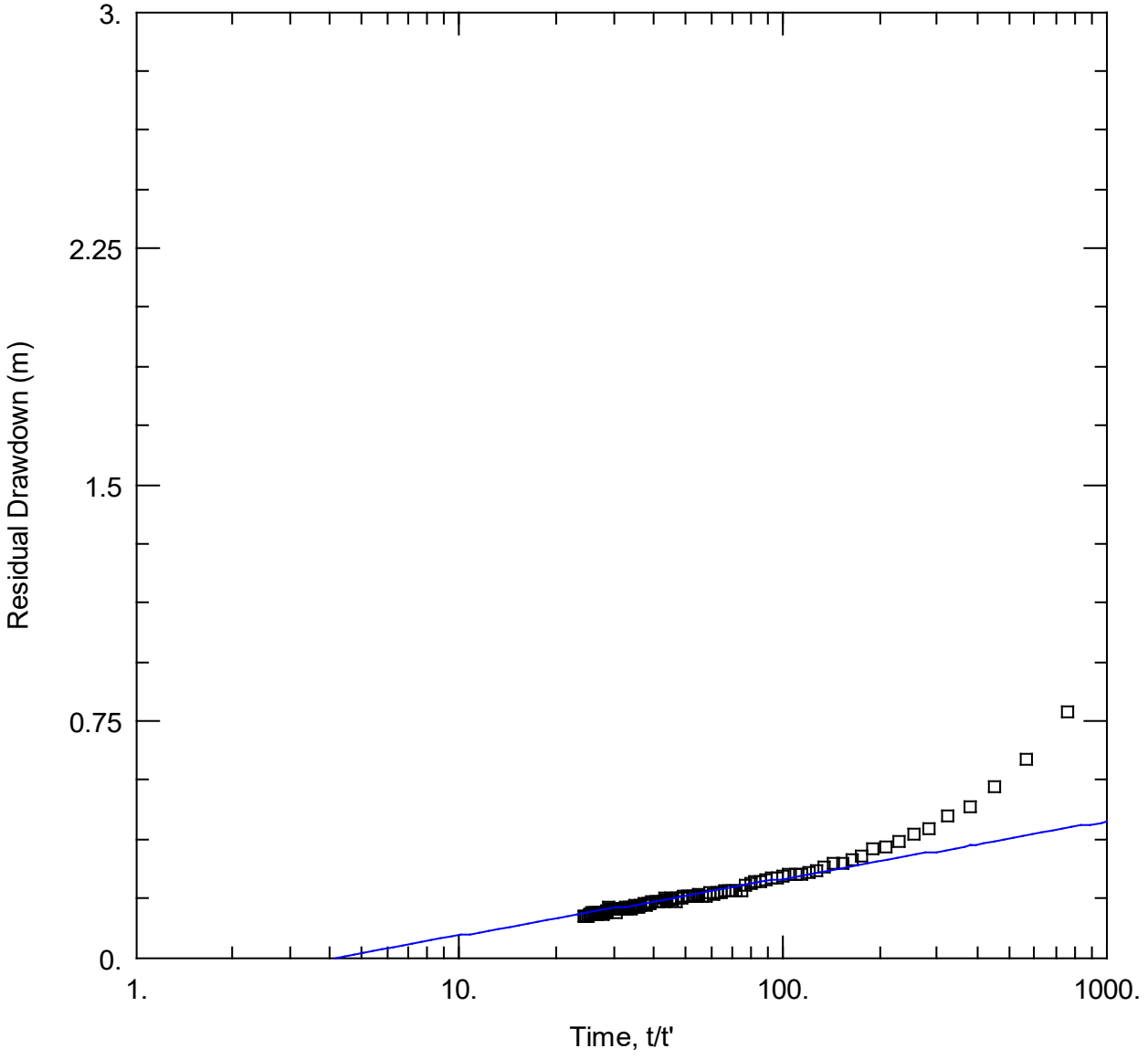


Estimated Transmissivity: 86 m^2/day or 2 x 10^{-5} m^2/s
Estimated Storativity: 2 x 10^{-10}

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW A): Theis Recovery (Confined Aquifer)



Estimated Transmissivity: 85 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW B): Drawdown and Recovery

Water Levels TW B

Static : 6.98 m below top of casing

TOC = 0.56 m above ground surface

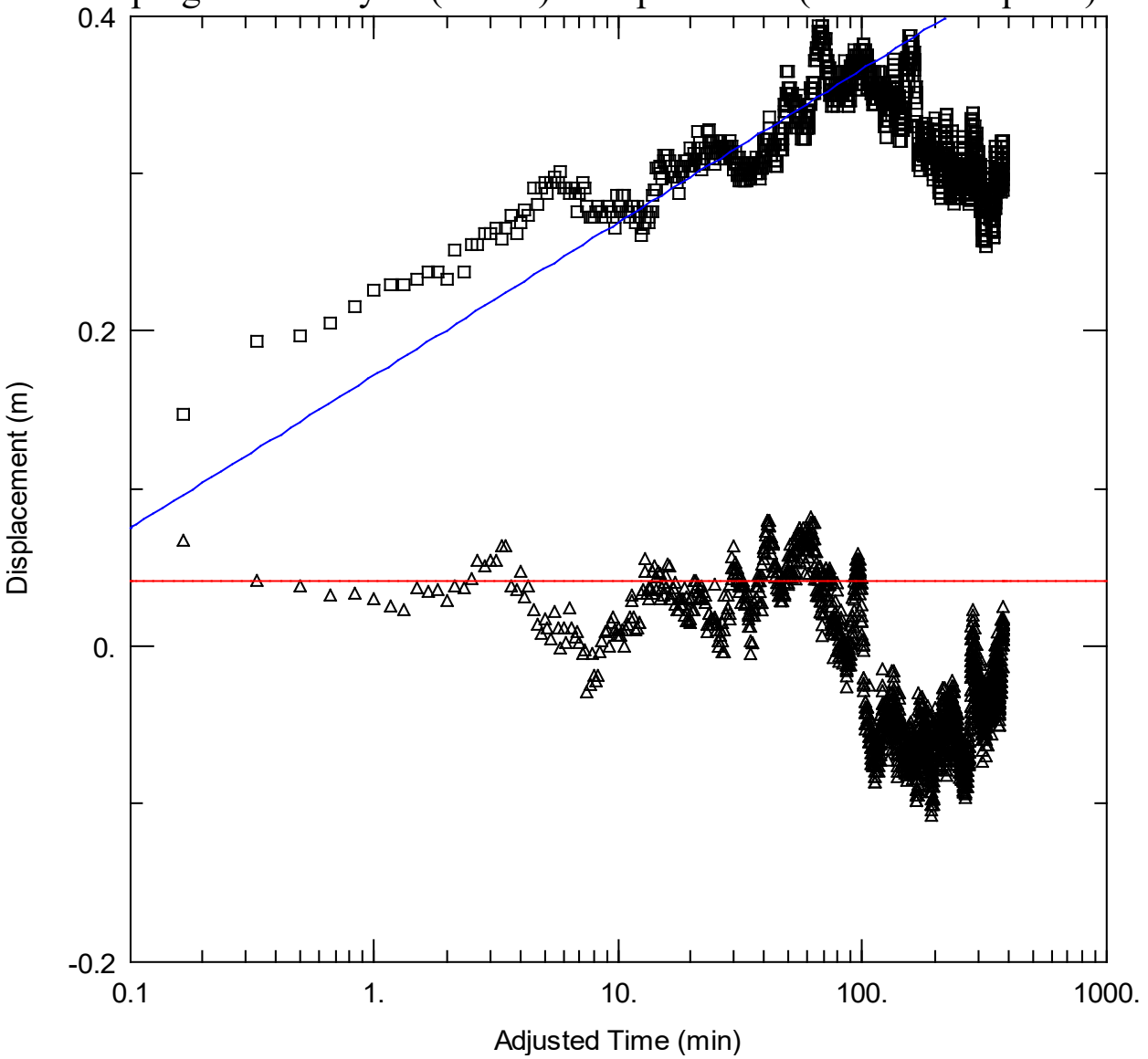
End of pump test (6-hours): 7.32 m below top of casing

Following recovery (2 hours): 7.00 m below top of casing

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 47 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

