

TW21-1C Water Supply Assessment Proposed Residential Development Creekside 2 - Village of Richmond 2770 Eagleson Road Ottawa, Ontario



Submitted to:

1470424 Ontario Inc. 301 Moodie Drive, Suite 100 Ottawa, Ontario K2H 9C4

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> December 14, 2021 Project: 61899.03

GEMTEC Consulting Engineers and Scientists Limited 32 Steacie Drive Ottawa, ON, Canada K2K 2A9

December 14, 2021

File: 61899.03

1470424 Ontario Inc. 301 Moodie Drive, Suite 100 Ottawa, Ontario K2H 9C4

Attention: Tyler Ferguson, Land Development Manager

Re: TW21-1C Water Supply Assessment, Proposed Residential Development Creekside 2 – Village of Richmond, 2770 Eagleson, Ottawa, Ontario

Please find enclosed our hydrogeological investigation report for the above noted project based on the scope of work provided in our proposal dated February 21, 2020. This report was prepared by GEMTEC Consulting Engineers and Scientists Limited (GEMTEC).

Do not hesitate to contact the undersigned if you have any questions or require additional information.

Andrius Paznekas, M.Sc., P.Geo

Steve Livingstone, M.Sc., P.Geo.

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Shaun Pelkey, M.Sc.E., P.Eng.



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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by 1470424 Ontario Inc. to carry out a hydrogeological investigation for a proposed residential subdivision (Creekside 2) which consists of a 25.67 hectare site (approximate) located in the northwest corner of Eagleson Drive and Perth Street within the Northeast Development Lands of the Village of Richmond in Ottawa, Ontario (refer to Figure 1, attached).

Based on the Village of Richmond Community Design Plan Amendment #181, dated March 9, 2017, development in the Western Development Lands, Northeast Development Lands and Industrial Lands shall be on the basis of communal well services. The preliminary development plan of Creekside 2 includes a total of 455 units: 74 semi-detached, 250 single family houses and 130 townhouses.

The development will require a water supply in the form of a communal well(s) to provide the source of water. The lots will be connected to a residential wastewater service and as such, an impacted assessment for septic services has not been conducted.

1.1 Technical Guidance

This study was carried out in general accordance with the technical requirements outlined in the Ministry of Environment and Conservation and Parks (MECP) document entitled Procedure D-5-5 Technical Guidance for Private Wells: Water Supply Assessment, or the principles of the MECP Hydrogeological Technical Information Requirements for Land Development Applications (April 1995) and the City of Ottawa document *Hydrogeological and Terrain Analysis Guidelines, March 2021.* The City of Ottawa had indicated that they will be the owner / operator of the communal well system and all wells must be constructed to their specifications and relevant sections of the City of Ottawa Official Plan. As such meetings were held with City representatives and the Rideau Valley Conservation Authority (RVCA) to discuss the proposed hydrogeological evaluation methodology and present submittals for review prior to the start of the field work.

A meeting with the City, 1470424 Ontario Inc. and the GEMTEC team was held on October 26, 2020 to review the proposed work scope and field program. On November 10, 2020, GEMTEC prepared and submitted to the City a Technical memo - Conceptual Site Model and Work Planentitled *Proposed Field Program to Support Creekside 2 Groundwater Supply Development Village of Richmond, Ottawa, Ontario.* This technical memorandum outlined the preliminary field testing program that will be carried out to support the groundwater supply assessment for the residential development of Creekside 2. The field program was developed using a preliminary Conceptual Site Model (CSM) that was established by the project team, technical specifications provided by the City of Ottawa, and common hydrogeological practices for communal well supplies.



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Following comments from the City on the technical memo, an updated memo was prepared and submitted on November 23, 2020. On November 30, 2020, an email was received by the GEMTEC team from the City that all comments had been addressed with no further comments.

As presented in the technical memo, the preferred location for the communal well within the development layout was provided on Figure A2.1 and the other test well location was located approximately 100 m to 300 m away (to be determined in the field). At the time of this investigation, the preferred location was based on the site infrastructure design and development fabric. An updated site infrastructure design (November 2021) is provided on Figure A2.2 which shows the location of the communal well located along Eagleson Drive in the southeast corner of the property. This proposed communal well is located approximately 120 metres from the test well location, as described in this report. As this revised location is proximal to the test well locations and the Nepean Aquifer is regionally extensive with similar hydrogeological properties, it is expected that comparable results in terms of groundwater quantity and quality will be obtained during communal well drilling in this area.

1.2 Study Objectives and Scope of Work

The purpose of this Hydrogeological and Water Supply Assessment is to evaluate the potential for the use of a communal well(s) system to support the water requirements of the proposed Creekside 2 development including groundwater quantity and quality. As such, the scope of work for the assessment included:

- Development of geological and hydrogeological framework and conceptual site model
- Evaluation of Water Demand and Potential Aquifer Yield
- Completion of a baseline water quality sampling program of private wells
- Completion of a Hydrogeological Investigation
 - Drill shallow and deep test wells
 - o Instrument on and off-site wells with water level data recorders
 - Complete a 72-hr pump test to determine potential well yields, water quality and communal well location siting
- Data Evaluation and Reporting

This report is arranged into seven sections, including this introduction. Section 2 provides background information on the physical setting of the Site from a regional perspective. Section 3 discusses the methods used to complete the site-specific hydrogeological investigation with Section 4 presenting the results of this assessment and the specific hydrogeological characteristics. Section 5 presents an evaluation of the impacts in terms of quantity and quality. Section 6 provides the conclusions and recommendations of the report. Section 7 provides closure, limitations and references. Figures and tables referred to in the text are provided in Appendices at the back of this report.

2.0 SITE BACKGROUND

2.1 Data Sources

The Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System was downloaded from the online platform in September 2020 to provide insight into the geology and hydrogeology of the Richmond area. The distribution of water wells contained within the database are illustrated as yellow circles on Figures A1 and A2 (figures referced A# are provided in Appendix A). As illustrated, there is a wealth of domestic water well data in the area west and south of the Site where individual wells were drilled for many of the residential subdivisions. In the agricultural areas north and east of Richmond, the density of water well data is significantly lower.

The Ministry's Permit to Take Water dataset was also downloaded from the MECP website and the only long-term active permits within the Richmond area are the municipal wells: Kings Park Wells 1 and 2, and Richmond West Well 1 and 2 (Figure A3). Permits exist in the database for short term takings such as pumping tests or construction dewatering, but these permits are not expected to impact the groundwater levels on the Site. The High Park Well located west of the Site (Figure A1) does not have a permit to take water but is a communal well of interest in this project.

A set of digital elevation model (DEM) tiles were downloaded from the Province's *Land Information Ontario* website to characterize the ground surface topography in the area (Figure A3). Specifically, the Digital Raster Acquisition Project Eastern Ontario (DRAPE) from 2019 was used to represent the ground surface in the area.

2.2 Site Description and Topography

The proposed development (the Site) is in situated at the northwest corner of Eagleson Drive and Perth Street within the Northeast Development Lands of the Village of Richmond. The Site is bounded to the north by agricultural land, and to the south by a rural commercial zone. To the west is a municipal drainage swale, then residential development along Shea Road. On the west side of Shea Road is an existing village residential zone. The site is currently used as agricultural lands.

Topography within the study area is relatively flat and slopes towards the Jock River, with elevations ranging from approximately 95 m asl in the northwest to 90 m asl adjacent to the Jock River and flood plains.

Surface drainage is interpreted to follow the local topographic features. A number of small creeks and streams occur in the study area including the municipal drainage swale that drain into the Jock River, a tributary to the Rideau River that flows through the Village of Richmond (see Figure A3).

2.3 Regional Geology

The Site is located within the Ottawa Valley Clay Plains physiographic region (Chapman and Putnam, 1984) which is characterized by clay plains with minor sand and gravel zones (see Figure A4).

Beneath the Study Area, the surficial geologic units consist of fine-grained clays, silty sand, and till that overlie limestone and sandstone bedrock. Minor amounts of sand and gravel were also noted. The Paleozoic-aged bedrock units of the Ottawa area were characterized by Williams (1991) in an Ontario Geological Survey report.

2.3.1 Overburden Geology

Overburden beneath the Site consists predominately of clay, till and lesser sands. The lowermost overburden sequence in the area is a glacial till, deposited during the late Wisconsin ice advance and retreat approximately 12,000 years ago. Overlying the till in many areas is glaciolacustrine silts and clays that were deposited when the area was isostatically depressed due to the weight of the glaciers, and marine seawater inundated the area forming the Champlain Sea. Thick layers of clay were deposited before the land surface rebounded, and the sea retreated to the east, down the St. Lawrence River valley. The ice sheet retreated northward, and large volumes of meltwater drained into the Ottawa area, in some places leaving behind sands and gravels on top of the marine silts and clays.

Figure A4 illustrates the surficial geology mapped in the area, which is mapped as glaciomarine silt and clay across much of Richmond, with a small area of sand and gravel mapped at surface west of the Richmond West municipal wells.

2.3.2 Paleozoic Bedrock Formations

Beneath the Site, the uppermost bedrock formation is a limestone unit that is interpreted to be part of the Oxford and March Formations, which are collectively referred to as the Beekmantown Group (Figure A5). The depth to the top of bedrock is shown on Figure A6.

The uppermost formation beneath the Site is the **Oxford Formation**, which is described as a dolostone with shaly and sandy interbeds that are up to 30 cm thick (Williams, 1991). The formation is characterized by light to medium brownish to greenish grey dolostone and is estimated to be approximately 30 m thick in the Richmond area.

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. Within the

Richmond area, the March Formation is estimated to be approximately 8 to 9 m thick (Paterson Group, 2011).

The underlying **Nepean Formation** is a quartz sandstone that is thinly bedded to massive and well sorted (see Figure A7 for interpreted depth to Nepean Formation). The sandstone is variable in colour and can be white to light grey, brown, reddish brown and green. It underlies the March Formation beneath the Site, and the upper Nepean Formation contact is marked by the lowermost unit of (sandy) dolostone. Locally, the Nepean Formation is described as cream coloured, coarse-grained sandstone with a weathered grey and irregular brown stained colour (Paterson Group, 2011).

2.4 Regional Hydrostratigraphy

There are no mapped overburden aquifers in the Richmond area and surrounding area; the only aquifers beneath the Site are the upper Oxford and March formation dolostones, and the underlying Nepean Formation sandstone. The water levels in the upper and lower bedrocks aquifers are similar, with groundwater levels lying only a few metres below ground surface.

The water level elevations reported in all water wells that are completed in bedrock are illustrated on Figures A8 to A12. The water levels recorded in the March and Oxford formations are denoted with circles, and the water levels for wells completed in the Nepean Formation are denoted by black squares and circles. The labels denote the static water level noted on the drillers log at the time the well was drilled. Water levels were collected from a wide variety of time periods from the 1960s to 2019 and represent water levels collected in spring when levels are at their highest and summer when levels are at their lowest. They water levels are useful for identifying broad trends across an area, but cannot be relied upon to provide the exact water level at any given point on the map. In general, water levels in the Richmond area lie 2 to 4 metres below ground surface and within 1 m in the low-lying areas along the Jock River (Figure A12). A three-dimensional view of surficial and bedrock geology across the site are illustrated on Figures A13 and A14.

2.5 Regional Groundwater Quality

In general, the groundwater quality from private wells in the Oxford and Nepean formations within the Village of Richmond is considered potable and good quality. Elevated concentrations of iron, hardness, sodium and total dissolved solids (TDS) and hydrogen sulphide occur locally (Golder, 2003, 2017; JWEL, 1991 and Geofirma, 2020). The identified elevated concentrations which can be locally present are typically within the range that can be treated by conventional water treatment systems.



3.0 STUDY METHODOLOGY

3.1 Groundwater Supply Investigation

3.1.1 Test Well Siting and Monitoring Well Network

A total of four bedrock test wells were advanced on-site from January 7 to January 15, 2021 by Air Rock Drilling Ltd. under well contractor license number 1119. Well grouting inspections were carried out by GEMTEC staff during the sealing of the well casings in all test wells. The test wells were completed in pairs, at two potential production well locations. Each well cluster includes a shallow bedrock well completed in the Oxford and March Formation (Beekmantown Group) and deep bedrock well completed in the Nepean Formation.

In addition to the four on-site bedrock test wells, groundwater level monitoring was completed in three private homeowner wells (A274440, A260995, A274380), one commercial well (TW2 – A138253) and a series of overburden monitoring wells installed as part of the geotechnical investigation (GEMTEC, 2021); refer to Detailed Site Plan Figure 1 for well locations.

3.1.2 Permit To Take Water (PTTW) Application

GEMTEC prepared and submitted a Category 2 PTTW application to the Ministry of the Environment, Conservation and Parks (MECP) required for groundwater pumping greater than 50,000 litres per day. The PTTW application was approved and issued by the MECP on March 3, 2021 (PTTW Number 7422-BYQNKJ). Groundwater pumping in excess of 50,000 litres per day was carried out in accordance with the permit requirements.

3.1.3 Hydraulic Testing

Pumping tests were completed at test well TW21-1C to assess the groundwater quality and quantity. Following well drilling, a preliminary pumping test was completed on February 2, 2021. The test well TW21-1C was pumped at a rate of approximately 340 litres per minute for a period of 2.5 hours, for a total groundwater discharge of approximately 49,000 litres. Groundwater quality samples were collected at the end of the pumping tests and submitted to Paracel Laboratories for 'subdivision package' and 'heavy metal' parameters.

A step test was completed at TW21-1C on March 12, 2021 in order to assess the performance of the well, prior to conducting a long-duration pumping test. The test well TW21-21C was pumped for three one-hour intervals at rates of approximately 680 litres per minute, 910 litres per minute and 1,060 litres per minute.

A 72-hour constant rate pumping test was completed at TW21-1C on March 15 to March 18, 2021. The pumping test was conducted by Aardvark Drilling Inc. using a 30Hp downhole pump, installed at a depth of 64.5 metres. The test well was pumped at a rate of approximately 910 litres per minute and groundwater discharge monitored using a calibrated flow meter and totalizer

(Seametrics model #IP117S-126). The groundwater was discharged to ground surface approximately 400 metres from the test well in accordance with permit requirements.

3.1.4 Groundwater Sampling

Groundwater samples from TW21-1C were collected during the February 2, 2021 short duration pumping test and from March 15-18, 2021 during the 72-hour pumping test. The groundwater samples were collected 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. All water samples, including samples for metal analysis, were unfiltered. The groundwater samples were subsequently submitted to Paracel laboratories in Ottawa, Ontario for the following parameters:

- February 2, 2021 (short duration pumping test) and March 16/17/18, 2021 (24-hour, 48-hour and 72-hour samples)
 - "Subdivision Package": total coliform, E. coli, fecal coliform, heterotrophic plate count, electrical conductivity, pH, hardness, total dissolved solids, alkalinity, fluoride, chloride, nitrate, nitrite, sulphate, ammonia, total kjeldahl nitrogen, dissolved organic carbon, phenols, hydrogen sulphide, true colour, turbidity, calcium, manganese, magnesium, potassium and sodium.
 - 'Heavy Metals": aluminum, antimony, arsenic, barium, boron, cadmium, chromium, chromium VI, copper, lead, mercury, selenium, uranium, and zinc.
- March 18, 2021 (72-hour sample)
 - Volatile Organic Compounds (VOCs), Petroleum Hydrocarbons (PHCs) and pesticides/herbicides.

Field parameters were measured at periodic intervals during the pumping tests. The measured field parameters and equipment used during the pumping test are provided in Table 3.1.

Field Parameters	Manufacturer	Model No.
Total and Free Chlorine	Hach	DR 900
pH, temperature, conductivity, total dissolved solids, dissolved oxygen and oxygen reduction potential	Horiba ¹	Horiba U-521
Turbidity	Hanna	HI 98703

Table 3.1 – Field Equipment Overview

Field Parameters	Manufacturer	Model No.
Colour (filtered ² and unfiltered)	Hach	DR 900

Notes: 1. Rental equipment from Maxim Environmental and Safety Inc. Calibrated by Maxim Environmental and checked/re-calibrated daily with standard solutions provided by Maxim. 2. Groundwater samples field filtered using 0.45 micron filters.

3.1.5 Borehole Geophysics

Downhole geophysical surveys were completed in four test wells (Figure 1) at the Site. The surveys were completed to characterize rock units within each test well. Surveys were focused on logging structures within the shallower Nepean formation (upper ~50 m) and the deeper Oxford / March formation (beyond ~50 m). Surveys logged rock units within each formation to characterize stratigraphy, fractures, joints, bedding, foliations, faults, etc. Downhole probes included both optical and acoustic imaging televiewers, and an additional probe (40GRP-1000) to log gamma, 16" normal resistivity, 64" normal resistivity, single point resistance, and spontaneous potential measurements.

Test wells were drilled in two different locations on the site and consisted of a shallow and deep well at each location. Shallow wells were contained within the upper 50 metres (Nepean formation) at each location, and deeper wells were cased to approximately 55 metres (below ground surface) and extended to depths of approximately 110 - 120 metres.

In completing the downhole program, geophysical surveys were conducted over a 3-day period from February 3 - 6, 2021. Equipment for the surveys required a 500 metre winch and data logger system, coupled with Mount Sopris ALT probes that included the following:

- QL40-ABI (acoustic televiewer);
- QL40-OBI (optical televiewer); and
- 40GRP-1000 probe.

Optical and acoustic televiewer data was collected and combined with gamma and resistivity logs generated by the 40GRP-1000 probe. Each of the probes are discussed in the following subsections.

3.1.6 Televiewers

Televiewer logging instruments are used to obtain high-resolution and oriented images of borehole walls for a variety of investigation types. These instruments function to provide in-situ and relatively undisturbed measurements of rock units where core recovery is difficult/unreliable, costly, or otherwise unavailable. Televiewer surveys are often used as standalone data sets, to provide supplemental information for drill programs, and/or as a quality control measure during characterization studies. For this investigation, data sets from both optical and acoustic

televiewers were used to image test wells to collect structural information in near surface formations to better understand the similarities and differences between these rock units.

A generalized schematic of the optical and acoustic televiewer probes deployed downhole is displayed in Figure D1, Appendix D.

3.1.7 Acoustic Televiewers

Downhole surveys at each test well were completed using the optical and acoustic televiewer, the 40GRP-1000 probe, a data logger, a winching system, and tripod positioned over each of the test wells. To initiate each of the surveys, probes were positioned over test wells, zeroed at ground surface, and lowered to full depth. Data collection was completed during ascent (under tension), which provided a more controlled data collection stream without the hang-ups that can occur as probes descend under the force of gravity. This is a necessity for the televiewers as they require centralizers to keep the probes positioned correctly in the boreholes, and during descent, these probes often get hung-up on borehole wall irregularities. During data collection, acoustic, optical, and 40GRP-1000 data records were acquired at a rate of approximately 1.5 m/min to ensure adequate sampling rates

3.2 Offsite Domestic Well Water Quality

The offsite water quality was assessed through sampling domestic private wells in the Creekside Phase 1 residential development, sampling Creekside Phase 1 test wells and a review of available hydrogeological reports for the adjacent commercial development, all of which are located west of the Site (Figure 1). The domestic water supply wells in the Creekside 1 development are completed in the limestone bedrock of the Oxford Formation, with well depths in the range of 25 to 66 metres.

Information letters were delivered in November 2020 to all residents within the Creekside Phase 1 residential development and homeowner sampling was completed between December 2020 and May 2021. A total of 19 homeowners voluntarily participated in the sampling program. Field testing for turbidity, pH, total dissolved solids, electrical conductivity, temperature and total chlorine was carried out at the time of sampling. Groundwater samples were collected from untreated taps (e.g. outdoor tap or pressure tank bypass) after running the cold water for a minimum of ten minutes. The samples were preserved in laboratory supplied bottles using established sampling protocols. The water samples were submitted to Paracel Laboratories Ltd. for 'subdivision package' parameters.

Water quality information from the commercial development was reviewed to assess the background water quality in the Nepean aquifer. The following background reports reviewed include:

- Hydrogeological Study, Proposed Development Part of Lot 26, Concession 4 Geographic Township of Goulbourn, City of Ottawa (Richmond Village), Ontario, report by Golder Associates report number: 1418381-1000, Rev.2, September 2017.
- Hydrogeological Report and Terrain Analysis, Proposed Commercial Development Phase
 2, Richmond Village Square, Ottawa, Ontario, report by Paterson Group Inc., Report:PH4188-LET.01, March 24, 2021.

Elevated chloride concentrations were noted during the Creekside 1 water quality sampling and further investigated by GEMTEC under a separate cover, titled "Investigation of Potential Chloride Sources – Creekside Subdivision Phase 1, Village of Richmond, Ottawa, Ontario" and dated May 31, 2021. The investigation is currently ongoing and under review by the MECP. Follow-up water quality sampling has been completed at numerous times since May, 2021 and reported under separate cover.

4.0 RESULTS AND DISCUSSION

4.1 Geologic Characterization

Beneath the Site, the geologic units consist of a fine-grained clays, silty sand and till that overlie limestone and sandstone bedrock. The Paleozoic-aged bedrock units of the Ottawa area were characterized by Williams (1991). A description of the geological site conditions is presented in this section based on local and recent on-site drilling data.

4.1.1 Overburden

The overburden geology was characterized on-site during the TW21-1C Water Supply Assessment completed by GEMTEC (Draft report dated Dec 11, 2020).

The fieldwork for this investigation was carried out between July 3 and 20, 2020. During that time, a total of 26 boreholes were advanced using a track mounted hollow stem auger drill rig supplied and operated by CCC Geotechnical and Environmental Drilling of Ottawa, Ontario.

Details for the boreholes advanced are provided below:

- 21 boreholes, numbered 20-01A, 20-02 to 20-04, 20-05A, 20-06, 20-07A, 20-08, 20-09, 20-10A, 20-11 to 20-15, 20-16A, 20-17, 20-18A, 20-19, 20-20, 20-21, and 20-25 were advanced to depths ranging from about 6.1 to 10.4 metres below ground surface.
- 6 boreholes, numbered 20-01B, 20-05B, 20-07B, 20-10B, 20-16B, and 20-18B were advanced adjacent to boreholes 20-01A, 20-05A, 20-07A, 20-10A, 20-16A, and 20-18A, respectively, for the installation of shallow monitoring wells and/or obtaining relatively undisturbed Shelby tube samples.

Well screens were sealed in the overburden at all borehole locations, except borehole 20-05B, to measure the groundwater levels and for hydraulic conductivity testing. The record of borehole sheets and monitoring well logs are provided in Appendix B.

From the investigation the overburden beneath the Site consists predominately of clay, till and lesser sands. The lowermost overburden sequence in the area is a glacial till, deposited during the late Wisconsin ice advance and retreat approximately 12,000 years ago. Overlying the till in many areas is glaciolacustrine silts and clays that were deposited when the area was isostatically depressed due to the weight of the glaciers, and marine seawater inundated the area forming the Champlain Sea. Thick layers of clay were deposited before the land surface rebounded, and the sea retreated to the east, down the St. Lawrence River valley. The ice sheet retreated northward, and large volumes of meltwater drained into the Ottawa area, in some places leaving behind sands and gravels on top of the marine silts and clays.

Figure A4 illustrates the surficial geology mapped in the area, which is mapped as glaciomarine silt and clay across much of Richmond, with a small area of sand and gravel mapped at surface west of the Richmond West municipal wells.

Based on detailed geotechnical studies (25 boreholes by GEMTEC, 7 boreholes by others), the overburden generally comprises deposits of silty clay and glacial till over bedrock. A layer of sand was also noted at two of the borehole locations. Native deposits of silty clay were encountered in all of the boreholes. Where fully penetrated, the silty clay extends to depths ranging from about 2.6 to 8.4 metres below ground surface.

Grain size distribution tests were undertaken on four selected samples of the weathered silty clay crust from boreholes 20-06, 20-13, 20-14, and 20-20. The results are summarized in Table 4.1.

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
20-06	2	08 – 1.4	0	2	45	53
20-13	3	1.5 – 2.1	0	1	38	61
20-14	3	1.5 – 2.1	0	2	41	57
20-20	3	1.5 – 2.1	0	2	37	61

Table 4.1 – Summary of Grain Size Distribution Test (Weathered Crust)

A deposit of glacial till was encountered below the silty clay and clayey silt in boreholes 20-01, 20-02, 20-04, 20-07 to 20-12, 20-15, and 20-17 to 20-21. The glacial till was not fully penetrated

in the boreholes but was proven to depths ranging from about 5.3 to 10.4 metres below ground surface (elevation ranging from about 83.3 to 88.8 metres).

Two grain size distribution test was undertaken on select samples of the glacial till from boreholes 20-15 and 20-19. The results are summarized in Table 4.2.

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
20-15	5	3.1 – 3.7	20	43	25	11
20-19	5	3.1 – 3.7	9	46	27	19

Table 4.2 – Summary of Grain Size Distribution Test (Glacial Till)

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

A deposit of sand with trace to some gravel was encountered below the glacial till in boreholes 20-12 and 20-15. Boreholes 20-12 and 20-15 extended 1.4 and 0.8 metres into the sand, respectively. The sand deposit was not fully penetrated by the boreholes but was proven to depths of about 6.7 and 6.1 in boreholes 20-12 and 10-15, respectively (elevations of about 87.2 and 88.0 metres, respectively).

One grain size distribution test was undertaken on a sample of the sand from borehole 20-15. The results are summarized in Table 4.3.

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
20-15	8	5.5 – 5.9	1	92	2	5

Table 4.3 – Summary of Grain Size Distribution Test (Sand)

Depth to Top of Bedrock/ Overburden Thickness

A surface was generated to illustrate the depth to the top of bedrock (overburden thickness) beneath the Site and surrounding areas (Figure A6). The surface was created using the depth at the uppermost bedrock contact noted in each drillers log in the MECP water well database. As illustrated on Figure A6, depth to bedrock in the Richmond area ranges from less than 1 m to over 15 m, but on average bedrock lies approximately 10 m below ground surface.

Inferred bedrock was recorded in site-specific geotechnical studies that were carried out at the Site. Table 4.4 summarizes the depth and the corresponding elevations of refusal and bedrock surface at the borehole locations.

Borehole	Ground Surface Elevation (metres)	Depth to Bedrock (metres)	Bedrock Surface Elevation (metres)
20-07	93.8	6.5	87.3 ¹
13-2	94.0	11.8	82.2 ²
13-4	93.6	12.3	81.3
13-8	-	13.6	-
13-9	-	11.8 ²	-
13-5	93.5	11.9	81.6
13-6	93.7	7.4	86.3
15-1	93.7	12.3	81.4
15-2	93.6	10.9	82.7

Table 11 - Rodrock	Curfago Cummary	Warious	agotophnical	ctudioc)
1 able 4.4 - Deulock	Surface Summary	(various	yeuleumilai	Sludies

Notes: 1 – Bedrock surface inferred from auger refusal

2 - Bedrock surface inferred from dynamic cone penetration testing

During the previous investigations, the limestone bedrock was encountered in boreholes 13-4 and 13-8 at depths of about 12.3 and 13.6 metres below ground surface. Refusal to dynamic cone penetration testing was encountered in boreholes 13-2 and 13-5 at depths of about 11.8 and 11.9 metres below ground surface. Based on the geotechnical study of the Site, the overburden thickness ranges in thickness from 6.5 to 13.6 metres, averaging 11 metres.

4.1.2 Bedrock

A total of four bedrock test wells were advanced on-site between January 7 and January 15, 2021. The construction details of the test wells are summarized in Table 4.5 below.

Test Well ID	Well Tag #	Geological Formation	Casing Diameter (m)	Casing Depth (m BGS)	Screen/Open Interval (m BGS)	Total Depth (m BGS)
TW21-1B	A313189	Oxford	0.152	15.8	15.8 – 48.8	48.8
TW21-1C (PUMPING WELL)	A313115	Nepean	0.203	57.3	57.3 – 122.2	122.2
TW21-2B	A313190	Oxford	0.152	15.2	15.2 – 45.7	45.7
TW21-2C	A313188	Nepean	0.152	57.3	57.3 – 109.1	109.1

Table 4.5 – Summary of Test Well Construction Details

As presented earlier, beneath the Site, the uppermost bedrock formation is a limestone unit that is interpreted to be part of the Oxford and March Formations, which are collectively referred to as the Beekmantown Group (Figure A5).

TW21-1B and TW21-2B Oxford Formation

The **Oxford Formation**, which is described as a dolostone with shaly and sandy interbeds that are up to 30 cm thick (Williams, 1991). The formation is characterized by light to medium brownish to greenish grey dolostone and is estimated to be approximately 30 m thick in the Richmond area.

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. Within the Richmond area, the March Formation is estimated to be approximately 8 to 9 m thick (Paterson Group, 2011).

<u>TW21-1B</u> was drilled into the Oxford formation to a total depth of 48.8 m bgs. The borehole log is presented in Appendix C and the major features are described below:

- Overburden Clay with gravel at depth of 14.02 m bgs
- Grey Limestone to a depth of 48.8 m bgs

<u>TW21-2B</u> was drilled to a depth a total depth of 45.7 m bg. The borehole log is presented in Appendix C and the major features are described below:

- Overburden Clay with some boulders and gravel to depth of 13.4 m bgs.
- White quartzite to a depth of 19.5 m bgs
- Grey limestone to a final depth of 45.7 m bgs.

TW21-1C and TW21-2C- Nepean Formation

The underlying **Nepean Formation** is a quartz sandstone that is thinly bedded to massive and well sorted. The sandstone is variable in colour and can be white to light grey, brown, reddish brown and green. It underlies the March Formation beneath the Site, and the upper Nepean Formation contact is marked by the lowermost unit of (sandy) dolostone. Locally, the Nepean Formation is described as cream coloured, coarse-grained sandstone with a weathered grey and irregular brown stained colour (Paterson Group, 2011).

<u>TW21-1C (main pumping well)</u> was drilled into the Nepean formation to a total depth of 122.2m bgs. The borehole log is presented in Appendix C and the major features are described below:

- Overburden consisting of Clay and Hardpan to a depth of 14.63 m bgs
- Grey Limestone with trace grey sandstone to depth of 67 m bgs
- Grey Sandstone to a depth of 122 m bgs

TW21-2C was drilled into the Nepean formation to a total depth of 109.1 m bgs. The borehole log is presented in Appendix C and the major features are described below:

- Overburden consisting of Clay with trace gravel to a depth of 14 m bgs
- Grey Limestone with trace grey sandstone to depth of 68 m bgs
- Grey Sandstone to a depth of 109.1 m bgs

Depth to Top of Nepean Sandstone

The topography at the top of the Nepean Formation was contoured by interpolating the uppermost "sandstone" descriptor in the water well record. As illustrated on Figure A7, depth to the Nepean Sandstone lies approximately 67m bgs based on the on-site drilling results. The figure also illustrates the locations of wells that intercept the top of the Nepean Formation; several wells intersect the Nepean Formation south and west of the Site, however, there are few deep bedrock wells east and north of the Site. The topography on the top of the Nepean Formation is fairly constant across the Richmond area, increasing slightly in areas where overburden thickens east of Richmond (Figure A7).



Cross-Sections

Figures A8 to A11 are cross-sections that were generated using the information contained within the MECP water well database. The cross-section locations are illustrated on Figure A1. The bedrock surface and the top of the Nepean Formation surface described in the overlying sections are illustrated on the sections to illustrated estimated depths to the top of these surfaces. The ground surface topography represented in the 2 m DEM was also applied as the uppermost line on the cross-section.

Figure A8 is a cross-section (A-A') that runs southwest to northeast across Richmond just north of and parallel to Perth Street with the Site lying on the right side of the cross-section. The main features are as follows:

- Overburden south of the Site along cross-section A-A' is approximately 10-12 m thick and is underlain by approximately 40 to 45 m of dolostone (limestone) of the March and Oxford Formations.
- Due to the coarse nature of lithologic descriptions noted in the water well drillers logs (e.g., limestone), these two formations were not able to be reliably subdivided on the cross-sections.
- As illustrated on Figure A8, the upper surface of the Nepean Formation sandstone lies approximately 50 m bgs. On-site drilling confirmed the depth to be on the order of 68 m bgs.

Figure A9 is a cross-section (B-B') that runs from the Site in the north through the Kings Park Well 2 in the central portion of the section to the southeastern reaches of the town of Richmond. The main features are as follows:

- Overburden beneath the Site is estimated to be approximately 4 m at the north end of the Site to 10 m at the south end (Figure A6), and is expected to consist of silt and clay at surface with a discontinuous fine-grained till overlying bedrock.
- The underlying Oxford and March Formation dolostone (limestone) underlie the overburden and the Nepean Formation was encountered at approximately 67 m below ground surface (Figure A7).
- As illustrated on the cross-section the domestic wells in the area are completed in both the upper limestone, as well as the lower Nepean Formation. The cross-section intersects the Jock River and a tributary of the Jock River and the difference in elevation between the riverbanks and the water level elevation are minor (< 2 to 3 m; Figure A9).

Figure A10 is a cross-section (C-C') that runs from north to south along the western reaches of the Site in the north, to the Kings Park Well 1 in the south. The main features are as follows:



- The cross-section illustrates the commercial well TW2, where a transducer is currently installed collecting background water levels, and the relationship between this well and the nearby Kings Park Well 1, approximately 1.3 km to the south.
- As illustrated on the cross-section (Figure A10), the depth to the upper surface of the Nepean Formation along the length of the cross-section is estimated to be approximately 50 to 55 m below ground surface.

Figure A11 is a cross-section (D-D') that runs from northwest to southeast through the neighbouring Creekside 1 residential development and commercial property. The main features are as follows:

- Overburden south of the Site along cross-section D-D' is approximately 8-12 m thick and is underlain by approximately 40 to 45 m of dolostone (limestone) of the March and Oxford Formations.
- Due to the coarse nature of lithologic descriptions noted in the water well drillers logs (e.g., limestone), these two formations were not able to be reliably subdivided on the cross-sections.
- The cross-section illustrates two test wells in the Creekside 1 development, TW15-01 and TW15-03 and a commercial well TW2, where pressure transducers are currently installed collecting background water levels.
- As illustrated on the cross-section (Figure A11), the depth to the upper surface of the Nepean Formation along the length of the cross-section is estimated to be approximately 50 to 55 m below ground surface.

In general, water levels in the Richmond area lie 2 to 4 metres below ground surface and within 1 m in the low-lying areas along the Jock River (Figure A12).

A summary of the local scale Site conditions is presented as 3-D conceptual models on Figures A13 and A14.

4.1.3 Bedrock Structural Characteristics

Figure A5 illustrates the uppermost bedrock group mapped in the area, as well as the location of bedrock faults; both mapping products were generated by the Geological Survey of Canada at a regional-scale, so uncertainty exists with the exact location of the geologic contacts and faults.

4.2 Borehole Geophysics

Both optical and acoustic images, structural data (joints/fractures and bedding foliations), resistivity, SPR, SP, and natural gamma are included in the logs in Appendix D. Optical and acoustic images are oriented to magnetic north and horizontal (ground surface) for dip.

Two primary fractures were noted in both the upper Oxford-March and lower Nepean formations and are shown in the summary images below.



Figure D2 (Appendix D) - Illustration displaying primary fractures noted in Oxford/March and Nepean Formations.

Individual pole plots for each test hole are included in Appendix D.

Fracture set 1 represents bedding plane fractures. These fractures are relatively flat lying in both formations but the bedding in the Nepean Sandstone dips more uniformly at 5 to 10 degrees in an east – northeast direction. Fracture set 2 is sub-vertical and strikes at approximately 170 degrees but dips more prominently to the north in the deeper sandstone unit. The presence of a similarly orientated sub-vertical fracture set in both upper and lower bedrock formations may indicate a similar genesis. Fracture set 2 may transmit groundwater from the shallow limestone bedrock to the deeper sandstone unit.

Fracture apertures / fracture zones (low amplitude acoustic responses) in the Nepean Sandstone are typically wider than in the upper predominately limestone Formations which may explain why the sandstone has a much higher storage coefficient and transmissivity.

4.3 Water Supply Investigation

4.3.1 Test Well and Observation Well Network

The construction details of the test wells are summarized in Table 4.6 below. In addition to the on-site bedrock test wells, a series of off-site bedrock domestic and commercial water supply wells were used for groundwater level monitoring (refer to Detailed Site Plan, Figure 1 for well locations and Table 3.1 for well construction details). The test well and observation well records are provided in Appendix C.



