HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

Project No.: CCO-21-3339-01

Prepared for:

Nupur Chakravorty, OAA, LEED AP BD+C, B.Arch.
Senior Project Manager
City of Ottawa

Prepared by:

McIntosh Perry Consulting Engineers Ltd.
115 Walgreen Road
Carp, Ontario
K0A 1L0

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McIntosh Perry ('MP') was retained by the City of Ottawa ('the Client') to conduct a Scoped Hydrogeological Assessment and Terrain Analysis in support the City of Ottawa Site Plan Approval (SPA) process for the construction of an addition to the Corkery Community Centre, located at 3447 and 3449 Old Almonte Road, Ottawa, Ontario (collectively referred to as 'the Site').

This report has been prepared using data collected from an existing water supply well at 3447 Old Almonte Road, Ottawa, ON (Test Well 1) by Mcintosh Perry staff on February 3, 2022. An additional well at the Ottawa Fire Station 84 (Test Well 2) located immediately west of the Site (3449 Old Almonte Road) was tested for water quality, as per the City of Ottawa guidance. Hydrogeological data from these wells are considered representative of the Site.

Ground surface at the Site is relatively flat, with a large portion of the site having a very gentle slope towards the east. Site elevation ranges from approximately 156 - 160 metres above sea level (m asl). Surface drainage is interpreted to reflect surface topography and is likely controlled via permeable areas and ditches along the roadway. Based on public mapping, the site represents a triple divide point between three local subwatersheds, with a larger portion of site draining to the south and east towards Huntley Creek (Carp River), and the remaining portions to the north and east to Corkery Creek (Carp River), and to the east towards Cody Creek (Mississippi River). Given this, shallow groundwater flow direction in the vicinity of the Site is difficult to infer.

Test Well 1 was pumped for a duration of six (6) hours and was sampled twice during this time. The pumping rate during the 6-hour pumping test (approximately 32 L/min) is considered sufficient to supply the proposed development.

Water quality results indicate that the bedrock aquifer provides good quality water, which may be considered suitable for human consumption. All water from Test Well 1 and Test Well 2 meets all applicable health-related standards and guidelines at the present time. Some treatment may be desired for aesthetic reasons.

On-site overburden in the area of the subject site is listed by the Ontario Geological Survey (OGS) as bedrock-drift complex in a Paleozoic terrain, and fine-textured glaciomarine deposits, which typically indicates shallow overburden. This assertion is supported by MECP WWIS records, which indicate an average depth to bedrock of approximately 2.2 m below ground surface (bgs) for listed wells within 500 m of the Site.

The Site appears to be capable of supporting the proposed from a hydrogeological perspective.

The existing on-site sewage system components appear to be constructed in conformance with applicable stipulations as per applicable Ontario Regulations and sufficiently sized to accommodate the expanded community centre.

The result of the impact assessment related to the on-site sewage systems indicate that the proposed community centre expansion will not be associated with unacceptable off-site impacts.

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1.0 INTRODUCTION

McIntosh Perry ('MP') was retained by the City of Ottawa ('the Client') to conduct a Hydrogeological Assessment and Terrain Analysis in support of the City of Ottawa Site Plan Approval (SPA) process for the construction of an addition to the Corkery Community Centre, located at 3447 Old Almonte Road, Ottawa, Ontario (collectively referred to as 'the Site').

Based on pre-consultation with City of Ottawa personnel, the scope of the hydrogeological investigation is to confirm whether an existing well at the Site (which currently serves the Corkery Community Centre) has sufficient capacity to serve the proposed addition as well as the existing community centre, and to confirm groundwater quality in the existing well. The scope of the septic assessment is to demonstrate that the Corkery Community Centre's existing on-site sewage system does not and will not adversely impact the existing on-site well water supply or existing water supply wells on surrounding properties as per section 5.2.5 of the City's Hydrogeological and Terrain Analysis Guidelines (March 2021).

The Site location is shown on Figure 1 – Site Location, and an outline of the Site showing the neighbouring properties is presented on Figure 2 – Site Layout.

This report has been prepared using data collected from an existing water supply well located on-Site by Mcintosh Perry staff on February 3, 2022.