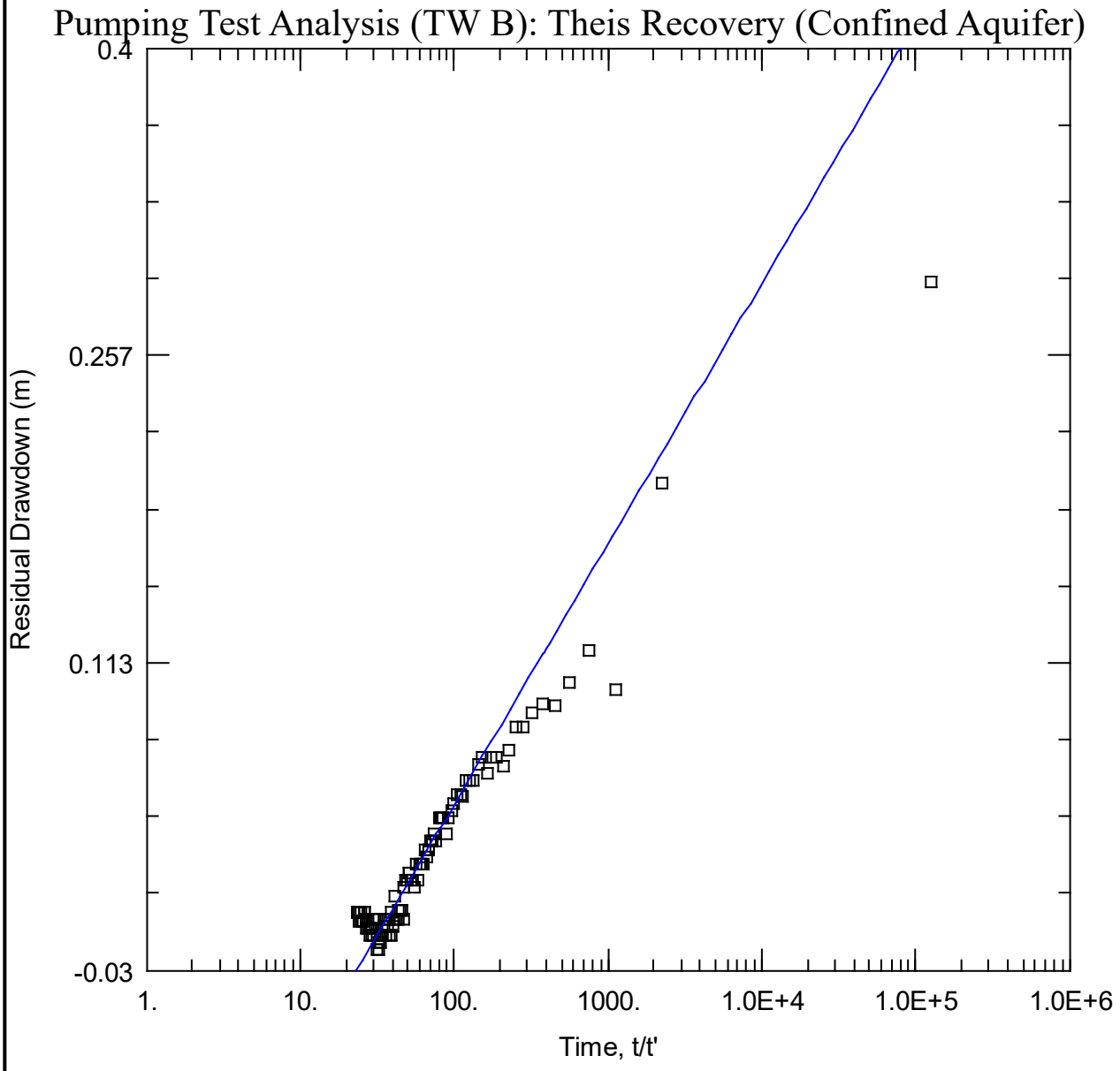
Pumping Test Analysis (TW B): Cooper-Jacob (Confined Aquifer)



Estimated Transmissivity: 157 m^2/day or 3 x 10^{-5} m^2/s
Estimated Storativity: 0.7

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 47 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

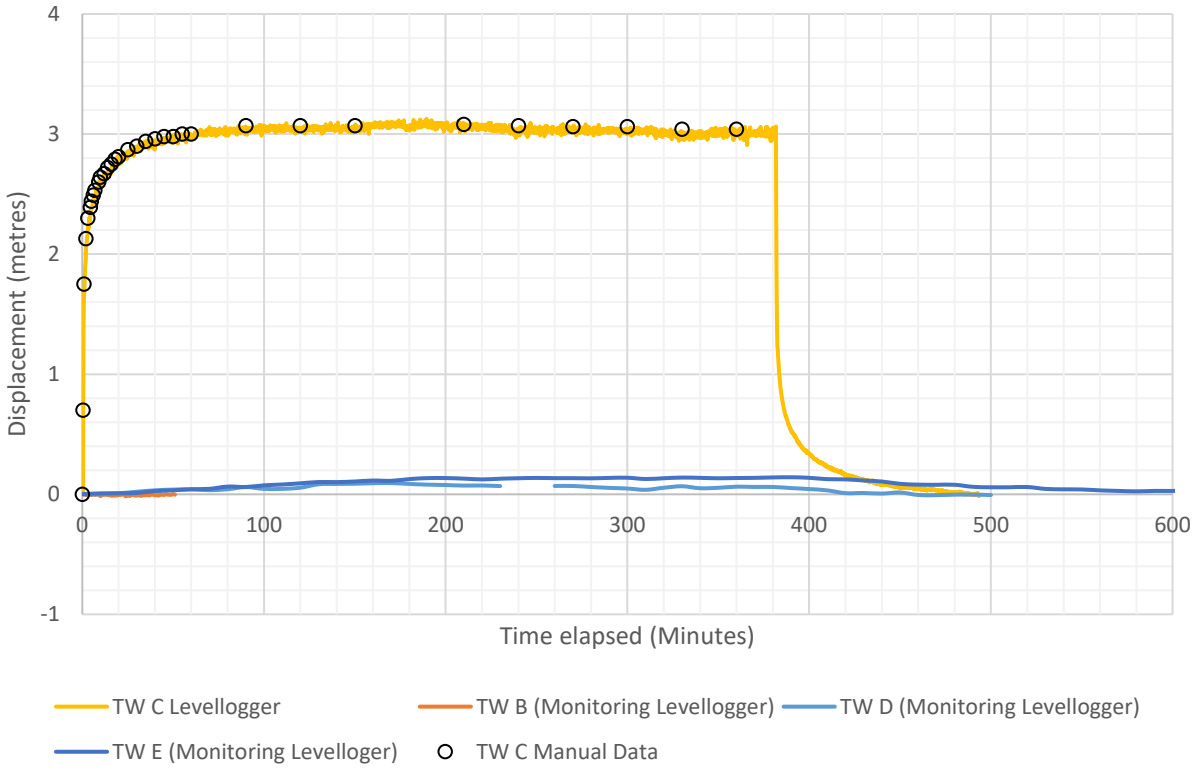


Estimated Transmissivity: 126 m^2/day or 3 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW C): Drawdown and Recovery



Water Levels TW C

Static : 9.23 m below top of casing

TOC = 0.83 m above ground surface

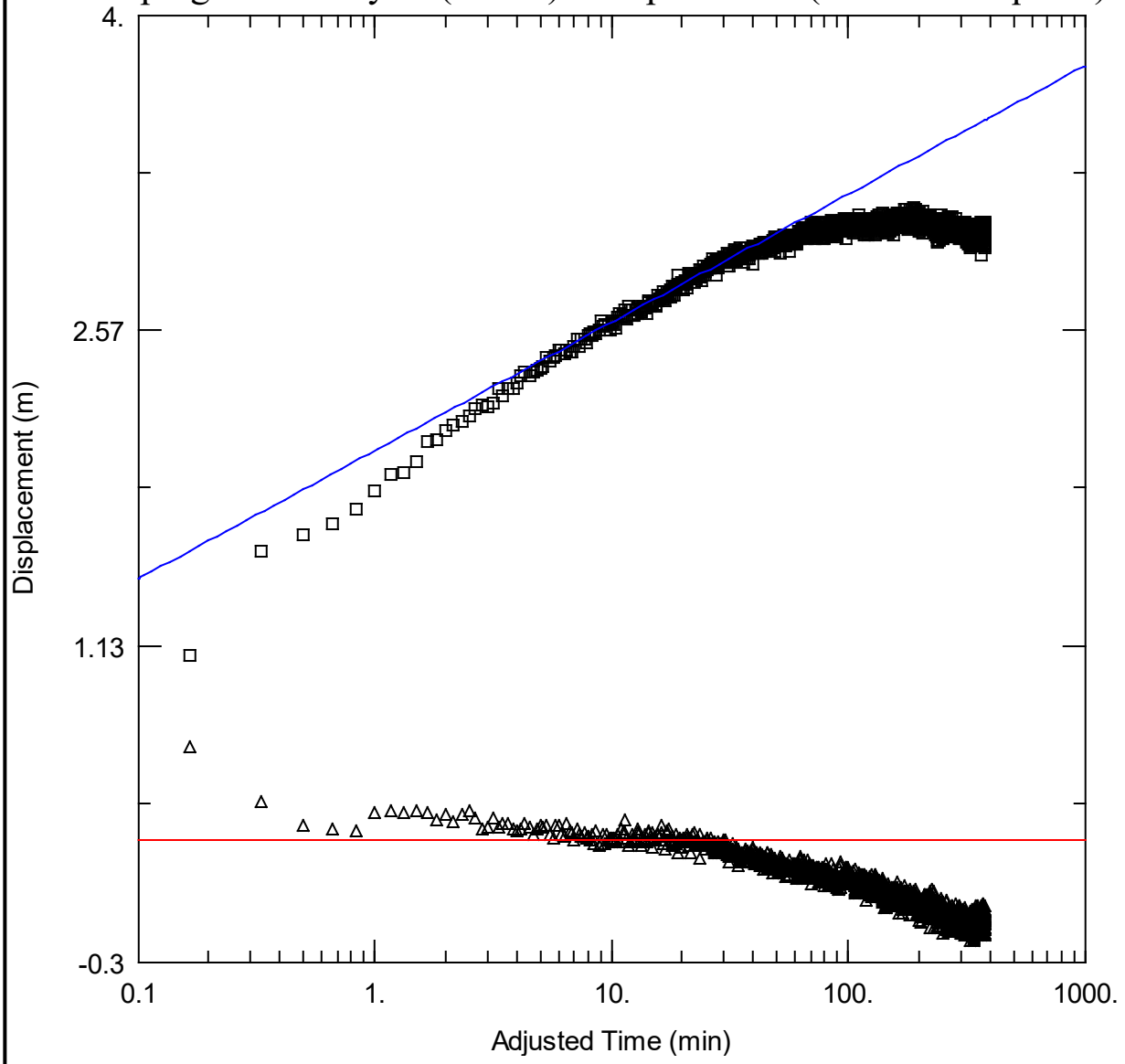
End of pump test (6-hours): 12.27 m below top of casing