	Test Well ID ¹	Well Tag #	Geological Formation	Casing Diameter (m)	Casing Depth (m BGS)	Screen/Open Interval (m BGS)	Total Depth (m BGS)	Distance to Pumped Well (m)
Cluster 1	MW20-07S	_ (1)	Overburden	0.051	2.5	2.5 – 4.0	4.0	70
	MW20-07D	_ (1)	Overburden	0.051	5.0	5.0 - 6.5	6.5	70
ite Well	TW21-1B	A313189	Oxford	0.152	15.8	15.8 – 48.8	48.8	12
On-Si	TW20-1C (PUMPING WELL)	A313115	Nepean	0.203	57.3	57.3 – 122.2	122.2	0
lell	MW20-15	_ (1)	Overburden	0.051	2.5	2.5 - 4.0	4.0	230
-Site W	TW20-2B	A313190	Oxford	0.152	15.2	15.2 – 45.7	45.7	225
Ö	TW21-2C	A313188	Nepean	0.152	57.3	57.3 – 109.1	109.1	225
Site Overburden	MW20-01S	_ (1)	Overburden	0.051	2.32	2.32 – 3.84	3.84	290
	MW20-01D	_ (1)	Overburden	0.051	7.68	7.68 – 9.20	9.20	290
	MW20-16S	_ (1)	Overburden	0.051	2.48	2.48 - 4.00	4.00	225
	MW20-16D	_ (1)	Overburden	0.051	7.68	7.68 – 9.20	9.20	225
ò	MW20-18S	_ (1)	Overburden	0.051	2.48	2.48 - 4.00	4.00	400
	MW20-19S	_ (1)	Overburden	0.051	2.48	2.48 – 4.00	4.00	340
<u>_</u> 0	TW15-01	A165020	Oxford	0.152	13.1	13.1 – 29.9	29.9	680
Off-Site Bedrock Wel	TW15-03	A165022	Oxford	0.152	9.4	9.4 – 28.5	28.5	615
	Colonnade TW2	A138253	Oxford / Nepean	0.152	16.4	16.4 - 49.1	49.1	550
	A274440	_(2)	Oxford	0.152	14.0	14.0 - 30.5	30.5	550

Table 4.6 – Summary of Test Well Construction Details

	Test Well ID ¹	Well Tag #	Geological Formation	Casing Diameter (m)	Casing Depth (m BGS)	Screen/Open Interval (m BGS)	Total Depth (m BGS)	Distance to Pumped Well (m)
	A260995	_(2)	Oxford	0.152	12.2	12.2 – 42.7	42.7	580
	A274380	_(2)	Oxford	0.152	9.75	9.75 – 25.0	25.0	560

1. Monitoring well installed as part of geotechnical investigation (GEMTEC, 2021)

2. Water well ID not provided in order to protect the confidentiality of private well owners. Well information maintained by GEMTEC.

4.3.2 TW21-1C Hydraulic Testing Results

The transmissivity and storativity of the water supply aquifer were estimated from the 72-hour pumping test drawdown data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. An analysis of the pumping test data was carried out using the Cooper-Jacob and Theis recovery methods.

Test Well TW21-1C sustained a constant pumping rate of approximately 910 litres per minute for a period of 72 hours. The maximum observed drawdown in the pumping well, TW21-1C was 44.07 metres (65% of the available drawdown). Observation wells located 10 to 725 metres from the pumping well reported water level drawdown ranging from <0.1 to 5.67 metres. Following cessation of pumping, the water level in TW21-1C recovered 95% within 2 hours.

A summary of the maximum observed drawdown, estimated transmissivity and storativity from the pumping well and observation wells are provided in Table 4.7. The drawdown and recovery plots are provided in Appendix E.

	Test Well ID ¹	Geological Formation	Total Depth (m BGS)	Distance to Pumped Well (m)	Maximum Drawdown @ 72 hours (m)	T ¹ Drawdown (m²/day)	T ¹ Recovery (m²/day)	S² (-)
Well Cluster 1	MW20-07S	Overburden	4.0	70	0.31	-	-	-
	MW20-07D	Overburden	6.5	70	1.19	-	-	-
	TW21-1B	Oxford	48.8	12	5.67	58	47	3 x 10 ⁻³
	TW21-1C (PUMPING WELL)	Nepean	122.2	0	44.07	39	50	-
el <	MW20-15S	Overburden	4.0	230	<0.1	-	-	-

Table 4.7: Aquifer Test Results

	Test Well ID ¹	Geological Formation	Total Depth (m BGS)	Distance to Pumped Well (m)	Maximum Drawdown @ 72 hours (m)	T ¹ Drawdown (m²/day)	T ¹ Recovery (m²/day)	S² (-)
	TW21-2B	Oxford	45.7	225	0.88	670	864	3 x 10 ⁻⁴
	TW21-2C	Nepean	109.1	225	0.85	670	813	3 x 10 ⁻⁴
Overburden Monitoring	MW20-01S	Overburden	3.84	290	<0.1	-	-	-
	MW20-01D	Overburden	9.20	290	0.66	-	-	-
	MW20-16S	Overburden	4.00	225	<0.1	-	-	-
	MW20-16D	Overburden	9.20	225	1.27	-	-	-
	MW20-18S	Overburden	4.00	400	<0.1	-	-	-
	MW20-19S	Overburden	4.00	340	<0.1	-	-	-
Off-Site	TW15-01	Oxford	29.9	680	<0.1	-	-	-
	TW15-03	Oxford	28.5	615	0.44	-	-	
	Colonnade TW2	Oxford / Nepean	49.1	550	0.46 ³	-	-	-
	A274440	Oxford	30.5	550	0.41 ³	-	-	-
	A260995	Oxford	42.7	580	0.40 ³	-	-	-
	A274380	Oxford	25.0	560	0.46 ³	-	-	-

Notes: 1. T = transmissivity; 2. S = Storativity; 3. Residential or commercial well in-use.

The calculated transmissivity of the pumping well (TW21-1C) is 39 and 50 m²/day from drawdown and recovery, respectively. The calculated transmissivity of the observation well cluster TW21-2B (Oxford) and TW21-2C (Nepean) ranged from 670 to 864 m²/day, with a storativity of 3 x 10⁻⁴. The calculated transmissivity and storativity from the bedrock observation wells are consistent with transmissivity (362 to 755 m²/day) and storativity (1.0×10^{-2} to 1.4×10^{-4}) estimates from local studies of the Nepean Aquifer (Golder, 2011; Geofirma, 2021). The transmissivity estimates from the pumping well TW21-1C are an order of magnitude lower than TW21-2B and TW21-2C; however, this can be attributed to head losses in the pumped well and well efficiency and thus not representative of the aquifer properties.

4.3.3 Aquifer Hydraulic Connectivity

Pumping in the Nepean Sandstone caused drawdown in the upper bedrock formations and in the overburden (deep) monitoring wells that were installed in both the till and clay (with sand seams). Sub-vertical fractures that cut across both the deep and shallow bedrock Formations likely transmit groundwater to the deeper aquifer during pumping. The hydraulic connection between

the two Formations was also noted in the pump test data from the Western Development Lands, although not described in detail, the drawdown data for shallow and deep bedrock wells show a similar hydraulic response to this this study.

The drawdown in the deep monitoring wells suggest that the groundwater in the overburden is connected to the bedrock aquifer system and that the overburden will respond to pumping stresses in the deep bedrock aquifers. The drawdown in a deep overburden well MW20-16D, installed in the clay was 1.27 metres and located 225 metres from the pumping well. The clay at this location was noted to contain sand seams which likely connects to the sandy till or silty sand soils.

4.4 TW21-1C Water Quality Results

The results of the chemical, physical and bacteriological analyses on the water samples from test well TW21-1C is summarized in Appendix G and the laboratory results from Paracel are provided in Appendix H.

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 test (refer to Appendix G).

Based on water samples collected from test well TW21-1C, all samples were non-detect for total coliform, e. Coli and fecal coliform bacteria. The water quality meets the Ontario Drinking Water Quality Standards (ODWQS) maximum acceptable concentrations.

4.4.2 Other Health Related Parameters

No other maximum acceptable concentration limits of the ODWQS were exceeded in the 24-hour, 48-hour or 72-hour water samples collected from TW21-1C. This includes fluoride, nitrate, nitrite, heavy metals (mercury, aluminum, antimony, arsenic, barium, boron, cadmium, chromium, copper, lead, manganese, selenium and uranium), PHCs, VOCs or pesticides/herbicides.

4.4.3 Operational Guideline Exceedances

Operational related exceedances of the ODWQS were noted for hardness and these are discussed in the following section:

Hardness

The concentration of hardness in water samples obtained from TW21-1C ranged from 326 to 340 mg/L as $CaCO_3$ and is higher than 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 CaCO3 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 reported 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 considered to be 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.

4.4.4 Aesthetic Objective Exceedances

Aesthetic objective exceedances of the ODWQS included total dissolved solids and colour. These exceedances are discussed in the following sections:

Total Dissolved Solids (TDS)

The TDS levels in samples from TW21-1C during the 72-hour pumping test increased from 484 to 514 mg/L. The sample collected at 72-hours exceeds the ODWQS aesthetic objective of 500 mg/L, with a TDS of 514 mg/L. 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 hardness following 72-hours of pumping. The LSI was calculated to be 0.68, using a field-measured groundwater temperature of 8°C (refer to Appendix F). The calculated LSI value is between 0.5 and 2, which indicates the groundwater scale forming, but non-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 considered to be acceptable.

Colour

The analytical laboratory results for colour are reported as 'colour' (TCU; filtered) and 'apparent colour' (ACU; unfiltered). The colour decreased from 15 TCU to 7 TCU from the 24-hour and 72-hour samples respectively. Similarly, the apparent colour decreased from 28 to 19 ACU from the 24-hour and 72-hour samples respectively.

Water having a faint yellow/brown colour can be caused by organic materials and contributed to by iron and manganese. Colour is not generally considered a health issue and the aesthetic objective is set by appearance. The elevated laboratory colour may be the result of iron and manganese, which can precipitate out of solution and increase the colour levels.

Although the laboratory-measured colour exceeded the MECP D-5-5 aesthetic objective of 5 TCU, the field-measured colour was non-detectable (less than 5 TCU). The colour decreased throughout the pumping test, along with turbidity, and is anticipated to further decrease following additional well development. The elevated laboratory colour levels are likely related to iron and manganese and based on the measured true colour at the time of sampling, the colour levels are considered to be acceptable.

4.4.5 Notable Parameters

A Golder (2011) study of the Nepean Aquifer in Richmond reported chloride concentrations in the 43-44 mg/L range. The 2018 Annual Monitoring Report for the Kings Park communal wells, in the Village of Richmond reported chloride concentrations in treated water of 168.8 mg/L (City of Ottawa, 2018).

During the 72-hour pump test for this study chloride was noted to increase from 94 mg/L after 24 hours of pumping to 122 mg/L after 48 hours and finally 138 mg/L at the end of the 72 hour test. The increase in chloride is still with in the range of values noted in the Kings Park Communal wells and elsewhere for the Nepean Aquifer. A study of the Nepean Aquifer in Greely (Geofirma, 2021) reported increasing chloride concentrations from 85 to 104 mg/L and 116 to 129 mg/L in two Nepean test wells.

4.5 Offsite Well Water Quality Results – Creekside 1

The offsite water quality was assessed by sampling 24 domestic private wells and two test wells in the Creekside 1 development, all of which are completed in limestone bedrock of the Oxford Formation (refer to Water Well Records in Appendix H)

The domestic well sampling identified five private wells and one test well localized in the southern portion of the Creekside 1 development with multiple ODWQS aesthetic objective and operational guideline exceedances. The ODWQS exceedances include chloride (366 - 837 mg/L), hardness (522 – 1110 mg/L), sodium (133 – 270 mg/L), turbidity (<0.1 - 34.4 NTU) and total dissolved solids (842 - 2080 mg/L). These exceedances were further investigated by GEMTEC under a separate cover, titled "Investigation of Potential Chloride Sources – Creekside Subdivision Phase 1, Village of Richmond, Ottawa, Ontario" and dated May 31, 2021.

The hydrogeological investigation (GEMTEC, 2021) identified a stormwater management pond in an adjacent property as a potential source of chlorides. The investigation into this impact is ongoing. Follow-up sampling of the six affected private wells completed in July 2021 found significant decreases in chloride concentrations, from 223 – 837 mg/L to 103 - 224 mg/L (Appendix I). The decreases in chloride concentrations supports the hydrogeological conceptual model presented in GEMTEC (2021), which suggests seasonal de-icing salt inputs into the local groundwater system from the adjacent stormwater management pond. Follow-up water quality sampling has been completed since July 2021 and reported under separate cover. Further testing will be required to confirm the source and appropriate mitigation measures.

With the exception of the six impacted private wells in the Creekside 1 development, the water quality in the other 18 private wells sampled, meets all the ODWQS health related, maximum acceptable concentrations and treatability limits. A summary of the water quality results is provided in Appendix I. The following operational guideline and aesthetic objective exceedances are noted:

- Operational guideline: hardness (17 / 18 wells) and organic nitrogen (1 / 18 wells)
- Aesthetic Objective: total dissolved solids (3/ 17 wells), colour (6 / 18 wells), turbidity (1 / 17 wells) and iron (2 / 18 wells).

The groundwater quality of the 17 private wells are generally consistent with the findings of the initial Creekside 1 hydrogeological investigation (Golder, 2017), with aesthetic objective exceedances of colour and total dissolved solids, and operational guideline exceedances of hardness. Some variability in the range of water quality parameters were observed as expected given the number of wells tested and the variability in private wells depths.

The investigation is currently ongoing and under review by the MECP. Follow-up water quality sampling has been completed at numerous times since May, 2021 and reported under separate cover.

5.0 IMPACT ASSESSMENT

Based on the results of this study the following impact assessment is presented.

5.1 Water Quantity

The aquifer is capable of meeting the water quantity demands of the proposed 455-unit subdivision. As part of this study a test well was pumped at approximately 2.5 times the average demand (peak rate) for the development for 72 hours. The resulting maximum drawdown in the aquifer was 44.1 metres (65% of the available drawdown) and the test well recovered quickly, less than 2 hours for 95% recovery.

It is anticipated that the final production well(s) will encounter similar aquifer hydraulics to the test wells in the proposed communal well location (See Figure A2.2 in Appendix A); however, the production wells will be 50% larger in diameter than the main test well, 305 mm versus 203 mm, and the actual operational pumping will be less than the 72 hours test duration. Based on these factors the pumping stresses on the aquifer system by the final production well(s) and resulting drawdowns will be less that those imposed during the pump test.

5.2 Wellhead Protection and Water Quality Impacts

The results of this study suggest that the bedrock and surficial overburden groundwater systems are more interconnected, at least local to the study area, than other past studies have shown. From a wellhead protection perspective, this would mean that more recharge and potential chemical inputs could occur in areas where the surficial soils are thin or the near surface clay is absent. Overall, this may also reduce the size of the modelled wellhead capture zones.

The aquifer may be more vulnerable to surficial contamination from reduced thickness of low permeability soils or higher permeable windows above the upper bedrock aquifer. Groundwater quality impacts from chlorides have been identified in the Creekside 1 residential subdivision (GEMTEC, 2021). The hydrogeological investigation (GEMTEC, 2021) suggests seasonal deicing salt inputs into the upper limestone bedrock from the adjacent stormwater management pond, which is excavated approximately 4 metres below ground surface. The investigation is ongoing and the source of chlorides has not been confirmed.

The impacted water supply wells in the Creekside 1 development are localized to the shallow water supply wells in the southern portion of the development. Follow-up sampling suggests that the source is seasonally active and the inputs are rapidly flushed through the aquifer system. Appropriate mitigation measures and well head protection best management practices are expected to reduce potential impacts to the shallow bedrock aquifer and the proposed deep water supply aquifer for the Creekside 2 development.

5.3 Hydrogeological Sensitivity

Water levels recorded as part of this investigation demonstrate that the deeper Nepean aquifer and shallow Oxford / March Formations are interconnected and that high rates of groundwater pumping from the deeper aquifer causes drawdown in the upper bedrock system. In addition, pumping from the deeper aquifer also causes drawdown in the deep overburden sediments. However, the absence of drawdown in near surface wells installed in the clay deposits suggests that the aquifer system is still somewhat isolated from surface contamination.

Hydrogeological sensitive areas may exist where the clay is absent or it is removed from the surface by excavation. In general, the groundwater chemistry results, an absence of nitrate compounds and bacteriological parameters, also supports the water level data and suggest that the Site is not hydrogeological sensitive. However, consideration should be given to any excavations, such as storm water ponds, that could remove protective clays from the near surface at the Site. In these instances where excavations must be made, protective clay liners or geosynthetic liners should be considered.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

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

- The surficial geology across the Site generally consists of deposits of clay (with sand seams), till and lesser sands. The lowermost overburden sequence in the area is glacial till, overlain by glaciolacustrine silts and clays. Sand layers were also noted at two of 25 borehole locations. The Site overburden thickness ranges from approximately 6.5 to 13.6 metres, averaging 11 metres.
- The Site is not considered to be hydrogeologically sensitive based on the absence of thin soils, highly permeable soils or karst features.
- The water supply aquifers encountered at the Site includes limestone of the Oxford and March Formations (Beekmantown Group) underlain by sandstones of the Nepean Formation.
 - The Nepean sandstone lies approximately 67m bgs based on the on-site drilling results and is aquifer tested in this investigation.
 - Neighbouring water well users primarily rely on the Oxford and March Formation water supply aquifer.
 - Similar geological and hydrogeological conditions were found at both drilling and testing locations (e.g. TW21-1C; TW21-2C) located spatial 230 metres apart across the development site.
- Hydrogeological conceptual model (CSM)
 - The CSM was updated based on the on-site drilling results and hydraulic responses during the pump tests
 - The drawdown in the deep monitoring wells suggest that the groundwater in the overburden is connected to the bedrock aquifer system and that the overburden will respond to pumping stresses in the deep bedrock aquifers.

- Specifically, pumping in the Nepean Sandstone caused drawdown in the upper bedrock formations and in the overburden (deep) monitoring wells that were installed in both the till and clay (with sand seams).
- It is likely that the sub-vertical fractures that cut across both the deep and shallow bedrock Formations can transmit groundwater to the deeper aquifer during pumping. The presence of a similarly orientated sub-vertical fracture set in both upper and lower bedrock formations may indicate a similar genesis.
- Fracture aperatures / fracture zones in the Nepean Sandstone are typically wider than in the upper predominately limestone Formations which may explain why the sandstone has a much higher storage coefficient and transmissivity.
- The measured water level drawdowns within the overburden unit during the pump tests, should be evaluated as part of the building geotechnical designs.
- The aquifer may be more vulnerable to surficial contamination from reduced thickness of low permeability soils or higher permeable windows above the upper bedrock aquifer
- The water quality available from test well TW21-1C, completed in the Nepean sandstone aquifer is safe for consumption based on the absence of health-related exceedances; however, groundwater treatment for aesthetic parameters will be required.
 - Treatment for hardness, colour and iron may be desirable and can be treated using conventional water softeners and/or manganese greensand filters.
 - Sodium concentrations exceed the warning level for persons on sodium restricted diets of 20 mg/L and the Local Medical Officer of Health should be notified.
 - Total Dissolved Solids slightly exceeded the ODWQS aesthetic objective of 500 mg/L at 514 mg/L. LSI values indicate the water is considered scale forming, but non-corrosive; some encrustation can be expected.
- The water quality of the upper bedrock water supply aquifer (Oxford/March Formations), with the exception of the localized wells in the southern portion of the Creekside 1 development, meets the ODWQS maximum acceptable concentrations and treatability limits, with aesthetic objective and operational guideline exceedances of colour, total dissolved solids, hardness and the sodium warning level.
 - Private well owners interviewed in Creekside 1 Phase 1 noted multiple groundwater quality issues, namely 'sulfur' odours, iron staining, high hardness and total dissolved solids. The groundwater quality issues are consistent with the aesthetic objective and operational guideline exceedances stated in the hydrogeological investigation (Golder, 2017). Although the sampling did not identify ODWQS for hydrogen sulphide, 'sulphur' odours were noted by 10 homeowners.
 - Multiple wells in the southern portion of the Creekside 1 development have reported intermittent elevated chlorides, total dissolved solids, sodium, hardness

and turbidity. An offsite impact is suspected as the source of the contamination. This potential source is currently being investigated.

- Impacted wells are localized to the southern portion of Phase 1 of the Creekside 1 development.
- Follow-up sampling in July 2021 found decreasing chloride concentrations in all affected wells which are within the ODWQS aesthetic objective, suggesting that the source is seasonally active and the inputs are rapidly flushed through the aquifer system.
- The investigation is currently ongoing and under review by the MECP.
 Follow-up water quality sampling has been completed at numerous times since May, 2021 and reported under separate cover.
- The water quality determined in the course of this investigation is representative of longterm water quality and is consistent with water quality investigations of the Nepean Aquifer in the Ottawa area (Golder, 2011; Geofirma, 2021; City of Ottawa 2018; City of Ottawa, 2020).
- The quantity of groundwater available from the proposed water supply aquifer is sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term.
 - TW21-1C was pumped at a constant rate of approximately 910 litres per minute for 72 hours. The maximum drawdown observed at the end of pumping was 44.07 metres and following cessation of pumping, the water level recovered 95% within 2 hours.
 - The large drawdown observed in TW21-1C and relatively low transmissivity of the pumping well can be attributed to well inefficiencies (i.e. well losses, pump configuration, pump depth, etc.). Larger diameter production wells will reduce well inefficiencies and associated water level drawdown.
- Interference between neighbouring private drinking water wells is expected to be minimal.
 - Drawdown at neighbouring residential wells in the Creekside 1 development (Oxford/March Formations) and Colonnade commercial development (Oxford/ March/ Nepean Formation) during the pumping test was less than 0.5 metres.



6.2 Recommendations

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

6.2.1 Well Construction Recommendations

- Future production wells should be constructed in accordance with the City of Ottawa's Drinking Water Facility Design Guidelines and MECP regulations, including, but not limited to, Ontario Reg. 903. The well bore opening should be a minimum of 0.254 metres (10 inches) to reduce well inefficiencies.
- Well casings should be extended at least 57.3 metres (188 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.
- The future production wells should be located proximal to TW21-1C within the proposed Communal Well location in accordance with any specific wellhead protection requirements. As the Nepean Aquifer is regionally extensive with similar hydrogeological properties, it is expected that comparable results in terms of groundwater quantity and quality will be obtained during communal well drilling at the proposed preferred location within the development area.

6.2.2 Water Quality Recommendations

- It is recommended that a water quality treatment specialist appropriately configure and size the treatment systems.
- 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.


7.0 CLOSURE

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

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

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

os

Stephen Livingstone, M.Sc., P.Geo. Senior Hydrogeologist



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7.2 Limitations

This report was prepared for 1470424 Ontario Inc. and is intended for the exclusive use of 1470424 Ontario Inc. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and 1470424 Ontario Inc. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgments of GEMTEC based on the Site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the Site, subsurface investigations at discrete locations and depths and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the Site that were unavailable for direct investigation, subsurface locations on the Site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, reassess the conclusions presented herein.





APPENDIX A

Conceptual Site Model Figures

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)



- Municipal/ Communal Well
 Permitted Water Takers
 Potential Monitoring/ Test Wells
 Water Wells
 Site Boundary
 Cross-Section Location
- Roads Intermittent Streams Permanent Rivers Geotechnical Well/ Potential Monitoring Well

Creekside Development Conceptual Site Model

Site Map and Cross-Section Locations



1



Water Wells 0

Site Map





Water Wells 0

Revised Site Plan



2.2



_	Site Area	Ground
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	Roads	
	Intermittent Streams	
	Permanent Rivers	
—	Ground Surface Contours (2 m)	



Conceptual Site Model























APPENDIX B

Record of Borehole Sheets (GEMTEC, 2021)

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)

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 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

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		0mm OD)				4	SS	610	5												Filler Sand	
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- 4	Po	low Stem.	Stiff to very stiff, grey SILTY CLAY		9 <u>0.07</u> 3.66			210	1											-		
-		Hol				0	33	310														
- 5											€									-		
			Very loose to loose, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		88.40 5.33	7	SS	405	2	•												
- 6 						8	SS	355	5	-												
			End of borehole	ø Ki	87.02 6.71																	63
- 8																						
- - 9																						
- - 10 -																						
- 11 - -																					GROUNDWATE OBSERVATION DATE DEPTH (m)	ER NS ELE\ (m)
- - - - - 12																					20-09-30 1.7 모	92.1
		<u>C</u>	SEMTEC																		GED: ML CKED: WAM	

	Ģ	SOIL PROFILE				SAN	IPLES		● PE RI	NETR SISTA	ATIO) (N)	, BLOV	VS/0.3	؛ + m	SHEAF - NATI	r sti Jrai	RENG⊺ L⊕R	ΓΗ (Cι EMOL	ı), kPA JLDED	<u>_</u> 0	
	DRING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	OWS/0.3m	▲ ^D	'NAMIO SISTA	C PE NCE	NET E, BL	RATIC OWS/0	N).3m	,	wa w _p —	TER		ENT,	% ₩ _L	ADDITIONA LAB. TESTIN	PIEZOME OR STANDPI INSTALLA
	Ĭ	Ground Surface	STI	(m) 93.58	_		Ľ ∠	Ы		10	20	3	0 4	10 	50	60 : : :	70) 8	2 9 	90		
		TOPSOIL Stiff to very stiff, grey brown SILTY		93.45 0.13	1	SS	205	18														Above Ground Protector & Bentonite
		CLAY, trace sand (WEATHERED CRUST)			2	SS	100	9				· · · · · · · · · · · · · · · · · · ·					· · ·					Soil Cuttings
												· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·				
	(O				3	SS	455	5			H		0	ł							_	Bentonite
der	(210mm O				4	SS	610	4				· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·						Filter Sand
Power Au	w Stem Auger			8 <u>9.92</u>	5	SS	610	2	•							0						50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
	Hollo	Firm to stiff, grey SILTY CLAY		3.66						, 		· · · · · · · · · · · · · · · · · · ·									-	
					6	SS	610	wн							0		· · · · · · · · · · · · · · · · · · ·					Soil Cuttings
									-	, ,		· · · · · · · · · · · · · · · · · · ·										Son Cuttings
-		End of borehole		87.48 6.10						Ð:											-	
												· · · · · · · · · · · · · · · · · · ·					· · ·				-	
												· · · · · · · · · · · · · · · · · · ·					· · ·					
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												· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·							-	
																						GROUNDWA
																						OBSERVATI DATE DEPTH (m) 20-09-30 2.1 5

RECORD OF BOI	REHOLE 20-05B
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SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 16 2020

щ		ДŎ	SOIL PROFILE		-		SAN	IPLES		● PE RE	NETRA	TION NCE (N), BLOV	VS/0.3n	SH 1 + N	EAR S	TREN	GTH (Cu REMOL	u), kPA JLDED	٥٢	
EPTH SCAI METRES		RING METH	DESCRIPTION	ATA PLOT	ELEV. DEPTH	UMBER	ТҮРЕ	COVERY, mm	WS/0.3m	▲ DY RE	NAMIC SISTAN	PENE NCE, BI	tratio Lows/(N).3m	W	WATE	R COI	NTENT, V	% w _L	ADDITIONA AB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
		BO		STR	(m)	z		RE	BLC	1	0 2	20 3	30 4	05	i0 6	60 T	70 I	80	90	د ۲	
-			Ground Surface	1. 1. J. J.	93.58																
			Stiff to very stiff, grey brown SILTY CLAY, trace sand (WEATHERED CRUST)		0.13																
	1																				
	2	(DD)																			
	- Aucor	r Auger Ider (210mr																			Soil Cuttings
	3	ow Stem Au																			
	4	Holl			8 <u>9.92</u> 3.66																
						1	TP	610	PM												
	5		Fod of bookste		88.22					<u>.</u> Ф.			+								
	6		Soil stratigraphy inferred from BH 20-5A		5.30																- - - -
0T 11-30-20	7																				-
EC 2018.GE	в																				- - -
GPJ GEMT																					
020-07-17.	9																				
0GS_R0 \$	D																				-
1899.04 B(1																				-
0 0 0 1 1	2																				_
NREH											::::	::::	[::::	::::	::::		:::	: : : : :	::::		
GEO - BC	9																			LOGG CHEC	ed: Ml Ked: WAM

 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

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 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 14 2020

ш		B	SOIL PROFILE				SAN	IPLES		● PE			BLOV	VS/0.3n	SH	EAR S	GTH (Cu	I), kPA	. (1)		
DEPTH SCAL METRES		BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	BLOWS/0.3m	▲ DY RE		PENE NCE, B	TRATIO LOWS/(N).3m	ν _F		TENT,	% w _L	ADDITIONAL LAB. TESTING	PIEZOME OR STANDP INSTALLA	TER PIPE TION
	t		Ground Surface		93.72												 				
			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		9 <u>3.52</u> 0.20	1	SS	180	14		•									Above Ground Protector & Bentonite	
- - - 1						2	SS	355	5	•		Þ		1					MH	Soil Cuttings	
						3	SS	610	5											Bentonite	
- 2	2	(DO				4	SS	610	5											 Filter Sand	
- 3	Augor A	Auger aer (260mm																		50 mm diameter, 1.52 metre length,	
		w Stem Auc			8 <u>9.91</u> 3.81	5	SS	610	5											slotted SCH 40 PVC Pipe	
		Hollo	Stiff, grey SILTY CLAY			6	SS	610	wн												
- 5	5										Ð				·+·					Soil Cuttings	
						7	SS	610	wн				0								
	,		End of borebole		<u>87.17</u> 6.55	8	SS	610	wн												
11-30-20 11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1																					
2018.GDT																					-
20-07-17.GF	,																				-
0GS R0 20																					
06 61899.04 BO																				GROUNDW, OBSERVAT DATE DEPTH (m) 20-09-30 2.0 2	ATER
	2																				
BOR		\mathbf{C}	Gemtec																LOGG	ED: ML	
Geo		C	d Scientists																CHEC	KED: WAM	

RECORD	OF	BORE	IOLE	20-07A
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 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 20 2020

	L		2	SOIL PROFILE				SAN	IPLES		● PE	NETR/	ATION NCE (N) BLOV	VS/0.3r	SH n ⊥ N	EAR S	TRENG	STH (Cu	I), kPA	.0		
	ES	Η Η Η			OT		~		۲,	E		010171), DLOI	10/0.01						STINC	PIEZOMETER	२
Π	IETR	U U		DESCRIPTION	A PL	ELEV.	1BER	ΡE	NCEF	S/0.3					N N	14/	WATE	R CON	TENT, '	% \w	DEICO	STANDPIPE	
	2				IRAT	DEPTH (m)	NUN	F	L C C C	LOW		0017				•• _F	- -	20			AD	INSTALLATIO	N
⊢			,		ν'				-	8													
F	0		+	Ground Surface TOPSOIL	11.1	93.80 93.65																Above Ground	-
Ē				Stiff to very stiff arey brown SILTY		0.15	1	SS	205	10												Bentonite	201-
Ē				CLAY, with sand seams																			0-
Ē	1																						
Ē							2	SS	405	6													A.
E																							8
E							3	SS	610	5					0								A
F	2																					Soil Cuttings	A
F			<u>í</u>																				
F			un M				4	SS	610	4	•											× B	
Ē	3	ger	(210r																				B
Ē		er Au	uger			90.45	5	22	610	6													図
Ē		Powe	em A	Very loose to compact, grey SILTY		3.35				Ľ													
Ē			ow St	SAND, some gravel, with cobbles and boulders (GLACIAL TILL)																			
Ē	4		Holld		XX	Í	6	SS	205	9											1	Denterite	-
Ē					$\langle X \rangle$																	Bentonite	-
Ē					1/-		_																
F	5						7	SS	205	3												Filter Sand	╞
Ē										-													
Ē					NZ		8	SS	25	9												50 mm diameter, 1.52	
E	6				68/																	metre length, slotted SCH 40	
E	0				1/			00	400	00													-
F				Augeneratural		87.27	9	55	100	20													
50				End of borehole		0.00																	-
1-30	7																						-
ЪĒ																							-
018.G																							-
	8																						
E E																							-
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	11																					GROUNDWATER	~
899.0																						OBSERVATIONS	ELEV.
																						20-09-30 2.6 ▽	(m) _ - 91.3 -
<u>I</u> HO	12																						
BORE			(-	FMTEC																	LOGG	ED: ML	
ġ	0		Con																		CHEC	KED: WAM	
٥L			AND	JUEN11515																			

 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

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 DATUM:
 CGVD28

 BORING DATE:
 Jul 17 2020

щ		OD	SOIL PROFILE				SAN	IPLES		● PE RE	NETRA	TION). BLOV	VS/0.3n	SH n + N	IEAR S	TRENG	TH (Cu REMOU	i), kPA ILDED	, U	
SCAL		METH		LOT		щ		RY,	Зm			- ()				WATE		TENT	%	ONAL	PIEZOMETER OR
PTH		ЫQN	DESCRIPTION	TA P	ELEV.	MBE	ΥPE	DVE mm	VS/0.	▲ ^{DY} RE	NAMIC SISTAN	PENET	rratic _ows/()N 0.3m	W		W		-/w,	B. TE	STANDPIPE
		BORI		STRA	(m)	R		REC	BLOV	1	0 2	20 3	30 4	40 5	50 6	- 60 7	70 8	30 9	90	A A	
	╈	T	Ground Surface	0	03.80																
Ē			TOPSOIL		93.60 93.65																Above Ground Protector &
F			Stiff to very stiff, grey brown SILTY		0.15																Bentonite
F			CLAY, with sand seams (WEATHERED CRUST)																		
E	1																				Soil Cuttings
Ē		â																			
Ē		0 E																			
E	ģ	1 (210r													::::						Bentonite
Ē	2	nder (<u></u> ⊻ <mark></mark>
F		am Al																			Filter Sand
F		v Ste																			
Ē	3	Pllo																			50 mm
Ē					90.45																diameter, 1.52 metre length, slotted SCH 40
Ē			Very loose to compact, grev SILTY	XX	3.35]															PVC Pipe
Ē			SAND, some gravel, with cobbles and boulders (GLACIAL TILL)	\mathcal{N}																	
Ē	4			XX	80.50															1	Soil Cuttings
Ē	F	1	End of borehole	v. x. X T	4.27	1															Con Counigo DLUM
F			20-7A																		
E.	5																				
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б <u>г</u>																					
70 50 50 10 10 10 10	1																				GROUNDWATER OBSERVATIONS
0189																					DATE DEPTH ELEV. (m) (m)
je P																					20-09-30 2.1 💆 91.7
	2																				
	-										::::	::::			:::::		::::	:::i			
ਸ਼੍ਰੋ		0	<u>JEMTEC</u>																	LOGG	ED: ML
		Co	DNSULTING ENGINEERS D Scientists																	CHEC	KED: WAM

RECORD	OF	BOREH	IOLE	20-08
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CLIENT: Cardel Homes PROJECT: Geotechnical & Hydrogeological Investigation JOB#: 61899.04 LOCATION: See Site Plan, Figure 1

SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 6 2020

ш		ОD	SOIL PROFILE				SAN	IPLES		● PE RF	NETR. SISTA	ATION	I) BLOV	VS/0.3n	SH	EAR S		GTH (Cu	u), kPA	. (7)	
DEPTH SCAL METRES		BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	BLOWS/0.3m	▲ DY RE	NAMIO SISTA 0	C PENE NCE, B 20	TRATIC LOWS/0	N 0.3m 10 5	. , , W	WATE P	R CON W 70	ITENT,	% ₩ _L 90	ADDITIONAL LAB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
	t		Ground Surface	0,	93.70																
			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY, trace sand (WEATHERED		0.10	1	SS	355	9	•											Above Ground Protector &
			CRUST)			2	SS	405	5	•				0							Bentonite
						3	SS	610	5	•											Ţ
		(DD)				4	SS	610	5					0							Filter Sand
	er Auger	uger (210mm								-	Ð								+	-	50 mm diameter, 1.52 metre length, slotted SCH 40
	Powe	llow Stem Au	Firm, grey SILTY CLAY		<u>90.04</u> 3.66	5	88	610	WH	-			<u></u>						+	-	
		Н						010		-											
5						6	TP	610	PM												Soil Cuttings
			Very loose grey SILTY SAND, some gravel, with cobbles (GLACIAL TILL)		88.06 5.64															-	
			End of borehole		86.99 6.71	7	SS	150	2	•											
																				-	
																					- - -
																					GROUNDWATER -
																					OBSERVATIONS DATE DEPTH ELEV. 20-09-30 1.8 91.9
		<u>C</u>											`		•		<u> </u>			LOGG CHEC	GED: ML

 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 17 2020

щ		QO	SOIL PROFILE				SAM	IPLES		● PE RE	NETR.	ATION NCE (N), BLOV	/S/0.3m	SH 1 + N	EAR S	TRENG	STH (Cu REMOL	J), kPA	ı۵		
DEPTH SCAL METRES		30RING METH	DESCRIPTION	TRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	LOWS/0.3m	▲ DY RE		C PENE NCE, B	TRATIO LOWS/0	N 1.3m	W _F	WATE		TENT,	~ % ₩ _L	ADDITIONAL LAB. TESTIN	PIEZOMETE OR STANDPIP INSTALLATI	ER PE ION
-			Cround Surface	ν,	02.91			-														
E 0					0.05	1	22	205	8												Above Ground Protector & Bentonite	-
Ē			Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)					200		-												
						2	SS	610	9						· · · · · ·						Soil Cuttings	¥ A
Ē																						
						3	SS	610	7	•											Bentonite	
																					⊻.	
Ē		m OD)				4	SS	535	4	•											Filter Sand	目
- 3	JOEL	- (210m																			50 mm diameter, 1.52	
	ower Ai	n Auger				5	SS	610	3												slotted SCH 40 PVC Pipe	
	٩	w Sten			8 <u>9.85</u>					⊕											1 1 1 1 1	
		Hollo	Stiff, grey SILTY CLAY		0.00						⊕ :				+						AC A	
						6	22	610	1													
- 5 -						0		010														
E					88.09						⊕				:: : :							
- 6			Compact, grey SILTY SAND, some gravel, with cobbles and boulders		5.72																	
-			(GLACIAL TILL)			7	SS	355	15		•											
	-		End of borehole	<u> </u>	87.10 6.71																KC	<u>1081</u> :
																						-
018.GL																						-
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17.17. 17.17 17.17 19.17																						-
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9 														· · · · ·								-
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09- 10- 11																					GROUNDWAT	IER –
01899																					DATE DEPTH (m)	ELEV. (m)
																					20-09-30 2.2 上	91.6
		$\frac{1}{100}$																		LOGG		
5		AN	D SCIENTISTS																	CHEC	RED. WAM	