Following recovery (2 hours): 9.37 m below top of casing

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW C): Cooper-Jacob (Confined Aquifer)



Estimated Transmissivity: 26 m^2/day or 8 x 10^{-6} m^2/s
Estimated Storativity: 3 x 10^{-3}

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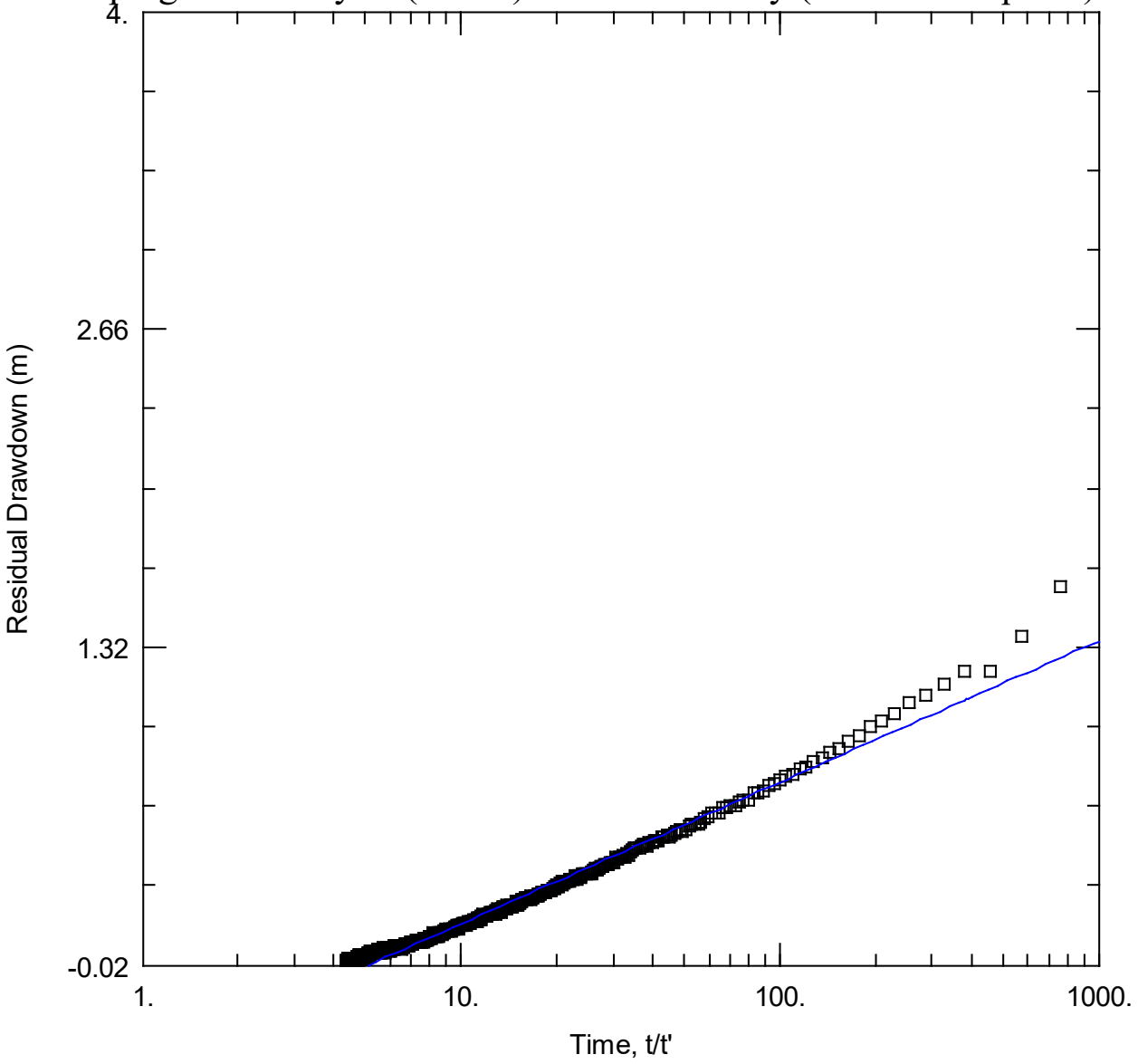
Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW C): Theis Recovery (Confined Aquifer)

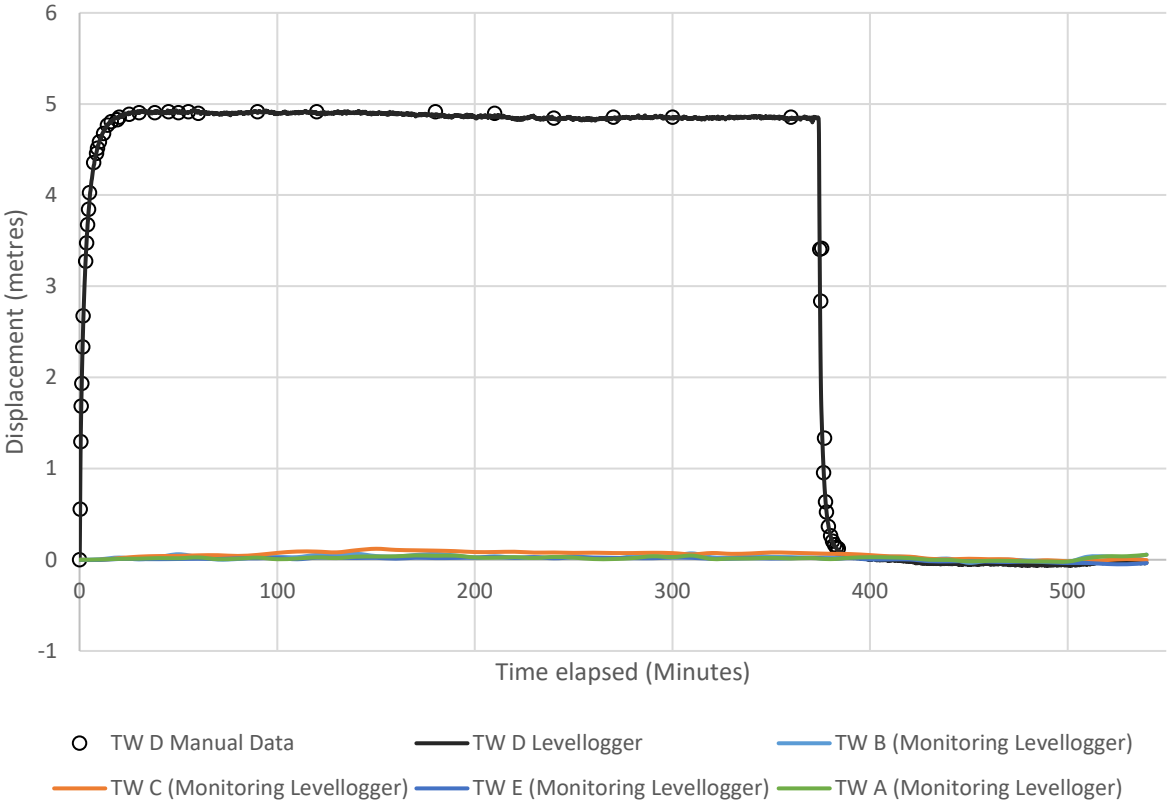


Estimated Transmissivity: 26 m^2/day or 8 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 44 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Data (TW D): Drawdown and Recovery