RECORD OF BO	DREHOLE 20-10A
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 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 13 2020

Set 0 (1) Discontration (1) Discontration (1) Discontration (1) Set 0 (1) S	щ			SOIL PROFILE	•	-		SAN	IPLES		● PE RE	NETR SIST/	ATION	N), BLO	WS/0.	.3m	SHE + N/	EAR S	TREN	GTH (REM	Cu), OULI	kPA DED	<u> </u>	
Image: Subset of the set	DEPTH SCAI METRES		אוואט אובוד	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	.OWS/0.3m	▲ DY RE	NAMI SISTA	C PENE NCE, E	ETRATI BLOWS	ON /0.3m		۷ W _P	WATE	R COI W	NTEN	T, %	+w_∟	ADDITIONA LAB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
- -		à	ň		ST	(m)	_		2	Ē	1	0	20	30	40	50	60) 7 	70 	80	90)		
- 1 - 1 - 2 -	- 0	┝		Ground Surface TOPSOIL	1. 1. N.	93.68																· · · · ·		Above Ground
- 1 - 2 - 3 - 3 - 3 - 3 - 4				Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.20	1	SS	100	11														Bentonite
- 2 - 3 - 4 - 4 - 5 - 5 - 6 - 6 - 6 - 7 - 6 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7	- 1						2	SS	75	9														
2 3 35 405 6 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	-																							
- 3 - 4 - 5 - 6 - 6 - 7 -	- 2 -						3	SS	405	5						¶U :								
3	-						4	ss	610	4	•													
- -	- 3						5	SS	610	4	•))						· · · · · · · · · · · · · · · · · · ·			
- 5 - 6 - 7 -	- 4					8 <u>9.87</u> 3.81								· · · · · · · · · · · · · · · · · · ·										Soil Cuttings
- 5 0	-		m OD)	Fille to suit, grey Sicht GLAT			6	SS	610	1				· · · · · · · · · · · · · · · · · · ·						· · · · · · · · · · · · · · · · · · ·				
a -	- - - 5	Auger	jer (210m								•			+								· · · · · · · · · · · · · · · · · · ·		
- 6	-	Power	Stem Aug				7	SS	610	wн	⊕				+		0							
- 7 - 7 - 8 - 9 -	- 6		Hollow															· · · · ·				· · · · · ·		
- 7 - 7 - 8 8 55 610 1 - 0 0 <t< td=""><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>€ </td><td></td><td></td><td></td><td></td><td>F</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	-											€ 					F							
 - 8 - 8 - 8 - 9 - 9 - 10 - 10 - 12 - 12 - 12 - 12 - 10 - 12 - 10 - 10 - 12 - 10 - 11 - 12 - 14 - 15 - 15 - 15 - 14 - 15 - 15 - 14 - 15 - 15 - 15 - 15 - 16 - 16 - 16	- 7					86.36 7.32	8	SS	610	1	•			0										Bentonite
- 9	0			Loose, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)			9	SS	405	3														Filter Sand
9	- 0																							50 mm diameter, 1.52 metre length, slotted SCH 40
 Compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL) 10 End of borehole 11 12 13 12 12 13 12 12 13 14 11 12 13 12 13 14 14 15 16 16 16 16 16 16 16 16 17 17 18 18 19 10 10	- 9					84.54	10	SS	610	4		0												PVC Pipe
- 10 12 SS 610 27 • • Soil Cuttings - 11 End of borehole 10.36 I				Compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		9.14	11	SS	455	28														
- 11 End of borehole 10.36 10.	- 10						12	SS	610	27		0							· · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · ·		Soil Cuttings
- 11 - 12				End of borehole	<u> </u>	83.32 10.36																		Notes: <u>600</u> Monitoring well blocked at 2.1m depth
- 12	- 11																					· · · · · ·		
	- 12											:::							::::		::			
			ANI	D SCIENTISTS																			CHEC	KED: WAM

RECORD OF BO	DREHOLE 20-10B
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SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 14 2020

щ		SOIL PROFILE				SAMPLES				■ PENETRATION SHEAR STRENGTH (Cu), kPA ■ RESISTANCE (N), BLOWS/0.3m + NATURAL ⊕ REMOULDED								i), kPA ILDED	ں _	U	
DEPTH SCAL METRES	BORING METH	보 보 연 DESCRIPTION 전 DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	▲ DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m 10 20 30 40 50 60 70 80 90							PIEZOMETER OR STANDPIPE INSTALLATION					
		Ground Surface		93.68																	
		TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		<u>93.48</u> 0.20																Above Ground Protector & Bentonite Soil Cuttings	
- - - - - - - - - -	wer Auger	Auger (210mm OD)																		Bentonite	
	Po			<u></u>																50 mm ····· diameter, 1.52 ···· slotted SCH 40 ····· PVC Pipe ·····	
				88.50																Soil Cuttings	
6 07		Soil stratigraphy inferred from BH 20-10A																			
8 2018/GDI 11-30-2																					
אבאטרב בטפא גע 11 11 11 11 11 11 11 11 11 11 11 11 11																					
0LE LOG 61899.04 BL																				GROUNDWATER OBSERVATIONS DATE DEPTH ELEV (m) 20-09-30 2.1 又 91.6	
GEO - BUKEHU		GEMTEC Consulting Engineers and Scientists								· · · · ·									LOGG CHEC	ED: ML KED: WAM	

 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 10 2020

щ		ПО	SOIL PROFILE				SAMPLES				PENETRATION SHEAR STRENGTH (Cu), kPA RESISTANCE (N), BLOWS/0.3m + NATURAL ⊕ REMOULDED												
DEPTH SCAL METRES		BORING METH	DESCRIPTION	TRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	aLOWS/0.3m	▲ DYNAMIC PENETRATION WATER CONTENT, % W W PIEZOMETER OR W ▲ DYNAMIC PENETRATION W W W 10 20 30 40 50 60 70 80 90								R <u>:</u>)N					
	╉	T	Cround Surface	0 O	02 77									<u> </u>									
		T			93.77 93.57 0.20	1	ss	125	9												Above Ground Protector & Bentonite	24	
			CLAY (WEATHERED CRUST)																				
						2	SS	230	6	•	0										Soil Cuttings	N CAN	
						3	SS	610	5	•											Bentonite		
		(DD)				4	ss	610	4	•											Filter Sand		
	- Audor	ger (210mm					SS	610	3												50 mm diameter, 1.52 metre length, slotted SCH 40		
	TOWOO	w Stem Au	6 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7		9 <u>0.11</u> 3.66																PVC Pipe		
		Hollo			89.30	6	SS	610	WН														
	5		SILT, some sand, trace gravel			7	SS	405	4	•)						МН			
			Loose to compact, grey SILTY SAND, some gravel, with cobbles and		88.28 5.49	8	SS	205	23			•									Soil Cuttings		
			boulders (GLACIAL TILL)		97.06	9	9	SS	455	10													
	, -		End of borehole	V 17. 17. 1	6.71																<u>KL X</u>	- التصر - -	
3.601 1																						-	
	3																						
7.6.1-1																						-	
/0-02)																					-	
20 10 10 10	,																						
																						-	
																					GROUNDWATE	R –	
0.61899.0																					OBSERVATIONS DATE DEPTH (m) 20-09-30 2.3 ∑	S ELEV. (m) 91.5	
∐- Ш- 12 НОН 12	2																						
- BOKE			GEMTEC													LOGO	ED: ML						
		Co	onsulting Engineers nd Scientists																	CHEC	KED: WAM		
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 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 17 2020

ш		ДO		SOIL PROFILE		-		SAN	IPLES		● PE RE	NETR. SISTA	ATION NCE (N), BLO\	VS/0.3r	SH n + N		TRENG	TH (Cu REMOU	I), kPA	ı۵		
DEPTH SCAL	METRES	BORING METH		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	▲ DY RE	NAMIO SISTA	C PENE NCE, B 20	TRATIC LOWS/	0N 0.3m 40 {	W _F	WATE	R CON W 70 8	TENT, 9	% ₩ _L 90	ADDITIONAI LAB. TESTIN	PIEZOME OR STANDP INSTALLA	TER PIPE TION
	0			Ground Surface		93.94																Alterna Orenand	
	Ū			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.10	1	SS	100	12		•										Protector & Bentonite	
	1						2	SS	355	9												Soil Cuttings	
	2						3	SS	610	5	•		F		-10							Bentonite	201 201 -
			m OD)				4	SS	610	4	•											Filter Sand	
	3	wer Auger	Auger (210m			<u>90.49</u> 3.45	5	SS	610	4	•											50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe	
	4	Ро	Hollow Stem	Very loose to loose, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)			6	SS	255	4	•												
	5						7	SS	255	5	•												
-			-	Compact, grey SAND, some gravel	<u> </u>	88.61 5.33	8	SS	355	28												Soil Cuttings	
	6						9	SS	455	24													
0-20	_			End of borehole		6.71																	- 12224 - -
11-3	'																						-
GDT																							-
2018																							-
MTEO	8																						-
E																							-
7.GP																							-
-1-1-	9																						
202																							-
SS_RC																							-
	10																						
로																							-
BORE																							-
9.04	11																					GROUNDW/ OBSERVAT	ATER -
6189																						DATE DEPTH (m)	H ELEV.
																						20-09-30 2.6	¥ 91.3 -
HOLE	12																						+ =
BORE			<u> </u>	FMTEC	•						•		```			<u> </u>				· · · ·	LOGG	ED: MI	
-F			Cor																		CHEC	KED: WAM	
Ō			AND	JUENTISTS																			

RECORD	OF	BOREHOL	.E 20-13
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SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 6 2020

щ		DO	SOIL PROFILE				SAN	IPLES		● PE RE	NETR/ SISTA	ATION NCE (N). BLOV	VS/0.3n	SH 1 — M	IEAR S	TRENG	GTH (C	u), kPA JLDED	, U	
DEPTH SCAL METRES		BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	BLOWS/0.3m	▲ DY RE	NAMIC SISTA	PENE NCE, B	TRATIC LOWS/(N).3m	w ₁	WATE	R CON W 70	ITENT, 80	% ₩ _L 90	ADDITIONAL LAB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
		Τ	Ground Surface		93.97																
			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.08	1	SS	355	11		•										Above Ground
						2	SS	510	9												Soil Cuttings
						3	SS	610	8	•		Ⅰ €								МН	Benton ite
		(DO)				4	SS	610	3	•											Filter Sand
- 3	Auger	ger (210mm				5		610	2												50 mm
	Power	w Stem Aug	Firm to stiff, grey SILTY CLAY		9 <u>0.46</u> 3.51		33	010	-					1 · · · · · · · · · · · · · · · · · · ·							PVC Pipe
		Hollo												+::::							
5						6	SS	610	wн												
						7	SS	610	1					0							Soil Cuttings
			End of borehole		87.26 6.71										 						
201 11-30-2																					
8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1																					
7.GPJ GEN																					-
0_2020-07-1																					
TELOGS R																					
4 BOREHO																					GROUNDWATER
LOG 61899.0																					DBSERVATIONS DATE DEPTH (m) ELEV. (m) 20-09-30 1.8 \sqrt{2} 92.2
	l																				
GEO-BOKE			SEMTEC		•					•		<u> </u>	<u>, .,</u>							LOGG CHEC	ED: ML KED: WAM

RECORD	OF	BOREHO	LE 20-14
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SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 9 2020

-	ł	ç	2	SOIL PROFILE	1	•		SAM	IPLES		●PE	NETI SIST	RATIO	ON E (N),	BLOV	VS/0.3	SH m + M	EAR S	TRENG AL ⊕ F	TH (Cu REMOU	ı), kPA JLDED	<u>ں</u>		
	METRES		אוואס ואוב ו	DESCRIPTION	RATA PLOT	ELEV. DEPTH	JUMBER	ТҮРЕ	ECOVERY, mm	m£.0/S/VC		(NAM ESIST	iic pe 'Anci	ENET E, BL	RATIO OWS/(N).3m	W	WATE	R CON W	TENT,	% —∣ w _L	ADDITIONA AB. TESTIN	PIEZOMET OR STANDPI INSTALLAT	ter IPE TION
	נ				STF	(m)	2		R	BLO		10	20	30	0 4	0	50 6	50 7	70 E	30 9	90			
F	0			Ground Surface	1. 1. J. J.	93.91																	Above Ground	
				Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.20	1	SS	50	11		•											Protector & Bentonite	
	1						2	SS	50	4													Soil Cuttings	
																							2	
	2		_				3	SS	455	3	•		•			ю						МН	Bentonite	-
			Dmm OD				4	SS	610	3						0							Filter Sand	
Ē	3	r Auger	ger (21(50 mm	
		Powe	Stem Au			00.25	5	SS	610	2	•			· · · · · · · · · · · · · · · · · · ·	(D.							metre length, slotted SCH 40 PVC Pipe	
Ē	4		Hollow	Firm to stiff, grey SILTY CLAY		<u>90.25</u> 3.66						Ð				+							-	
												Ð			:+:									
	5						6	SS	610	wн				· · · ·	· · · · · ·		0							
												⊕ : :											Soil Cuttings	
	6					07.04							⊕	· · · ·		+								
	-			End of borehole	ллллл	6.10							⊕ : 											- 1990-1991 - -
80-20	7																							
DT 11-3	'																							
2018.G																								-
3EMTEC	8													· · · · · · · · · · · · · · · · · · ·										
7.GPJ (· · · · · · · · · · · · · · · · · · ·										
020-07-1	9																							
SS_R0_2														· · · · · · · · · · · · · · · · · · ·										
DIE LOG	10																							
BOREHC																								-
899.04 I	11																						GROUNDWA OBSERVATIO	ATER -
LOG 61																							20-09-30 2.2 <u>v</u>	(m) _ Z 91.7 -
EHOLE	12																							
CO-BORI			<u>C</u>																				ED: ML	
ЪГ			AND	Scientists																		UTEC		

 CLIENT:
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 See Site Plan, Figure 1

SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 10 2020

щ		DD	SOIL PROFILE		-		SAN	/IPLES		● PE RE	NETR SISTA	ATION), BLOV	VS/0.3r	Sł n +	HEAR S	TRENG	TH (Cu REMOU	ı), kPA JLDED	ں،		
DEPTH SCAL METRES		ORING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	RECOVERY, mm	-OWS/0.3m	▲ DY RE	NAMIO	C PENE NCE, B	TRATIO LOWS/(N).3m	v	WATE		TENT,	% ⊣w _L	ADDITIONAI LAB. TESTIN	PIEZOME OR STANDF INSTALLA	ETER PIPE ATION
	+	ā T		ST				Ľ.	B	1	0	20 :	30 4	10 E	50	60 i	70 8	30 9	90			
F	┝		Ground Surface TOPSOIL	<u></u>	94.09																Above Ground	
			Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.20	1	SS	355	8												Bentonite	
	1					2	ss	0	9												Soil Cuttings	
						2		405	7												Pontonito	
	2	(DD)					33	405														
	1001	uyei r (260mm				4	SS	610	6	•											Filter Sand	
	0 10 10	tem Auger	Very loose to compact, grey gravelly SILTY SAND, some clay, with cobbles		91.04 3.05	5	SS	355	6	•		Ó								мн	50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe	
	4	Hollow S	and boulders (GLACIAL TILL)																			
						6	SS	200	1													
	5					7	SS	200	26			•									Soil Cuttingo	
			Loose, grey SAND	<u>(10/17</u>	88.76 5.33	8	SS	355	6			0								мн	Son Cuttings	
	3		End of borehole		87.99 6.10																	
0-20	,																					-
Ē	<i>'</i>																					
2010.010																						-
	3																					
-11.61	9																					
2020-01																						-
	b																					-
																						-
1 1 1 1	1																				GROUNDW OBSERVA	ATER -
LOG 618																					DATE (m) 20-09-30 2.4	(m) -
	2																					
		6	SEMTEC	1		1	1	1	1		1		1	1	L	1	1	1	1		ED: MI	
			NSULTING ENGINEERS D SCIENTISTS																	CHEC	KED: WAM	
ار		AN	U JULINII JIJ																	-		

No. No. <th>Q</th> <th>SOIL PROFILE</th> <th></th> <th></th> <th></th> <th>SAM</th> <th>IPLES</th> <th></th> <th>● PE</th> <th>NETR/</th> <th></th> <th></th> <th></th> <th>SH</th> <th>IEAR S</th> <th></th> <th>GTH (C</th> <th>u), kPA</th> <th></th> <th></th>	Q	SOIL PROFILE				SAM	IPLES		● PE	NETR/				SH	IEAR S		GTH (C	u), kPA		
Image: Control Surface	MEIRES DRING METHC	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	-OWS/0.3m		NAMIC SISTA	NCE (N PENE NCE, B	TRATIC	VS/0.3n)N 0.3m	1 + ∩ ₩		AL ⊕ :R CON W →		ULDED , % — W _L	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0 Vertical 0<	B	Cround Surface	ST	(11)			Ľ	B				30 4	40 5	50 E	30 7 	70	80	90		
1 3 33 33 33 33 34 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 35 30 3 3 35 30 3 3 35 30 3 3 35 30 4 4 3 35 30 4 4 3 35 30 4 4 3 35 30 4 4 3 35 30 4 4 4 3 35 30 4 4 4 3 35 30 1 4 4 3 35 30 1 4 4 4 3 35 30 1 4	0			0.10	1		210	0												Above Ground
1 2 S		Stiff to very stiff, grey brown SILTY CLAY, trace sand seams (WEATHERED CRUST)				33	310	9												Bentonite
2 3 SS 60 5 6 1	1				2	SS	610	8			I C		1							KONON
3	2				3	SS	610	5	•										_	
3 Image: Sill TY CLAY, trace 9 5 55 55 6 1 Image: Sill TY CLAY, trace 1 Image: Sill TY CLAY, trace 1 1 Image: Sill TY CLAY, trace 1 1 Image: Sill TY CLAY, trace 1					4	ss	610	4	•			0								Ā
4 0	3	Firm to stiff, grey SILTY CLAY, trace		9 <u>0.72</u> 3.05	5	SS	610	1												
0 0	4	sand seams								Ð.										Soil Cuttings
b F	T OD mm									Ð		+	-							
a b b b c	თ wer Auger Auger (21(6	ТР	610	PM												
7 SS 610 WH 0 <td>Po Hollow Stem</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td></td> <td></td> <td>+</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Po Hollow Stem								•			+								
7 0	0				7	SS	610	wн							C	>				
8 Image: second se	7									Φ									-	Bentonite
8 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1									-	⊕								+		Filter Sand
9 9 1 1 1 1 1 1 1 1 1 1 1 1 1	8				8	SS	610	wн											_	50 mm
9 0 1 1 1 1 1 1 1 1 1 1 1 1 1										⊕				+						slotted SCH 40 PVC Pipe
9 SS 310 2 • O So	9									⊕ 						: : : 			-	
		5 . //		83.91	9	SS	310	2	•			0								Soil Cuttings
	0			9.00																
	1																			GROUNDWATER OBSERVATIONS
																				DATE DEPTH (m) E 20-09-30 2.6 ∑ 9
																			1	

 CLIENT:
 Cardel Homes

 PROJECT:
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 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 7 2020

щ		дĢ	SOIL PROFILE				SAM	IPLES		● PE RE	NETRA SISTAI	TION), BLOV	VS/0.3r	S⊦ n +I	IEAR S		TH (C	u), kPA JLDED	ں _		
DEPTH SCA METRES		DRING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	OWS/0.3m	▲ DY RE	NAMIC SISTAI	PENE NCE, B	TRATIC LOWS/(N).3m	w	WATE	R CON W	TENT,	% —∣ w _L	ADDITIONA LAB. TESTIN	PIEZOME OR STANDF INSTALLA	eter Pipe Ation
	_	ĕ		ST	(11)			œ	BL	1	0 2	20 3 	30 4	10 1 	50 (50 · · · · ·	70 8	30 · · · ·	90			
- o			Ground Surface	in the state	93.77																Above Ground	
			Stiff to very stiff, grey brown SILTY CLAY, trace sand seams (WEATHERED CRUST)		0.10																Soil Cuttings	
	Je	10mm OD)																			 Bentonite	
- 2	Power Aude	v Stem Auger (2																			Filter Sand	
		Hollo	Firm to stiff, grey SILTY CLAY, trace sand seams		<u>90.72</u> 3.05																50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe	
			End of borehole Soil stratioraphy inferred from BH		<u>89.50</u> 4.27																	
- - - - - - - -	;		20-16A																			- - - - -
																						- - - - -
1-30-20 																						
C 2018.GDT 1																						-
7.GPJ GEMTE																						-
8 R0 2020-07-'																						
DREHOLE LOG																						
0.6 61899.04 BC																					GROUNDW OBSERVAT DATE DEPT (m) 20-09-30 1.5	ATER - FIONS - H ELEV. (m) 2 92.3
																						-
3EO - BUKEL			SEMTEC	I	<u> </u>	I	<u> </u>	<u> </u>		<u></u>	<u> ::</u>	<u> ::</u>	<u> ::</u>	<u> :</u> :	<u>1:</u>	<u>1:</u>	<u>1:</u>	<u>1:</u> :	. <u> ::</u>	LOGG CHEC	GED: ML	

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SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 6 2020

ш		DD	SOIL PROFILE	-	-		SAN	IPLES		● PE RE	NETRA SISTA	ATION NCE (N), BLOV	VS/0.3n	SH 1 + N	EAR S	TRENG	TH (Cu REMOU	J), kPA JLDED	<u>ں</u>	
DEPTH SCAL	METRES	RING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	JUMBER	ТҮРЕ	ECOVERY, mm	OWS/0.3m	▲ DY RE	NAMIC SISTA	PENE NCE, B	TRATIO LOWS/(N).3m	W	WATE		TENT,	% —∣ w _L	ADDITIONAI AB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
		B		STF	(m)	2		R	BL(1	0 2	20 ;	30 4	10 5	ο ε 	60 7	70 8	30 !	90		
F	0		Ground Surface TOPSOIL	· · · · · ·	93.79 93.66																Above Ground
			Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.13	1	SS	280	9												Bentonite
	1					2	SS	460	6	•			0								Soil Cuttings
	2					3	SS	610	7												Bentonite
						4	ss	610	4	•											Filter Sand
	3	- Auger									.							· · · · · ·			50 mm diameter, 1.52 metre length, slotted SCH 40
		Power									Ð										PVC Pipe
-	4	MolloH											+						+.		
	5				4.57	5	SS	610	wн					C							
					88.07																Soil Cuttings
-	6		Very dense, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		5.72																
20	-		End of borehole		87.08 6.71	6	SS	310	109		Ó								>>	•	
11-30-	7																				-
S.GDT																					
C 2018	8																				
	U																				-
GPL																					-
07-17.	9																				-
2020-1																					
N RO																					-
	10																				
SOREH(
1899.04 I	11																				GROUNDWATER OBSERVATIONS DATE DEPTH ELEV.
10G 61																					(m) (m) - 20-09-30 1.3 ⊻ 92.5 -
HOLE HOLE	12																			-	
BORE			Gemtec			•	•			•										LOGG	ED: ML
GEO		C	ONSULTING ENGINEERS ND SCIENTISTS																	CHEC	KED: WAM

RECORD OF DOREHOLE 20-10A

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 9 2020

	i	DD	SOIL PROFILE				SAN	IPLES		● PE RE	NETR/ SISTA	ATION NCE (N). BLOV	NS/0.3r	SH n + N	EAR S	TRENG	TH (Cu REMOU	i), kPA ILDED	, U		
	METRES	DRING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	.OWS/0.3m	▲ ^{DY} RE	NAMIC	PENE NCE, BI	rratic _ows/	0N 0.3m	W _F	WATE	R CON	TENT,	% w _L	ADDITIONAI LAB. TESTIN	PIEZOME OR STANDP INSTALLA	ter IPe Tion
Ļ	_	B T		ST	(11)	_		Ľ.	Ē	1	0 2	20 3	80 4	40 <u></u>	50 6	0 7	'0 ε	80 §	90 			
F	0		Ground Surface TOPSOIL	11.	93.94 93.79																Above Ground	-
			Stiff to very stiff, grey brown SILTY CLAY, trace sand seams (WEATHERED CRUST)		0.15	1	SS	50	9												Bentonite	
	1					2	SS	50	6													
						3	SS	355	6	•		 	C									
	2																					
						4	SS	610	5												Soil Cuttings	
	3		Firm to stiff, grey SILTY CLAY		90.89 3.05	5	SS	610	3	•				-10								
Ē																						
F	4	ĺ	Ô							•												
E		Č								Ð				+								NA
	5	er Auger	1ger (210r			6	SS	610	wн								0					
Ē		Powe	em Au																			<u>, 101</u>
Ē		č	low St																		Bentonite	-
Ē	6		HOI												· · · · · ·							
Ē						7		610			Ð											
E						'	33	010	VVII													
30-20	7																					
÷F											•							-				
8.GD																					Filter Sand	
C 201	8					8	SS	610	3	•			0									
E H	Ŭ				85.56																50 mm diameter, 1.52	
			Compact. grev SILTY SAND. some		8.38	0	00	405	00												metre length, slotted SCH 40 PVC Pipe	
17.6	_		gravel, with cobbles and boulders (GLACIAL TILL)			9	55	405	20													
-20-02	9			<u> </u>																		
0_202						10	SS	460	16												Soil Cuttings	
SS_R					A	10		400													Noto:	
ŠF	10	+	End of borehole	?;X:	4																Monitoring well blocked at	19401-
																					4.0m depth	
BORE																						
1-1-1-	11																					
6189																						-
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ē	6																			LUGG		
ВГ	-)	AND SCIENTISTS																	CHEC	RED. WAN	

	ДОН		SOIL PROFILE		1		SAN	/IPLES		●PE RE	NETR/ SISTA	ATION NCE (N), BLOV	/S/0.3m	HR + ר	IEAR S NATUR	TRENG AL ⊕ I	GTH (C REMO	u), kPA ULDED	RG ^A L		
	DRING MET		DESCRIPTION	RATA PLOT	ELEV.	NUMBER	ТҮРЕ	ECOVERY, mm	OWS/0.3m	▲ DY RE	'NAMIC SISTA	PENE NCE, B	TRATIO LOWS/0	N .3m	w	WATE	R CON W	TENT	, % — W _L	ADDITION/ _AB. TESTI	PIEZC (STAN INSTAI	METER DR IDPIPE _LATION
_	Ш Ш		Cround Surface	STI	(m)	2		R	BL	1	0 :	20 3	30 4	0 5	io e	30 7 ::::	70 8	30 :::	90			
1			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY, trace sand seams (WEATHERED CRUST)		93.94 93.79 0.15															-	Above Grou Protector Benton Soil Cuttin	nd & Ite JADAJOA gs
2	Power Auger	stem Auger (210mm OD)			<u>90.</u> 89									····································						-	Filter Sa	
4	:	Hollow S	Firm to stiff, grey SILTY CLAY		3.05																diameter, 1. metre leng slotted SCH PVC Pi	52 th 9 e
-						1	ТР	610	PM		Ð										Soil Cuttin	
5			End of borehole Soil stratigraphy inferred from BH 20-18A		88.76 5.18									+								202
6																						
7																						
8													I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I	I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I	• •				Image Image <th< td=""><td></td><td></td><td></td></th<>			
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 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 8 2020

щ	T	ДĢ	SOIL PROFILE				SAN	/IPLES		● PE RE	NETR SISTA		N (N),	BLOV	/S/0.3	SI Im +	HEAR S		GTH (C REMO	u), kPA ULDED	٥∟	
DEPTH SCAI METRES		ORING METH	DESCRIPTION	FRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	LOWS/0.3m	▲ DY RE	NAMI SISTA		NET , BL	RATIO OWS/0	N).3m		WATE			. % — w _L	ADDITIONA LAB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
	+			ی ا	(,					1		20	30			50	60 ::::	1:::	80	90		
⊢ °	ŀ		Ground Surface TOPSOIL	ithia	94.20				-				::	<u> </u>							-	Above Ground
			Stiff to very stiff, grey brown SILTY CLAY, trace sand seams		0.00	1	SS	75	11	_			· · · · · · · · · · · · · · · · · · ·									Bentonite
			(WEATHERED GROST)			2	SS	510	5				· · · · · · · · · · · · · · · · · · ·								-	Soil Cuttings
2	:	0				3	ss	610	4	•		ŀ				Ō					-	Bentonite
		uger r (210mm Of	Loose to compact, grey brown SILTY		<u>91.61</u> 2.59	4	SS	610	8	•			· · · · · · · · · · · · · · · · · · ·									Filter Sand
		v Stem Auge	SAND, trace gravel, with cobbies and boulders (GLACIAL TILL)		90.54	5	SS	455	20		D:	•	· · · · · · · · · · · · · · · · · · ·								мн	diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
		Hollon	Loose to compact, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		3.66	6	SS	125	11		•										-	
						7	SS	100	10				· · · · · · · · · · · · · · · · · · ·								_	Soil Cuttings
Ę																						
					88 10	8	SS	255	16		•		· · ·									
			End of borehole		6.10								· · · · · · · · · · · · · · · · · · ·									
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																					LOGO	
Ы		AI	ND SCIENTISTS																		CHEC	NED: WAM

CLIENT: Cardel Homes PROJECT: Geotechnical & Hydrogeological Investigation JOB#: 61899.04 LOCATION: See Site Plan, Figure 1

SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 8 2020

щ		OD	SOIL PROFILE				SAN	1PLES		● PE RE		ATION NCE (N). BLOV	VS/0.3r	SH n + N	EAR S	TRENG	TH (Cu REMOU), kPA LDED	, U	
DEPTH SCAL METRES		BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	BLOWS/0.3m	▲ DY RE	NAMIC SISTA	PENE NCE, B	TRATIC LOWS/(0N 0.3m 40 5	W _F	WATE	R CON W	TENT, S	 ₩ ₩	ADDITIONAL LAB. TESTIN	PIEZOMETER OR STANDPIPE INSTALLATION
			Ground Surface		93.87																
			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.08	1	SS	100	9												Above Ground
						2	SS	205	7	•											Soil Cuttings
						3	SS	610	4	•				Ð						МН	Bentonite
		n OD)				4	SS	610	2	•											Filter Sand
	var Augar	kei Augei Auger (210mi	Firm, grey SILTY CLAY		9 <u>0.97</u> 2.90	5	SS	610	1	•											50 mm diameter, 1.52 slotted SCH 40 PVC Pipe
- - - 4	WCC.	ollow Stem 4								€				+							
		I				6	SS	610	WH	: ::€				: : + :							
5										÷.											Soil Cuttings
6	;										Ð										
80-20			End of borehole		87.16 6.71	7	SS	610	WH												
2018.GDT 11-0																					
2020-07-17.0 1 1 1 1 1 1 1 6)																				
10 10 10 10																					
BOREHOLE																					
6 61899.04																					GROUNDWATER OBSERVATIONS DATE DEPTH (m) ELEV. (m) 20-09-30 1.2 92.6
GEO - BOF			DENTEC																	LOGG	ED: ML KED: WAM

 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 7 2020

Ц		ДŎЧ	SOIL PROFILE	1	1		SAN	IPLES	1	● PE RE	NETR	ATION NCE (I	N), BLOV	//S/0.3i	S⊦ m +I	HEAR S	STRENG	TH (Cu REMOL	u), kPA JLDED	μ	
DEPTH SCA METRES		30RING MET	DESCRIPTION	TRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	3LOWS/0.3m	▲ DY RE	'NAMIO SISTA	C PENI NCE, I	TRATIO	DN 0.3m 40	W			TENT,	% ₩ _L 90	ADDITION/ LAB. TESTII	PIEZOMETER OR STANDPIPE INSTALLATION
		T	Ground Surface	ο Ο	03.88				ш												
ǰ			TOPSOIL		0.10																Above Ground Protector &
			Stiff to very stiff, grey brown SILTY CLAY, trace sand seams (WEATHERED CRUST)			1	SS	310	9	-											Bentonite
- - 1 - 1						2	SS	610	5	•											Soil Cutting
- - 2 -						3	SS	610	4					0- I						-	Bentonite
		n OD)				4	SS	610	3	•											Filter Sand
- 3	Ē	210m			9 <u>0.83</u>															-	50 mm
	wer Aug	Auger (Firm to stiff, grey SILTY CLAY		3.05	5	SS	610	1					Ó							metre length, slotted SCH 40 PVC Pipe
È	ď	/ Ster																			
- 4		Hollow									₩ ∋			+							
						6		610													
- 5						0	- 33	010	VVI											-	
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 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 14 2020

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DEPTH SCAI METRES		BORING METH	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	BLOWS/0.3m	▲ DY RE	NAMIC SISTA	PENE NCE, B	TRATIC LOWS/0 30 4	0N 0.3m 40 5	W _F	WATE	R CON W	TENT, 9	% w _L 90	ADDITIONA LAB. TESTIN	PIEZOMETE OR STANDPIPI INSTALLATIO	ER E ON
	t		Ground Surface		92.97											::::						
			TOPSOIL Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		<u>92.77</u> 0.20	1	SS	205	18												Above Ground Protector & Bentonite	
						2	ss	150	8	•											Soil Cuttings	
- 2						3	ss	510	5	•		ŀ		θI							Bentonite	
		Im OD)				4	SS	610	4	•											Filter Sand	
		n Auger (210n	Soft to firm, grey SILTY CLAY		8 <u>9.92</u> 3.05	5	SS	610	1	•					0						50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe	
- - - - -	<u>.</u>	Hollow Sten											+									
	;					6	ТР	610	PM													
											₽			+							Soil Cuttings	
			Very loose to loose, grey SILTY SAND, some gravel, with cobbles and boulders (GLACIAL TILL)		86.87 6.10 86.26	7	SS	455	4	•	0											
90-51 7			End of borehole		6.71																	-
018.GDT 11																						-
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9-1-1-9																						-
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BOREHOI																					000111-000	
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GEO-BC			DEIVITEC NSULTING ENGINEERS D SCIENTISTS																	LOGG	ed: ML Ked: WAM	