Water Levels TW D

Static : 4.265 m below top of casing

TOC = 0.42 m above ground surface

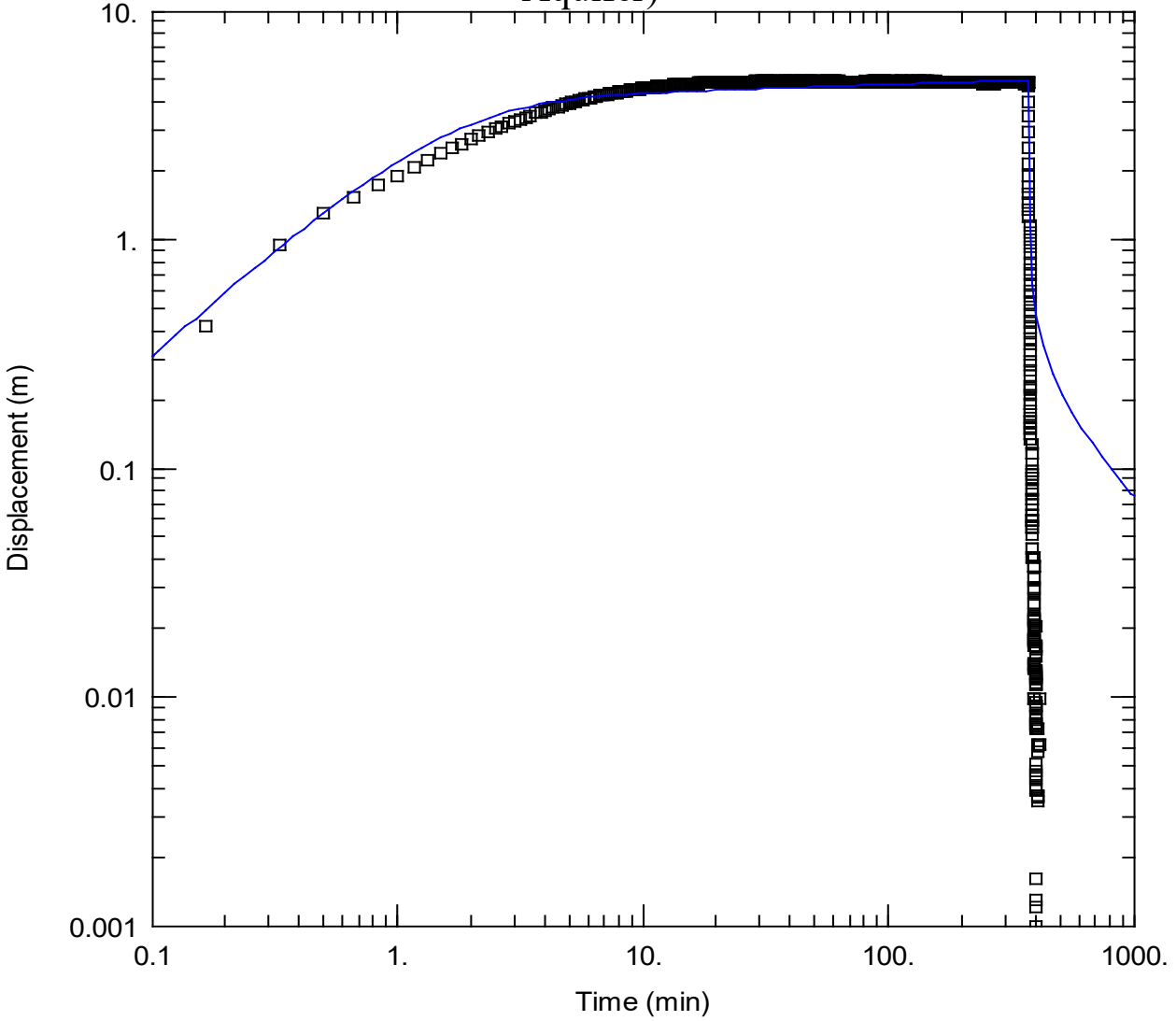
End of pump test (6-hours): 9.12 m below top of casing

Following recovery (2 hours): 4.39 m below top of casing

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Papadopoulos-Cooper	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 50 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Analysis (TW D): Papadopoulos- Cooper (Confined Aquifer)



Estimated Transmissivity: 41 m^2/day or 1 x 10^{-5} m^2/s
Estimated Storativity: 1 x 10^{-10}

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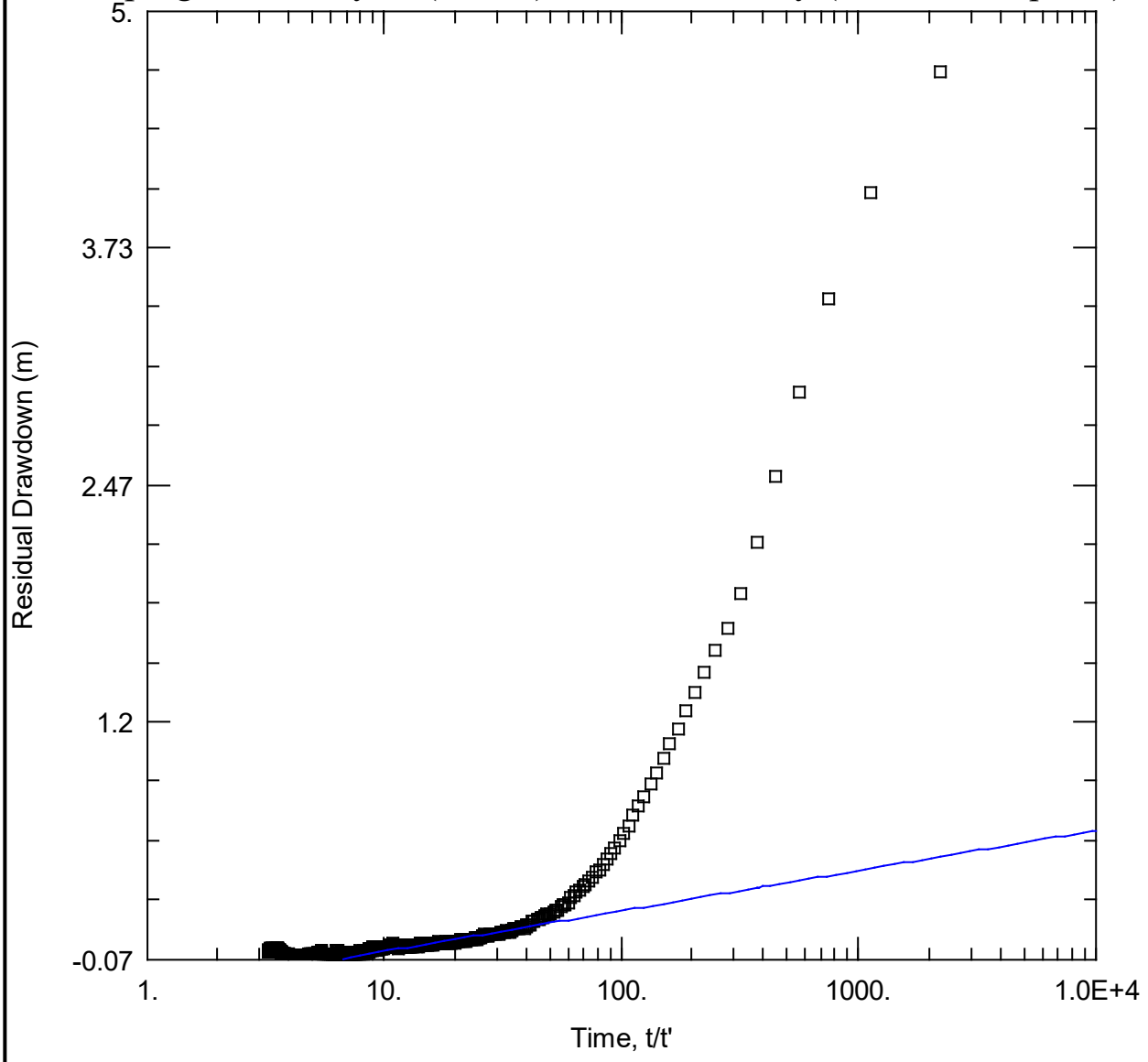
Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 50 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Analysis (TW D): Theis Recovery (Confined Aquifer)