APPENDIX C

On-Site & Observation Well Records

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)

leasurements re	ecorded in: 🗌 M	etric An	nperial		A313115		Regulation		Page	er Res	of
Vell Owner's	Information						1		· aye_		<u> </u>
irst Name	La	ast Name/Org 1471	anization	Ontario	Inc.C/O GEMT	E-mail Address	and a second] Well (Constructed
lailing Address (S	Street Number/Name	e)			Municipality	Province	Postal Code	e 1	elephone N	lo. (inc.	area code)
Vell Location					Ottawa	ON	K2K	249			
ddress of Well Lo	Perth Street Numb	oer/Name)	NACY		Township		Lot AI	1	Concession		
ounty/District/Mu	micipality		14101		City/Town/Village		20	Provinc	4 ce	Postal	Code
Ottawa TM Coordinates	Zone Easting	, Nort	thing		Richmond Municipal Plan and Sublo	t Number		Onta	rig / c	14	-
NAD 8 3	18 43515	50 9	50062	63	and oublo			TE	ST WEI	LL 21	I-1C
General Colour	Most Commo	is/Abandon	iment Se	ealing Rec	ord (see instructions on the her Materials	e back of this form)	eral Description	<u></u>	T	Den	th (m/ft)
		Clay								From 0 /	16 1
	-	Hard	Par)						16 /	48 /
Grey		Limesto	one				the second second		ti ti	48 /	167 /
Grey		Limesto	one v	J/Gre	ey Sand Star	e (trace)	\rangle			167	221 /
Grev	5 () 5 ()	Sandst	one						-	221 /	246 /
Grey	in a second second	Sandsti	one	1. THE				11.2		246	3661
										500	
	TES	TW	EL		21-1C	(8"1)	VELI)			
Depth Set at L	<u>പ്പം</u>	Annular S	pace		1		Results of W	ell Yield	I Testing		1
From To	(Alarian	Material and	Type)		(m /#)	Atter test of well yield,	water was: ree	Dra	w Down Water Level	Time	ecovery Water Level
178 0	Bentonit			1977 - 19	10.9	If pumping discontinue	Not teste	(min) Static	(m/ft)	(min)	(m/ft) 13.3 4
· - · · · · · · · · · · · · · · · · · ·	Geriller IIU	- sion y	des a la composition de la composition		40.2	X	,	Level	10.5	1	12
	1					. //					
						Pump intake set at (mi	0	2	10.8	2	10.9
Mathod	Construction			101-11-11		Pump intake set at (mi 300 Pumping rate (I/min /#	10 PM	2	10.8 11	2 .	10.9 9.9
Method of	Construction	Public	c	Well Us	se	Pump intake set at (m 300 Pumping rate (l/min / 20	0 EM	2 3 4	10.8 11 11.1	2 3	10.9 9.9 9.2
Method of Cable Tool Rotary (Convention Rotary (Reverse)	Construction Diamond onal) Jetting Driving	Public Dome	c estic stock	Well Us Comme Municip Test Ho	se ercial Dewatering al Dewatering al Monitoring	Pump intake set at (mi 300 Pumping rate (l/min / (20 Duration of pumping 1 hrs + 0 n	D PM nin	2 3 4 5	10.8 11 11.1 11.2	2 3 4. 5	10.9 9.9 9.2 9.2
Method of Cable Tool Rotary (Convention Rotary (Reverse) Boring Air percussion	Construction Diamond onal) Jeting Driving Digging	Public Dome Lives Irrigat	c estic stock tion strial	Well Us Comme Municip Test Ho Cooling	se ercial Not used bal Dewatering ble Monitoring & Air Conditioning	Pump intake set at (mi 300 Pumping rate (/min /@ 20 Duration of pumping <u>1 hrs + 0 n</u> Final water level end o 13/3 ''	nin f pumping (m/ft)	2 3 4 5 10	10.8 11 11.1 11.2 11.5	2 3 4. 5 10	10.9 9.9 9.2 9.2 9.2
Method of Cable Tool Rotary (Conventin Rotary (Reverse) Boring Air percussion Other, specify	Construction Diamond Jetting Digging Construction	Public Dome Livesi Irrigat Other	c estic stock tion strial r, specify	Well Us Comme Municip Test Ho Cooling	se ercial Not used al Dewatering ble Monitoring & Air Conditioning	Pump intake set at (mi 300 Pumping rate (/min / (20 Duration of pumping <u>1</u> hrs + <u>0</u> n Final water level end o 13.3 " If flowing give rate (/mi	nin f pumping (m/ft)	2 3 4 5 10 15	10.8 11 11.1 11.2 11.5 11.8	2 3 4. 5 10 15	10.9 9.9 9.2 9.2 9.2 9.2
Method of Cable Tool Rotary (Conventia Rotary (Reverse) Boring Air percussion Other, specify Inside Open	Construction Dlamond onal) Dtriving Digging Construction Rec Hole OR Material	Public Dome Uvesi Infigat Other cord - Casin Wall	c estic itock tition strial r, specify <u>ng</u> Dept	Well Us Comme Municip Test Ho Cooling h (m/@)	se arcial Not used bal Dewatering le Monitoring & Air Conditioning Status of Well Water Supply	Pump intake set at (mi 300 Pumping rate (l/mi / (20 Duration of pumping <u>1</u> hrs + <u>0</u> n Final water level end o 13/3 " If flowing give rate (l/mi Recommended pump	nin of pumping (m/ft) in/GPM) depth (m/ft)	2 3 4 5 10 15 20	10.8 11 11.1 11.2 11.5 11.5 11.8 - 12.1	2 3 4. 5 10 15 20	10.9 9.9 9.2 9.2 9.2 9.2 9.2 9.2 9.2
Method of Cable Tool Rotary (Conventia Rotary (Reverse) Boring Air percussion Other, specify Inside Diameter (Canton) Conc	Construction Diamond Jetting Digging Digging Construction Rec Hole OR Material anized, Fibreglass, rete, Plastic, Steel)	Public Dome Livesi Inrigat Other Coord - Casin Wall Thickness (cm)	c estic ttock ttion strial r, specify ng Dept From	Well Us Comme Municip Test Ho Cooling	se ercial Not used al Dewatering ble Monitoring & Air Conditioning & Air Conditioning Status of Well Water Supply Replacement Well Test Hole	Pump intake set at (mi 300 Pumping rate (/min / (20 Duration of pumping <u>1</u> hrs + <u>0</u> n Final water /evel end o 13.3 " If flowing give rate (/mi Recommended pump <u>100</u>		2 3 4 5 10 15 20 25	10.8 11 11.1 11.2 11.5 11.8 12.1 12.3	2 · 3 3 4 . 5 10 15 20 25	10.9 9.9 9.2 9.2 9.2 9.2 9.2 9.2 9.2 9.2
Method of Cable Tool Rotary (Conventie Rotary (Reverse) Boring Air percussion J Other, specify Inside Diameter Conce Air Quent Open Conce	Construction Diamond onal) Jeting Driving Digging Construction Rec Hole OR Material anized, Fibreglass, rete, Plastic, Steel) el	Urest Urest	c estic took tion strial r, specify Dept From +2 (Well Us Comme Municip Test Ho Cooling	se arcial Not used bal Dewatering le Monitoring & Air Conditioning Status of Well Status of Well Replacement Well Recharge Well Dewatering Well	Pump intake set at (mi 300 Pumping rate (l/mi / (20 Duration of pumping <u>1</u> hrs + <u>0</u> n Final water level end o 13/3 '' If flowing give rate (l/mi Recommended pump (l/min/Equal)		2 3 4 5 10 15 20 25 30	10.8 11 11.1 11.2 11.5 11.8 12.1 12.3 12.5	2 · 3 3 4. 5 10 15 20 25 30	10.9 9.9 9.2 9.2 9.2 9.2 9.2 9.2 9.2 9.2 9
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Overburder	n and Bedro	ock Materia	als/Abando	50063	aling Reco	ord (see instructions on th	e back of this form)	and the second second	TE	ST WE	LL#2	21-20
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Dentil 7	at le m		Annular	Space		<u> </u>		Results of We	ell Yiel	d Testing		
From	To To		Material ar	aant Used nd Type)		(m ³ /t ³)	After test of well yield	, water was: free	Dr. Time	aw Down Water Level	Re	ecovery Water Level
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Metho	od of Const	ruction			Well Us	ie	Pumping rate (I/min /	GPM)	3	9.1	3	7.8
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Boring	verse)	Driving		estock gation	Test Hol Cooling	e Monitoring & Air Conditioning	Final water level end	min of pumping (m/th)	5	9.1	5	7.8
Other, spec	sion cify		_ Ind	ustrial ner, specify			9.6	1.1.30.00	10	9.2	10	7.8
	Const	ruction Re	cord - Cas	sing		Status of Well	If flowing give rate (I/n	nin/GPM)	15	9.3	15	7.8
Incido				Dont	h (mlt)	NEVIAL-LAND				9.3		
Diameter	Open Hole OF (Galvanized, F	R Material ibreglass,	Wall Thickness	Dept	To	Replacement Well	Recommended pump	o depth (nt/ft)	20		05	7.8
Diameter (cm/f)	Open Hole OF (Galvanized, F Concrete, Plas	R Material Fibreglass, stic, Steel)	Wall Thickness (cm/m)	From		Replacement Well Test Hole Replacement Well	Recommended pump	o depth (nfft)	20	9.4	25	7.8
	Galvanized, F Concrete, Plas	R Material Fibreglass, stic, Steel)	Wall Thickness (cm/n)	From	To	Replacement Well Test Hole Recharge Well Dewatering Well	Recommended pump Recommended pump (I/min/CPM)	o depth (nm) o rate	20 25 30	9.4	25	7.8 7.8 7.8
Diameter (cm/g) 5 1/4" 6 "	Open Hole OF (Galvanized, F Concrete, Plas Steel Open Ho	R Material Fibreglass, stic, Steel)	Wall Thickness (cm/ū) (188	From +21	To 188	Replacement Well Recharge Well Dewatering Well Observation and/or Monitoring Hole	Recommended pump	p depth (nff) p rate	20 25 30 40	9.4 9.4 9.5	25 30 40	7.8 7.8 7.8 7.8
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Outside Diameter	Open Hole Of (Galvanized, F Concrete, Plas Steel Open Ho Const Materi	R Material Fibreglass, stic, Steel)	Wall Thickness (cm/a) .188	From +2 / / 600 een Depti	To / 656 358 ¹ h (m/ft)	Water Supply Replacement Well Test Hole Recharge Well Dewatering Well Observation and/or Monitoring Hole Alteration (Construction) Abandoned, Insufficient Supply Abandoned, Poor Water Quality	Recommended pump Recommended pump (I/min/PM) Well production (I/min Desmended? Desmended? No Please provide a ma	o depth (nff) o rate F Map of We ap below followin	20 25 30 40 50 60 ell Loc	9.4 9.4 9.5 9.6 9.6 '' ation uctions on th	25 30 40 50 60	7.8 7.8 7.8 7.8 7.8 7.8 7.8 7.8 7.8 7.8
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SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 16 2020

Solution	щ 6		SOIL PROFILE				SAN	IPLES		● PE RE	NETRA SISTAI	ATION NCE (N)	, BLOV	/S/0.3m	SH 1 + N	EAR S	TRENG	GTH (Cu REMOU	ı), kPA JLDED	ıu		
L B E C E E C	EPTH SCAL METRES	RING METH	DESCRIPTION	АТА РLOT	ELEV. DEPTH	JUMBER	ТҮРЕ	ECOVERY, mm	DW/S/0.3m	▲ DY RE	NAMIC	PENET	RATIO OWS/0	N).3m	W _F	WATE		TENT,	% ⊣w	ADDITIONAL AB. TESTIN	PIEZOMETI OR STANDPIP INSTALLATI	ER E ON
0 0		BO		STR	(m)	z		R	BLG	1	0 2	20 3	0 4	0 5	0 6	0 7	'0 8	30 §	90 	`_		
Image: Suff overy slip grey brown SLLTY 1 88 205 12 1 <td>- 0</td> <td>$\left \right$</td> <td>Ground Surface</td> <td>1. 1. J.</td> <td>93.88</td> <td></td> <td>Above Ground</td> <td></td>	- 0	$\left \right $	Ground Surface	1. 1. J.	93.88																Above Ground	
1 1			Stiff to very stiff, grey brown SILTY CLAY, with sand seams (WEATHERED CRUST)		0.20	1	SS	205	12		•										Protector & Bentonite	
2 3 SS 45 5 SS 6 3 SS 45 5 SS 5 SS 10 SS						2	SS	100	7	•												
2 3 4 SS 610 9						3	SS	455	5	•				€								
3 4 \$\$\$ \$\$ 610 9 •	2																				Z	
4 5 SS 6 SS 610 4 • <td>- 3</td> <td></td> <td></td> <td></td> <td></td> <td>4</td> <td>SS</td> <td>610</td> <td>9</td> <td></td> <td>Soil Cuttings</td> <td></td>	- 3					4	SS	610	9												Soil Cuttings	
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Image: State of the s	- 4	m OD)	Stiff, grey SILTY CLAY		9 <u>0.07</u> 3.81	6	SS	610	2	•												
5 B S	r I I I I I	iger (210m				7	ss	610	wн													
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0 0			boulders (GLACIAL TILL)			8	SS	610	7	•												
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11 S 455 3 • 50 mm diameter, 15, 20 11 SO 455 3 • 50 mm diameter, 15, 20 Cave						10	SS	610	3												Filter Sand	
11 SS 455 3 •																					50 mm diameter, 1.52 metre length, slotted SCH 40	
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	- 10		End of borehole		9.75																	-
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	- 11																				GROUNDWAT OBSERVATIO	ER – NS -
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		(-	SEMTEC	-				-							-					LOGG	ED: ML	
Consulting Engineers CHECKED: WAM		COL	NSULTING ENGINEERS D Scientists																	CHEC	KED: WAM	

RECORD OF	BOREHOLE	E 20-01B
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 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 16 2020

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DEPTH SCAL MFTRFS		30RING METH	DESCRIPTION	TRATA PLOT	ELEV. DEPTH (m)	NUMBER	ТҮРЕ	RECOVERY, mm	LOWS/0.3m	▲ DY RE	NAMIC SISTAI	PENE NCE, BI	RATIO OWS/(0N 0.3m	W _F	WATE			% ⊣w_	ADDITIONAI LAB. TESTIN	PIEZOMETE OR STANDPIPE INSTALLATIO	ER E ON
	+	Ť	Ground Surface	S	93.88				ш													
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Ē			(WEATHERED CRUST)																		Soil Cuttings	
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È.	3	Ţ																			50 mm diameter, 1.52	
Ē																					slotted SCH 40 PVC Pipe	
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GEC		C	onsulting Engineers nd Scientists																	CHEC	KED: WAM	

RECORD	OF	BORE	IOLE	20-07A
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 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 20 2020

	L		2	SOIL PROFILE				SAN	IPLES		● PE	NETR/	ATION NCE (N) BLOV	VS/0.3r	SH n ⊥ N	EAR S	TRENG	STH (Cu	I), kPA	. (7)		
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Ē			ow St	SAND, some gravel, with cobbles and boulders (GLACIAL TILL)																			
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 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

 SHEET:
 1 OF 1

 DATUM:
 CGVD28

 BORING DATE:
 Jul 17 2020

щ		OD	SOIL PROFILE				SAN	IPLES		● PE RE	NETRA	TION). BLOV	VS/0.3n	SH n + N	IEAR S	TRENG	TH (Cu REMOU	i), kPA ILDED	, U	
SCAL		METH		LOT		щ		RY,	Зm			- ()				WATE		TENT	%	ONAL	PIEZOMETER OR
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	╈	T	Ground Surface	0	03.80																
Ē	p		TOPSOIL		93.60 93.65																Above Ground Protector &
F			Stiff to very stiff, grey brown SILTY		0.15																Bentonite
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Ē	3	Pllo																			50 mm
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Ē			Very loose to compact, grev SILTY	XX	3.35]															PVC Pipe
Ē			SAND, some gravel, with cobbles and boulders (GLACIAL TILL)	\mathcal{N}																	
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 CLIENT:
 Cardel Homes

 PROJECT:
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 JOB#:
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 LOCATION:
 See Site Plan, Figure 1

SHEET:	1 OF 1
DATUM:	CGVD28
BORING DATE:	Jul 10 2020

щ		DD	SOIL PROFILE		-		SAN	/IPLES		● PE RE	NETR SISTA	ATION), BLOV	VS/0.3r	Sł n +	HEAR S	TRENG	TH (Cu REMOU	ı), kPA JLDED	ں،		
DEPTH SCAL METRES		ORING METH	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	RECOVERY, mm	-OWS/0.3m	▲ DY RE	NAMIO	C PENE NCE, B	TRATIO LOWS/(N).3m	v	WATE		TENT,	% ⊣w _L	ADDITIONAI LAB. TESTIN	PIEZOME OR STANDF INSTALLA	ETER PIPE ATION
	+	ā T		ST				Ľ.	B	1	0	20 :	30 4	10 E	50	60 i	70 8	30 9	90			
F	┝		Ground Surface TOPSOIL	<u></u>	94.09																Above Ground	
			Stiff to very stiff, grey brown SILTY CLAY (WEATHERED CRUST)		0.20	1	SS	355	8												Bentonite	
	1					2	ss	0	9												Soil Cuttings	
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	2	(DD)					33	405														
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	0 10 10	tem Auger	Very loose to compact, grey gravelly SILTY SAND, some clay, with cobbles		91.04 3.05	5	SS	355	6	•		Ó								мн	50 mm diameter, 1.52 metre length, slotted SCH 40 PVC Pipe	
	4	Hollow S	and boulders (GLACIAL TILL)																			
						6	SS	200	1													
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			Loose, grey SAND	<u>(10/7</u>	88.76 5.33	8	SS	355	6			0								мн	Son Cuttings	
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No. No. <th>Q</th> <th>SOIL PROFILE</th> <th></th> <th></th> <th></th> <th>SAM</th> <th>IPLES</th> <th></th> <th>● PE</th> <th>NETR/</th> <th></th> <th></th> <th></th> <th>SH</th> <th>IEAR S</th> <th></th> <th>GTH (C</th> <th>u), kPA</th> <th></th> <th></th>	Q	SOIL PROFILE				SAM	IPLES		● PE	NETR/				SH	IEAR S		GTH (C	u), kPA		
Image: Control Surface	MEIRES DRING METHC	DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	ТҮРЕ	ECOVERY, mm	-OWS/0.3m		NAMIC SISTA	NCE (N PENE NCE, B	TRATIC	VS/0.3n)N 0.3m	1 + ∩ ₩		AL⊕ R CON W		ULDED , % — W _L	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
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 CLIENT:
 Cardel Homes

 PROJECT:
 Geotechnical & Hydrogeological Investigation

 JOB#:
 61899.04

 LOCATION:
 See Site Plan, Figure 1

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 7 2020

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 See Site Plan, Figure 1

SHEET:1 OF 1DATUM:CGVD28BORING DATE:Jul 8 2020

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		v Stem Auge	SAND, trace gravel, with cobbles and boulders (GLACIAL TILL)		90.54	5	SS	455	20		D:	•	· · · · · · · · · · · · · · · · · · ·								мн	diameter, 1.52 metre length, slotted SCH 40 PVC Pipe
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APPENDIX D

Geophysics

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)





	GEMTEC	Logged By	Brett Webster	Drilled Depth	n 48.75 metres	\checkmark	, Broken Zone / Ur	ndifferentiated		Limes	stone		
	Consulting Engineers and Scientists	Reviewed by	Mike West	Elevation						Limes	stone/shale		
Client	Cardel Homes	Date Logged	February 2021	Angle	Vertical	-	Major Open Joint	/ Fracture		Limes	stone - dolom	itic (10-50% Dolomite))
Project #	61899.04	Hole Number	TW21-1B	Location	Creekside Development	Ó	Minor Open Joint	/ Fracture					
Depth	Acoustic Image Optical Image	3D Core	Gamma	Structu	ures Lithology	Spon	taneous Potential	16" Short Resi	stivity	64" Long R	esistivity	Single Point Resistar	nce
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	GEMTEC Consulting Engineers and Scientists	Logged By Bret Reviewed by Mike	t Webster e West	Drilled Depth 122.	25 metres	Major Open Joint	/ Fracture	Argillaceous sand	istone
Client	Cardel Homes	Date Logged Feb	ruary 2021	Angle Verti	cal			Limestone/shale	
Project #	61899.04	Hole Number TW2	21-1C	Location Cree	kside Development			Limestone - dolor	nitic (10-50% Dolomite)
Depth	Acoustic Image Optical Image	3D Log	Gamma	Structures	Lithology	Spontaneous Potential	16" Short Resistance	64" Long Resistance	Single Point Resistance
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Depth	Acoustic Image	Optical Image	3D Log	Gamma		Structu	ires	Lithology	Spont	aneous Pot	ential	16"	Short Resis	tance	64" L	ong Res	istance	Single Point	t Resis	tance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 9	90° 180	° 270° 0'	,	-500	mV	200	0	Ohm.m	10000	0	Ohm.m	10000	0 Oh	ims	1000
- 69.50 -																				
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- 69.75 -		and the second																		
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	Depth	Acoustic Image	Optical Image	3D Log	Gamma		St	ructures	Lithology	Sponta	neous Pote	ntial 16	" Short Resis	tance	64" Lo	ng Resis	tance	Single Point Res	sistance
	1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 85	0 0	° 90°	180° 270° 0°		-500	mV	200 0	Ohm.m	10000	0	Ohm.m	10000	0 Ohms	1000
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Depth	Acoustic Image	Optical Image	3D Log	Gamma	I		Struc	tures		Lithology	Spontan	eous Po	tential	16"	Short Resis	tance	64" L	ong Resis	ance	Single P	oint Res	sistance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	, 360°	0 Cps	850	0° 9	0° 18	30° 270	° 0°		-500	mV	200	0	Ohm.m	10000	0	Ohm.m	10000	0	Ohms	1000
	and the										-											
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Depth	Acoustic Image	Optical Image	3D Log	Gamma	Structures		Lithology	Spontaneous Pc	tential	16" Short Resistance	64" l	Long Resistan	nce	Single Point	t Resist	ance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 90° 180° 270	0° 0°		-500 mV	200	0 Ohm.m 10000	0	Ohm.m 1	0000	0 Oh	nms	1000
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Depth	Acoustic Image	Optical Image	3D Log	Gamma		S	Structures		Lithology	Spontaneou	is Pote	ential	16'	' Short Resis	tance	64" I	Long Resist	ance	Single Poin	t Resistar	nce
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 85	0 0°	90°	180° 270	ا ۵° ۵°		ا -500 m ^۱	v	200	0	Ohm.m	10000	0	Ohm.m	10000	0 Oł	ıms 1	1000
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Depth	Acoustic Image	Optical Image	3D Log	Gamma		Struc	tures		Lithology	Sponta	aneous Pote	ntial	16" SI	nort Resista	ance	64" Lo	ong Resist	ance	Single Poi	nt Resi	stance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0°9	0° 18	0° 270	° 0°		-500	mV	200	0	Ohm.m	10000	0	Ohm.m	10000	0 C)hms	1000
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Depth	Acoustic Image	Optical Image	3D Log	Gamma	Structures	Lithology	Spontaneous Potential	16" Short Resistance	64" Long Resistance	Single Point Resistance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 90° 180° 270° 0°	1	-500 mV 200	0 Ohm.m 10000	0 Ohm.m 10000	0 Ohms 1000
- 93.75 -										
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- 94.25 -										
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- 96.50 -										



Depth	Acoustic Image	Optical Image	3D Log	Gamma	Structures	Lithology	Spontaneous Potential	16" Short Resistance	64" Long Resistance	Single Point Resistance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	' 360°	0 Cps 850	0° 90° 180° 270° 0°		-500 mV 200	0 Ohm.m 10000	0 Ohm.m 10000	0 Ohms 1000
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- 97.75		as contracts								
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Depth	Acoustic Image	Optical Image	3D Log	Gamma		St	ructure	s	Lithology	Spont	taneous Po	tential	16" Short Res	istance	64'	" Long Resist	ance	Single F	oint Resis	stance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 8	50 0°	90°	180°	270° 0	•	-500	mV	200	0 Ohm.m	10000	0	Ohm.m	10000	0	Ohms	1000
- 101.75 -																				
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Depth	Acoustic Image	Optical Image	3D Log	Gamma	Structures	Lithology	Spontaneous Potential	16" Short Resistance	64" Long Resistance	Single Point Resistance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 90° 180° 270°	0°	-500 mV 200	0 Ohm.m 10000	0 Ohm.m 10000	0 Ohms 1000
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- 112.75 -										



Depth	Acoustic Image	Optical Image	3D Log	Gamma	s	Struc	tures		Lithology	Spont	aneous Pote	ntial	16" Short Resistance	64	4" Long Resistance	Single	Point Resis	tance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 90°	18	0° 270°	0°		-500	mV	200 0) Ohm.m 10000	0	Ohm.m 10000	0	Ohms	1000
- 114.00 -																		
- 114.25 -			1 Any															
- 114.50 -			and the second s															
- 114.75 -		X	- Not							- - - - - - - - - - -								
- 115.00 -			and a second															
- 115.25 -			t to the			/				- - - - - - - - - - -								
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- 116.00 -			T															
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- 116.50 -			and the second second															
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Depth	Acoustic Image	Optical Image	3D Log	Gamma	Structures	Lithology	Spontaneous Potential	16" Short Resistance	64" Long Resistance	Single Point Resistance
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	360°	0 Cps 850	0° 90° 180° 270° 0°	1	-500 mV 200	0 Ohm.m 10000	0 Ohm.m 10000	0 Ohms 1000
- 118.00 -			and and							
- 118.25 -										
- 118.50 -			Carlos Carlos							
- 118.75 -										
- 119.00 -										
- 119.25 -										
- 119.50 -										
- 119.75 -										





Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 200	0° 90° 180° 270° 0°		0 mV 600	0 Ohm.m 5000	0 Ohm.m 5000	0 Ohm 1000
- 23.75 -										
- 24.00 -										
- 24.25 -										
- 24.50 -										
- 24.75 -										
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 200	0° 90° 180° 270° 0°	1	1 0 mV 600	0 Ohm.m 5000	0 Ohm.m 5000	0 Ohm 1000
- 27.75 -										
- 28.00 -										
- 28.25 -										
- 28.50 -										
- 28.75 -										
- 29.00 -										
- 29.25 -										
- 29.75 -										
- 30.00 -										
- 30.25 -										
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 200	0° 90° 180° 270° 0°		0 mV 600	0 Ohm.m 5000 0	Ohm.m 5000	0 Ohm 1000
- 31.75	-	Barris and	A. Star							
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- 32.00	- Alexand		No.							
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- 34.50										
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1m:10m	0 3000 0° 90° 180° 270° 0°	ا 0° 90° 180° 270° 0°	-0°	0 Cps 200	0° 90° 180° 270° 0°	I	0 mV 6	00 0 Ohm.m 5000	0 Ohm.m 5000	0 Ohm 1000
- 35.75 -			etter tra							
- 36.00 -										
- 36.25 -										
- 36.50 -										
- 36.75 -										
- 37.00 -										
- 37.50 -										
- 37.75 -										
- 38.00 -										
- 38.25 -										
- 38.50 -										



Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 200	0° 90° 180° 270° 0	•	0 mV 60	00 0 Ohm.m 5000	0 Ohm.m 5000	0 Ohm 1000
- 30.75			and the second							
39.75										
- 40.00										
			ATTENTS							
		State								
- 40.25		Contraction of	Carl and							
			der ze							
- 40.50 ·										
			State of the second							
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			and the second							
44.00										
- 41.00		A THE DA	The second se							
			And							
- 41.25										
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- 41.75										
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- 42.00										
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- 42.25			A BLOW							
42.20		and the second	anger and an and an							
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma		Structures		Lithology	VSP		N16		N	54		S	PR	
1m:10m	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps	200	0° 90° 180° 27	0° 0°		0 mV	600	0 Ohm.m	5000	0 Oh	m.m	5000	0 0	9hm 1	000
- 43.75 -																		

	<u>GEMTEC</u>	Logged By	Brett Webster	Drilled Depth	45.75 metres	Major	Open Joint / F	racture		Argillaceous san	dstone
Client	Consulting Engineers and Scientists	Reviewed by	Mike West	Elevation		Minor	Open Joint / F	racture		Limestone	
Project #	61899.04	Hole Number	TW21-2C	Location	vertical Creekside Development					Limestone - dolo	mitic (10-50% Dolomite)
Depth	Amplitude-NM Image-NM	3D Core	Gamma	Structu	res Lithology	VSP		N16		N64	SPR
) 3000			-		+					+
1ft:10ft (0° 90° 180° 270°)° 90° 180° 270° 0°	0° -0°	0 Cps 4	50 0° 90° 180°	270°0°	0 mV	650 0	Ohm.m	10000 0	Ohm.m 10000	0 Ohm 120
- 190.29 -											
- 191.11 -											
- 191.93 -		and the second									
- 192 75 -											
192.13											
- 193.57 -		terer" at									
			22								
- 194.39 -			-								
- 195.21 -											
- 196.03 -		A CONTRACT									
20 19 19 10											
- 196.85 -											
- 197.67 -											
- 198.49 -											



Depth	Amplitude-NM	Image-NM	3D Core	Gamma	St	ructures		Lithology	VSP			N16		1	164		SPR	
1ft:10ft	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 450	0° 90°	180° 27	0° 0°		1 0 mV	650	0	Ohm.m	10000	0 OI	ım.m 1000	0 0	Ohm	1200
- 202.59 -																		
- 203.41 -		in a start of the																
- 204.23 -																		
- 205.05 -			and the															
- 205.87 -			San															
- 206.69 -																		
- 207.51 -																		
- 208.33 -																		
- 209.15 -																		
- 209.97 -																		
- 210.79 -																		
- 211.61 -																		



Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1ft:10ft	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 450	0° 90° 180° 270° 0°		0 mV 650 0) Ohm.m 10000	0 Ohm.m 10000	0 Ohm 1200
- 215.72 -										
216 54										
- 210.04 -										
- 217.36 -		-								
- 218.18 -		and an								
- 219.00 -										
- 219.82 -		a a suite de la constante de la Reconstante de la constante de la Reconstante de la constante de la								
- 220.64 -										
- 221.46 -										
- 222.28 -										
- 223.10 -										
- 223.92 -										
- 224.74 -										



Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	Ν	116	N64		SPR	
1ft:10ft	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 450	0° 90° 180° 270° 0°	1	0 mV	650 0 Of	ım.m 10000	0 Ohm.m 1	0000	0 Ohm	1200
- 228.84 -													
- 229.66 -													
- 230.48 -													
- 231.30 -													
- 232.12 -													
- 232.94 -													
- 233.76 -		T IT WI											
- 234.58 -													
- 235.40 -													
- 236.22 -													
- 237.86 -													
			A state										



Depth	Amplitude-NM	Image-NM	3D Core	Gamma		S	Structi	ures		Lithology	VS	þ			N16			N64			SPR	
1ft:10ft	0 3000	0° 90° 180° 270° 0°	-l -0°	0 Cps 4	450 0)° 90°	180)° 270	° 0°	<u> </u>	0 m\	′ 6	50 0) (Dhm.m	10000	0	Ohm.m	10000	0	Ohm	1200
	0° 90° 180° 270° 0°				_							_										-
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	and the second second		Statute analy																			
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma		Struc	tures		Lithology	VSP		N16			N64		\$	SPR	
1ft:10ft	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 45	0 0° 9	90° 18	30° 270	° 0°	I .	0 mV	650	0 Ohm.m	10000	0	Ohm.m	10000	0 0	Ohm	1200
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Depth	Amplitude-NM	Image-NM	3D Core	Gamma	Structures	Lithology	VSP	N16	N64	SPR
1ft:10ft	0 3000 0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	-0°	0 Cps 450	0° 90° 180° 270° 0°	1	0 mV 650	0 Ohm.m 10000	0 Ohm.m 10000	0 Ohm 1200
- 308.40 -										
- 309.22 -										
- 310.04 -										
- 310.86 -										
- 312.50 -			A Y CO							
- 313.32 -										
- 314.14 -										
- 314.96 -			A Denied							
- 315.78 -										
- 316.60 -										
- 317.42 -										




Page 11



Page 12



Attribute : Type Symbol Code - Description 1 - Major Open Joint / Fracture 2 - Minor Open Joint / Fracture •

TW21-1B



Plot: Structures Symbol Name All

Nb Points 217.00

Azi Mean 12.47 Dip Mean 4.85 Azi Min Dip Min 0.00 0.00 Azi Max Dip Max 358.58 86.17

Attribute : Type Symbol Code - Description • 1 - Major Open Joint / Fracture 2 - Minor Open Joint / Fracture

TW21-1C



Plot: Structures Symbol Name All

Nb Points 326.00

Azi Mean 73.13

Dip Mean 12.58

Azi Min 0.00

Dip Min 0.00

Dip Max 42.30

Azi Max

358.58

Attribute : Type Symbol Code - Description 1 - Major Open Joint / Fracture 2 - Minor Open Joint / Fracture •

TW21-2B



Plot: Structures Symbol Name All

Nb Points 196.00

Azi Mean 159.71 Dip Mean 3.21 Azi Min 0.00

in Dip Min 0.00 Dip Max 82.95

Azi Max

358.58

Attribute : Type Symbol Code - Description 1 - Major Open Joint / Fracture 2 - Minor Open Joint / Fracture •

TW21-2C



Plot: Structures Symbol Name All

Nb Points 456.00 Azi Mean 99.70 Dip Mean 7.56 Azi Min 0.00

Dip Min Azi Max 0.00 354.33 Dip Max 82.31

APPENDIX E

TW21-1C Pumping Test Data

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)



















APPENDIX F

Water Quality Summary (Creekside 2)

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)

<u>61899.03</u>

Field Measured Water Quality Parameters

Date/Time	March 15, 2021	March 16, 2021 Noon 24-hr	March 17, 2021 Noon 48-hr	March 18, 2021 Noon 72-hr
pН	6.58	7.64	7.95	7.88
Temp (°C)	7.48	8.63	9.20	8.05
EC (us/cm)	733	854	929	987
TDS (ppm)	468	546	595	633
Turbidity (NTU)	6.46	3.7	1.5	2.03
Colour (ACU - unfiltered)	-	-	5, 6, 4	22, 25, 26
Colour (TCU – filtered)	-	-	<5	<5
Free chlorine (mg/L)	-	<0.02	<0.02	<0.02
Total Chlorine (mg/L)	-	<0.02	<0.02	<0.02
DO mg/L	-	4.53	6.96	8.35
DP %	-	38.9	60.0	68.4
ORP mV	-	34	20	20
Sample Collected (Y / N)	Y	Y	Y	Y

TW21-1C Tag #A313115

TW21-1C Water Quality Summary (1/3)

SEMTEC Consulting Engineers and Scientists Limited								
PROJECT: 61899.03			n 1.11	n 1.4				
Parameter	Units	MDL	Regulation	Regulation	Step-Test		72-Hour P-Test	
					TW21-1c 2106227-01	TW21-1C 24hr 2112287-01	TW21-1C 48h 2112452-01	TW21-1C 72hr 2112541-01
Sample Date (m/d/y)			ODWQS - Maximum Allowable Concentration	ODWQS Asthetic Objectives / Operational Guidelines	02/02/2021	03/16/2021	03/17/2021	03/18/2021
Microbiological Parameters								
E. Coli	CFU/100 mL	1	0 CFU/100 mL	-	ND (1)	ND (1)	ND (1)	ND (1)
Fecal Coliforms	CFU/100 mL	1	-	-	ND (1)	ND (1)	ND (1)	ND (1)
Total Coliforms	CFU/100 mL	1	0 CFU/100 mL	-	ND (1)	ND (1)	ND (1)	ND (1)
Heterotrophic Plate Count	CFU/mL	10	-	-	30	ND (10)	ND (10)	ND (10)
General Inorganics								
Alkalinity, total	mg/L	5	-	500 mg/L	299	287	279	279
Ammonia as N	mg/L	0.01	-	-	0.08	0.16	0.14	0.14
Dissolved Organic Carbon	mg/L	0.5	-	5 mg/L	1.2	2.8	2.4	1.7
Colour	TCU	2	-	5 TCU (5 ACU)	ND (2)	15	8	7
Colour, apparent	ACU	2	-	5 TCU (5 ACU)	47	28	24	19
Conductivity	uS/cm	5	-	-	685	876	961	1040
Hardness	mg/L		-	80 - 100 mg/L	340	326	335	334
рН	pH Units	0.1	-	-	7.8	8.0	8.0	8.2
Phenolics	mg/L	0.001	-	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Total Dissolved Solids	mg/L	10	-	500 mg/L	400	484	500	514
Sulphide	mg/L	0.02	-	0.5 mg/L	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)
Tannin & Lignin	mg/L	0.1	-	-	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Total Kjeldahl Nitrogen	mg/L	0.1	-	-	0.1	0.1	0.2	0.1
Turbidity	NTU	0.1	-	5 NTU	5.8	3.4	2.9	2.0
Anions								
Bromide	mg/L	0.1	-	-	ND(0.1)	0.3	0.4	0.4
Chloride	mg/L	1	-	250 mg/L	47	94	122	138
Fluoride	mg/L	0.1	1.5 mg/L	-	0.5	0.2	0.2	0.5
Nitrate as N	mg/L	0.1	10 mg/L	-	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Nitrite as N	mg/L	0.05	1 mg/L	-	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	1	-	500 mg/L	36	38	42	44
Metals								
Mercury	mg/L	0.0001	0.001 mg/L	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Aluminum	mg/L	0.001	-	0.1 mg/L	0.067	0.079	0.060	0.026
Antimony	mg/L	0.0005	0.006 mg/L	-	ND (0.0005)	ND (0.0005)	ND (0.0005)	ND (0.0005)
Arsenic	mg/L	0.001	0.01 mg/L	-	0.002	0.001	0.001	0.001
Barium	mg/L	0.001	1 mg/L	-	0.224	0.222	0.231	0.226
Boron	mg/L	0.01	5 mg/L	-	0.12	0.18	0.18	0.20
Cadmium	mg/L	0.0001	0.005 mg/L	-	ND (0.0001)	ND (0.0001)	ND (0.0001)	ND (0.0001)
Calcium	mg/L	0.1	-	-	85.0	82.5	85.9	85.2
Chromium (VI)	mg/L	0.010	-	-	ND (1)	ND (0.010)	ND (0.010)	ND (0.001)
Chromium	mg/L	0.001	0.05 mg/L	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.010)
Copper	mg/L	0.0005	-	1 mg/L	ND (0.0005)	0.0007	ND (0.0005)	ND (0.0005)
Iron	mg/L	0.1	-	0.3 mg/L	0.5	0.3	0.3	0.3
Lead	mg/L	0.0001	0.01 mg/L		ND (0.0001)	ND (0.0001)	0.0001	0.0001
Magnesium	mg/L	0.2	-	-	31.0	29.1	29.4	29.4
Manganese	mg/L	0.005	-	0.05 mg/L	0.030	0.029	0.029	0.029
Potassium	mg/L	0.1	-	-	4.5	5.4	5.7	5.9
Selenium	mg/L	0.001	0.05 mg/L	-	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)
Sodium	mg/L	0.2	20 mg/L	200 mg/L	37.0	66.7	82.2	87.3
Uranium	mg/L	0.0001	0.02 mg/L	-	0.0006	0.0008	0.0007	0.0008
Zinc	mg/L	0.005	-	5 mg/L	ND (0.005)	0.008	ND (0.005)	0.007



TW21-1C Water Quality Summary (2/3)