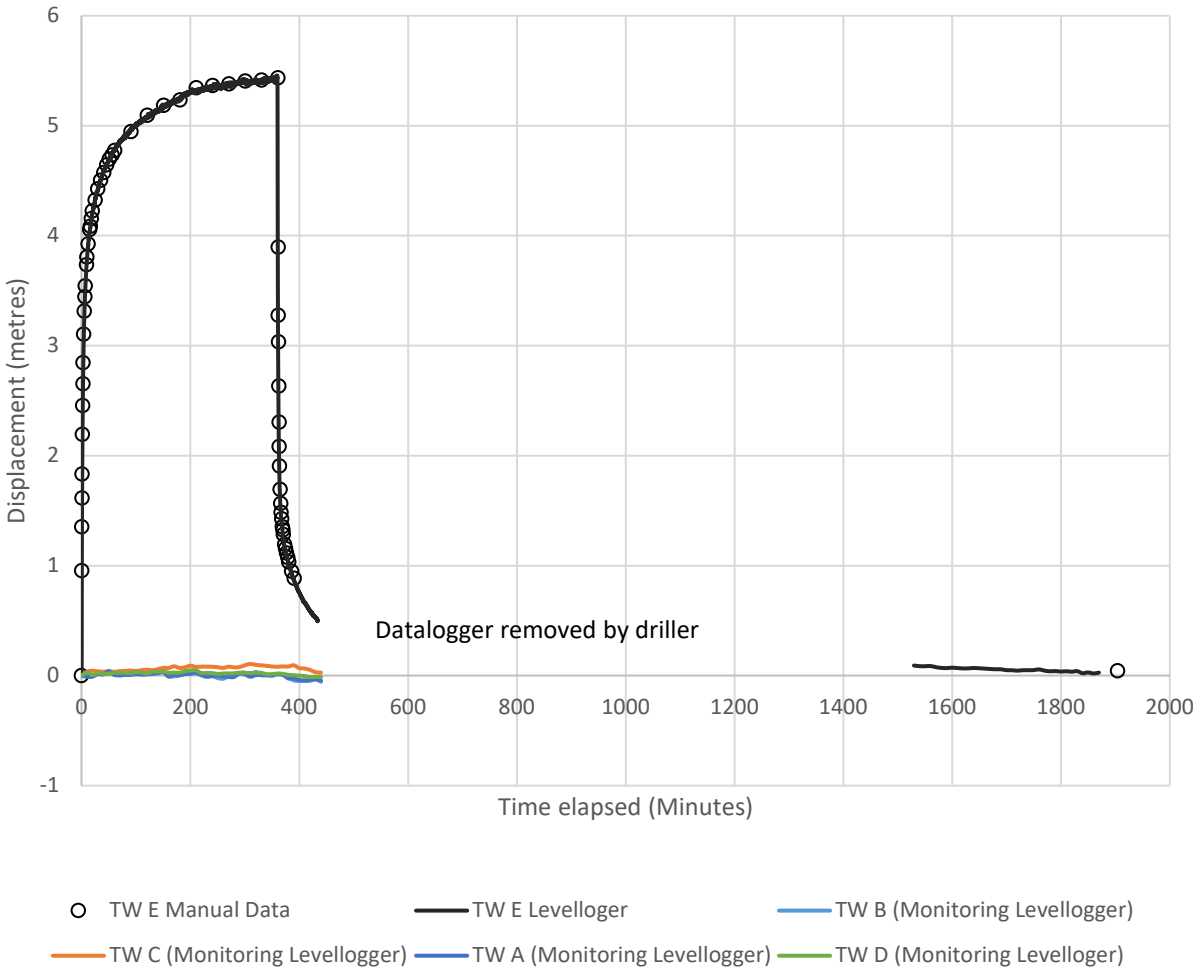


Estimated Transmissivity: 70 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

Pumping Test Data (TW E): Drawdown and Recovery



Water Levels TW-5

Static : 5.315 m below top of casing

TOC = 0.43 m above ground surface

End of pump test (6-hours): 10.73 m below top of casing

Following recovery (2 hours): 6.20 m below top of casing

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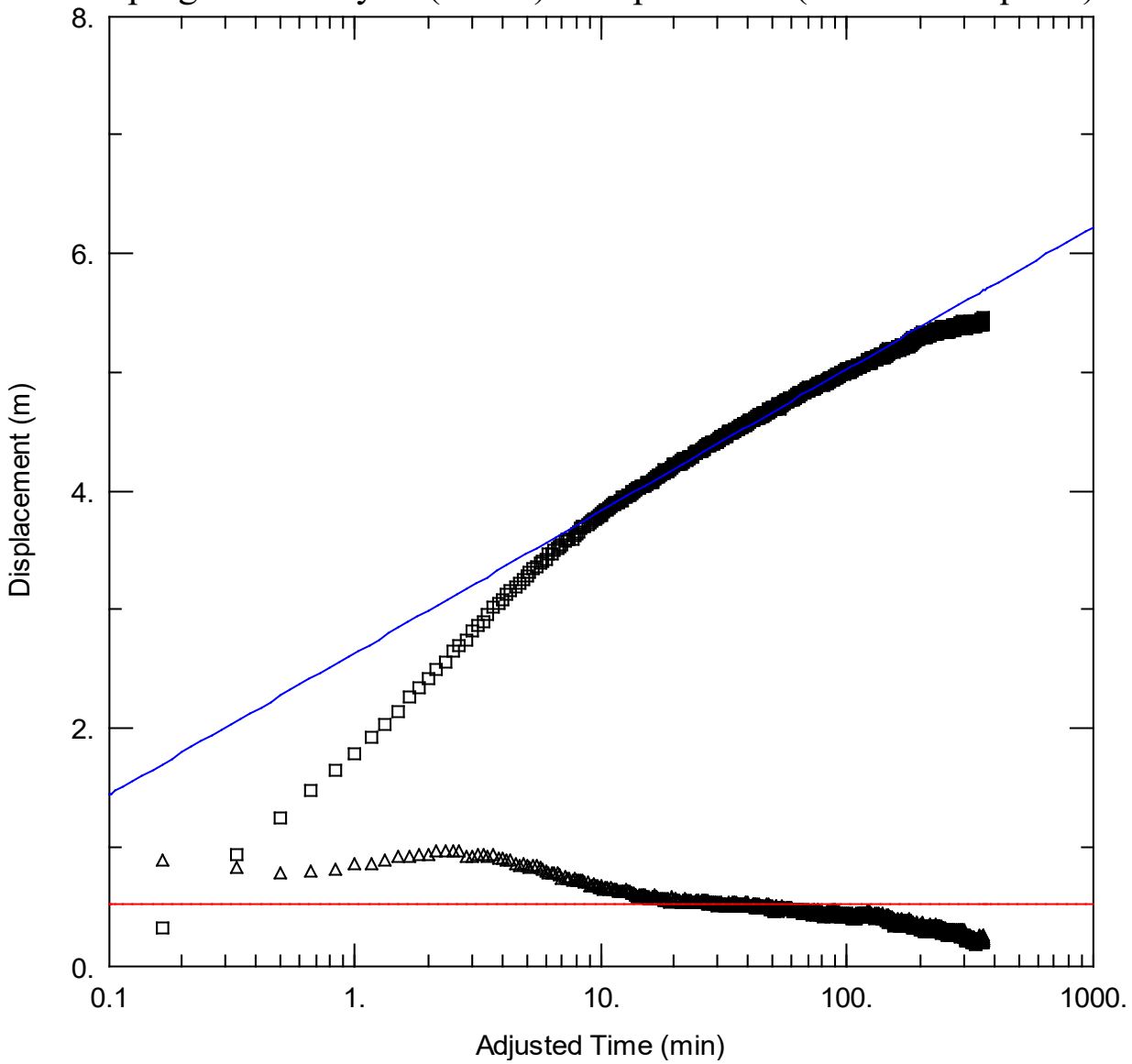
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

Pumping Test Analysis (TW E): Cooper-Jacob (Confined Aquifer)



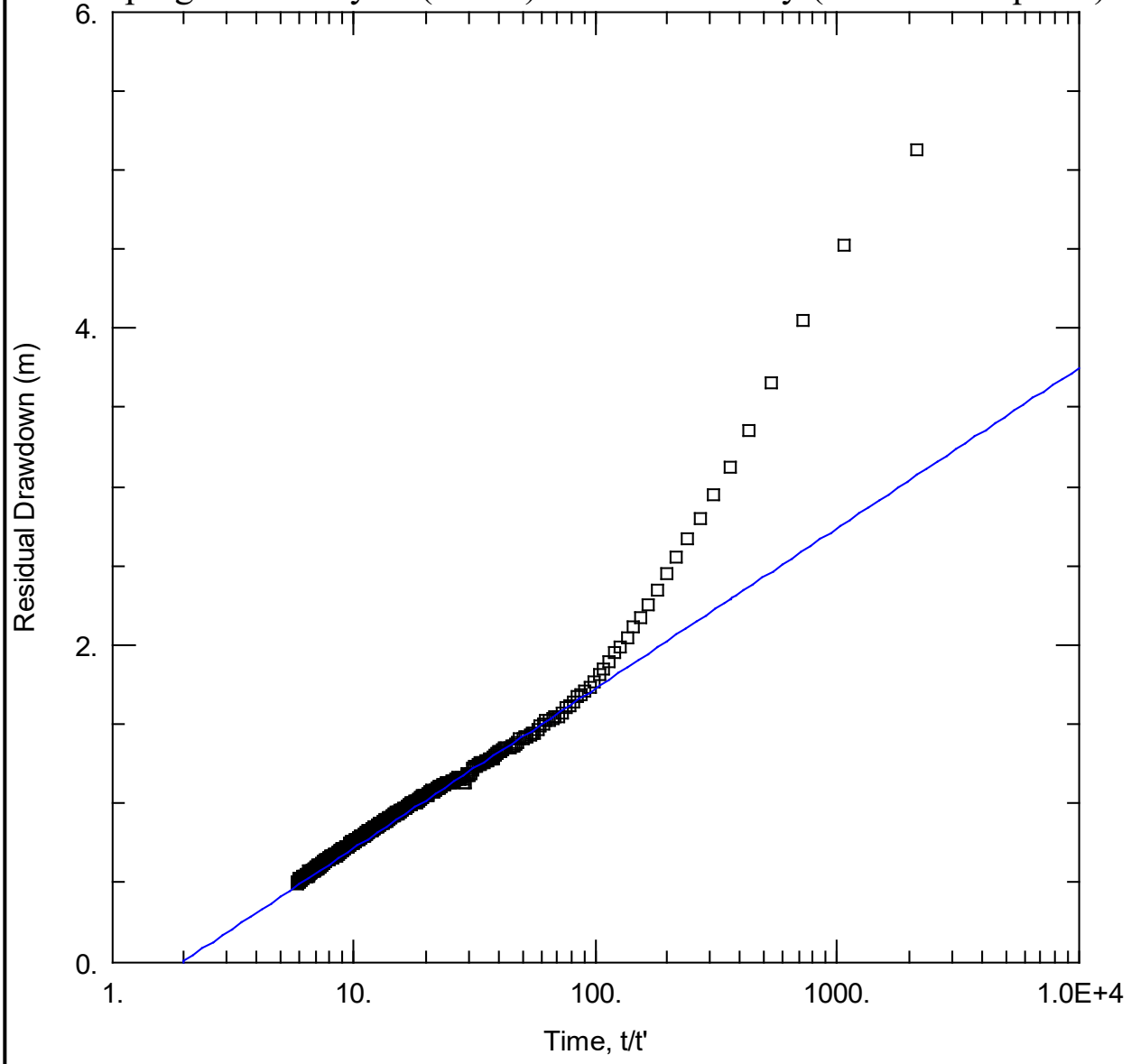
Estimated Transmissivity: 13 m^2/day or 3 x 10^{-6} m^2/s

Estimated Storativity: 0.02

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

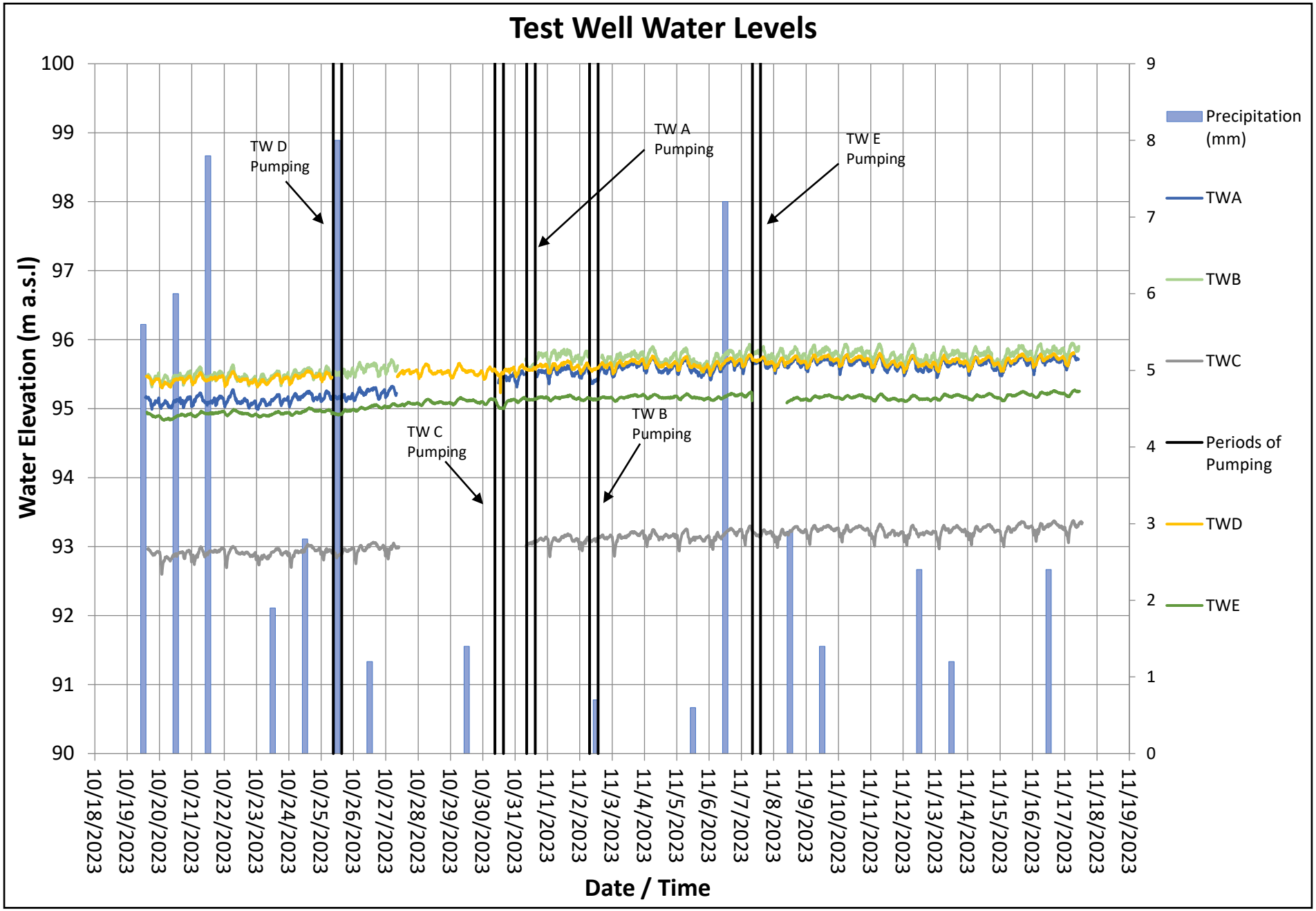
Pumping Test Analysis (TW E): Theis Recovery (Confined Aquifer)



Estimated Transmissivity: 15 m^2/day or 3 x 10^{-6} m^2/s

APPENDIX G

Long-Term Water Level Monitoring Graphs



Note: Gaps in time series represent period in which monitoring loggers were removed from wells to accommodate for pumping tests and/or sampling.

Project: 100554.003

Date: December 2023

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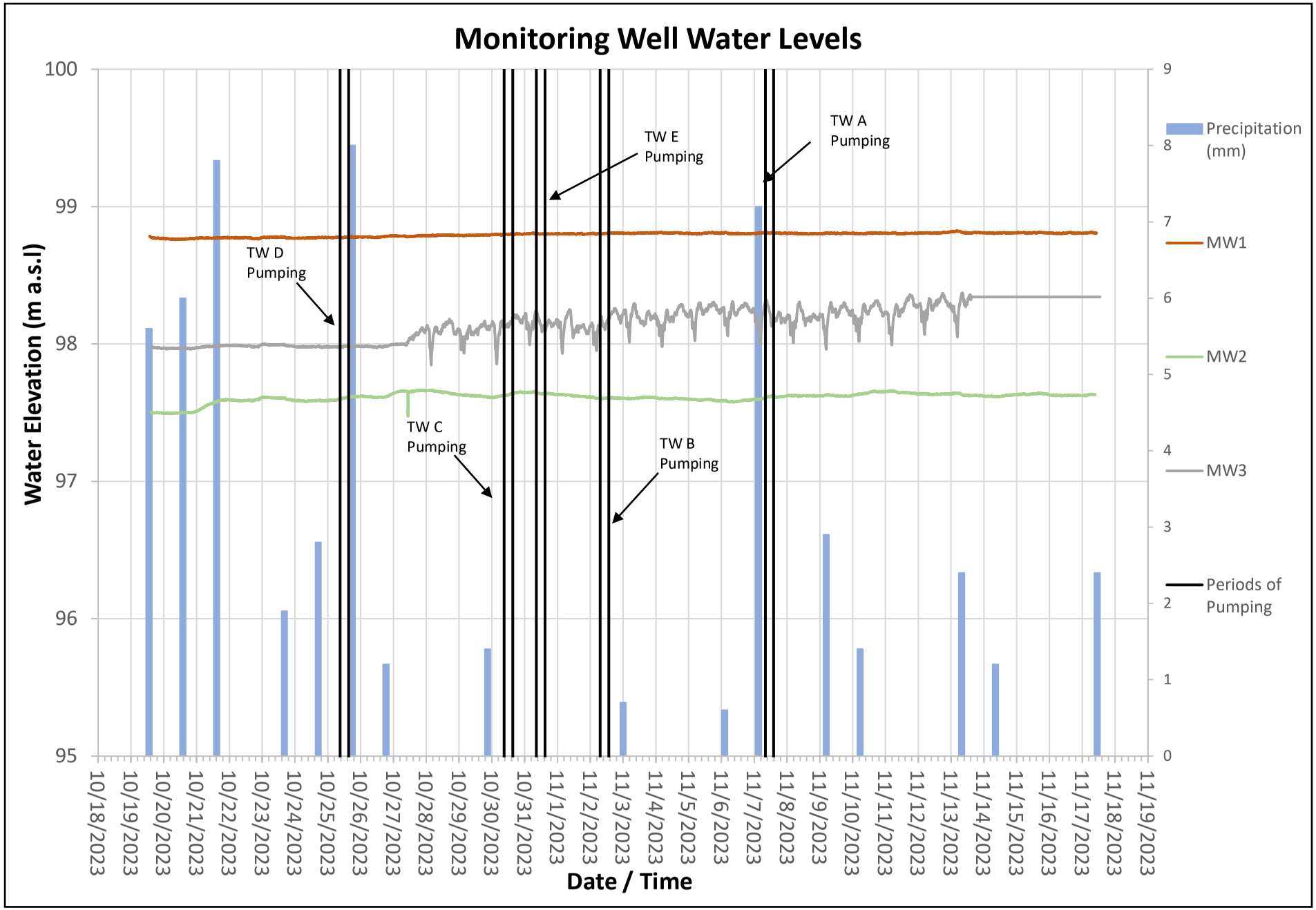