GEMTEC Consulting Engineers and	Scientists Limite	ed						
PROJECT: 61899.03			.	.		-		
Parameter	Units	MDL	Regulation	Regulation	Step-Test		72-Hour P-Test	
					TW21-1c 2106227-01	TW21-1C 24hr 2112287-01	TW21-1C 48h 2112452-01	TW21-1C 72hr 2112541-01
Sample Date (m/d/y)			Ontario Drinking Water Standards - Maximum Allowable Concentration	Ontario Drinking Water Standards - Asthetic Objectives	02/02/2021	03/16/2021	03/17/2021	03/18/2021
Volatiles								
Acetone	mg/L	0.0050	-	-	-	-	-	ND (0.0050)
Benzene	mg/L	0.0005	0.005 mg/L	-	-	-	-	ND (0.0005)
Bromodichloromethane	mg/L	0.0005	0.016 mg/L	-	-	-	-	ND (0.0005)
Bromoform	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Bromomethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Carbon Tetrachloride	mg/L	0.0002	0.002 mg/L	-	-	-	-	ND (0.0002)
Chlorobenzene	mg/L	0.0005	0.08 mg/L	0.03 mg/L	-	-	-	ND (0.0005)
Chloroform	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Dibromochloromethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Dichlorodifluoromethane	mg/L	0.0010	-	-	-	-	-	ND (0.0010)
1,2-Dichlorobenzene	mg/L	0.0005	0.2 mg/L	0.003 mg/L	-	-	-	ND (0.0005)
1,3-Dichlorobenzene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,4-Dichlorobenzene	mg/L	0.0005	0.005 mg/L	0.001 mg/L	-	-	-	ND (0.0005)
1,1-Dichloroethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,2-Dichloroethane	mg/L	0.0005	0.005 mg/L	-	-	-	-	ND (0.0005)
1,1-Dichloroethylene	mg/L	0.0005	0.014 mg/L		-	-	-	ND (0.0005)
cis-1,2-Dichloroethylene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
trans-1,2-Dichloroethylene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,2-Dichloropropane	mg/L	0.0005			-	-	-	ND (0.0005)
cis-1,3-Dichloropropylene	mg/L	0.0005			-	-	-	ND (0.0005)
trans-1,3-Dichloropropylene	mg/L	0.0005			-	-	-	ND (0.0005)
1,3-Dichloropropene, total	mg/L	0.0005			-	-	-	ND (0.0005)
Ethylbenzene	mg/L	0.0005	0.14 mg/L	0.0016 mg/L	-	-	-	ND (0.0005)
Ethylene dibromide (dibromoethan	mg/L	0.200	-	-	-	-	-	ND (0.200)
Hexane	mg/L	0.0010	-	-	-	-	-	ND (0.0010)
Methyl Ethyl Ketone (2-Butanone)	mg/L	0.0050	-	-	-	-	-	ND (0.0050)
Methyl Isobutyl Ketone	mg/L	0.0050			-	-	-	ND (0.0050)
Methyl tert-butyl ether	mg/L	0.0020	-	0.015 mg/L	-	-	-	ND (0.0020)
Methylene Chloride	mg/L	0.0050	0.05 mg/L	-	-	-	-	ND (0.0050)
Styrene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,1,1,2-Tetrachloroethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,1,2,2-Tetrachloroethane	mg/L	0.0005		-	-	-	-	ND (0.0005)
Tetrachloroethylene	mg/L	0.0005	0.01 mg/L		-	-	-	ND (0.0005)
Toluene	mg/L	0.0005	0.06 mg/L	0.024 mg/L	-	-	-	ND (0.0005)
1,1,1-Trichloroethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
1,1,2-Trichloroethane	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Trichloroethylene	mg/L	0.0005	0.005 mg/L	-	-	-	-	ND (0.0005)
Trichlorofluoromethane	mg/L	0.0010	-	-	-	-	-	ND (0.0010)
Vinyl Chloride	mg/L	0.0002	0.002 mg/L	-	-	-	-	ND (0.0002)
m/p-Xylene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
o-Xylene	mg/L	0.0005	-	-	-	-	-	ND (0.0005)
Xylenes, total	mg/L	0.0005	0.09 mg/L	0.02 mg/L	-	-	-	ND (0.0005)
Hydrocarbons		1						
F1 PHCs (C6-C10)	mg/L	0.0250	-	-	-	-	-	ND (0.0250)
F2 PHCs (C10-C16)	mg/L	0.1	-	-	-	-	-	ND (0.1)
F3 PHCs (C16-C34)	mg/L	0.1	-		-	-	-	ND (0.1)
F4 PHCs (C34-C50)	mg/L	0.1	-	-	-	-	-	ND (0.1)



TW21-1C Water Quality Summary (3/3)

GEMTEC Consulting Engineers and	Scientists Limite	ed						
PROJECT: 61899.03		1	[[
Parameter	Units	MDL	Regulation	Regulation	Step-Test		72-Hour P-Test	r
					TW21-1c 2106227-01	TW21-1C 24hr 2112287-01	TW21-1C 48h 2112452-01	TW21-1C 72hr 2112541-01
Sample Date (m/d/y)			Ontario Drinking Water Standards - Maximum Allowable Concentration	Ontario Drinking Water Standards - Asthetic Objectives	02/02/2021	03/16/2021	03/17/2021	03/18/2021
Herbicdes / Pesticides								
2,3,4,6-Tetrachlorophenol	ug/L	-	-	-	-	-	-	<0.3
2,4,6-Trichlorophenol	ug/L	-	-	-	-	-	-	<0.2
2,4-Dichlorophenol	ug/L	-	-	-	-	-	-	<0.2
Pentachlorophenol	ug/L	-	-	-	-	-	-	<0.3
Carbaryl	ug/L	-	-	-	-	-	-	<1
Carbofuran	ug/L	-	-	-	-	-	-	<2
Diuron	ug/L	-	-	-	-	-	-	<6
Diquat	ug/L	-	-	-	-	-	-	<0.4
Paraquat	ug/L	-	-	-	-	-	-	<0.2
Alachlor	ug/L	-	-	-	-	-	-	<0.231
Atrazine	ug/L	-	-	-	-	-	-	<0.231
Azinphos-methyl (Guthion)	ug/L	-	-	-	-	-	-	<0.173
Chlorpyriphos (Dursban)	ug/L	-	-	-	-	-	-	<0.173
Desethyl atrazine	ug/L	-	-	-	-	-	-	<0.289
Diazinon	ug/L	-	-	-	-	-	-	<0.173
Dimethoate	ug/L	-	-	-	-	-	-	<0.173
Malathion	ug/L	-	-	-	-	-	-	<0.173
Metolachlor	ug/L	-	-	-	-	-	-	<0.116
Metribuzin (Sencor)	ug/L	-	-	-	-	-	-	<0.116
Phorate	ug/L	-	-	-	-	-	-	<0.116
Prometryne	ug/L	-	-	-	-	-	-	<0.0578
Simazine	ug/L	-	-	-	-	-	-	<0.173
Terbufos	ug/L	-	-	-	-	-	-	<0.116
Triallate	ug/L	-	-	-	-	-	-	<0.116
Trifluralin	ug/L	-	-	-	-	-	-	<0.116
Benzo(a)pyrene	ug/L	-	-	-	-	-	-	<0.01
Decachlorobiphenyl (Surr.)	% Rec	-	-	-	-	-	-	136
Total PCBs	ug/L	-	-	-	-	-	-	<0.06
2,4-D	ug/L	-	-	-	-	-	-	<0.365
Bromoxynil	ug/L	-	-	-	-	-	-	<0.0972
Dicamba	ug/L	-	-	-	-	-	-	<0.0851
Dichlorophenyl acetic acid (Surr.	% Rec	-	-	-	-	-	-	88.3
Diclofop-methyl	ug/L	-	-	-	-	-	-	<0.122
МСРА	ug/L	-	-	-	-	-	-	<6.08
Picloram	ug/L	-	-	-	-	-	-	<0.0851
Atrazine + N-dealkylated metabo	ug/L	-	-	-	-	-	-	<0.5



Langelier Saturation Index Calculation

Project 61899.03 Test Well: TW21-1C 72-hr Date: March 18, 2021

<u>Inputs</u>

pH =	8.2	
Total Dissolved Solids =	514	
Calcium (as $CaCO_3$) =	213	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	279	
Temperature (^o C) =	8	(estimated)

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

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

And:

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

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

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

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

Output:	
A =	0.17
B =	2.42
C =	1.93
D =	2.45
pH _s =	7.52
LSI =	0.68

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



APPENDIX G

Laboratory Certificates of Analysis

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)



RELIABLE.

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

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO: Project: 61899.03 Custody: 12097

Report Date: 23-Mar-2021 Order Date: 16-Mar-2021

Order #: 2112287

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

Client ID Paracel ID 2112287-01

TW21-1C 24hr

Approved By:

Mark Foto

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



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

Analysis Summary Table

Report Date: 23-Mar-2021 Order Date: 16-Mar-2021

Project Description: 61899.03

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-Mar-21	22-Mar-21
Ammonia, as N	EPA 351.2 - Auto Colour	18-Mar-21	18-Mar-21
Anions	EPA 300.1 - IC	18-Mar-21	18-Mar-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	17-Mar-21	18-Mar-21
Colour	SM2120 - Spectrophotometric	17-Mar-21	17-Mar-21
Colour, apparent	SM2120 - Spectrophotometric	17-Mar-21	17-Mar-21
Conductivity	EPA 9050A- probe @25 °C	22-Mar-21	22-Mar-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	18-Mar-21	18-Mar-21
E. coli	MOE E3407	17-Mar-21	17-Mar-21
Fecal Coliform	SM 9222D	17-Mar-21	17-Mar-21
Heterotrophic Plate Count	SM 9215C	17-Mar-21	17-Mar-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	18-Mar-21	18-Mar-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	17-Mar-21	17-Mar-21
рН	EPA 150.1 - pH probe @25 °C	22-Mar-21	22-Mar-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	17-Mar-21	17-Mar-21
Hardness	Hardness as CaCO3	17-Mar-21	17-Mar-21
Sulphide	SM 4500SE - Colourimetric	18-Mar-21	18-Mar-21
Tannin/Lignin	SM 5550B - Colourimetric	22-Mar-21	22-Mar-21
Total Coliform	MOE E3407	17-Mar-21	17-Mar-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-Mar-21	22-Mar-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Mar-21	22-Mar-21
Turbidity	SM 2130B - Turbidity meter	17-Mar-21	17-Mar-21



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021

Order Date: 16-Mar-2021

Project Description: 61899.03

	Client ID:	TW21-1C 24hr	-	-	-
	Sample Date:	16-Mar-21 12:00	-	-	-
	Sample ID:	Drinking Water	-	-	-
Microbiological Parameters	MDL/Offits	Brinking Water			
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-
General Inorganics			•		
Alkalinity, total	5 mg/L	287	-	-	-
Ammonia as N	0.01 mg/L	0.16	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.8	-	-	-
Colour	2 TCU	15	-	-	-
Colour, apparent	2 ACU	28	-	-	-
Conductivity	5 uS/cm	876	-	-	-
Hardness	mg/L	326	-	-	-
рН	0.1 pH Units	8.0	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	484	-	-	-
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	3.4	-	-	-
Anions					
Chloride	1 mg/L	94	-	-	-
Fluoride	0.1 mg/L	0.2	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	38	-	-	-
Metals					-
Mercury	0.0001 mg/L	<0.0001	-	-	-
Aluminum	0.001 mg/L	0.079	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-
Arsenic	0.001 mg/L	0.001	-	-	-
Barium	0.001 mg/L	0.222	-	-	-
Boron	0.01 mg/L	0.18	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Calcium	0.1 mg/L	82.5	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Order #: 2112287

Report Date: 23-Mar-2021 Order Date: 16-Mar-2021

Project Description: 61899.03

	Client ID:	TW21-1C 24hr	-	-	-
	Sample Date:	16-Mar-21 12:00	-	-	-
	Sample ID:	2112287-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Chromium (VI)	0.010 mg/L	<0.010	-	-	-
Copper	0.0005 mg/L	0.0007	-	-	-
Iron	0.1 mg/L	0.3	-	-	-
Lead	0.0001 mg/L	<0.0001	-	-	-
Magnesium	0.2 mg/L	29.1	-	-	-
Manganese	0.005 mg/L	0.029	-	-	-
Potassium	0.1 mg/L	5.4	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-
Sodium	0.2 mg/L	66.7	-	-	-
Uranium	0.0001 mg/L	0.0008	-	-	-
Zinc	0.005 mg/L	0.008	-	-	-



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021 Order Date: 16-Mar-2021

Project Description: 61899.03

Method Quality Control: Blank

			Source		%REC	%REC			
Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	ma/L						
Nitrate as N	ND	0.1	ma/L						
Nitrite as N	ND	0.05	ma/L						
Sulphate	ND	1	ma/L						
General Inorganics			5						
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	ΤČU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	ma/L						
Total Dissolved Solids	ND	10	ma/L						
Sulphide	ND	0.02	ma/L						
Tannin & Lignin	ND	0.1	ma/L						
Total Kieldahl Nitrogen	ND	0.1	ma/L						
Turbidity	ND	0.1	NTU						
Metals									
Mercury	ND	0.0001	ma/L						
Aluminum	ND	0.001	ma/L						
Antimony	ND	0.0005	ma/L						
Arsenic	ND	0.001	ma/L						
Barium	ND	0.001	ma/L						
Boron	ND	0.01	ma/L						
Cadmium	ND	0.0001	ma/L						
Calcium	ND	0.1	ma/L						
Chromium (VI)	ND	0.010	ma/L						
Chromium	ND	0.001	ma/L						
Copper	ND	0.0005	ma/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Sodium	ND	0.2	mg/L						
Uranium	ND	0.0001	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters			Ū						
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						
•									



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021 Order Date: 16-Mar-2021

Project Description: 61899.03

Method Quality Control: Duplicate

Analyte Result Limit Units Result SAREC Limit RPD Limit Notes Anions -		Reporting			Source		%RFC		RPD	
Ahons Chioride 94.8 1 mg/L 94.2 0.6 10 Flouride 9.2 0.1 mg/L ND ND <td< th=""><th>Analyte</th><th>Result</th><th>Limit</th><th>Units</th><th>Result</th><th>%REC</th><th>Limit</th><th>RPD</th><th>Limit</th><th>Notes</th></td<>	Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes
Chindie 94.8 1 mg/L 94.2 0.6 0 Nitride as N ND 0.1 mg/L ND ND ND Nitride as N ND 0.05 mg/L ND NC 10 Sulphate 38.8 1 mg/L 28.7 19 14 Ammonia as N 0.268 0.01 mg/L 0.251 2.5 17.7 Dissolved Organic Carbon 14.7 0.5 mg/L 13.3 8.8 3.7 Colour apparent 9 2 ACU 9 0.0 12 Conductivity 850 5 uStorn 87.8 3.0 5 Tamin & Lignin ND 0.01 mg/L ND ND 10 Subpide ND 0.02 mg/L ND ND 11 Tatal Dissolved Organic Carbon 0.2 0.1 mg/L ND ND 12 Conductivity 85.0 5 uStorn	Anions									
Function 0.22 0.1 mg/L 0.22 0.8 10 Nitrite as N ND 0.05 mg/L ND ND 10 Sulphate 38.6 1 mg/L 38.3 0.8 10 Anamionia as N 0.258 0.01 mg/L 287 1.9 14 Animonia as N 0.258 0.01 mg/L 0.251 2.5 17.7 Dissolved Organic Carbon 1.4,7 0.5 mg/L 0.251 0.0 12 Colour, apparent 9 2 ACU 9 0.0 12 Colour, apparent 9 2 ACU 9 0.0 12 Colour, apparent ND 0.01 mg/L ND ND 10 Total Koldah Nitrogen ND 0.001 mg/L ND NC 10 Total Koldah Nitrogen 0.28 0.1 mg/L ND NC 10 Total Koldah Nitrogen 0.28 0.1<	Chloride	94.8	1	mg/L	94.2			0.6	10	
Nitrite as N ND 0.1 mgL ND NC 10 Sulphale 38.6 1 mgL 38.3 0.8 10 Annonia as N 2.82 5 mgL 2.87 1.9 1.4 Annonia as N 2.25 0.11 mgL 2.87 0.0 12 Colour 15 2 TCU 15 0.0 12 Colour 15 2 TCU 15 0.0 12 Colour parent 9 2 ACU 9 0.0 12 Colour parent 8.0 5 uStorn 876 3.0 5 PH 8.0 0.1 mgL ND 0.0 10 Total Disolved Solids 544 10 mgL ND NC 10 Sulphide ND 0.01 mgL ND NC 10 Total Disolved Solids 544 10 mgL ND 10 10 <td>Fluoride</td> <td>0.22</td> <td>0.1</td> <td>ma/L</td> <td>0.22</td> <td></td> <td></td> <td>0.8</td> <td>10</td> <td></td>	Fluoride	0.22	0.1	ma/L	0.22			0.8	10	
Nthite as N ND 0.05 mg/L ND NC 10 Subphate 38.6 1 mg/L 38.3 0.8 0.8 General Inorganics Alkalinity, total 28.2 5 mg/L 2.87 1.9 1.4 Ammonia as N 0.258 0.01 mg/L 0.251 2.5 17.7 Dissolved Organic Carbon 14.7 0.5 mg/L 13.3 9.8 37 Colour, apparent 9 2 ACU 9 0.0 12 Conductivity 850 5 us/cm 876 3.0 5 pH 8.0 0.1 mg/L ND 0.5 3.3 Phenolics ND 0.02 mg/L ND NC 10 Suphate ND 0.1 mg/L ND NC 10 Total Ng/Edati Nitrogen 0.28 0.1 mg/L 0.003 0.001 mg/L 0.002 3.3 20	Nitrate as N	ND	0.1	ma/L	ND			NC	10	
Sulphaie 38.6 1 mg/L 38.3 0.8 10 General Loroganics Kakiniri, total 22 5 mg/L 287 1.9 14 Ammonia as N 0.258 0.01 mg/L 0.261 2.5 17.7 Dissolved Organic Carbon 14.7 0.5 mg/L 0.261 0.0 12 Colour 15 2 TCU 15.3 0.0 12 Colour oparent 9 2 ACU 9 0.0 12 Conductivity 850 5 uS/cm 876 3.0 5 PH 8.0 0.1 mg/L ND NC 10 Calubisoviced Solids 544 10 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 10 Calubisoviced Solids 544 10 mg/L ND NC 10 Sulphide ND 0.01	Nitrite as N	ND	0.05	ma/L	ND			NC	10	
Control No. Sec. <	Sulphate	38.6	1	ma/L	38.3			0.8	10	
Akainity, total 282 5 mg/L 287 19 14 Ammonia as N 0.258 0.01 mg/L 0.251 2.5 17.7 Disolved Organic Carbon 14.7 0.5 mg/L 13.3 9.8 37 Colour 15 2 TCU 15 0.0 12 Conductivity 850 5 uScm 876 3.0 5 pH 8.0 0.1 mg/L ND NC 10 Total Disolved Solids 544 10 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 10 Total Kjeldahl Nitrogen 0.28 0.1 mg/L ND NC 10 Tarhin & Ljpin ND 0.1 mg/L ND NC 10 Altimory 0.008 0.001 mg/L ND NC 20 Artimory 0.008 0.001 mg/L ND NC 20 Artimory 0.0008 0.001 mg/L ND NC 20 Artimory 0.002 0.01 mg/L ND NC 20 Artimory 0.000	General Inorganics			5						
Armonia as N 0.288 0.01 mgL 0.251 2.5 17.7 Dissolved Organic Carbon 14.7 0.5 mgL 13.3 9.8 37 Oclour 15 2 TCU 15 0.0 12 Colour, apparent 9 2 ACU 9 0.0 12 Conductivity 850 5 uS/cm 876 3.0 5 pH 8.0 0.1 pH/thits 8.0 0.5 3.3 Phenolics ND 0.001 mgL ND NC 10 Total Dissolved Solids 544 10 mgL ND NC 11 Total Kjedah Nitrogen 0.28 0.1 mgL ND NC 10 Tanin & Lipin ND 0.01 mgL ND NC 16 Total Kjedah Nitrogen 0.03 0.001 mgL ND NC 20 Autiminum 0.003 0.001 mgL	Alkalinity total	282	5	ma/l	287			19	14	
Dissolved Organic Carbon 14.7 0.5 mg/L 13.3 9.8 37 Colour 15 2 TCU 15 0.0 12 Colour, apparent 9 2 ACU 9 0.0 12 Conductivity 850 5 uS/cm 876 3.0 5 pH 8.0 0.1 pf/line 8.0 0.1 mg/L ND 0.5 3.3 Phenolics ND 0.02 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 10 Total Dissolved Solids 544 10 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 17 10 Metal ND 0.001 mg/L ND 0.003 6.6 20 Aluminum 0.003 0.001 mg/L ND 0.02 3.2 20	Ammonia as N	0.258	0 01	mg/L	0.251			2.5	17.7	
Colour, apparent 15 2 TCU 15 0 12 Colour, apparent 9 2 ACU 9 0.0 12 Conductivity 850 5 uls/cm 876 3.0 5 pH 8.0 0.1 pH Uhits 8.0 0.5 3.3 Phenolics ND 0.001 mg/L ND NC 10 Total Dissolved Solids 544 10 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 10 Tatal Kjeldahl Nitrogen 0.28 0.1 mg/L ND 0.30 6.8 16 Turbidity 1.7 0.1 NTU 1.6 7.2 10 Mercury ND 0.001 mg/L ND 0.02 3.3 20 Marcury 0.003 0.001 mg/L ND NC 20 Artimony 0.023 0.001 <t< td=""><td>Dissolved Organic Carbon</td><td>14 7</td><td>0.5</td><td>ma/l</td><td>13.3</td><td></td><td></td><td>9.8</td><td>37</td><td></td></t<>	Dissolved Organic Carbon	14 7	0.5	ma/l	13.3			9.8	37	
Colur, apparent p 2 ACU 9 0.0 12 Conductivity 850 5 uS/cm 876 3.0 5 pH 8.0 0.1 pH/linits 8.0 0.5 3.3 Phenolics ND 0.001 mg/L ND NC 10 Sulphide ND 0.02 mg/L ND NC 10 Total Dissolved Solids 544 10 mg/L S28 3.0 10 Tannin & Lignin ND 0.1 mg/L ND 0.30 6.8 16 Totak kjedahi Nitogen 0.28 0.1 mg/L ND 0.30 6.8 16 Totak kjedahi Nitogen 0.203 0.001 mg/L ND 0.02 16 16 Aluminum 0.003 0.001 mg/L ND NC 20 Autimum 0.023 0.001 mg/L ND 0.02 3.2 20 Cato	Colour	15	2	TCU	15			0.0	12	
Conductivity 850 5 uS/cm 876 3.0 5 pH 8.0 0.1 pH Units 8.0 0.5 3.3 Phenolics ND 0.001 mg/L ND ND ND Total Dissolved Solids 544 10 mg/L S28 3.0 10 Sulphide ND 0.02 mg/L ND ND 11 Total Dissolved Solids 544 10 mg/L 0.30 68 16 Total Kjeldshi Nitrogen 0.28 0.1 mg/L 0.30 68 16 Total Kjeldshi Nitrogen 0.28 0.1 mg/L 0.30 0.6 20 Aluminum 0.003 0.001 mg/L 0.003 0.6 20 Aluminum 0.003 0.001 mg/L ND 0.02 3.2 20 Arienic ND 0.001 mg/L ND 0.02 3.2 20 Cadrium 0.022 </td <td>Colour apparent</td> <td>9</td> <td>2</td> <td>ACU</td> <td>9</td> <td></td> <td></td> <td>0.0</td> <td>12</td> <td></td>	Colour apparent	9	2	ACU	9			0.0	12	
pH 8.0 0.1 pH Units 8.0 0.5 3.3 Phenolics ND 0.001 mg/L ND N	Conductivity	850	5	uS/cm	876			3.0	5	
phenolics ND 0.01 mg/L ND NC 10 Total Dissolved Solids 544 10 mg/L ND NC 10 Total Dissolved Solids ND 0.02 mg/L ND NC 10 Tanin & Lignin ND 0.1 mg/L ND NC 11 Total Kjeldahl Nitrogen 0.28 0.1 mg/L 0.30 6.8 16 Turbidity 1.7 0.1 NTU 1.6 7.2 10 Mercury ND 0.0001 mg/L 0.003 0.6 20 Antimony 0.003 0.001 mg/L ND NC 20 Arsenic ND 0.023 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L ND 0.02 3.3 20 Cadmium ND 0.002 0.01 mg/L ND NC 20 Cadium ND	pH	8.0	0 1	nH Units	8.0			0.5	33	
Total Dissolved Solids 544 10 mg/L 528 3.0 10 Sulphide ND 0.02 mg/L ND NC 11 Tannin & Lignin ND 0.1 mg/L 0.30 6.8 16 Turbidity 1.7 0.1 mg/L 0.30 6.8 16 Turbidity 1.7 0.1 NTU 1.6 7.2 10 Metals ND 0.0001 mg/L 0.003 0.6 20 Antimony 0.003 0.001 mg/L ND NC 20 Arsenic ND 0.001 mg/L 0.022 3.3 20 Barium 0.023 0.01 mg/L ND NC 20 Cadium 38.4 0.1 mg/L ND NC 20 Calcium ND 0.001 mg/L ND ND NC 20 Calcium ND 0.010 mg/L	Phenolics	ND	0.001	ma/l	ND			NC	10	
Total booles ontab Ora Total Total Total ND 0.02 mg/L ND NC 10 Tannin & Lignin ND 0.1 mg/L ND NC 11 Total Kjeldah Nitrogen 0.28 0.1 mg/L 0.30 6.88 16 Turbidity 1.7 0.1 NTU 1.6 7.2 10 Metals	Total Dissolved Solids	544	10	mg/L	528			3.0	10	
Optimize ND 0.01 mg/L ND	Sulphide		0.02	mg/L				NC	10	
Turning Light The Fri The The The Total Kjeldah Nitrogen 0.28 0.1 mg/L 0.30 6.8 16 Turbidity 1.7 0.1 NTU 1.6 7.2 10 Metals	Tannin & Lignin	ND	0.02	mg/L	ND			NC	10	
Number of the second	Total Kieldahl Nitrogen	0.28	0.1	mg/L	0.30			6.8	16	
Noticity N.P. O.Y. Mark N.S. Y.Z. N.S. Mercury ND 0.0001 mg/L ND 0.003 0.66 20 Aluminum 0.003 0.001 mg/L ND NC 20 Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L ND NC 20 Boron 0.02 0.01 mg/L ND NC 20 Cadmium ND 0.001 mg/L ND NC 20 Cadmium ND 0.001 mg/L ND NC 20 Cadium ND 0.001 mg/L ND NC 20 Chromium (VI) ND 0.0077 0.0005 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L ND NC 20 Magnesium 2.0 0.1 mg/L	Turbidity	1 7	0.1	NTU	1.6			7.2	10	
Mercury ND 0.0001 mg/L ND NC 20 Aluminum 0.003 0.001 mg/L 0.003 0.6 20 Antimony 0.0008 0.0005 mg/L ND NC 20 Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L 0.022 3.3 20 Boron 0.02 0.01 mg/L 0.02 3.2 20 Cadmium ND 0.0001 mg/L ND NC 20 Cadrium ND 0.001 mg/L ND NC 20 Chromium (VI) ND 0.010 mg/L ND NC 20 Chromium (VI) ND 0.01 mg/L ND NC 20 Iron ND 0.1 mg/L ND NC 20 Iron ND 0.01 mg/L ND NC 20	Metale	1.7	0.1	NIO	1.0			1.2	10	
Mercury ND 0.0001 mg/L ND NC 20 Aluminum 0.003 0.001 mg/L 0.003 0.6 20 Antimony 0.0008 0.0005 mg/L ND NC 20 Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L ND 0.02 3.2 20 Cadmium 0.02 0.01 mg/L ND NC 20 Cadmium ND 0.0001 mg/L ND NC 20 Cadmium 38.4 0.1 mg/L ND NC 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L ND NC 20 Iron ND 0.1 mg/L ND NC 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 </td <td>metais</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	metais									
Aluminum 0.003 0.001 mg/L 0.003 0.6 20 Antimony 0.0008 0.0005 mg/L ND NC 20 Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L 0.022 3.3 20 Boron 0.02 0.01 mg/L ND 0.02 3.2 20 Cadmium ND 0.0001 mg/L ND ND 20 Calcium 38.4 0.1 mg/L 38.5 0.1 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.005 mg/L ND NC 20 Icad 0.008 0.001 mg/L ND NC 20 Icad 0.008 0.001 mg/L ND NC 20 Icad 0.0005 mg/L ND NC 2	Mercury	ND	0.0001	mg/L	ND			NC	20	
Antimony 0.0008 0.0005 mg/L ND NC 20 Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L 0.022 3.2 20 Boron 0.02 0.01 mg/L ND 0.02 3.2 20 Cadmium ND 0.0001 mg/L ND NC 20 Cadrium 38.4 0.1 mg/L ND 0.02 20 Chromium (VI) ND 0.010 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L ND NC 20 Lead 0.008 0.0011 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Magnesium 0.003 0.001 mg/L ND NC 20 Selenium ND 0.001 mg/L ND	Aluminum	0.003	0.001	mg/L	0.003			0.6	20	
Arsenic ND 0.001 mg/L ND NC 20 Barium 0.023 0.001 mg/L 0.022 3.3 20 Boron 0.02 0.01 mg/L ND 0.02 20 Cadmium ND 0.0001 mg/L ND NC 20 Calcium 38.4 0.1 mg/L ND NC 20 Chromium (VI) ND 0.010 mg/L ND NC 20 Chromium ND 0.001 mg/L ND NC 20 Chromium ND 0.001 mg/L ND NC 20 Chromium ND 0.001 mg/L ND NC 20 Copper 0.0077 0.005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L 0.0008 0.001 120 120 20 20 20 20 20 20 20	Antimony	0.0008	0.0005	mg/L	ND			NC	20	
Barium 0.023 0.001 mg/L 0.022 3.3 20 Boron 0.02 0.01 mg/L 0.02 3.2 20 Cadmium ND 0.0001 mg/L ND NC 20 Calcium 38.4 0.1 mg/L ND NC 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnesee ND 0.005 mg/L 9.4 6.8 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Solium 18.8 0.2 mg/L ND NC 20 Varanium 0.003 0.001 mg/L 0.003 3.7	Arsenic	ND	0.001	mg/L	ND			NC	20	
Boron 0.02 0.01 mg/L 0.02 3.2 20 Cadmium ND 0.0001 mg/L ND NC 20 Calcium 38.4 0.1 mg/L 38.5 0.1 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.008 0.0011 mg/L 0.0079 2.5 20 Magnesium 8.8 0.2 mg/L 0.008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Selenium 0.003 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L ND 1.7 20 Uranium 0.003 0.0001 mg/L 0.003 3.7	Barium	0.023	0.001	mg/L	0.022			3.3	20	
Cadmium ND 0.0001 mg/L ND NC 20 Calcium 38.4 0.1 mg/L 38.5 0.1 20 Chromium (VI) ND 0.010 mg/L ND NC 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Sodium 18.8 0.2 mg/L ND NC 20 Varantum 0.003 0.001 mg/L 0.003 3.7 20 Sodium 18.8 0.2 mg/L 0.039 0.5	Boron	0.02	0.01	mg/L	0.02			3.2	20	
Calcium 38.4 0.1 mg/L 38.5 0.1 20 Chromium (VI) ND 0.010 mg/L ND ND 20 Chromium (VI) ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.001 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Sodium 18.8 0.2 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 0.039 0.5 20 Wirenbiological Parameters E coli MD 1 CFU/	Cadmium	ND	0.0001	mg/L	ND			NC	20	
Chromium (VI) ND 0.010 mg/L ND NC 20 Chromium ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Potassium 2.0 0.1 mg/L ND NC 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L ND NC 20 Sodium 0.003 0.0001 mg/L ND NC 20 Sodium 0.003 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E.coli ND 1 CFU/100 mL <t< td=""><td>Calcium</td><td>38.4</td><td>0.1</td><td>mg/L</td><td>38.5</td><td></td><td></td><td>0.1</td><td>20</td><td></td></t<>	Calcium	38.4	0.1	mg/L	38.5			0.1	20	
Chromium ND 0.001 mg/L ND NC 20 Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L ND NC 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.003 0.001 mg/L 0.003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E coli ND 1 CFU/100 mL<	Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Copper 0.0077 0.0005 mg/L 0.0079 2.5 20 Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.0039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E Coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 10	Chromium	ND	0.001	mg/L	ND			NC	20	
Iron ND 0.1 mg/L ND NC 20 Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.003 0.005 mg/L 0.003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E Coli ND 1 CFU/100 mL ND 1.5 20 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Fotal Coliforms ND 1	Copper	0.0077	0.0005	mg/L	0.0079			2.5	20	
Lead 0.0008 0.0001 mg/L 0.0008 4.1 20 Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.003 0.005 mg/L 0.003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E coli ND 1 CFU/100 mL ND 0.5 20 Microbiological Coliforms ND 1 CFU/100 mL ND 30 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count <td< td=""><td>Iron</td><td>ND</td><td>0.1</td><td>mg/L</td><td>ND</td><td></td><td></td><td>NC</td><td>20</td><td></td></td<>	Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium 8.8 0.2 mg/L 9.4 6.8 20 Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.003 0.001 mg/L 0.003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E coli ND 1 CFU/100 mL ND 1.5 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Fotal Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/100 mL ND NC 30	Lead	0.0008	0.0001	mg/L	0.0008			4.1	20	
Manganese ND 0.005 mg/L ND NC 20 Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.003 0.001 mg/L 0.003 3.7 20 Zinc 0.39 0.05 mg/L 0.039 0.5 20 Microbiological Parameters K K K K K K K E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/100 mL ND NC 30	Magnesium	8.8	0.2	mg/L	9.4			6.8	20	
Potassium 2.0 0.1 mg/L 2.0 1.7 20 Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.0003 0.0001 mg/L 0.0003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Manganese	ND	0.005	mg/L	ND			NC	20	
Selenium ND 0.001 mg/L ND NC 20 Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.0003 0.0001 mg/L 0.0003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Potassium	2.0	0.1	mg/L	2.0			1.7	20	
Sodium 18.8 0.2 mg/L 19.5 3.4 20 Uranium 0.0003 0.0001 mg/L 0.0003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Selenium	ND	0.001	mg/L	ND			NC	20	
Uranium 0.0003 0.0001 mg/L 0.0003 3.7 20 Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Sodium	18.8	0.2	mg/L	19.5			3.4	20	
Zinc 0.039 0.005 mg/L 0.039 0.5 20 Microbiological Parameters E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Uranium	0.0003	0.0001	mg/L	0.0003			3.7	20	
Microbiological Parameters ND 1 CFU/100 mL ND NC 30 E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Zinc	0.039	0.005	mg/L	0.039			0.5	20	
E. coli ND 1 CFU/100 mL ND NC 30 Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Microbiological Parameters									
Fecal Coliforms ND 1 CFU/100 mL ND NC 30 Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	E. coli	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms ND 1 CFU/100 mL ND NC 30 Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Heterotrophic Plate Count ND 10 CFU/mL ND NC 30	Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	
	Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	



Client: GEMTEC Consulting Engineers and Scientists Limited Client PO:

Order #: 2112287

Report Date: 23-Mar-2021

Order Date: 16-Mar-2021

Project Description: 61899.03

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.74	1	mg/L	ND	97.4	85-115			
Fluoride	1.17	0.1	mg/L	0.22	94.7	79-121			
Nitrate as N	1.06	0.1	mg/L	ND	106	79-120			
Nitrite as N	1.03	0.05	mg/L	ND	103	84-117			
Sulphate	47.0	1	mg/L	38.3	86.7	74-126			
General Inorganics									
Ammonia as N	0.503	0.01	mg/L	0.251	101	81-124			
Dissolved Organic Carbon	20.6	0.5	mg/L	13.3	73.3	60-133			
Phenolics	0.028	0.001	mg/L	ND	111	69-132			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.51	0.02	mg/L	ND	102	79-115			
Tannin & Lignin	1.1	0.1	mg/L	ND	106	71-113			
Total Kjeldahl Nitrogen	2.00	0.1	mg/L	0.37	81.8	81-126			
Metals									
Mercury	0.0033	0.0001	mg/L	ND	108	70-130			
Aluminum	46.1	0.001	mg/L	3.42	85.4	80-120			
Antimony	49.2	0.0005	mg/L	0.175	98.1	80-120			
Arsenic	49.2	0.001	mg/L	0.788	96.8	80-120			
Barium	69.7	0.001	mg/L	22.4	94.6	80-120			
Boron	64.9	0.01	mg/L	23.8	82.2	80-120			
Cadmium	46.7	0.0001	mg/L	0.0378	93.3	80-120			
Calcium	47400	0.1	mg/L	38500	89.8	80-120			
Chromium (VI)	0.209	0.010	mg/L	ND	104	70-130			
Chromium	51.5	0.001	mg/L	0.296	102	80-120			
Copper	54.0	0.0005	mg/L	7.90	92.3	80-120			
Iron	2370	0.1	mg/L	28.0	93.7	80-120			
Lead	40.0	0.0001	mg/L	0.833	78.4	80-120		Q	S-02
Magnesium	19500	0.2	mg/L	9380	101	80-120			
Manganese	50.7	0.005	mg/L	0.652	100	80-120			
Potassium	13700	0.1	mg/L	2000	117	80-120			
Selenium	46.0	0.001	mg/L	0.151	91.8	80-120			
Sodium	29600	0.2	mg/L	19500	101	80-120			
Uranium	41.8	0.0001	mg/L	0.330	83.0	80-120			
Zinc	82.1	0.005	mg/L	39.0	86.1	80-120			



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

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 Report Date: 23-Mar-2021 Order Date: 16-Mar-2021 Project Description: 61899.03



RELIABLE.