Project: 100554.003
Date: December 2023

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APPENDIX H

Well Interference Simulation

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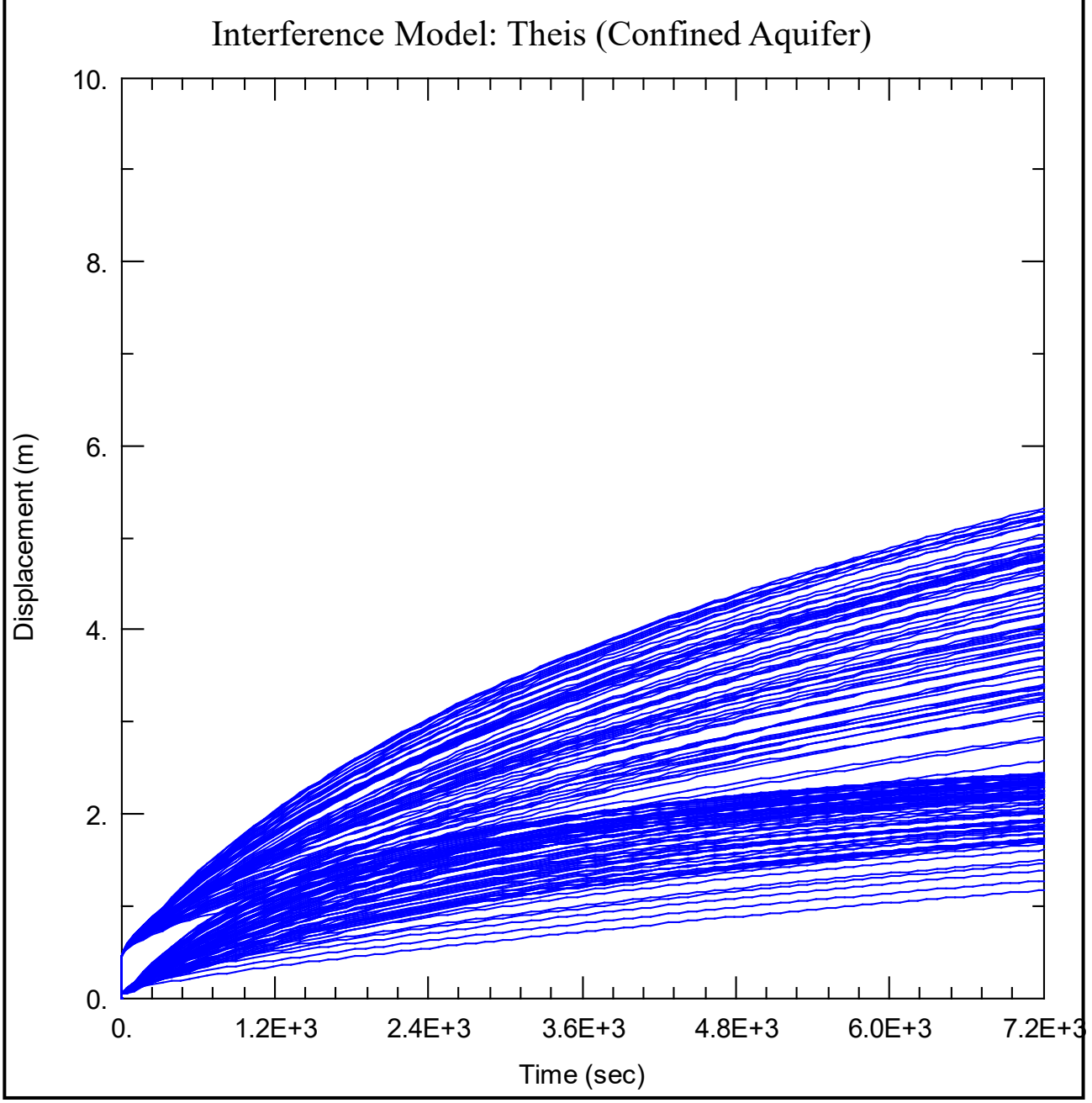
Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Model Created by: SE	No. of Pumping Wells: 71	Duration: 2 hours
Aquifer Thickness: 55 m	Software: Aqtesolv	Pumping Rate: 18.9 L/min
Transmissivity: 49.3 m^2/day	Storativity: 5 x 10^{-5}	



APPENDIX I

LSI Calculations

Langelier Saturation Index Calculation

Project: 100554.003
Location: 1600 Stagecoach Road
Sample ID: TW B - 6hr

Inputs

pH =	7.9	
Total Dissolved Solids =	900	
Calcium (as $CaCO_3$) =	120	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	352	
Temperature (^oC) =	10	Assumed average groundwater temperature

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

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

And:

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

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

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

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

Output:

A =	0.20
B =	2.38
C =	1.68
D =	2.55
pH_s =	7.65

LSI = 0.25

LSI Value	Indication
-2.0 to -0.5	Serious corrosion
-0.5 to 0.0	Slight corrosion but non-scale forming
LSI = 0	Balanced but corrosion possible
0.0 to 0.5	Slightly scale forming and corrosive
0.5 to 2	Scale forming but non corrosive

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Langelier Saturation Index Calculation

Project: 100554.003
Location: 1600 Stagecoach Road
Sample ID: TW D - 6hr

Inputs

pH =	8	
Total Dissolved Solids =	588	
Calcium (as $CaCO_3$) =	84.9	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	268	
Temperature (^oC) =	10	Assumed average groundwater temperature

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

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

And:

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

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

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

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

Output:

A =	0.18
B =	2.38
C =	1.53
D =	2.43
pH_s =	7.90
LSI =	**0.10**

LSI Value	Indication
-2.0 to -0.5	Serious corrosion
-0.5 to 0.0	Slight corrosion but non-scale forming
LSI = 0	Balanced but corrosion possible
0.0 to 0.5	Slightly scale forming and corrosive
0.5 to 2	Scale forming but non corrosive

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APPENDIX J

Pre-Consultation Summary

Work Plan Review

Subject: Work Plan Review for Proposed Hydrogeological and Terrain Analysis, Proposed Residential Subdivision, Cedar Lakes Phases 3-6, 1600 Stagecoach Road, Ottawa (Greely), Ontario, prepared by GEMTEC, August 1, 2023.

Date: September 12, 2023

Reviewed Background Reports:

- Paterson Group, April 1, 2011, Terrain Analysis and Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3, Geographic Township of Osgoode, Ottawa (Greely), Ontario
- South Nation Conservation, December 16, 2015, Re: Hydrogeological Study Performance Report("Report"), Proposed Phase 2 Development, Cedar Lakes Subdivision, Ottawa (Greely), Ontario, Prepared by Patterson Group Inc., September 4, 2015 and Cedar Lakes Subdivision – Hydrogeological Study Performance Report, Response to SNC comments ("Response Letter"), Prepared by ARK Engineering and Development, November 13, 2015.
- Ontario Municipal Board, June 17, 2016, Case NO(S) PL101449, PL140495

Attendees

Jeffrey Ostafichuk (JO)	City of Ottawa
Kevin Hall	City of Ottawa
Andrius Paznekas (AP)	GEMTEC
Daniel Payer	ARK Engineering
Rob Kell (RK)	Dillon
Angella Graham (AG)	Dillon
Matt McCurdy (MM)	Dillon
Minoo Yazdanpanah (MY)	Dillon

Notes

Item	Discussion
	Introduction of Attendees
	Hydrogeological Investigation
1.	Five drilled groundwater test wells will be utilized for the hydrogeological investigation (to satisfy the Ministry of the Environment, Conservation and Parks (MECP) Procedure D-5-5 requirements for sites up to 40 hectares). The test wells include three existing wells (TW-A, TW-B, and TW-C), and two proposed test wells (TW-D and TW-E). It should be noted that these test wells have been renamed to avoid confusion with other wells in the area. • TW-A and TW-C are existing from previous investigations. These two wells do not have 40 m of the well casings; however, sleeves will be installed to 40 m to meet the targeted casing depth. • TW-B is installed in the City's Park and has a 40-meter casing. • TW-D and TW-E are proposed wells that will be drilled and cased to 40 m depth as part of this study. Test well construction will be supervised and documented by

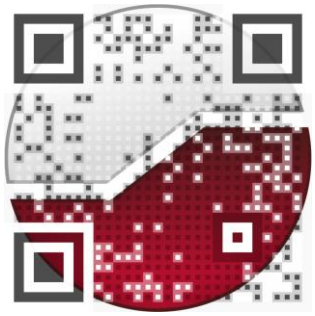
Item	Discussion
	GEMTEC field staff, which will include lithological logging, test well construction, well grout inspection, and well chlorination. • TW-A and TW-C will be chlorinated during extension. TW-B will be chlorinated 24-48 hours before the pump test. Residual chlorine levels will be monitored before water quality sample collection. • The integrity of each existing test well will be assessed before use and replacement / new wells used, if necessary. • Test wells will be adequately distributed across the area for proper characterization and analysis.
2.	As noted above, the TW-A and TW-C casing will be extended to 40 metres with 4-inch casing. • Whether TW-A and TW-C will be used in the future development depends on pending lot planning confirmation. If designated for development, input on the suitable pump for the 4-inch well can be provided. The proposed TW-D and TW-E are planned for a potential development site where they can be used as supply wells. If these wells are unsuitable for future development, abandonment will be considered.
3.	MECP Water Well Records in the vicinity of the site will be reviewed. This includes records in Cedar Lakes Phases 1 and 2 to assess whether the well construction and casing length recommendations were followed.
4.	Water well surveys and sampling will be conducted at nearby private residences to assess the characteristics of water available in the vicinity of the subject site and comply with MECP Procedure D-5-5 and well construction recommendations. • Dillon recommends that private well survey letters be distributed to all neighbours, rather than pre-selecting only five wells. The letters would ideally be distributed using registered mail, creating a reference of the attempted correspondence if property owners later suggest they were not contacted. The City prefers to have this type of record, as most future complaints come through them. • It is also recommended that when selecting wells for the survey, those with a depth of 40 meters or more (targeted aquifer) are distinguished from shallower wells, so as to address potential interference. • GEMTEC proposed giving all adjacent homes the opportunity to participate in the well survey questionnaire, with a first-come, first-serve approach for sampling. If this approach is taken, rationale must be provided for why it is adequate, and that nearby property owners are satisfied with their level of involvement.
5.	The six hour constant flow rate pump tests will be conducted on each of the five test wells, including water level measurements and water sampling (two samples per pump test) in each of the groundwater test wells. • Samples will be submitted to an accredited laboratory for 'subdivision package' parameters, after three and six hours of pumping, and 'trace metal' analyses after six hours of pumping. Field parameters and free and total chlorine will be monitored in

Item	Discussion
	the field during the pump tests. Analytical results will be compared to applicable criteria (ODWS). • All the test wells will be instrumented with water level data loggers, and a barologger will be used onsite. • Pre and post pump test groundwater level monitoring should be completed at each test well during static conditions. • Observation data will also be collected from nearby overburden monitoring wells during each pump test. • The pumping rate flow will be dependent on each individual well. GEMTEC will try to maximize the rate to facilitate the larger hydraulic response but generally use a target maximum rate of 80 L/minute (20 USGal/min).
5.1.	Radon has been identified as an issue in the area and testing of radon is recommended. The investigation should take into account the recent information/suggestions provided by the City (Tessa Di'Iorio).
5.2.	Pump test water level data will be analyzed to estimate the transmissivity and storativity of the groundwater supply aquifer, including drawdown and recovery graphs of each well pump test. Interference effects between wells within the proposed residential subdivision will be modelled.
5.3.	Long term water level monitoring will be conducted in at least two test wells to monitor potential interference between the proposed development and daily water use within Phases 1 and 2 of Cedar Lakes, which is operating at a denser lot distribution than the proposed Phases 3-6. • GEMTEC has proposed that long-term monitoring will span from a few weeks to couple of months, as seasonal variations generally do not impact interference between the wells. • Dillon recommends longer-term monitoring over several seasons (as per Section 8.2.5 of the guidance document), and if an alternative approach is taken (e.g., reducing the monitoring period), strong rationale must be provided for why that data is adequate.
	Terrain and Septic Impact Assessment
6.	Information from previous site investigations (e.g., Paterson, 2011) will be used for assessing soil conditions, as wells as supplemented with the drilling of 3 overburden monitoring wells. • Dillon suggests conducting an additional test pitting or drilling program in previously unexplored areas, particularly in the southwestern region of the site. If a more limited dataset is used for characterizing the site, strong rationale must be provided why that is adequate.
7.	Overburden monitoring wells will be strategically placed to aid in monitoring shallow groundwater quality (e.g., elevated levels of nitrates) in the shallow groundwater, and the hydraulic connection of the overburden aquifer with the bedrock aquifer during pumping tests of nearby test wells (all monitoring wells).
7.1.	For monitoring background nitrate levels across the site, GEMTEC suggests that conducting one

Item	Discussion
	round of overburden nitrate sampling will be adequate, unless elevated levels are detected (i.e., greater than the 2.5 mg/L specified in the guidance document). • Dillon suggests that monitoring to assess nitrate levels be conducted over a longer period, and that if a more limited approach is taken, strong rationale must be provided (e.g., reference to other representative data, how seasonality may impact results, etc.). Alternatively, sampling could be conducted during conditions that roughly correspond with seasonal variations in moisture content, such as following significant rain events and dry periods. • The monitoring program should also consider potential impacts on neighbouring wells with shallower casings. This might include collecting strategic nitrate samples from specific water supply wells during the private well survey/sampling.
8.	Infiltration rates will be assessed by conducting infiltration testing using a Guelph Permeameter at six locations. • Samples will collected at each location for grain size analysis; however, enough grain size samples will be collected to adequately characterize all the various soil types present across the site.
8.1.	As part of the Impact Risk Assessment for the proposed on-site sewage systems, a water balance is typically required for the site. • It was suggested that a water balance is not required given the reduced number of lots and increase in pervious area; however, Dillon suggests that a water balance still be conducted given the vulnerable underlying aquifer, and historical high nitrate levels at the site. If a water balance is not completed, corresponding rationale for any assumptions or findings must be provided. It should also be noted that a water balance will be required as part of the stormwater management assessment and report. • It was also previously noted that the site is located within the Shields Creek Subwatershed Study Area, which would require the site to maintain recharge rates after development and necessitate a water balance to demonstrate this would be the case; however, it appears that the site actually lies just outside this area and is therefore not subject to those requirements. That being said, and as noted above, rationale must still be provided for not completing a water balance at the site. • Regarding whether stormwater pond area can be included in as a recharge area for nitrate loading calculations; the conventional approach (and the guidance document) suggests that this area should be excluded. Dillon recommends adherence to this methodology. Given the larger lot sizes, it is unlikely to be a concern.
	Other Discussion Subjects
9.	Lot Fabric: • The concept plan showing the location of the septic and well for each lot will be provided.
10.	Cumulative Well Supply Impact Assessment: • It should be noted that evaluating the impact not only on the targeted aquifer but also on shallow wells is important.

Item	Discussion
11.	Watercourse and Wetland: • Dillon specified the necessary setback distance from wetlands and watercourses when planning lot fabrication. Also, they confirmed that the setback area cannot be utilized for lot fabric or septic systems. • It was then noted that watercourses run from north to south and have been artificially constructed for Phase 1 and 2. Historically, there were no natural watercourses on the site. There is a registered municipal easement with a 15-meter maintenance corridor indicated on the title. There are no wetlands present on the site.
12.	Existing PTTW: • An existing PTTW (license 7184-BZ5SAE) for groundwater and surface water dewatering was noted, which included 1,500,000 liters/day, dated March 25, 2021 to March 26, 2026 at two locations on the site. • GEMTEC confirmed that the existing PTTW is for the construction of the ponds. There is no ongoing water taking and the permits are for construction purposes.

experience • knowledge • integrity



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

expérience • connaissance • intégrité