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

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO: Project: 61899.03 Custody: 14579

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Order #: 2112452

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

Paracel ID **Client ID** 2112452-01 TW21-16 48h

Approved By:

Mark Foto

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



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

Analysis Summary Table

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Project Description: 61899.03

Analysis	Method Reference/Description	Extraction Date	Analysis Date	
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-Mar-21	22-Mar-21	
Ammonia, as N	EPA 351.2 - Auto Colour	22-Mar-21	23-Mar-21	
Anions	EPA 300.1 - IC	18-Mar-21	18-Mar-21	
Chromium, hexavalent - water	MOE E3056 - colourimetric	19-Mar-21	19-Mar-21	
Colour	SM2120 - Spectrophotometric	18-Mar-21	18-Mar-21	
Colour, apparent	SM2120 - Spectrophotometric	18-Mar-21	18-Mar-21	
Conductivity	EPA 9050A- probe @25 °C	22-Mar-21	22-Mar-21	
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	18-Mar-21	18-Mar-21	
E. coli	MOE E3407	18-Mar-21	18-Mar-21	
Fecal Coliform	SM 9222D	18-Mar-21	18-Mar-21	
Heterotrophic Plate Count	SM 9215C	18-Mar-21	20-Mar-21	
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	19-Mar-21	23-Mar-21	
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Mar-21	18-Mar-21	
рН	EPA 150.1 - pH probe @25 °C	22-Mar-21	22-Mar-21	
Phenolics	EPA 420.2 - Auto Colour, 4AAP	19-Mar-21	19-Mar-21	
Hardness	Hardness as CaCO3	18-Mar-21	18-Mar-21	
Sulphide	SM 4500SE - Colourimetric	18-Mar-21	18-Mar-21	
Tannin/Lignin	SM 5550B - Colourimetric	22-Mar-21	22-Mar-21	
Total Coliform	MOE E3407	18-Mar-21	18-Mar-21	
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-Mar-21	22-Mar-21	
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Mar-21	22-Mar-21	
Turbidity	SM 2130B - Turbidity meter	18-Mar-21	18-Mar-21	



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021

Order Date: 17-Mar-2021

Project Description: 61899.03

	Client ID:	TW21-16 48h	-	-	-
	Sample Date:	17-Mar-21 09:00 2112452-01	-	-	-
	Sample ID:	Drinking Water	_	-	-
Microbiological Parameters	MDL/OIIIts				
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	279	-	-	-
Ammonia as N	0.01 mg/L	0.14	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.4	-	-	-
Colour	2 TCU	8	-	-	-
Colour, apparent	2 ACU	24	-	-	-
Conductivity	5 uS/cm	961	-	-	-
Hardness	mg/L	335	-	-	-
рН	0.1 pH Units	8.0	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	500	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-
Turbidity	0.1 NTU	2.9	-	-	-
Anions	•				
Chloride	1 mg/L	122	-	-	-
Fluoride	0.1 mg/L	0.2	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	42	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	-	-	-
Aluminum	0.001 mg/L	0.060	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-
Arsenic	0.001 mg/L	0.001	-	-	-
Barium	0.001 mg/L	0.231	-	-	-
Boron	0.01 mg/L	0.18	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Calcium	0.1 mg/L	85.9	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Order #: 2112452

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Project Description: 61899.03

	Client ID:	TW21-16 48h	-	-	-
	Sample Date:	17-Mar-21 09:00	-	-	-
	Sample ID:	2112452-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Chromium (VI)	0.010 mg/L	<0.010	-	-	-
Copper	0.0005 mg/L	<0.0005	-	-	-
Iron	0.1 mg/L	0.3	-	-	-
Lead	0.0001 mg/L	0.0001	-	-	-
Magnesium	0.2 mg/L	29.4	-	-	-
Manganese	0.005 mg/L	0.029	-	-	-
Potassium	0.1 mg/L	5.7	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-
Sodium	0.2 mg/L	82.2	-	-	-
Uranium	0.0001 mg/L	0.0007	-	-	-
Zinc	0.005 mg/L	<0.005	-	-	-


Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Project Description: 61899.03

Method Quality Control: Blank

		Reporting		Source		%REC		RPD	
Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes
Anions									
Chloride	ND	1	ma/l						
Fluoride	ND	0.1	ma/l						
Nitrate as N	ND	0.1	ma/l						
Nitrite as N	ND	0.05	ma/l						
Sulphate	ND	1	ma/l						
General Inorganics									
Alkalinity, total	ND	5	ma/L						
Ammonia as N	ND	0.01	ma/L						
Dissolved Organic Carbon	ND	0.5	ma/l						
Colour	ND	2	TCU						
Colour apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0 001	ma/l						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.02	mg/L						
Total Kieldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTL						
Metals	ND	0.1	NIG						
Mercupy		0.0001	ma/l						
Aluminum		0.0001	mg/L						
Antimony		0.001	mg/L						
Amenio		0.0005	mg/L						
Arsenic		0.001	mg/L						
Baran		0.001	mg/L						
Cadmium		0.01	mg/L						
Calcium		0.0001	mg/L						
		0.1	mg/L						
Chromium		0.010	mg/L						
Conpor		0.001	mg/L						
lrop		0.0005	mg/L						
Lead		0.001	mg/L						
Magaaaium		0.0001	mg/L						
Magnesium		0.2	mg/L						
Potossium		0.005	mg/L						
Solonium		0.1	mg/L						
Selenium		0.001	mg/L						
Soulum		0.2	mg/L						
Zino		0.0001	mg/L						
Zille Microhiological Derematore	ND	0.005	mg/L						
wicrobiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Iotal Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Project Description: 61899.03

Method Quality Control: Duplicate

		Reporting				%REC		RPD	RPD	
Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes	
Anions										
Chloride	94.8	1	mg/L	94.2			0.6	10		
Fluoride	0.22	0.1	ma/L	0.22			0.8	10		
Nitrate as N	ND	0.1	ma/L	ND			NC	10		
Nitrite as N	ND	0.05	ma/L	ND			NC	10		
Sulphate	38.6	1	ma/L	38.3			0.8	10		
General Inorganics										
Alkalinity total	282	5	ma/l	287			19	14		
Ammonia as N	0 166	0.01	mg/L	0 168			1.0	17.7		
Dissolved Organic Carbon	14 7	0.5	mg/L	13.3			9.8	37		
Colour	8	2	TCU	8			0.0	12		
Colour apparent	25	2	ACU	24			4 1	12		
Conductivity	850	5	uS/cm	876			3.0	5		
nH	8.0	01	nH Inite	8.0			0.0	33		
Phenolics		0.001	ma/l				NC	10		
Total Dissolved Solids	544	10	mg/L	528			3.0	10		
Sulphide		0.02	mg/L	ND			NC	10		
		0.02	mg/L				NC	10		
Total Kieldahl Nitrogen	0.28	0.1	mg/L	0.30			6.8	16		
	2.0	0.1	NTU	0.30			0.0	10		
	3.0	0.1	NIU	2.9			2.0	10		
Metals										
Mercury	ND	0.0001	mg/L	ND			NC	20		
Aluminum	0.056	0.001	mg/L	0.057			2.0	20		
Antimony	ND	0.0005	mg/L	ND			NC	20		
Arsenic	ND	0.001	mg/L	ND			NC	20		
Barium	0.012	0.001	mg/L	0.012			0.7	20		
Boron	ND	0.01	mg/L	ND			NC	20		
Cadmium	ND	0.0001	mg/L	ND			NC	20		
Calcium	9.4	0.1	mg/L	9.4			0.0	20		
Chromium (VI)	ND	0.010	mg/L	ND			NC	20		
Chromium	ND	0.001	mg/L	ND			NC	20		
Copper	0.0041	0.0005	mg/L	0.0040			0.3	20		
Iron	ND	0.1	mg/L	ND			NC	20		
Lead	0.0010	0.0001	mg/L	0.0010			5.0	20		
Magnesium	2.3	0.2	mg/L	2.3			2.7	20		
Manganese	ND	0.005	mg/L	ND			NC	20		
Potassium	0.8	0.1	mg/L	0.8			0.2	20		
Selenium	ND	0.001	mg/L	ND			NC	20		
Sodium	17.1	0.2	mg/L	17.2			0.6	20		
Uranium	ND	0.0001	mg/L	ND			NC	20		
Zinc	0.008	0.005	mg/L	0.008			1.0	20		
Microbiological Parameters										
E. coli	ND	1	CFU/100 mL	ND			NC	30		
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30		
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30		
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30		



Client: GEMTEC Consulting Engineers and Scientists Limited Client PO: Report Date: 23-Mar-2021 Order Date: 17-Mar-2021

Project Description: 61899.03

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.74	1	mg/L	ND	97.4	85-115			
Fluoride	1.17	0.1	mg/L	0.22	94.7	79-121			
Nitrate as N	1.06	0.1	mg/L	ND	106	79-120			
Nitrite as N	1.03	0.05	mg/L	ND	103	84-117			
Sulphate	47.0	1	mg/L	38.3	86.7	74-126			
General Inorganics									
Ammonia as N	0.421	0.01	mg/L	0.168	101	81-124			
Dissolved Organic Carbon	20.6	0.5	mg/L	13.3	73.3	60-133			
Phenolics	0.025	0.001	mg/L	ND	99.7	69-132			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.51	0.02	mg/L	ND	102	79-115			
Tannin & Lignin	1.1	0.1	mg/L	ND	106	71-113			
Total Kjeldahl Nitrogen	2.00	0.1	mg/L	0.37	81.8	81-126			
Metals									
Mercury	0.0032	0.0001	mg/L	ND	108	70-130			
Aluminum	65.5	0.001	mg/L	24.2	82.6	80-120			
Antimony	54.5	0.0005	mg/L	0.436	108	80-120			
Arsenic	50.1	0.001	mg/L	0.202	99.8	80-120			
Barium	67.1	0.001	mg/L	12.4	109	80-120			
Boron	53.3	0.01	mg/L	5.80	94.9	80-120			
Cadmium	53.2	0.0001	mg/L	0.0432	106	80-120			
Chromium (VI)	0.209	0.010	mg/L	ND	104	70-130			
Chromium	54.4	0.001	mg/L	0.136	109	80-120			
Copper	54.0	0.0005	mg/L	4.05	99.8	80-120			
Iron	2460	0.1	mg/L	72.7	95.6	80-120			
Lead	46.3	0.0001	mg/L	0.954	90.6	80-120			
Magnesium	14000	0.2	mg/L	2330	116	80-120			
Manganese	56.8	0.005	mg/L	3.51	107	80-120			
Potassium	12200	0.1	mg/L	731	115	80-120			
Selenium	49.2	0.001	mg/L	0.113	98.2	80-120			
Sodium	27500	0.2	mg/L	17200	103	80-120			
Uranium	45.1	0.0001	mg/L	0.0398	90.0	80-120			
Zinc	65.4	0.005	mg/L	8.08	115	80-120			



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

Order #: 2112452

Report Date: 23-Mar-2021 Order Date: 17-Mar-2021 Project Description: 61899.03

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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



RELIABLE.

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

Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

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

Client PO: Project: 61899.03 Custody: 13283

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Order #: 2112541

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

Paracel ID **Client ID** 2112541-01

TW21-1C 72hr

Approved By:

Mark Foto

Mark Foto, M.Sc. Lab Supervisor

Any use of these results implies your agreement that our total liability in connection with this work, however arising, shall be limited to the amount paid by you for this work, and that our employees or agents shall not under any circumstances be liable to you in connection with this work.



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

Analysis Summary Table

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-Mar-21	23-Mar-21
Ammonia, as N	EPA 351.2 - Auto Colour	22-Mar-21	23-Mar-21
Anions	EPA 300.1 - IC	22-Mar-21	22-Mar-21
Chromium, hexavalent - water	MOE E3056 - colourimetric	19-Mar-21	19-Mar-21
Colour	SM2120 - Spectrophotometric	19-Mar-21	19-Mar-21
Colour, apparent	SM2120 - Spectrophotometric	19-Mar-21	19-Mar-21
Conductivity	EPA 9050A- probe @25 °C	22-Mar-21	23-Mar-21
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	23-Mar-21	23-Mar-21
E. coli	MOE E3407	19-Mar-21	19-Mar-21
Fecal Coliform	SM 9222D	19-Mar-21	19-Mar-21
Heterotrophic Plate Count	SM 9215C	20-Mar-21	22-Mar-21
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	19-Mar-21	23-Mar-21
Metals, ICP-MS	EPA 200.8 - ICP-MS	19-Mar-21	19-Mar-21
рН	EPA 150.1 - pH probe @25 °C	22-Mar-21	23-Mar-21
PHC F1	CWS Tier 1 - P&T GC-FID	22-Mar-21	23-Mar-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	23-Mar-21	24-Mar-21
Phenolics	EPA 420.2 - Auto Colour, 4AAP	19-Mar-21	19-Mar-21
REG 153: VOCs by P&T GC/MS	EPA 624 - P&T GC-MS	22-Mar-21	23-Mar-21
Hardness	Hardness as CaCO3	19-Mar-21	19-Mar-21
Sulphide	SM 4500SE - Colourimetric	23-Mar-21	23-Mar-21
Tannin/Lignin	SM 5550B - Colourimetric	22-Mar-21	22-Mar-21
Total Coliform	MOE E3407	19-Mar-21	19-Mar-21
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-Mar-21	22-Mar-21
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Mar-21	22-Mar-21
Turbidity	SM 2130B - Turbidity meter	19-Mar-21	19-Mar-21



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021

Order Date: 18-Mar-2021

Project Description: 61899.03

	_				
	Client ID:	TW21-1C 72hr	-	-	-
	Sample Date:	18-Mar-21 12:00 2112541-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	279	-	-	-
Ammonia as N	0.01 mg/L	0.14	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.7	-	-	-
Colour	2 TCU	7	-	-	-
Colour, apparent	2 ACU	19	-	-	-
Conductivity	5 uS/cm	1040	-	-	-
Hardness	mg/L	334	-	-	-
рН	0.1 pH Units	8.2	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	514	-	-	-
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	2.0	-	-	-
Anions					
Chloride	1 mg/L	138	-	-	-
Fluoride	0.1 mg/L	0.5	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	44	-	-	-
Metals					
Mercury	0.0001 mg/L	<0.0001	-	-	-
Aluminum	0.001 mg/L	0.026	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-
Arsenic	0.001 mg/L	0.001	-	-	-
Barium	0.001 mg/L	0.226	-	-	-
Boron	0.01 mg/L	0.20	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-
Calcium	0.1 mg/L	85.2	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021

Order Date: 18-Mar-2021

Project Description: 61899.03

	Client ID: Sample Date:	TW21-1C 72hr 18-Mar-21 12:00	-	-	-
	Sample ID:	2112541-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Chromium (VI)	0.010 mg/L	<0.010	-	-	-
Copper	0.0005 mg/L	<0.0005	-	-	-
Iron	0.1 mg/L	0.3	-	-	-
Lead	0.0001 mg/L	0.0001	-	-	-
Magnesium	0.2 mg/L	29.4	-	-	-
Manganese	0.005 mg/L	0.029	-	-	-
Potassium	0.1 mg/L	5.9	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-
Sodium	0.2 mg/L	87.3	-	-	-
Uranium	0.0001 mg/L	0.0008	-	-	-
Zinc	0.005 mg/L	0.007	-	-	-
Volatiles					
Acetone	0.0050 mg/L	<0.0050	-	-	-
Benzene	0.0005 mg/L	<0.0005	-	-	-
Bromodichloromethane	0.0005 mg/L	<0.0005	-	-	-
Bromoform	0.0005 mg/L	<0.0005	-	-	-
Bromomethane	0.0005 mg/L	<0.0005	-	-	-
Carbon Tetrachloride	0.0002 mg/L	<0.0002	-	-	-
Chlorobenzene	0.0005 mg/L	<0.0005	-	-	-
Chloroform	0.0005 mg/L	<0.0005	-	-	-
Dibromochloromethane	0.0005 mg/L	<0.0005	-	-	-
Dichlorodifluoromethane	0.0010 mg/L	<0.0010	-	-	-
1,2-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,3-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,4-Dichlorobenzene	0.0005 mg/L	<0.0005	-	-	-
1,1-Dichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,2-Dichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,1-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-
cis-1,2-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-
trans-1,2-Dichloroethylene	0.0005 mg/L	<0.0005	-	-	-
1,2-Dichloropropane	0.0005 mg/L	<0.0005	-	-	-
cis-1,3-Dichloropropylene	0.0005 mg/L	<0.0005	-	-	-
trans-1,3-Dichloropropylene	0.0005 mg/L	<0.0005	-	-	-
1,3-Dichloropropene, total	0.0005 mg/L	<0.0005	-	-	-
Ethylbenzene	0.0005 mg/L	<0.0005	-	-	-
Ethylene dibromide (dibromoethane, 1,2-)	0.200 mg/L	<0.200	-	-	-

PARACEL LABORATORIES LTD.

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021

Order Date: 18-Mar-2021

Project Description: 61899.03

	r				
	Client ID:	TW21-1C 72hr	-	-	-
	Sample Date:	18-Mar-21 12:00	-	-	-
	Sample ID:	2112541-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Hexane	0.0010 mg/L	<0.0010	-	-	-
Methyl Ethyl Ketone (2-Butanone)	0.0050 mg/L	<0.0050	-	-	-
Methyl Isobutyl Ketone	0.0050 mg/L	<0.0050	-	-	-
Methyl tert-butyl ether	0.0020 mg/L	<0.0020	-	-	-
Methylene Chloride	0.0050 mg/L	<0.0050	-	-	-
Styrene	0.0005 mg/L	<0.0005	-	-	-
1,1,1,2-Tetrachloroethane	0.0005 mg/L	<0.0005	-	-	-
1,1,2,2-Tetrachloroethane	0.0005 mg/L	<0.0005	-	-	-
Tetrachloroethylene	0.0005 mg/L	<0.0005	-	-	-
Toluene	0.0005 mg/L	<0.0005	-	-	-
1,1,1-Trichloroethane	0.0005 mg/L	<0.0005	-	-	-
1,1,2-Trichloroethane	0.0005 mg/L	<0.0005	-	-	-
Trichloroethylene	0.0005 mg/L	<0.0005	-	-	-
Trichlorofluoromethane	0.0010 mg/L	<0.0010	-	-	-
Vinyl chloride	0.0002 mg/L	<0.0002	-	-	-
m,p-Xylenes	0.0005 mg/L	<0.0005	-	-	-
o-Xylene	0.0005 mg/L	<0.0005	-	-	-
Xylenes, total	0.0005 mg/L	<0.0005	-	-	-
4-Bromofluorobenzene	Surrogate	91.9%	-	-	-
Dibromofluoromethane	Surrogate	85.9%	-	-	-
Toluene-d8	Surrogate	107%	-	-	-
Hydrocarbons			• • • •		
F1 PHCs (C6-C10)	0.0250 mg/L	<0.0250	-	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	-	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	-	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	-	-	-



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	ICU						
Colour, apparent	ND	2	ACU						
Conductivity	ND	5	uS/cm						
Total Dissolved Solida		0.001	mg/L						
Sulphide		0.02	mg/L						
Tannin & Lignin		0.02	mg/L						
Total Kieldahl Nitrogen		0.1	mg/L						
Turbidity	ND	0.1	NTI I						
Hydrocarbons	ND	0.1	NTO .						
- F2 PHCs (C10-C16) - PAHs	0.0		ma/l						
E3 PHCs (C16-C34) - PAHs	0.0		mg/L						
F1 PHCs (C6-C10)	ND	0.0250	ma/L						
F2 PHCs (C10-C16)	ND	0.1	ma/L						
F3 PHCs (C16-C34)	ND	0.1	mg/L						
F4 PHCs (C34-C50)	ND	0.1	mg/L						
Metals			Ū						
Mercury	ND	0.0001	ma/l						
Aluminum	ND	0.0001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	ma/L						
Barium	ND	0.001	ma/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium (VI)	ND	0.010	mg/L						
Chromium	ND	0.001	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Selenium		0.001	mg/L						
Socium		0.2	mg/L						
Zinc	ND	0.0001	mg/L						
Microbiological Parameters		0.000							
E coli	ND	1	CEU/100 ml						
Fecal Coliforms	ND	1	CFU/100 ml						
Total Coliforms	ND	1	CFU/100 ml						
Heterotrophic Plate Count	ND	10	CFU/mL						
Volatiles									
Acetone	ND	0 0050	ma/l						
Renzene	ND	0.0005	ma/L						
Bromodichloromethane	ND	0 0005	ma/l						
Bromoform	ND	0.0005	ma/L						
Bromomethane	ND	0.0005	mg/L						
			5						



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Method Quality Control: Blank

Analyte	Result	Reporting	Units	Source Result	%REC	%REC	RPD	RPD Limit	Notes
				result	, in the o	Linin		Linit	
Carbon Tetrachloride	ND	0.0002	mg/L						
Chlorobenzene	ND	0.0005	mg/L						
Chloroform	ND	0.0005	mg/L						
Dibromochloromethane	ND	0.0005	mg/L						
Dichlorodifluoromethane	ND	0.0010	mg/L						
1,2-Dichlorobenzene	ND	0.0005	mg/L						
1,3-Dichlorobenzene	ND	0.0005	mg/L						
1,4-Dichlorobenzene	ND	0.0005	mg/L						
1,1-Dichloroethane	ND	0.0005	mg/L						
1,2-Dichloroethane	ND	0.0005	mg/L						
1,1-Dichloroethylene	ND	0.0005	mg/L						
cis-1,2-Dichloroethylene	ND	0.0005	mg/L						
trans-1,2-Dichloroethylene	ND	0.0005	mg/L						
1,2-Dichloropropane	ND	0.0005	mg/L						
cis-1,3-Dichloropropylene	ND	0.0005	mg/L						
trans-1,3-Dichloropropylene	ND	0.0005	mg/L						
1,3-Dichloropropene, total	ND	0.0005	mg/L						
Ethylbenzene	ND	0.0005	mg/L						
Ethylene dibromide (dibromoethane, 1,2	ND	0.200	mg/L						
Hexane	ND	0.0010	mg/L						
Methyl Ethyl Ketone (2-Butanone)	ND	0.0050	mg/L						
Methyl Isobutyl Ketone	ND	0.0050	mg/L						
Methyl tert-butyl ether	ND	0.0020	mg/L						
Methylene Chloride	ND	0.0050	mg/L						
Styrene	ND	0.0005	mg/L						
1,1,1,2-Tetrachloroethane	ND	0.0005	mg/L						
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L						
Tetrachloroethylene	ND	0.0005	ma/L						
Toluene	ND	0.0005	ma/L						
1.1.1-Trichloroethane	ND	0.0005	ma/L						
1.1.2-Trichloroethane	ND	0.0005	ma/L						
Trichloroethylene	ND	0.0005	mg/L						
Trichlorofluoromethane	ND	0.0010	ma/l						
Vinvl chloride	ND	0.0002	ma/l						
m n-Xvlenes	ND	0.0005	mg/L						
o-Xvlene	ND	0.0005	mg/L						
Xylenes total	ND	0.0005	mg/L						
Surrogate: 4-Bromofluorobenzene	0.0731	0.0000	ma/l		913	50-140			
Surrogate: Dibromofluoromethane	0.0686		ma/l		85.8	50 140			
Surrogate. Distontionation	0.0000		ma/l		107	50-140			
Surrogate: 1010ene-av	0.0859		mg/L		107	50-140			



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Method Quality Control: Duplicate

		Reporting		Source		%REC		RPD	
Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes
Anions									
Chloride	7.02	1	mg/L	7.12			1.4	10	
Fluoride	0.71	0.1	mg/L	0.73			2.9	10	
Nitrate as N	0.59	0.1	mg/L	0.60			1.6	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	24.6	1	mg/L	24.8			0.9	10	
General Inorganics									
Alkalinity total	282	5	ma/l	287			19	14	
Ammonia as N	0 166	0 01	mg/L	0 168			1.0	17 7	
Dissolved Organic Carbon	4.0	0.5	mg/L	3.3			19.6	37	
Colour	8	2	TCU	8			0.0	12	
Colour apparent	19	2	ACU	19			0.0	12	
Conductivity	850	5	uS/cm	876			3.0	5	
pH	8.0	0 1	nH Units	8.0			0.5	33	
Phenolics	ND	0.001	ma/l	ND			NC	10	
Total Dissolved Solids	544	10	mg/L	528			3.0	10	
Sulphide		0.02	mg/L				NC	10	
Tannin & Lignin	ND	0.02	mg/L	ND			NC	10	
Total Kieldahl Nitrogen	0.28	0.1	mg/L	0.30			6.8	16	
Turbidity	18.7	0.1	NTU	18.6			0.0	10	
Hydrocarbons	10.7	0.1	NIO	10.0			0.5	10	
F1 PHCs (C6-C10)	ND	0.0250	mg/L	ND			NC	30	
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	0.023	0.001	mg/L	0.022			3.2	20	
Boron	0.06	0.01	mg/L	0.06			0.8	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	94.1	0.1	mg/L	93.3			0.9	20	
Chromium (VI)	ND	0.010	mg/L	ND			NC	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Copper	0.0052	0.0005	mg/L	0.0054			3.7	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0004	0.0001	mg/L	0.0005			16.6	20	
Magnesium	26.3	0.2	mg/L	25.9			1.4	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	3.2	0.1	mg/L	3.1			2.0	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Sodium	10.7	0.2	mg/L	11.0			3.5	20	
Uranium	ND	0.0001	mg/L	0.0001			NC	20	
Zinc	0.005	0.005	mg/L	0.005			1.1	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	1			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	
Volatiles									
Acetone	ND	0 0050	ma/l	ND			NC	30	
Renzene	ND	0.0005	mg/L				NC	30	
Bromodichloromethane	ND	0.0005	ma/L	ND			NC	30	
Bromoform	ND	0.0005	mg/L				NC	30	
Bromomethane	ND	0.0005	mg/L				NC	30	
Carbon Tetrachloride		0.0005	mg/L				NC	30	
Chlorobenzene	ND	0.0002	mg/L				NC	30	
	ND	0.0000	ing/L				NO	50	



Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Method Quality Control: Duplicate

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

		Reporting		Source		%REC		RPD	
Analyte	Result	Limit	Units	Result	%REC	Limit	RPD	Limit	Notes
Chloroform	ND	0.0005	ma/L	ND			NC	30	
Dibromochloromethane	ND	0.0005	ma/L	ND			NC	30	
Dichlorodifluoromethane	ND	0.0010	ma/l	ND			NC	30	
1.2-Dichlorobenzene	ND	0.0005	ma/L	ND			NC	30	
1.3-Dichlorobenzene	ND	0.0005	ma/L	ND			NC	30	
1.4-Dichlorobenzene	ND	0.0005	ma/L	ND			NC	30	
1.1-Dichloroethane	ND	0.0005	ma/L	ND			NC	30	
1.2-Dichloroethane	ND	0.0005	ma/L	ND			NC	30	
1.1-Dichloroethylene	ND	0.0005	ma/L	ND			NC	30	
cis-1.2-Dichloroethylene	ND	0.0005	ma/L	ND			NC	30	
trans-1.2-Dichloroethvlene	ND	0.0005	ma/L	ND			NC	30	
1.2-Dichloropropane	ND	0.0005	ma/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.0005	mg/L	ND			NC	30	
Ethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Ethylene dibromide (dibromoethane, 1,2	ND	0.200	mg/L	ND			NC	30	
Hexane	ND	0.0010	mg/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	0.0050	mg/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	0.0050	mg/L	ND			NC	30	
Methyl tert-butyl ether	ND	0.0020	mg/L	ND			NC	30	
Methylene Chloride	ND	0.0050	mg/L	ND			NC	30	
Styrene	ND	0.0005	mg/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.0005	mg/L	ND			NC	30	
Tetrachloroethylene	ND	0.0005	mg/L	ND			NC	30	
Toluene	ND	0.0005	mg/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.0005	mg/L	ND			NC	30	
Trichloroethylene	ND	0.0005	mg/L	ND			NC	30	
Trichlorofluoromethane	ND	0.0010	mg/L	ND			NC	30	
Vinyl chloride	ND	0.0002	mg/L	ND			NC	30	
m,p-Xylenes	ND	0.0005	mg/L	ND			NC	30	
o-Xylene	ND	0.0005	mg/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	0.0717		mg/L		89.6	50-140			
Surrogate: Dibromofluoromethane	0.0754		mg/L		94.2	50-140			
Surrogate: Toluene-d8	0.0864		mg/L		108	50-140			



Client: GEMTEC Consulting Engineers and Scientists Limited Client PO: Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.7	1	mg/L	7.12	95.6	77-123			
Fluoride	1.54	0.1	mg/L	0.73	80.7	79-121			
Nitrate as N	1.60	0.1	mg/L	0.60	100	79-120			
Nitrite as N	0.914	0.05	mg/L	ND	91.4	84-117			
Sulphate	33.2	1	mg/L	24.8	84.1	74-126			
General Inorganics									
Ammonia as N	0.421	0.01	mg/L	0.168	101	81-124			
Dissolved Organic Carbon	13.9	0.5	mg/L	3.3	107	60-133			
Phenolics	0.025	0.001	mg/L	ND	99.7	69-132			
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	1.1	0.1	mg/L	ND	106	71-113			
Total Kjeldahl Nitrogen	2.00	0.1	mg/L	0.37	81.8	81-126			
Hydrocarbons									
F1 PHCs (C6-C10)	2.21	0.0250	mg/L	ND	110	68-117			
F2 PHCs (C10-C16)	1.4	0.1	mg/L	ND	86.2	60-140			
F3 PHCs (C16-C34)	3.7	0.1	mg/L	ND	95.3	60-140			
F4 PHCs (C34-C50)	2.2	0.1	mg/L	ND	89.5	60-140			
Metals									
Mercury	0.0032	0.0001	mg/L	ND	108	70-130			
Aluminum	42.2	0.001	mg/L	ND	84.4	80-120			
Antimony	42.6	0.0005	mg/L	ND	85.1	80-120			
Arsenic	49.9	0.001	mg/L	0.135	99.5	80-120			
Barium	68.3	0.001	mg/L	22.5	91.7	80-120			
Boron	55.4	0.01	mg/L	9.16	92.6	80-120			
Cadmium	45.3	0.0001	mg/L	0.0603	90.5	80-120			
Calcium	20800	0.1	mg/L	9130	117	80-120			
Chromium (VI)	0.209	0.010	mg/L	ND	104	70-130			
Chromium	52.8	0.001	mg/L	0.084	105	80-120			
Copper	51.6	0.0005	mg/L	5.42	92.3	80-120			
Iron	2410	0.1	mg/L	8.3	96.1	80-120			
Lead	42.5	0.0001	mg/L	0.473	84.0	80-120			
Magnesium	36200	0.2	mg/L	25900	103	80-120			
Manganese	55.3	0.005	mg/L	3.83	103	80-120			
Potassium	12500	0.1	mg/L	732	117	80-120			
Selenium	47.7	0.001	mg/L	0.124	95.1	80-120			
Sodium	21700	0.2	mg/L	11000	107	80-120			
Uranium	46.9	0.0001	mg/L	0.128	93.6	80-120			
Zinc	50.3	0.005	mg/L	5.19	90.3	80-120			
Volatiles									
Acetone	0.112	0.0050	mg/L	ND	112	50-140			
Benzene	0.0367	0.0005	mg/L	ND	91.8	60-130			
Bromodichloromethane	0.0338	0.0005	mg/L	ND	84.5	60-130			
Bromoform	0.0430	0.0005	mg/L	ND	108	60-130			
Bromomethane	0.0335	0.0005	mg/L	ND	83.6	50-140			
Carbon Tetrachloride	0.0338	0.0002	mg/L	ND	84.5	60-130			
Chlorobenzene	0.0426	0.0005	mg/L	ND	106	60-130			



Client: GEMTEC Consulting Engineers and Scientists Limited Client PO:

Method Quality Control: Spike

Report Date: 24-Mar-2021 Order Date: 18-Mar-2021

Project Description: 61899.03

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Chloroform	0.0391	0.0005	mg/L	ND	97.6	60-130			
Dibromochloromethane	0.0372	0.0005	mg/L	ND	93.0	60-130			
Dichlorodifluoromethane	0.0357	0.0010	mg/L	ND	89.3	50-140			
1,2-Dichlorobenzene	0.0400	0.0005	mg/L	ND	100	60-130			
1,3-Dichlorobenzene	0.0399	0.0005	mg/L	ND	99.8	60-130			
1,4-Dichlorobenzene	0.0398	0.0005	mg/L	ND	99.4	60-130			
1,1-Dichloroethane	0.0346	0.0005	mg/L	ND	86.4	60-130			
1,2-Dichloroethane	0.0446	0.0005	mg/L	ND	111	60-130			
1,1-Dichloroethylene	0.0302	0.0005	mg/L	ND	75.6	60-130			
cis-1,2-Dichloroethylene	0.0310	0.0005	mg/L	ND	77.6	60-130			
trans-1,2-Dichloroethylene	0.0310	0.0005	mg/L	ND	77.6	60-130			
1,2-Dichloropropane	0.0368	0.0005	mg/L	ND	91.9	60-130			
cis-1,3-Dichloropropylene	0.0396	0.0005	mg/L	ND	99.1	60-130			
trans-1,3-Dichloropropylene	0.0329	0.0005	mg/L	ND	82.3	60-130			
Ethylbenzene	0.0410	0.0005	mg/L	ND	103	60-130			
Hexane	0.0298	0.0010	mg/L	ND	74.6	60-130			
Methyl Ethyl Ketone (2-Butanone)	0.0865	0.0050	mg/L	ND	86.5	50-140			
Methyl Isobutyl Ketone	0.0835	0.0050	mg/L	ND	83.5	50-140			
Methyl tert-butyl ether	0.0847	0.0020	mg/L	ND	84.7	50-140			
Methylene Chloride	0.0323	0.0050	mg/L	ND	80.8	60-130			
Styrene	0.0432	0.0005	mg/L	ND	108	60-130			
1,1,1,2-Tetrachloroethane	0.0400	0.0005	mg/L	ND	100	60-130			
1,1,2,2-Tetrachloroethane	0.0436	0.0005	mg/L	ND	109	60-130			
Tetrachloroethylene	0.0434	0.0005	mg/L	ND	109	60-130			
Toluene	0.0440	0.0005	mg/L	ND	110	60-130			
1,1,1-Trichloroethane	0.0326	0.0005	mg/L	ND	81.4	60-130			
1,1,2-Trichloroethane	0.0354	0.0005	mg/L	ND	88.4	60-130			
Trichloroethylene	0.0365	0.0005	mg/L	ND	91.2	60-130			
Trichlorofluoromethane	0.0320	0.0010	mg/L	ND	80.0	60-130			
Vinyl chloride	0.0351	0.0002	mg/L	ND	87.8	50-140			
m,p-Xylenes	0.0941	0.0005	mg/L	ND	118	60-130			
o-Xylene	0.0393	0.0005	mg/L	ND	98.3	60-130			
Surrogate: 4-Bromofluorobenzene	0.0834		mg/L		104	50-140			
Surrogate: Dibromofluoromethane	0.0763		mg/L		95.4	50-140			
Surrogate: Toluene-d8	0.0826		mg/L		103	50-140			



Certificate of Analysis Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.

- F1 range corrected for BTEX.

- F2 to F3 ranges corrected for appropriate PAHs where available.

- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.

- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.

- When reported, data for F4G has been processed using a silica gel cleanup.



RELIABLE.

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

Subcontracted Analysis

CoC Number:	13282		
Reference:			
Client PO:			
Client Project(s):	61899.03	Report Date:	7-Apr-21
Paracel Report No	2113090	Order Date:	18-Mar-21
Attn: Andrius Pazne	kas		
Kanata, ON K2K 2A	9	Fax: (6)	13) 836-9731
32 Steacie Drive		Tel: (6	13) 836-1422
GEMTEC Consultin	ig Engineers and Scientists Limited		

Sample(s) from this project were subcontracted for the listed parameters. A copy of the subcontractor's report is attached

Paracel ID **Client ID** 2113090-01 TW21-1C-72hr

Analysis ODWS - REG 170 Sch 24 less VOCs



Client:	Dale Robertson	Work Order Number:	425827
Company:	Paracel Laboratories Ltd Ottawa	PO #:	
Address:	300-2319 St. Laurent Blvd.	Regulation:	None
	Ottawa, ON, K1G 4J8	Project #:	2113090
Phone/Fax:	(613) 731-9577 / (613) 731-9064	DWS #:	
Email:	drobertson@paracellabs.com	Sampled By:	
Date Order Received:	3/23/2021	Analysis Started:	3/29/2021
Arrival Temperature:	7 °C	Analysis Completed:	4/7/2021

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Туре	Comments	Date Collected	Time Collected
TW21-1C-72hr	1627333	Water	None		3/18/2021	12:00 PM

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Acid Ext. Water (A41)	Garson	Determination of Acid Extractables in Water by GC-MS	Modified from SW846-8270D
Carbamates/W (A57)	Garson	Determination of Carbamate Pesticides and Diuron in Water by HPLC	Modified from SW846-8318A
Diquat/Paraquat/ Water (A70)	Garson	Determination of Diquat and Paraquat in water by HPLC	Modified from EPA 549.2
OPPest Water (A18)	Garson	Determination of Triazine Herbicides and Organophosphorus Pesticides in Water	Modified from SW846-8270 D
PAH Water SIM (A41)	Garson	Determination of PAH in Water by GC/MS	Modified from SW846-8270D
PCBs Water (A19)	Garson	Determination of Polychlorinated Biphenyls in Water by GC/ECD	Modified from SW846-8082-A
PhenoxyHerb-W (A56)	Garson	Determination of Phenoxy Acid Herbicides in Water by GC/ECD/ECD	Modified from SW846-8151A
Sched. 24 Aggregrate Grp 1 (R99)	Garson	Calculation of Schedule 24 Aggregrate Parameters	In House

REPORT COMMENTS

Not Reportable



Paracel Laboratories Ltd.- Ottawa

CERTIFICATE OF ANALYSIS

Work Order Number: 425827

This report has been approved by:

Fal Halvon

Brad Halvorson, B.Sc. Laboratory Director



Paracel Laboratories Ltd.- Ottawa

Work Order Number: 425827

WORK ORDER RESULTS

Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
Acid Extractable Organics	Result	MDL	Units	Criteria: ODWS
2,3,4,6-Tetrachlorophenol	<0.3	0.3	ug/L	100
2,4,6-Trichlorophenol	<0.2	0.2	ug/L	5
2,4-Dichlorophenol	<0.2	0.2	ug/L	900
Pentachlorophenol	<0.3	0.3	ug/L	60
	T\//21 _ 1	IC - 72br		
Sample Description	14421-	10 - 7211		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
Carbamate Pesticides	Result	MDL	Units	Criteria: ODWS
Carbamate Pesticides	Result <1	MDL 1	Units ug/L	Criteria: ODWS 90
Carbamate Pesticides Carbaryl Carbofuran	Result <1 <2	MDL 1 2	Units ug/L ug/L	Criteria: ODWS 90 90
Carbamate Pesticides Carbaryl Carbofuran Diuron	Result <1 <2 <6	MDL 1 2 6	Units ug/L ug/L ug/L	Criteria: ODWS 90 90 150
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description	Result <1 <2 <6 TW21 - 1	MDL 1 2 6 IC - 72hr	Units ug/L ug/L ug/L	Criteria: ODWS 90 90 150
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description	Result <1 <2 <6 TW21 - 1 3/18/2021	MDL 1 2 6 IC - 72hr 12:00 PM	Units ug/L ug/L ug/L	Criteria: ODWS 90 90 150
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description Sample Date	Result <1 <2 <6 TW21 - 1 3/18/2021	MDL 1 2 6 IC - 72hr 12:00 PM	Units ug/L ug/L ug/L	Criteria: ODWS 90 90 150
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description Sample Date Lab ID	Result <1 <2 <6 TW21 - 1 3/18/2021 1621	MDL 1 2 6 IC - 72hr 12:00 PM 7333	Units ug/L ug/L ug/L	Criteria: ODWS 90 90 150
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description Sample Date Lab ID OP Pesticides	Result <1	MDL 1 2 6 IC - 72hr 12:00 PM 7333 MDL	Units ug/L ug/L ug/L	Criteria: ODWS 90 150 Criteria: ODWS
Carbamate Pesticides Carbaryl Carbofuran Diuron Sample Description Sample Date Lab ID OP Pesticides Alachlor	Result <1	MDL 1 2 6 IC - 72hr 12:00 PM 7333 MDL 0.231	Units ug/L ug/L Units ug/L	Criteria: ODWS 90 90 150 Criteria: ODWS
Carbamate Pesticides Carbofuran Diuron Sample Description Sample Date Lab ID OP Pesticides Alachlor Atrazine	Result <1	MDL 1 2 6 IC - 72hr 12:00 PM 7333 MDL 0.231 0.231	Units ug/L ug/L Ug/L	Criteria: ODWS 90 150 Criteria: ODWS 5 ~



Paracel Laboratories Ltd.- Ottawa

Work Order Number: 425827

Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
OP Pesticides	Result	MDL	Units	Criteria: ODWS
Chlorpyriphos (Dursban)	<0.173	0.173	ug/L	90
Desethyl atrazine	<0.289	0.289	ug/L	~
Diazinon	<0.173	0.173	ug/L	20
Dimethoate	<0.173	0.173	ug/L	20
Malathion	<0.173	0.173	ug/L	190
Metolachlor	<0.116	0.116	ug/L	50
Metribuzin (Sencor)	<0.116	0.116	ug/L	80
Phorate	<0.116	0.116	ug/L	2
Prometryne	<0.0578	0.0578	ug/L	1
Simazine	<0.173	0.173	ug/L	10
Terbufos	<0.116	0.116	ug/L	1
Triallate	<0.116	0.116	ug/L	230
Trifluralin	<0.116	0.116	ug/L	45
Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
PAH	Result	MDL	Units	Criteria: ODWS

< 0.01

0.01

ug/L

Benzo(a)pyrene

0.01



Paracel Laboratories Ltd.- Ottawa

Work Order Number: 425827

Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
PCBs	Result	MDL	Units	Criteria: ODWS
Decachlorobiphenyl (Surr.)	136	N/A	% Rec	~
Total PCBs	<0.06	0.06	ug/L	3
Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627333			
Pesticides	Result	MDL	Units	Criteria: ODWS
Diquat	<0.4	0.4	ug/L	70
Paraquat	<0.2	0.2	ug/L	10
Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
Phenoxyacid Herbicides	Result	MDL	Units	Criteria: ODWS
2,4-D	<0.365	0.365	ug/L	100
Bromoxynil	<0.0972	0.0972	ug/L	5
Dicamba	<0.0851	0.0851	ug/L	120
Dichlorophenyl acetic acid (Surr.)	88.3	N/A	% Rec	~
Diclofop-methyl	<0.122	0.122	ug/L	9
MCPA	<6.08	6.08	ug/L	100
Picloram	<0.0851	0.0851	ug/L	190



Paracel Laboratories Ltd.- Ottawa

Work Order Number: 425827

Sample Description	TW21 - 1	IC - 72hr		
Sample Date	3/18/2021	12:00 PM		
Lab ID	1627	7333		
Schedule 24 Organics	Result	MDL	Units	Criteria: ODWS
Atrazine + N-dealkylated metabolites (Calc.)	<0.5	0.5	ug/L	5

LEGEND

Dates: Dates are formatted as mm/dd/year throughout this report.

[rr]: After a parameter name indicates a re-run of that parameter. If multiple re-runs exist they are suffixed by a number. Sample may not have been handled according to the recommended temperature, hold time and head space requirements of the method after the initial analysis.

MDL: Method detection limit or minimum reporting limit.

% Rec: Surrogate compounds are added to the sample in some cases and the recovery is reported as a % recovered.

~: In a criteria column indicates the criteria is not applicable for the parameter row.

Quality Control: All associated Quality Control data is available on request.

Field Data: Reports containing Field Parameters represent data that has been collected and provided by the client. Testmark is not responsible for the validity of this data which may be used in subsequent calculations.

Sample Condition Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.

APPENDIX H

Off-Site MECP Water Well Records

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)

Ontari	O Ministry of the Environment	Wéll T	ag No. (Place Sticker a A165020	nd/or Print Below)	Regulatior	ı 903 (W Ontario Wa	' ell R ater Res	Record
Measurements reco			Tag #: A16	65020 <u> </u>		villijeno ost			
First Name	Last Name / Orgar	ization		E-mail Address			r		Constructed
	1470424 On	tario Inc	•				E	by We	ell Owner
Mailing Address (Stre	eet Number/Name)		Municipality	Province	Postal Code		Telephone	No. (inc.	area code)
Well Location			nepean		K411 704				
Address of Well Loca	ation (Street Number/Name)		Township		Lot	2008/07/02/	Concessio	n	
TW15-01 She	a Road		Goulbourn						
Ottawa Carl	eton		Richmond			Ont	ario	Postal	
UTM Coordinates Zor	ne Easting Northing]	Municipal Plan and Subl	ot Number		Other			
NAD 8 3 1	8 4 3 4 4 9 8 5 0 0	0 6 0 8 5							
Overburden and Be	edrock Materials/Abandonme	nt Sealing Rec	ord (see instructions on the	e back of this form)	al Deceriation		<u> </u>	Dep	th (<i>m/ft</i>)
		0		Gener				From '	
Brown	Clay			Paci	, ced			0	3.35
Grey	Clay			Stic	cky			3.35	11.88
Grey	Limestone			Meda	ium			11.88	29.86
	Annular Spac	e		R	esults of We	ll Yiel	d Testing		
Depth Set at (<i>m/ft)</i> From To	Type of Sealant L (Material and Typ	lsed e)	Volume Placed (m³/ft³)	After test of well yield, w	vater was:	Dr. Time	aw Down Water Leve	Re I Time	ecovery Water Level
13.10 0	Grouted Cement &		.42m ³	Other, specify		(min)	(m/ft)	(min)	(m/ft)
				If pumping discontinued	l, give reason:	Static Level	3.11		
						1	3.16	1	3.08
				Pump intake set at (m,	/ft)	2	3.14	2	3.08
				Pumping rate (//min / G		3	3 14	3	3 08
Method of Co	onstruction	Well U	se	45.5	<i>a</i> 10)	1	0.10	1	2.00
Rotary (Conventiona	al) User Jetting Jetting Jetting	Comm Munici	pal Dewatering	Duration of pumping			5.15		5.08
Rotary (Reverse)	Driving	X Test H	ole Donitoring	<u> </u>		5	3.14	5	3.08
Air percussion			g & Air Conditioning	3.08	pumping (min)	10	3.13	10	3.08
Other, specify	Other, sp	ecify		If flowing give rate (I/m	in / GPM)	15	3.13	15	3.08
Inside Open Ho	Instruction Record - Casing	Depth (m/ft)	Status of Well	Recommended nump	depth (m/ft)	20	3.13	20	3.08
Diameter (Galvaniz (cm/in) Concrete	red, Fibreglass, Thickness Plastic, Steel) (cm/in) Fr	om To	Replacement Well	12.19	depart (miny	25	3 13	25	3 05
27 12 0-		10.10	L Test Hole	Recommended pump	rate	30	3 13	30	
27.13 Upe		13.10	Dewatering Well	45.5		40	2 12	40	
15.86 Ste	el .48 +.	45 13.10	Observation and/or Monitoring Hole	Well production (I/min /	' GPM)		3.13		
			Alteration (Construction)	Disinfected?		50	3.12	50	
			Abandoned,	X Yes No		60	3.12	60	
Cuteida	construction Record - Screen	D 4 / 70	Abandoned, Poor	Plassa provida a map b	Map of We	II Loc	ation		
Diameter (Plastic, Ga	faterial alvanized, Steel) Slot No.	Deptn (<i>m/n)</i>	Abandoned, other,	riease provide a map o		ISUUCU		ack.	
			specify		FRAN	K TO	WN XX	<u>}</u>	
			Other, specify	A					
							1		
Water found at Depth	Water Details	Percent Der	Hole Diameter				6	Ma	RE ST
14.02(<i>m/ft</i>) Gas	Other, specify	From	To (cm/in)				28.		
Water found at Depth	Kind of Water: Fresh X Unte	ested 0	13.10 15.86				R		
29.22(m/ft) Gas	Other, specify	13.10	29.86 15.55				63	1	
(<i>m/ft</i>) Gas		sted					N.		
	ell Contractor and Well Tech	nician Informa	tion		\bigcirc		۲ٽ		
Business Name of Wel	I Contractor	We	ell Contractor's Licence No.		0			KAN	1215 70
Uapital Wate	r Supply Ltd.]	L 5 5 8	Commonter	15-01			10111	JAC JIK
Box 490	oot munioormanio)	, c	Stittsville	Comments.					
Province P	ostal Code Business E-mai	I Address							
Untario K	2 S 1 A 6 offic	cocapita	lwater.ca	Well owner's Date Pac information	kage Delivered			ry Use	Only
6 1 3 8 3 6	1 7 6 6 Miller	stephen	rirst Name)	package 2 0 1	5091	1		188	3470
Well Technician's Licence	No. Signature of Technician and	or Contractor Da	te Submitted	X Yes	rk Completed		r í	67 A	חבר ן
0 0 9	7 Allything 1	2	0 1 5 0 9 1 5	<u> </u>	5081	8	Received 9	06 9	ידר י
JOUDE (2007/12) © Quee	an s Primter for Ontario, 2007 V.		Ministry's Copy						

) Ont	Cario Minis the Ei	try of nvironmen	t	Well Ta	ag No . <i>(Place</i> A16502	Sticker ar	nd/or Print Below)	Regulatio	n 903 (V Ontario V	Vell Vater Re	Record
Measurements	s recorded in:	Metric] Imperial		Tag #:	A16	5021 —			Pag	ie	of
Well Owner First Name	's Information	Last Name / 147042/	'Organizatio 4 Ontar	n io Inc	J		E-mail Address				U Well	Constructed
Mailing Addres	s (Street Number/Na	me)	, oncur	ro rue	• Municipality		Province	Postal Code		Telephon	e No. (ind	c. area code)
301 Mood	ie Dr. Suite	<u>100</u>			Nepean		Ontario	K 2 H 9	Q 4			
Address of Wel	n I Location (Street Nu	mber/Name)		Township			Lot		Concess	ion	
TW15-02	Shea Rd.				Gou1bour	'n						
Ottawa Ca	Municipality arleton				Richmond	ge			Provin Ont	ice ario	Post	al Code
UTM Coordinate	s Zone Easting	1	lorthing		Municipal Plan	and Sublo	t Number		Other			
NAD 8	3 1 8 4 3 4	6 5 7 5	5 0 0 5	8 9 6								
General Colour	Most Com	non Materia	onment Se	ot	ora <i>(see instruc</i> i her Materials	tions on the	back of this form) Gene	eral Description	1		De	pth (<i>m/ft</i>)
Brown							Pag	lead			From	2 04
Grev	Clay						Fac	<u>keu</u>			2 0	3.04
Grev	Gray	۵1	1	Prokon	Rock		Wet	СКУ			7.04	10 26
Grev	Lime	stone		JIUKEII	NUCK			+			10 36	5 24 38
Grey	Lime	stone					Bad	lv Broker	<u>ר</u>		24.38	3 31 39
Grev	Lime	stone			*****		hoM	- <u>)</u> <u>-</u>			21.30	37 48
							incu	<u>rum</u>			J1 . J	/ 5/.40
		Annula	r Space					Results of We	ell Yiel	d Testin	g	1
Depth Set at (From	(<i>m/ft</i>) To	Type of Se (Material a	alant Used nd Type)		Volume P	vlaced	After test of well yield,	water was:	Dra	aw Down Water Le	F I Time	Recovery Water Level
11 27	0 Groute	d Comon	t & Bon	tonito	1 302	_3	Other, specify		(min)	(m/ft)	(min)	(m/ft)
		u oemen		CONTLE	1.3921	11	If pumping discontinue	ed, give reason:	Level	3.18		
									1	5.26	1	6.55
							Pump intake set at (r 21 33	m/ft)	2	5.68	2	5.43
Mothod	of Construction			Woll Lie			Pumping rate (I/min /	GPM)	3	6.23	3	4.50
Cable Tool		Ι 🗌 Ρι	ıblic		ercial 🗌 No	ot used	36.40		4	6.53	4	4.00
Rotary (Conve	entional) Detting		omestic vestock	Municip	bal 🗌 Do De 🗌 M	ewatering onitoring	-6 hrs + 10 r	nin	5	6.80	5	3.57
Boring			igation	Cooling	& Air Conditioni	ng	Final water level end c	of pumping (m/ft)	10	7.23	10	3.16
Other, specify	ו י		her, <i>specify</i> _				8.15	nin / GPM)	15	7 71	15	3 1 5
	Construction R	ecord - Ca	sing		Status of	fWell	33		20	7 97	20	3 15
Inside Op Diameter (G	oen Hole OR Material alvanized, Fibreglass,	Wall Thickness	Depth	n (<i>m/ft</i>)	│ LX Water Sup □ Replacem	oply ent Well	Recommended pump	o depth (<i>m/ft</i>)	25	1.21	25	2 15
	oncrete, Plastic, Steel)	(cm/in)	TION	10	Test Hole	Moll	Recommended pump	o rate	30	0.00	30	J.IJ
27.13	Open		0	11.27	- Dewaterin	g Well	(//min/GPM) 36.40		40	8.00	40	3.15
15.86	Steel	.48	+.45	11.27	Observatio	n and/or Hole	Well production (I/min	i / GPM)	40	8.02	40	3.15
					Alteration (Construct	ion)	Disinfected?		50		50	3.15
					Abandone	d, t Supply	A Yes No		60	8.15	60	3.15
Outside	Construction R	ecord - Scre	en Depth	(<i>m/ft</i>)	Abandone	d, Poor ality	Please provide a map	Map of We below following	instruction	ation ons on the	back.	
Diameter (Pla: (cm/in)	stic, Galvanized, Steel)	Slot No.	From	То	Abandone	d, other,	Y	, c				
							LA X	ICHMOND	ZL			
					Other, spe	cify				- Manual II / Times and a superior	1	and a second
	Water Det	ails		F	lole Diameter							
Water found at	Depth Kind of Water	: EFresh	XUntested	Dep From	th (<i>m/ft)</i> [Diameter (cm/in)						
Water found at	_]Gas	<i>cify</i> ∵ □ Fresh	XUntested	0	11.27	15.86				ſ	3	
33.52m/ft)	Gas Other, spe	cify		11.27	37.48	15.55		TW 15-0	2	,		
Water found at I	Depth Kind of Water	: Fresh	Untested						\oslash	l	S.	
(11/11)	Well Contracto	r and Well	Technicia	n Informat	tion					Ċ	5	
Business Name	of Well Contractor	т. 1		We	Il Contractor's Lic	ence No.						
Business Addres	s (Street Number/Nar	Ltd.		1	. 5 5 nicipality	8	Comments				177-1	·····
Box 490		- ,		S	tittsvil	1e						
Province	Postal Code	Business	E-mail Addı	ress								
Bus.Telephone No	n ∠ S I A D. (inc. area code) Nai	ne of Well T	11Ce@/C echnician (L	apital ast Name,	water.ca First Name)		vveil owner's Date Pa information	ackage Delivered	۱ <u> </u>	Mini Audit No.	stry Use ″1 ∩	
5 1 3 8 3	6 1 7 6 6	Mille	r, Step	hen	,		delivered 20	L <u>b</u> 091 ork Completed		۵.	- T Q	0405
vveii rechnician's L 0 0 9	icence No. Signature	of Technicia	n and/or Cor	ntractor Dat	e Submitted		No b h	5 0 0 1		DEC	16	2015
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Min An Measurements recorded in:	tistry of the Enviro d Climate Change ☐ Metric	mperial	N/A		Regulation	903 Ontario I Pa	Water Reso ge	ources A
Well Owner's Information	n (de la
First Name 147A	Last Name / O		= 100	E-mail Address			Well C	Constructe
Vailing Address (Street Number	Name) 81 Moc	die Dr	Municipality we of	Province	Postal Code	3 Telephor	ne No. (inc.	area code)
Nell Location Address of Well Location (Stree'	Number/Name)		Township		Lot	Conces	sion	Sa P
3315 SF	EA Ko	AD	South	Down	flue	Province	4 Postal	Code
Otawa - (arlete	S	Rich	moral		Ontario		
JTM Coordinates Zone Eastin	4.50 S	thing	Municipal Plan and Sub	lot Number	24	Pher	45	x.7
Overburden and Bedrock M	aterials/Abandon	ment Sealing Re	cord (see instructions on t	he back of this form)		THIS		
General Colour Most C	common Material	C	Other Materials	Gen	eral Description	_	Erom Dept	h (<i>m(n</i>))
	6"01	illed v	Ell Alber	velan ma	2nt		0'	123
		*	ETW 15-	02-1/2				
								1
h 0 A. 1 A	1.1		~ ~ ;					
KWWK Attache	2-WIT	AS HIG	50021					
scopped where	Supply	1- HUS	19/15					
	Annular S	ipace		1	Results of We	Il Vield Testin		
Depth Set at (matter	Type of Seala	ant Used	Volume Placed	After test of well yield,	water was:	Draw Dowr	Re	covery
123' 31 38	Halenai and		RI RAOS	□ Clear and sand □ Other, specify	free	(min) (m/ft)	evel Time V (<i>min</i>)	(m/ft)
31 J P	0.0.11	ucq	26,0163	If pumping discontinue	ed, give reason:	Static Level	1	
2 0 Day	214411					1	1	
4								
				Pump intake set at (m	vft)	2	2	
Method of Constructio	n	Well L	lse	Pump intake set at (m Pumping rate (Vmin / C	vít) SPM)	2 3	2	
Method of Constructio	n 1ond 🗌 Public	Well L	Jse ercial _ Not used	Pump intake set at (m Pumping rate (l/min / C	vīt) GPM)	2 3 4	2 3 4	
Method of Constructio	n nond Public 1g Dome ng Livest	well L c Comm estic Munici tock Test H	Jse ercial Downsering lole Menitoring	Pump intake set at (m Pumping rate (//min / C Duration of pumping hrs +r	víť) GPM) min	2 3 4	2 3 4 5	
Method of Constructio	nond Public ng Dome ng Lives ing Inigat indus	Well L c Comm estic Munici tock Test H ion Coolin trial	Jse hercial Not used ipel Dewatering tole Menitoring g & Air Conditioning	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c	vft) SPM) min of pumping (m/tt)	2 3 4 10	2 3 4 5 10	
Method of Constructio	n. Public nond Public ng Dome ng Lives ing Infgat Indus Comp	Well L c Comm sstic Munici tock Test H don Coolin trial ; specify	Jse ercial Dewatering lole Menitoring g & Air Conditioning	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs + r Final water level end c	vít) SPM) nin of pumping (m/tt) in / GPM)	2 3 4 10 15	2 3 4 5 10 15	
Method of Constructio	n nond Public ng Dome ng Livesi ing Infus Other n Record - Casin al Wall	Well L c Comm astic Munici tock Test H iton Coolin trial ; specify g Depth (m/ft)	Jse hercial Not used ipal Dewatering lole Menitoring ig & Air Conditioning Status of Well Water Supply	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c If flowing give rate (l/m	vitt) spbM) min of pumping (m/ti) in / GPM) degth (m/ti)	2 3 4 5 10 15 20	2 3 4 5 10 15 20	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Digg Air percussion Other, specify Other, specify Constructio Inside Open Hole OR Materi Diameter Concrete, Plastic, Ster	n nond Public ng Dome ng Lives ing Infgat Other n Record - Casin al Wall s, Thickness i) (crn/n)	Well L c Comm sstic Munici tock Test H lion Coolin trial ; specify g Depth (m/ti) From To	Jse hercial Not used hercial Dewatering lole Menitoring g & Air Conditioning Status of Well Water Supply Replacement Well Test Hole	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c If flowing give rate (l/m Recommended pump	vR) min of pumping (m/tt) in / GPM depth (m/tt)	2 3 4 5 10 15 20 25	2 3 4 5 10 15 20 25	
Method of Construction Cable Tool Diar Rotary (Conventional) Jetti Boring Digg Air percussion Other, specify Inside Open Hole OR Mater Diarderer (Galvanized, Fibreglas Concrete, Plastic, Sterior)	nond Public ng Dome ng Lives ing Ingat ing Ingat indus indus n Record - Casin al Wall s, Thickness i) (cm/in)	Well L c Comm sstic Munici tock Test H lion Coolin triat specify Depth (m/it) From To	Jse hercial Not user hercial Dewatering hole Menitoring g & Air Conditioning Status of Well Water Supply Replacement Well Recharge Well Recharge Well	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs + r Final water level end c If flowing give rate (l/m Recommended pump Recommended pump	vR) SPM) of pumping (mR) in / GPM) death (mR) rate	2 3 4 10 15 20 25 30	2 3 4 5 10 15 20 25 30	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Dlgg Other, specify	n nond Public ng Dome ng Livesi ing Indus Other n Record - Casin al Wall s, Thickness al) (cm/in)	Well L c Commander astic Municilitation tock Test H ibon Coolin trial specify g	Dise Interview of the second	Pump intake set at (m Pumping rate (l/min / G Duration of pumping hrs +r Final water level end c If flowing give rate (l/m Recommended pump (l/min / GP/A) Well production (l/min /	vit) sPM) min of pumping (m/ti) in / GPM) deeth (m/ti) rate / GPMI	2 3 4 7 10 15 20 25 30 40	2 3 4 5 10 15 20 25 30 40	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Digg Air percussion Other, specify Other, specify	n nond Public ng Dome ng Lives ing Infgat Other n Record - Casin al Wall St, Thickness i) (cm/ln)	Well L c Comm sstic Munici tock Test H lion Coolin trial ; specify g Depth (m/it) From To	Jse hercial Not used hercial Dewatering hole Monitoring g & Air Conditioning Status of Well Replacement Well Recharge Well Dewatering Well Deservation and/or Monitoring Hole Alteration Alteration Alteration Secome Seco	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level and c If flowing give rate (l/m Recommended pump (l/min / GPM) Well production (l/min /	vR) min of pumping (m/t) in / GPM depth (m/t) rate	2 3 4 10 15 20 25 30 40 50	2 3 4 5 10 15 20 25 30 40 50	
Method of Construction Cable Tool Diar Rotary (Conventional) Jetti Boring Digg Air percussion Other, specify Other, specify	n nnnd l Publin ng Doms ng Lives ing l Infgat ind Vali Wali Wali Wali Wali (cm/in)	Well L c Comm sstic Munici tock Test H lion Coolin trial specify Depth (m/it) From To	Jse hercial Not used hercial Dewatering hole Menitoring g & Air Conditioning Status of Well Beglacement Well Dewatering Well Deservation and/or Monitoring Hole Alteration (Construction) Abandoned,	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs + r Final water level end c If flowing give rate (l/m Recommended pump Recommended pump (l/min / GPM) Well production (l/min / Resificated? No	vitt) SPM) in in formping (m/tt) in / GPM) deptn (m/tt) rate (GPM)	2 3 4 4 10 10 15 20 25 30 40 50 60	2 3 4 5 10 15 20 25 30 40 50 60	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Digg Air percussion Other, specify Other, specify Constructio Inside Open Hole OR Materi Dameter (Galvanized, Fibregias concrete, Plastic, Stee Constructio Construction Construction	n n n n n n n n n n n n n n n n n n n	Well L c Commentation sstic Municipation tock Test H iden Coolin trial specify Ig Depth (m/ft) From To	Jse hercial Not used ipal Dewatering lole Menitoring g & Air Conditioning Status of Well Water Supply Replacement Well Dewatering Well Deservation and/or Monitoring Hole Alteration (Construction) Abandoned, Insufficient Supply Abandoned, Poor	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c If flowing give rate (l/m Recommended pump Recommended pump (l/min / GPM) Well production (l/min / Nisfificied? No	VR) SPM) in f pumping (m/tt) in / GPM death (m/tt) rate (GPM) Map. of Wet	2 3 4 4 10 15 20 25 30 40 50 60 ILocation	2 3 4 5 10 15 20 25 30 40 50 60	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Digg Air percussion Other, specify Constructio Inside Diameter (Galvanized, Fibreglast Concrete, Plastic, Ster Construction Construction Outside Material Diameter (Plastic, Csewanized, State)	n nond Publi ng Dome ng Lives ing Infgat Other n Record - Casin al Wall St. Thickness (cm/ln) Record - Scree eff) Slot No.	Well L c Comm sstic Munici tock Test H ion Coolin trial specify g Depth (m/ft) From To n Depth (m/ft) From To	Jse hercial Not used hercial Dewatering hercial Dewatering hercial Dewatering hercial Dewatering hercial Not used hercial Dematering hercial Not used hercial Not used hercial Dematering hercial Not used hercial Dematering hercial Demat	Pump intake set at (m Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c If flowing give rate (l/m Recommended pump (l/min / GPM) Well production (l/min / Risinfacted? Level No Please provide a map	vitt) SPM) min of pumping (m/tt) in / GPM death (m/tt) rate / GPM Map. of Well p below following	2 3 4 10 10 15 20 25 30 40 50 60 I Location i instructions or	2 3 4 5 10 15 20 25 30 40 50 60 0	
Method of Construction Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Drivi Boring Dlgg Air percussion Other, specify Construction Galvanized, Fibregias Construction Construction Diameter Galvanized, Fibregias Construction Construction Outside Material (Plastic, Galvanized, Str Material	n nond Publi ng Dome ng Lives ing Infgat Other n Record - Casin at Wall Wall Wall Wall (cm/in) Record - Scree	Weil L c Comm sstic Munici tock Test H ispecify	Jse hercial Not user hercial Not user hercial Motioning black Air Conditioning Status of Well Status of Well Status of Well Becharge Well Dewatering Well Dewatering Well Dewatering Well Alteration (Construction) Abandoned, Poor Water Quality Abandoned, other, Specify VS (SV)	Pump intake set at (m Pumping rate (l/min / C Duration of pumping r Final water level end c If flowing give rate (l/m Recommended pump Recommended pump (l/min / GPM) Well production (l/min / Respired a mag	VR) SPM) in / GPM) death (m/R) rate (GPM) Map. of Wet b below following	2 3 4 4 10 15 20 25 30 40 50 60 I Location g instructions or	2 3 4 5 10 15 20 25 30 40 50 60 0 10 15 20 25 30 40 50 60	
Method of Constructio Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Driv Boring Digg Air percussion Other, specify Other, specify	n n nond l Publi ng l Dome ng l rigg	Well L c Commentation estic Municitic ispecify	Jse	Pump intake set at (min / C Pumping rate (l/min / C Duration of pumping hrs +r Final water level end c If flowing give rate (l/min Recommended pump Recommended pump (l/min / GPM) Well production (l/min / Response in the set of the s	VR) SPM) min of pumping (mR) death (mR) rate (GPM) Map. of Wet b below following	2 3 4 4 10 15 20 25 30 40 50 60 ILocation instructions or	2 3 4 5 10 15 20 25 30 40 50 60 50 60 50 60	
Method of Construction Cable Tool Diar Rotary (Conventional) Jetti Rotary (Reverse) Driv Boring Digg Air percussion Other, specify Other, specify Construction Inside Open Hole OR Material Diameter Open Hole OR Material Outside Diameter Outside Material Dameter (Plastic, Galvanized, Struction Outside Material Waterial Waterial	n n n n n n n n n n n n n n n n n n n	Well L c Comm sstic Municic tock Test H is peecify Coolin Ig Depth (m/fi) From To Depth (m/fi) From N Depth (m/fi) From To	Jse hercial Not used hercial Dewatering hercial Dewatering hercial Dewatering hercial Dewatering hercial Not used hercial Not used hercial Dewatering hercial Not used hercial Dewatering hercial Not used hercial Not used hercial Not used hercial Not used hercial Dewatering hercial Not used hercial Not used hercial Not used hercial Dewatering hercial Not used herc	Pump intake set at (m Pumping rate (l/min / C Duration of pumping r Final water level and c If flowing give rate (l/m Recommended pump (l/min / GPM) Well production (l/min / Risinfacted? No Please provide a map	viti) SPM) min of pumping (m/ti) in / GPM/ death (m/ti) rate / GPM/ Map. of Well p. below following	2 3 4 4 10 15 20 25 30 40 50 60 11 Location g instructions or	2 3 4 5 10 15 20 25 30 40 50 60 60 50 60 50 60	$\overline{\mathcal{D}}$
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Aeasurements reco	orded in: 🛛	Metric	Imperial	-	Tag #: A	165	<u>.</u>			Page		of
Nell Owner's Int	formation											
irst Name		Last Name / 0 1470424	Organizatio Ontar:	n io Inc.			E-mail Address				Well Dv V	Constructed
ailing Address (Stre	eet Number/Na	ame)			Municipality		Province	Postal Code		Telephone	No. (ind	c. area code)
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eneral Colour	Most Com	mon Material		Otr	her Materials		Gene	ral Description			From	To
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									1	5.26	1	6.55
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1			·		<u>i</u>		umping rate (V/min / C	PM)	3	6.23	3	4.50
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Rotary (Reverse)	Driving	Live	stock . ation	🛴 Test Hol	le 🗌 Monito & Air Conditionina	ring Fir	b IIISLO	pumping (m/ft)		0.80	10	3.5/
Air percussion	<u> </u>		Istrial		Ĵ,		8.15		- 10	123		3.10
Other, specity			er, specity		Ctatus of Mia		lowing give rate (I/m	in / GPM)	15	7.71	15	3.15
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lameter (Galvanizi (cm/in) Concrete,	ed, Fibreglass, Plastic, Steel)	Thickness (cm/in)	From	То	Replacement V	Vell	15.23		25		25	3.15
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06 Ch	- 11	10		11.27	Dewatering We		36.40		40	8 02	40	3 15
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(cm/in) (Plastic, Ga	alvanized, Steel)	Siot No.	From	То	Abandoned, oli	ner,	V					
and the spectrum							20 3	CHMONN	2	4		
					Other, specify	-				·	1	
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									en intelle ent et (r	/54)	1	4.54	1	3.24
								Fui	9.14	11/10)	2	3.91	2	3.22
Meth	hod of Co	nstruction			Well U	se		Pum	ping rate (I/min /	GPM)	3		3	3.22
Cable To	ool	Diamono		ublic	Comm	ercial] Not used		36.40 ation of pumping		4	3.71	4	3.22
Rotary (C	Conventional Reverse)	Driving		omestic vestock	Munici	ole] Dewatering] Monitoring	6	hrs +r	nin	5	3.71	5	3.22
Boring	ission	Digging		igation dustrial	Coolin	g & Air Conditi	oning	Final	l water level end c ק ד ג	f pumping (m/ft)	10	3.71	10	3.22
Other, sp	pecify			ther, specify _				If flow	wing give rate (l/r	nin / GPM)	15	3.72	15	3.22
Incido	Col	nstruction R	ecord - Ca	sing Depti	a (m/ft)	Status	of Well				20	3.72	20	3.22
Diameter (cm/in)	(Galvanize	ed, Fibreglass, Plastic Steel)	Thickness	From	То		ement Well		9.14	uepui (<i>min</i>)	25	3 73	25	3 22
07 10	0		(0/////)	0	0.77	I Test He Rechar	ole rge Well	Reco	ommended pump	o rate	30	3 74	30	3 22
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						(Constr	on ruction)	Disin	fected?		60	0.75	60	2.22
						Abando	oned, ient Supply		Yes 🔄 No	NA		3.73	00	3.22
Outside	M	aterial	ecora - Sch	Depth	n (<i>m/ft</i>)	Abando	oned, Poor Quality	Pleas	se provide a map	below following	instructi	ons on the	back.	
<i>(cm/in)</i>	(Plastic, Ga	Ivanized, Steel)	Slot No.	From	То	Abando	oned, other,		.N	FRANK 7	TOW NS	LA.		
									E					
						Other,	specify							
1		Water Det	tails			Hole Diame	ter							
Water found	d at Depth	Kind of Wate	r: Fresh	X Untested	Dej From	oth (<i>m/ft)</i> To	Diameter (cm/in)			TW.	15-0	3		
Water found	d at Depth	Kind of Wate	r: Fresh	X Untested	0	9.44	15.86					W		
28.95m	/ft) Gas	Other, spe	cify	passary	9.44	28.95	15.55					ý	J	
Water found	d at Depth	Kind of Water	r: ∐Fresh acify	Untested			-						1	
	We	ell Contracto	or and Well	Technicia	n Informa	ition	<u></u>]					3		
Business Na	ame of Well	Contractor	T L J		W	ell Contractor's	Licence No.					HS.		
Business Ad	1 watel	et Number/Na	ыса. me)		M	L D unicipality	<u>א כ</u>	Comr	ments:				•	
Box 490	0				2	Stittsvi	.11e							
Province Ontario	o K	ostal Code 2 S 1 ∆⊺	Business	s E-mail Add	ress anital	water o	a	Well	owner's Date P	ackage Deliveror	1999254	NAI::	stry Un-	Only
Bus.Telephor	ne No. (inc. a	area code) Na	me of Well 1	Fechnician (L	ast Name,	First Name)	·u	inform	nation			Audit No.	. 1 0	
6 1 3 8 Well Technicia	8 3 6 1 an's License	766	Mille	r, Step	hen	to Cub-it 1		delive	red Z U Date W	u S U 9	тЛ		TO	0400
0 0	9 7	7 Jul	A Mana	an anu/or Co	nuactor Da	0 1 5 0	915		No 2 0	1 5 0 8	2 d		; 16	2015
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Ontario Ministry of We	<u>जा</u> , 100000	Below)	V	Vell Record	TW1
Measurements recorded in: Metric Metric	A105585	R	egulation 903 Ontario V Pag	later Resources Act	
Well Owner's Information	a and the same and	Tool Interstored age	C. C. R. D. W. B. B. C. S.	States Contraction of States	
Colonnade Management Inc		E-mail Address		Well Constructed by Well Owner	
Maling Address (Street Number/Name)	Nepean	Province Po	K2E 798	a No, (inc. elles code)	
Well Location Address of Well Location (Street Number/Name)	Township	radio de la construcción de la cons I Los	Concess		
(no civic) Shea Road	Goulbourn		P/L 26 4		
Ottawa Carleton	Richmond		Ontarto	Postal Code	
NAD 8 3 10 AD4046 Spread	Municipal Pran and Subio	t Number	Other		
Overbürden and Bédrock Material/Abandonfinen Saabig General Colour Most Common Material	Other Materials	General D	escription	Depth (m(h))	
GreyClay			to and selected	0 24	
Gravel				24 27.8	
Grey Linestone		Avior		27.6 170	
Grey & White Sandstone C	nd Limeston	Mix	the second	198 203	
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	11:11 = 1				
Annulat Space	Volumo Diserve	After test of unit works works	the of Well Yield Testin		
From To (Material and Type)	(mgg)	Clear and sand free	Time Water La	vel Time Water Level	
Type 0 Beckorate sturry	197	If pumping discontinued, giv	treason: Level 5'(	" 62"	
and the second se		Proven langel and and Auritan	1 61	4 1 8.2"	
		190	2 6.2	2 5.1	
Method of Construction We	ell Use	Pumping rate (Umbrie GPM)	4 6.2	3 5.1	
Rotary (Conventionel) Jetting Convestie M Rotary (Revene) Driving Livestack Tr	tunicipal Dewatering est Hele Monitoripa	Duration of pumping hrs + min	5 8.2	5 51	
Boring Digging intraston Co	coling & Air Conditioning	Final water level and of pum	ping (mm) 10 6.2	10 51	
Other, specify Other, specify      Gonstruction Record - Gasing	Status of Weil	If flowing give rate (Vmin / G	PM) 15 8.2	15	
Inskie Open Hole OR Metbylai Vvas Depth (7745) Diameter (Gelvanized, Filregidaa, Thiokneap	P Kylater Supply	Recommended pump dept	h (nem) 20 6.2	20 51	
(angle) Concrete, Plasto, Stael) (angle) From T	Test Hole	Reconversided pump rate	30 8.2	25	
6 Steel 188 +2 10	Dewatering Well	20 -2 000	40 6.2	40 5.1	
	Monitoring Hale	Distantia 2096	50 62	50 51	
	Abandoned.	Yes No	60 6.2	4 60 <u>5.1</u>	
Construction Record - Screen Cutside Material Depth (m/t)	Ahandoned, Poor Water Quelity	Flease provide a map below	ap of Mell Location	back	
(amin) (Plastic, Glavenized, Steel) Sucrico, From T	To Abandoned, other appendy	1			
				3KM	
Witter Details	Hole Diameter	(NO C)	A		
Water found at Depth Kind of Water: Fresh Wintested	Depth (m/75) Diameter rom To (om/in)	CIVITS	$\uparrow$	A Con	
Water found at Depth Kind of Water: Fresh , Untested	1 100	stien 1	1 AKM	Q	
Water found at Depth Kind of Water: Fresh Untested	1985 203 51510	DAAD	Lan		
(7777) Gas   Other, specify Well Contractor and Well Technician Info	mation	10.1-	1 Cho	f	
Business Name of Well Contractor	Well Contractor's Licence No.	Pe	pth Stre	4	
Business Address (Street Number/Name) 8659 Franktown Road, RR#1	Municipality	Commenta,	ſ		
Province Postal Code Business E-mail Address		TEST V	JEL-		
Bus.Teirphone No. (inc. area code) Name of Well Technician (Last No.	ame, First Name)	information package	Delivered Audit No.	1 O O O T	
Will rechnigan a Donne No. Signature of Technician and Contracto	or Date Submitted	Yes Date :	ompletea Z	13301	
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W Well Record Ministry of Ontario the Environment **Regulation 903 Ontario Water Resources Act** 706 Metric Moperial 4 Measurements recorded in: Page Well Owner's Information Last Name / Organization First Name E-mail Address Well Constructed by Well Owner Ina - ( onnade NO geme n Telephone No. (inc. area code) Postal Code Mailing Address (Street Number/Name) Municipality Province #200-16 1 ONCO Ne Well Location Address of Well Location (Street Number/Name) Concession Lot -26 Province #5873 County/District/Municipality SHEA DAI  $= \mathbf{O} \mathbf{e}$ Village Postal Code Oft Ontario -Corle No UTM Coordinates Zone Northing Muni Numbe Easting oal Plan and Sublot Other 18 434846 NAD 8 3 18 43 4846 5005839 Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) Depth (m/ft Most Common Materia Other Materials General Description General Colour From ASI 6 SUDA N EN SPRE 33 PIVIC MEN AL HMENST A105589 OSAnnular Space **Results of Well Yield Testing** Depth Set at (m/ft) Volume Placed After test of well yield, water was: Draw Down Recovery Type of Sealant Used Time Water Level Time Water Level From То (Material and Type) (m³/ft³) Clear and sand free Other, specify (min) (m/ft) (min) (m/ft) Casing Expension +2 Static If pumping discontinued, give reason: Leve 1 1 Pump intake set at (m/ft) 2 3 3 Pumping rate (I/min / GPM) Method of Construction Well Use Diamond 4 4 Public Commercial Cable Tool Not used Duration of pumping Rotary (Conventional) Jetting Domestic Municipal Dewatering 5 5 hrs + min Rotary (Reverse) Driving Livestock Test Hole Monitoring Boring Irrigation Digging Cooling & Air Conditioning Final water level end of pumping (m/ft) 10 10 Air percussion Industrial Other, specify Other, specify 15 15 If flowing give rate (I/min / GPM **Construction Record - Casing** Status of Well 20 20 Depth (matt) Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) Inside Water Supply Wall Recommended pump depth (m/ft) Diamete Thicknes (crig/in) Replacement Well 25 25 From То (cm/in) Test Hole Recommended pump rate (I/min / GPM) it Stel Recharge Well 30 30 +2 188 -7 Dewatering Well 40 40 Observation and/or Well production (I/min / GPM) Monitoring Hole 50 50 Alteration (Construction) ected? 60 60 Abandoned, 'es Insufficient Supply **Construction Record - Screen** Map of Well Location Abandoned, Poor Outside Depth (m/ft) Water Quality Please provide a map below following instructions on the back. Material Diameter Slot No (Plastic, Galvanized, Steel Abandoned, other om (cm/in) То specify Other, specify Water Details Hole Diameter food Water found at Depth Kind of Water: Fresh Untested Depth (m/ft) Diameter From (cm/in) (m/ft) Gas Other, specify Parth St Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify _____ Water found at Depth Kind of Water: Fresh Untested (m/ft) Gas Other, specify Well Contractor and Well Technician Information Name of Well Contractor Well Contractor's Licence No Address (Street Number/Nam NG Mun Comments ICHMON Postal Code Business E-mail Address Ea code) Name of Well owner's Ministry Use Only Date Package Delivered information Well Technician (Last Name, First Name) ephone No. (inc. area code) Audit No package delivered 8 enny Decivere mand/or Contractor Date Submitted B8 DITO z155272 Date Work Completed Yes nature of Techni Date Submitted 0 3106 BM No 29 DEC 1 3 2013 06E (2007/10 © Queen's Printer for Ontario, 200 Ministry's Copy

Ontario Ministry of the Environment	Well Tag No. (Place Sticker an Tag#: A1382	dlor Print Below) 253	Regulation 903 Ontari	Well Record
Measurements recorded in: Metric Mimperial			F	'age of
First Name Last Name / Organizati	on	E-mail Address		Well Constructed
COLOMADE R	ZETAL OPPORTUNITY	/		by Well Owner
Mailing Address (Street Number/Name)	TE MUNICIPALITY	ANT	KaF7S861	ane No. (inc. area code)
Well Location				
Address of Well Location (Street Number/Name)	Township	000	Lot Conce	ssion
County/District/Municipality	City/Town/Village		Province	Postal Code
OTTAWA	RICHMO	NO	Ontario	
UTM Coordinates Zone Easting Northing	Municipal Plan and Sublot	t Number	Other	
Overburden and Bedrock Materials/Abandonment Se	ealing Record (see instructions on the i	back of this form)		
General Colour Most Common Material	Other Materials	Gener	al Description	Depth ( <i>m/ft)</i> From To
BROWN CLAY	STONES	DENSE		0 250
BROWN LIMESTONE &	DOCASIONAL LAYER	s offered	' LIMESTONE	25,75152
GREY SANDSTONE		<b></b>		152 161
	· · · · · · · · · · · · · · · · · · ·	-		
Annular Space		R	esults of Well Yield Tes	ting
Depth Set at (m/ft)     Type of Sealant Used       From     To       (Material and Type)	Volume Placed	After test of well yield, w	vater was: Draw Dov	vn Recovery
O 30 CEMENT GROUT	\$ 543	Other, specify	EARING (min) (m	( <i>min</i> ) ( <i>m/ft</i> )
0 34,5 RENITOMITE	1.37	If pumping discontinuec	I, give reason: Static Level	24
245 47 CENENT CPA	145		1 8,2	34 1 8,24
17 EZ DENTENITE SU	LADY DIL	Pump intake set at (mi	(ft) 2 8	34 2
41 33 BENTONTE SK	14KI .069	Pumping rate (Ilmin / G	PM) 3 8.2	6 3 1
Method of Construction	Well Use	30	4 8.3	6 4
Rotary (Conventional) Jetting Domestic	Municipal Dewatering	Duration of pumping	in 5 8	2/ 5
Rotary (Reverse)     Driving     Livestock     Digging     Irrigation	Cooling & Air Conditioning	Final water level end of	pumping ( <i>mlft</i> )	<b>7</b> 10
Air percussion		8.45	10 0.3	
Construction Record - Casing	Status of Well	If flowing give rate (I/mi	n / GPM) 15 3-3	0 15
Inside Open Hole OR Material Wall Dept	th ( <i>mlft</i> ) X Water Supply	Recommended pump	depth (m/ft) 20 8. 5	<i>D</i> 20
(cm/in) (cm/in) From	To Replacement Well	/00	25 8.4	25
104 STEEL 250 07-25	30 Recharge Well	(Ilmin / GPM)	rate 90 30 8.4	/3 30
64 STEEL 188 0+3+3	53 Dewatering Well	Well production ///min /	GPM) 40 P.4	14 40
10 00ENUM	Monitoring Hole	100	50 2.4	15 50
TO OPEN HOLE 33	(Construction)	Disinfected?	60 2.9	45 60
Construction Record - Screen	Insufficient Supply		Map of Well Location	
Outside Material Slot No. Dept	h ( <i>m/ft</i> ) Abandoned, Poor	Please provide a map b	elow following instructions on	the back.
(cmlin) (Plastic, Galvanized, Steel) Cict No. From	To Abandoned, other, specify		1834	
		20		MAL.
and the part is a second to a second				1 10 1
Water Details	Hole Diameter	$\mathfrak{S}$		
Water found at Depth Kind of Water: Kresh Untested	Depth ( <i>m/ft</i> ) Diameter From To ( <i>cm/in</i> )	e		<b>. د</b>
Water found at Depth Kind of Water: Fresh Untested	0 30 143	The last		
( <i>m</i> / <i>ft</i> ) Gas Other, <i>specify</i>	20 161 10	E.		
Water found at Depth Kind of Water: Fresh Untested	30 101 10			4.44
(m/π)GasOther, specify				
Business Name of Well Contractor	Well Contractor's Licence No.			
SAUNDERS WELL DRILLING	54879		PERTH	Sr.
	Municipality	Comments:		······································
Province Postal Code Business E-mail Add	Iress			
UNI. KOHIGO		Well owner's Date Pac	kage Delivered M	inistry Use Only
Bus. Lelephone No. (inc. area code) Name of Well Technician (I	Last Name, First Name)	backage delivered	30730 Audit N	
Well Technician's Licence No. Signature of Technician and/or Co	ontractor Date Submitted	Yes Date Wo	rk Completed	L / 5248
1 DEDGE (2007/12) @ Oulgar's Drink har before	20130915	No 60	50815 Receive	
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First Name	ner's Info	mation	1	<u>/</u>					4 		r age		
		L	ast Name /	Organizatio	omes l	nc.	E	-mail Address	naan ka da soo jirka di ka di ciki			] Well by W	Constru Vell Own
Mailing Add	tress (Street Ce 100-3	Number/Nam 01 M000	^{ne)} die Driv	e		Municipality Offawa	Pr	ovince ON	Postal Code	9¢4	Telephone I	No. (ind	c. area co
Well Loca Address of 3 Ri	ation Well Locatio UNNEL C	n (Street Nurr	nber/Name)			Township Goulbourn			Lot P/I	26	Concession	ו ו	
County/Dist	trict/Municip	rleton				City/Town/Village Richmond				Provir	nce	Posta	al Code
UTM Coord	dinates Zone	Easting	371   ^N	lorthing	994 i	Municipal Plan and Sü 4R-27894	blot Numb	er		Other S/	L 40		
Overburde	en and Bec	rock Materi	als/Aband	onment Se	aling Rec	ord (see instructions on	the back o	f this form)					
General Co	olour	Most Comn	non Materia Clav	l ,	0	ther Materials		Gene	eral Description	1		From 0	pth (mutt)
			Grav	rel								32 /	40
Grey			Lime	stone								40 '	91 *
Grey	-		Lime	stone						2 2 4		91	100
	0			~									+
X	PO	Æ	102	900	+	000 9	6						
A.	JOB	28	501	90	4	00							
Reconcessorem	ATTING STATISTICS	and the second second	A	*			1990 200 100 E	the stage of the second second	Desult			( NUCLEON ADDRESS	120402h705h00m
Depth Se	et at (m/R)		Type of Se	alant Used		Volume Placed	After to	est of well yield,	Results of W water was:	ell Yiel	d Testing aw Down	F	Recovery
From 40	38	Neat o	(Material a ement	nd Type)		(m³/@/ 9.36		lear and sand fi ther, specify	Not teste	Time (min)	Water Leve (m/ft)	Time (min)	Water L (m/ft
38	0'	Benton	iite slurry	(	<u>e de la co</u> Res	18.8	- If pum	ping discontinue	d, give reason:	Static Level	14.6"		23.9
					242			X		1	20.2	. 1	10
	1973年1月1日日										1 OH T		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1
		<u>1997 - 19</u> 2014 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1 2014 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1941 - 1	<u>- 1878</u> - 1975		a <u>n</u> George		Pump	intake set at (m) SD	Ð	2	21.7	2	1.
Meth	od of Con	struction			Well U	se	Pump	intake set at (m/ SU ing rate (l/min /@	¢ Ø	2	21.7	2	12
Meth	nod of Con	struction		blic	Well U	se International	Pump Pumpi	intake set at (m) 90 ing rate ( <i>I/min /</i> @ 20 on of pumping	P P	2 3 4	21.7 22.4 22.6	2 3 4	12 12 12
Meth Cable Toc Rotary (C Rotary (R	ood of Con ol conventional) Reverse)	struction		iblic omestic restock	Well U	se ercial Dotused pal Dewaterin ple Monitoring	g Duration	Intake set at (m) SU 20 on of pumping hrs +	هک Marin	2 3 4 5	21.7 22.4 22.8 22.8	2 3 4 5	12 12 12 12
Meth Cable Toc Rotary (C Rotary (R Bering Air percus	iod of Con ol conventional) teverse) ssion	Struction		iblic mestic vestock gation Justrial	Well U Comm Municip Test Ho Cooling	se ercial Not used pal Dewaterin ple Monitoring & Air Conditioning	Pump Pumpi g Durati Final w	Intake set at (m) 20 on of pumping 1 hrs + rr vater level end of 23,9	nin f pumping ( <i>m/l</i> t)	2 3 4 5 10	21.7 22.4 22.6 22.8 23.3	2 3 4 5 10	14 14 12 12 12
Meth Cable Toc Rotary (C Rotary (R Baring Air percus Other, spe	ood of Con ol conventional) leverse) sssion ecify	struction Diamond Jetting Driving Digging		iblic mestic restock gation Justrial her, specify	Well U Comm Municip Test Ho Cooling	Se ercial Not used hal Dewaterin ble Monitoring & Air Conditioning	Pump Pumpi	intelie set at (m/ 20 on of pumping 1 hrs + 0 rr vateplevel end of 23.9 ng give rate (/mi	nin f pumping (m/tt)	2 3 4 5 10 15	21.7 22.4 22.6 22.8 23.3 23.4	2 3 4 5 10 15	10 12 12 12 12 12
Meth Cable Toc Rotary (C Rotary (C Rotary (R Berrig Gite percus Other, spe Inside	nod of Con ol conventional) teverse) ssion ecify <u>Con</u> Open Hole	struction Diamond Jetting Driving Digging struction Rec OR Material	Pu Liv Int Ot ecord - Cas Wall	blic mestic restock gation Justrial her, specify sing Depti	Well-U Comm Municip Test Ho Cooling h.(m/ft)	se ercial Not used bal Dewaterin le Monitoring & Air Conditioning Status of Well Water Supply	Pump Pumpi Duration Final w If flowin	intake set at (m/ BU 20 of pumping 1 hrs + r vateplevel end of 23.9 23.9 mng give rate (//mi	nin f pumping (m/tt) n / GPM) depth (m/ttD)	2 3 4 5 10 15 20	21.7 22.4 22.6 22.8 23.3 23.4 23.5	2 3 4 5 10 15 20	12 12 12 12 12 12 12 12 12 12 12 12 12 1
Meth Cable Toc Rotary (R Bering Air percus Other, spe Inside Diameter (cm)	ood of Con ol conventional) leverse) ssion eeffy Con Open Hole (Galvanizec Concrete, F	struction Diamond Jetting Driving Digging struction.Re OR Material , Fibreglass, tastic, Steel)	Pu Liv Liv Inic Scord - Cas Wall Thickness (cm/in)	blic mestic restock gation tustrial her, <i>specify</i> <b>sing</b> Depti From	Well-U           Comm           Municij           Test Hc           Cooling           h (m/ft)           To	se ercial Not used pal Dewaterin ple Monitoring & Air Conditioning Status of Well Water Supply Replacement Well Test Hole	g I I I I I I I I I I I I I I I I I I I	intake set at ( <i>m</i> ) g g on of pumping hrs + 0 n yatepievel end of 23.9 ng give rate ( <i>lmi</i> ) yatepievel end of 23.9 ng give rate ( <i>lmi</i> ) yatepievel end of and an	nin f pumping (m/lt) n / GPM) depth (m/lt)	2 3 4 5 10 15 20 25	21.7 22.4 22.6 22.8 23.3 23.4 23.5 23.6 23.6	2 3 4 5 10 15 20 25	12 12 12 12 12 12 12 12 12
Meth Cable Toc Rotary (C Rotary (C Baring Other, spe Other, spe Inside Diameter (cm@) G1/4-tt	ind of Con of conventional) teverse) ssion ecify 	Struction	Pure Pure Pure Pure Pure Pure Pure Pure	iblic mestic restock gation tustrial her, specify sing Depti From +2 7	Well-U           Comm           Municij           Test Ha           Cooling           h (m/t)           To           48'	se ercial Dewaterin be Monitoring & Air Conditioning Status of Well Water Supply Replacement Well Recharge Well Recharge Well Dewatering Well	g Durati g Durati Final v Final v Recon	intake set at (m/ gu an of pumping hrs + n ratesievel end or 23.9 ng give rate (l/mil mmended pump mmended pump 2000 000000000000000000000000000000000	nin fpumping (m/lt) n / GPM) depth (m/lt) rate	2 3 4 5 10 15 20 25 30	21.7 22.4 22.6 22.8 23.3 23.4 23.5 23.6 23.6 23.7	2 3 4 5 10 15 20 25 30	12 12 12 12 12 12 12 12 12
Meth Cable Toc Rotary (C Rotary (R Bering Air percus Other, spe Inside Diameter (cm) 57/6"	bod of Com of conventional) teverse) ssion ecity <u>Con</u> Copen Hole (Galvanizec Concrete, F Steel Open H	struction Diamond Jetting Driving Digging struction Res OR Material , Fibreglass, lastic, Steel) <b>Iole</b>	- Pu Liv Im In Scord - Cas Wall Thickness (cm/in) ta	iblic mestic restock gation tustrial her, specify sing Depti From +2.7 48	Well U           Comm           Municij           Test H           Cooling           h (m/ft)           To           48 ⁴ 100	se ercial Not used bal Dewaterin be Monitoring & Air Conditioning Status of Well Water Supply Replacement Well Dewatering Well Observation and/ou Most interest Market	g g l Final v Final v Recon (//min/) Well pp	intake set at (m/ BU 20 and pumping 1 hrs + m vateplevel end of 23.9 mmended pump mended pump 2000 mmended pump 2000 mmended pump	Apple	2 3 4 5 10 15 20 25 30 40	21.7 22.4 22.6 22.8 23.3 23.4 23.5 23.6 23.7 23.8	2 3 4 5 10 15 20 25 30 40	12 12 12 12 12 12 12 12 12
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## **APPENDIX I**

Water Quality Summary (Creekside 1)

Report to: 1470424 Ontario Inc. Project: 61899.03 (December 14, 2021)
## Creekside 1 Domestic Well Water Quality

GEMTEC Consulting Engineers and Scientists Limited PROJECT: 100443.001													
Parameter	Units	MDL	TW15-1, TW15-2, TW15- 3 Range	PW Range	PW1	PW2	PW3	PW4	PW5	PW6	PW7	PW8	PW9
Sample Date (m/d/y)			2015 Hydrog (Golder, 2017)	2021 Sampling	12/07/2020	12/08/2020	12/07/2020	12/07/2020	12/08/2020	12/08/2020	12/15/2020	12/15/2020	12/07/2020
Microbiological Parameters													
E. Coli	CFU/100 ml	1	ND(1)	ND (1) - 1	ND (1)								
Fecal Coliforms	CFU/100 ml	1	-	ND (1) - 6	ND (1)								
Total Coliforms	CFU/100 ml	1	ND(1) - 2	ND (1) - 23	ND (1)								
Heterotrophic Plate Count	CFU/mL	10	-	ND(10) - >2000	ND (10)	40	10	30	50	30	20	ND (10)	ND (10)
General Inorganics													
Alkalinity, total	mg/L	5	226 - 268	237 - 279	250	238	243	262	249	243	258	256	246
Ammonia as N	mg/L	0.01	0.203 - 0.23	0.15 - 0.29	0.2	0.19	0.21	0.17	0.19	0.29	0.19	0.21	0.2
Dissolved Organic Carbon	mg/L	0.5	0.91 - 1.1	1.2 - 2.8	1.8	1.2	1.8	1.7	2	1.8	2	1.9	1.4
Colour	TCU	2	ND (2) - 6	2 - 14	9	4	13	5	ND (2)	2	2	4	6
Colour, apparent	ACU	2	-	3 - 57	21	11	20	9	3	5	4	7	18
Conductivity	uS/cm	5	839 - 967	675 - 1320	774	777	739	747	701	675	710	724	739
Hardness	mg/L		144 - 195	114 - 384	181	166	167	158	138	120	114	137	162
pH	pH Units	0.1	7.73 - 8.18	7.4 - 8.2	8	7.7	8.1	8	7.8	7.9	8.2	8.1	8.1
Phenolics	mg/L	0.001	ND (0.001) - ND(0.002)	ND(0.001) - 0.001	ND (0.001)								
Total Dissolved Solids	mg/L	10	545 - 629	260 - 670	394	380	406	370	372	364	298	344	372
Sulphide	mg/L	0.02	-	ND(0.02) - 0.03	ND (0.02)								
Tannin & Lignin	mg/L	0.1	ND(0.1) - 0.2	ND(0.1)	ND (0.1)								
Total Kjeldahl Nitrogen	mg/L	0.1	0.2 - 0.29	0.2 - 0.4	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.3	0.3
Turbidity	NTU	0.1	0.8 - 1.7	0.1 - 8.3	1.3	1	1.5	0.7	0.2	0.1	0.4	0.6	1
Organic Nitrogen (calculated)	mg/L	-	0 - 0.08	<0.10 - 0.2	0.1	0.1	0.1	0.1	<0.10	0.1	0.1	0.1	0.1
Anions													
Chloride	mg/L	1	104 - 118	49 - 122	79	80	73	54	62	58	49	55	65
Fluoride	mg/L	0.1	0.59 - 1.1	0.7 - 1.3	1.1	1.1	1.1	1.1	1.3	1.3	1.2	1.1	1.2
Nitrate as N	mg/L	0.1	ND(0.01)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Nitrite as N	mg/L	0.05	ND(0.08) - ND(0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	1	40 - 61	23 - 64	37	45	34	31	29	25	31	34	36
Metals													
Calcium	mg/L	0.1	28 - 71	28.2 - 95.6	48.7	44	44.5	43	37.4	30.9	28.2	33.9	43.7
Iron	mg/L	0.1	0.13 - 0.22	0.1 - 0.6	0.2	0.2	0.3	ND (0.1)	0.1				
Magnesium	mg/L	0.2	18 - 34	10.4 - 35.2	14.5	13.6	13.5	12.3	10.8	10.4	10.5	12.7	12.9
Manganese	mg/L	0.005	ND (0.01)	ND (0.005) - 0.021	0.009	0.008	0.008	0.008	0.008	ND (0.005)	0.005	0.006	0.011
Potassium	mg/L	0.1	6 - 7	4.8 - 6.5	5.9	5.3	6	5.5	4.8	5	5.4	6.1	5.4
Sodium	mg/L	0.2	88 - 123	62.4 - 115	95.8	100	93.5	93.1	98.3	99	107	102	93
Bromide	mg/L	0.1		0.1 - 0.4	0.4	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.3
lodide	mg/l												

GEMTEC Consulting Engineers and Scientists Limited													
PROJECT: 100443.001													
Parameter	Units	MDL	TW15-1, TW15-2, TW15- 3 Range	PW Range	PW10	PW11	PW13	PW17		PW21		PW23	PW24
Sample Date (m/d/y)			2015 Hydrog (Golder, 2017)	2021 Sampling	12/08/2020	12/07/2020	05/20/2021	12/07/2020	05/14/2021	07/14/2021	07/20/2021	07/20/2021	07/20/2021
Microbiological Parameters													
E. Coli	CFU/100 mL	1	ND(1)	ND (1) - 1	ND (1)	1							
Fecal Coliforms	CFU/100 mL	1	-	ND (1) - 6	ND (1)	6							
Total Coliforms	CFU/100 mL	1	ND(1) - 2	ND (1) - 23	ND (1)	23							
Heterotrophic Plate Count	CFU/mL	10	-	ND(10) - >2000	ND (10)	20	10	ND (10)	-	40	210	300	>2000
General Inorganics													
Alkalinity, total	mg/L	5	226 - 268	237 - 279	259	256	259	245	237	255	263	262	268
Ammonia as N	mg/L	0.01	0.203 - 0.23	0.15 - 0.29	0.18	0.29	0.23	0.15	0.2	0.23	0.18	0.02	0.19
Dissolved Organic Carbon	mg/L	0.5	0.91 - 1.1	1.2 - 2.8	1.6	2.4	2.2	2	ND (0.5)	1.6	2.9	2.2	2.6
Colour	TCU	2	ND (2) - 6	2 - 14	14	5	ND (2)	8	3	3	11	ND (2)	4
Colour, apparent	ACU	2	-	3 - 57	22	20	5	24	9	57	13	ND (2)	5
Conductivity	uS/cm	5	839 - 967	675 - 1320	751	683	947	900	947	802	830	837	1060
Hardness	mg/L		144 - 195	114 - 384	182	209	249	217	238	157	203	0.819 (1)	267
pH	pH Units	0.1	7.73 - 8.18	7.4 - 8.2	7.7	7.9	8	7.9	8	8.1	8.0	8.0	7.8
Phenolics	mg/L	0.001	ND (0.001) - ND(0.002)	ND(0.001) - 0.001	ND (0.001)	0.001	ND (0.001)	ND (0.001)	ND (0.001)				
Total Dissolved Solids	mg/L	10	545 - 629	260 - 670	386	326	504	260	504	420	432	430	518
Sulphide	mg/L	0.02		ND(0.02) - 0.03	ND (0.02)	ND (0.02)	ND (0.02)	0.03	ND (0.02)	ND (0.02)	0.02	ND (0.02)	ND (0.02)
Tannin & Lignin	mg/L	0.1	ND(0.1) - 0.2	ND(0.1)	ND (0.1)								
Total Kjeldahl Nitrogen	mg/L	0.1	0.2 - 0.29	0.2 - 0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	ND (0.1)	0.2
Turbidity	NTU	0.1	0.8 - 1.7	0.1 - 8.3	2	1.6	0.5	2.4	0.8	8.3	0.3	0.2	0.9
Organic Nitrogen (calculated)	mg/L	-	0 - 0.08	<0.10 - 0.2	0.1	<0.10	0.1	0.2	<0.10	<0.10	<0.10	<0.10	<0.10
Anions													
Chloride	mg/L	1	104 - 118	49 - 122	70	58	105	114	122	72	74	74	129
Fluoride	mg/L	0.1	0.59 - 1.1	0.7 - 1.3	1.1	0.9	0.9	0.9	0.9	1.1	0.8	0.8	0.7
Nitrate as N	mg/L	0.1	ND(0.01)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)
Nitrite as N	mg/L	0.05	ND(0.08) - ND(0.1)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	1	40 - 61	23 - 64	34	23	42	49	47	34	34	34	49
Metals													
Calcium	mg/L	0.1	28 - 71	28.2 - 95.6	48.9	52.4	60.9	59.8	62	40.7	53.0	0.3	67.7
Iron	mg/L	0.1	0.13 - 0.22	0.1 - 0.6	0.3	0.3	ND (0.1)	0.3	0.1	0.6	0.2	ND (0.1)	0.1
Magnesium	mg/L	0.2	18 - 34	10.4 - 35.2	14.5	19	23.6	16.5	20.3	13.4	17.1	ND (0.2)	23.8
Manganese	mg/L	0.005	ND (0.01)	ND (0.005) - 0.021	0.008	0.007	0.01	0.009	0.009	0.009	0.010	ND (0.005)	0.013
Potassium	mg/L	0.1	6 - 7	4.8 - 6.5	5.1	5.6	6.5	5.7	5.9	5.6	6.2	0.3	5.9
Sodium	mg/L	0.2	88 - 123	62.4 - 115	91.5	62.4	113	102	115	97.8	109	175	119
Bromide	mg/L	0.1	-	0.1 - 0.4	0.2	0.1	0.2	0.3	0.4	0.3	0.2	0.2	0.3
lodide	ma/l			-		-	ND (0.2)	-	ND (1.0)		-		-

Notes: 1. PW23 was collected post-water softener and possibly other treatment systems.



## GEMTEC Consulting Engineers and Scientists Limited PROJECT: 100443.001

Parameter	Units	MDL	DL PW12		PW14			PW15		PW16			PW18		PW19		
Sample Date (m/d/y)			01/04/2021	07/13/2021	12/07/2020	04/08/2021	07/20/2021	05/14/2021	07/14/2021	12/15/2020	04/08/2021	07/13/2021	05/20/2021	07/14/2021	12/07/2020	04/08/2021	07/13/2021
Microbiological Parameters																	
E. Coli	CFU/100 mL	1	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-
Fecal Coliforms	CFU/100 mL	1	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-
Total Coliforms	CFU/100 mL	1	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-	ND (1)	-	ND (1)	-	-
Heterotrophic Plate Count	CFU/mL	10	10	-	10	-	-	-	-	90	-	-	950	-	ND (10)	-	-
General Inorganics																	
Alkalinity, total	mg/L	5	279	-	331	-	-	363	-	311	-	-	336	-	381	-	-
Ammonia as N	mg/L	0.01	0.23	-	0.20	-	-	0.16	-	0.05	-	-	0.25	-	0.26	-	-
Dissolved Organic Carbon	mg/L	0.5	2.8	-	1.5	-	-	ND (0.5)	-	1.8	-	-	2.4	-	2.2	-	-
Colour	TCU	2	2	-	6	162	-	7	-	3	30	-	2	-	35	-	-
Colour, apparent	ACU	2	3	-	32	21	-	8	-	4	<2	-	45	-	117	-	-
Conductivity	uS/cm	5	1320	-	2000	-	-	2150	-	1730	-	-	2620	-	3240	-	-
Hardness	mg/L		384	-	642	534	-	644	-	522	686	-	843	-	1100	1110	-
рН	pH Units	0.1	7.4	-	7.5	-	-	7.7	-	7.6	-	-	7.4	-	7.3	-	-
Phenolics	mg/L	0.001	ND (0.001)	-	ND (0.001)	-	-	ND (0.001)	-	ND (0.001)	-	-	ND (0.001)	-	ND (0.001)	-	-
Total Dissolved Solids	mg/L	10	670	-	1140	1340	-	1260	-	842	1220	-	1610	-	2030	2080	-
Sulphide	mg/L	0.02	ND (0.02)	-	ND (0.02)	-	-	ND (0.02)	-	ND (0.02)	-	-	ND (0.02)	-	ND (0.02)	-	-
Tannin & Lignin	mg/L	0.1	ND (0.1)	-	ND (0.1)	-	-	0.2	-	ND (0.1)	-	-	ND (0.1)	-	ND (0.1)	-	-
Total Kjeldahl Nitrogen	mg/L	0.1	0.4	-	0.4	-	-	0.2	-	0.2	-	-	0.4	-	0.4	-	-
Turbidity	NTU	0.1	0.4	-	2.5	34.4	-	1.2	-	ND (0.1)	-	-	11.7	· ·	15.2	9.7	-
Organic Nitrogen (calculated)	mg/L	-	0.17	-	0.2	-	-	0.04	-	0.15	-	-	0.15	-	0.14	-	-
Anions																	
Chloride	mg/L	1	223	112	420	447	224	430	194	366	414	182	574	103	837	739	173
Fluoride	mg/L	0.1	0.7	-	0.4	-	-	0.3	-	0.4	-	-	0.4	-	0.4	-	-
Nitrate as N	mg/L	0.1	ND (0.1)	-	ND (0.5)	-	-	ND (0.1)	-	0.1	-	-	ND (0.1)	-	ND (0.5)	-	-
Nitrite as N	mg/L	0.05	ND (0.05)	-	ND (0.05)	-	-	ND (0.05)	-	ND (0.05)	-	-	ND (0.05)	-	ND (0.05)	-	-
Sulphate	mg/L	1	64	-	119	-	-	119	-	107	-	-	140	-	198	-	-
Metals																	
Calcium	mg/L	0.1	95.6	-	151	125	-	151	-	54.1	158	-	189	-	243	261	-
Iron	mg/L	0.1	ND (0.1)	-	0.3	2	-	0.3	-	ND (0.1)	-	-	0.8	-	1.3	0.9	-
Magnesium	mg/L	0.2	35.2	-	64.4	53.9	-	64.6	-	94.0	70.7	-	89.9	-	119	112	-
Manganese	mg/L	0.005	0.021	-	0.037	-	-	0.046	-	0.035	-	-	0.060	-	0.076	-	-
Potassium	mg/L	0.1	6.2	-	6.8	-	-	4.7	-	8.8	-	-	8.1	-	8.0	-	-
Sodium	mg/L	0.2	103	111	148	139	124	178	109	133	172	125	193	99.1	215	270	125
Bromide	mg/L	0.1	0.2	-	0.1	-	-	ND (0.1)	-	0.1	-	-	0.2	-	0.3	-	-
Iodide	mg/L	-	-	-	-	-	-	ND (1.0)	-	-	-	-	ND (0.2)	-	-	-	-



## Creekside 1 Test Wells - Water Quality

GEMTEC Consulting		Creekside Phase 1 (Golder, 2017)											
PROJECT: 100443.001			Т	W15-1 (A165020)			TW15-2 (A165021)		TW15-3 (A165022)				
Parameter	Units	MDL		TW15-1			TW15-2		TW15-3				
			A165020	A165020	A165020	A165021	A165021	A165021	A165022	A165022	A165022		
Sample Date (m/d/y)			Sep 2015 Ptest 3 Hr	Sep 2015 Ptest 6 Hr	May-21	Sep 2015 Ptest 3 Hr	Sep 2015 Ptest 6 Hr	ABANDONED	Sep 2015 Ptest 3 Hr	Sep 2015 Ptest 6 Hr	May-21		
Microbiological Parameters													
E. Coli	CFU/100 mL	1	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	-	ND (1)	ND (1)	ND (1)		
Fecal Coliforms	CFU/100 mL	1	-	-	ND (1)	-	-	-	-	-	ND (1)		
Total Coliforms	CFU/100 mL	1	2	2	ND (1)	ND (1)	ND (1)	-	ND (1)	ND (1)	ND (1)		
Heterotrophic Plate Count	CFU/mL	10	-	-	-	-	-	-	-	-			
General Inorganics													
Alkalinity, total	mg/L	5	229	226	260	244	251	-	265	268	359		
Ammonia as N	mg/L	0.01	0.23	0.23	0.28	0.251	0.203	-	0.235	0.207	0.28		
Dissolved Organic Carbon	mg/L	0.5	1.8	1.1	2.0	0.91	0.91	-	1.1	1	0.9		
Colour	TCU	2	4	ND(2)	4	ND(2)	ND(2)	-	4	6	16		
Colour, apparent	ACU	2	-	-	-	-	-	-	-	-			
Conductivity	uS/cm	5	839	839	782	887	879	-	975	967	1870		
Hardness	mg/L	-	144	144	138	195	195	-	316	317	585		
На	pH Units	0.1	7.75	7.73	8.1	8.24	8.18	-	8.18	8.13	7.5		
Phenolics	mg/L	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.002)	ND (0.002)	-	ND (0.002)	ND (0.002)	ND (0.001)		
Total Dissolved Solids	mg/L	10	545	545	402	577	571	-	634	629	1110		
Sulphide	mg/L	0.02	-	-	ND (0.02)	-	-	-	-	-	ND (0.02)		
Tannin & Lignin	mg/L	0.1	ND (0.1)	ND (0.1)	ND (0.1)	6.4	0.1	-	0.2	0.2	ND (0.1)		
Total Kieldahl Nitrogen	mg/L	0.1	0.2	0.2	0.4	0.29	0.25	-	0.36	0.29	0.4		
Turbidity	NTU	0.1	2.2	0.8	0.9			-	0.9	1.7	7.0		
Organic Nitrogen (calculated)	mg/L	-	0	0	0.1	0.04	0.05	-	0.12	0.08	0.12		
Anions	0,				-				-		-		
Chloride	mg/I	1	102	104	76	108	105	-	122	118	382		
Fluoride	mg/L	0.1	1.1	1.1	1.0	0.91	0.91	-	0.59	0.59	0.3		
Nitrate as N	mg/L	0.1	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	-	ND (0.1)	ND (0.1)	ND (0.1)		
Nitrite as N	mg/L	0.05	ND (0.08)	ND (0.08)	ND (0.05)	ND (0.08)	ND (0.08)	-	ND (0.1)	ND (0.1)	ND (0.05)		
Sulphate	mg/l	1	40	40	30	45	45	-	63	61	102		
Metals	1116/ 2	-	40		50	45	45		05	01	102		
Calcium	mg/l	0.1	28	28	34 7	40	40	-	72	71	136		
Iron	mg/L	0.1	0.27	0.13	01	0 19	0.16	-	0.22	0.22	0.6		
Magnesium	mg/l	0.2	18	18	12.5	23	23	-	33	34	59.4		
Manganese	mg/l	0.005	ND (0 01)	ND (0.01)	ND (0.005)	0.01	ND (0.01)	-	ND (0.01)	ND (0.01)	0.027		
Potassium	mg/l	0.005	7	7	5 5	6	6	_	6	6	6.7		
Sodium	mg/L	0.1	, 121	, 123	107	115	113	_	90	88	146		
3001011	1116/ -	0.2	121	123	107	111	113	-		00	140		





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