This Hydrogeological Evaluation addresses the following:

- Well Record search and evaluation;
- Background hydrogeological evaluation;
- Oversight of a minimum 6-hour pumping test on-Site;
- Water level and flow monitoring, field water quality analyses;
- Sampling and analysis – includes 3 samples analyzed for the 'Subdivision Supply Suite' of parameters (2 samples at on-Site, 1 sample at Ottawa Fire Station 84 located immediately west of the Site (3449 Old Almonte Road); and
- Data Evaluation and Report.

1.1 Consultation

The City of Ottawa and McIntosh Perry conducted a pre-application consultation with the City of Ottawa on November 18, 2021. The City of Ottawa provided information of what would be required for this Hydrogeological Report and Terrain Analysis.

2.0 BACKGROUND

2.1 Site Setting

The Site is located in the Carp area of the consolidated City of Ottawa, within the geographical township of Huntley (Figure 1). The site is zoned as Rural Institutional Sub-Zone 3 (RI3) as per the City of Ottawa Zoning By-Law Number 2008-250 sections 223 and 224.

At the present time, the Site is occupied by the Corkery Community Centre. At the time of investigation, on-Site conditions consisted primarily of one building, an outdoor skating rink, a play structure, and three soccer fields. Based on a review of aerial photographs (GeoOttawa), it appears that the Site was developed between 1991 and 1999.*It should be noted that Ontario Parcel data available on public provincial online mapping as well as the City of Ottawa's GeoOttawa GIS online mapping service suggest that the property parcel containing the Corkery Community Centre also encompasses Ottawa Fire Station 84 even though both facilities have separate entrances on Old Almonte Road as well as individual civic addresses. McIntosh Perry's scope of work for this assignment did not include legal surveying to establish property parcel boundaries and as such, this report accounts for both possibilities.*

2.2 Neighbouring Properties and Land Uses

The Site is bounded by rural residential land to the north, east, south and west, with Old Almonte Road to the south, undeveloped forested land to the east/south, and the Ottawa Fire Station 84 to the west.

The Site has frontage to Old Almonte Road. While MECP Water Well Information System (WWIS) records for the area do not provide the detailed locations of most wells, all developments within the area are assumed to be privately serviced with wells and on-site sewage systems.

Figure 3 – MECP Wells Record Summary, presents the MECP Well Tag numbers and approximate well locations, where available, for wells within approximately 500 m of the Site.

2.3 Hydrology

Topography was reviewed on the Atlas of Canada–Toporama website. Site elevation ranges from approximately 156 - 160 metres above sea level (m asl) and is a local high point. Ground surface at the Site is relatively flat, with a large portion of the site having a very gentle slope towards the east.

Surface drainage is interpreted to reflect surface topography and is likely controlled via permeable areas and ditches along the roadway. Based on the Ministry of Natural Resources and Forestry (MNRF)'s GIS Ontario Flow Assessment Tool, the site represents a triple divide point between three local subwatersheds, with a larger portion of site draining to the south and east towards Huntley Creek (Carp River), and the remaining portions to the north and east to Corkery Creek (Carp River), and to the east towards Cody Creek (Mississippi River). Given this, shallow groundwater flow direction in the vicinity of the Site is difficult to infer.

The closest large permanent water bodies are the Mississippi River and Carp River, both located approximately 10 km from the site to the southwest and northeast of the Site, respectively, at their closest points. On regional scale, surface water is likely to flow both to the Mississippi River and Carp River given its location at the headwaters of three local sub-watersheds and on the divide of two Quaternary Watersheds (i.e. Mississippi River to the west and Carp River to the east).

2.4 Geology and Hydrogeology

On-site overburden at the Site is identified by the Ontario Geological Survey (OGS) as a contact between coarse-textured glaciomarine deposits consisting of sand, gravel, minor silt and clay, and Paleozoic bedrock. According to notes provided by during the pre-application consultation meeting, there are suspected thin soils in the area. This assertion is supported by MECP WWIS records, which indicate an average depth to bedrock of approximately 2.2 m below ground surface (bgs) for listed wells within 500 m of the Site. Refer to Section 5.0 for a more detailed discussion regarding surficial geology. On-site bedrock is generally characterized as limestone, dolostone, shale, arkose, and sandstone from the Ottawa and Simcoe Groups, and the Shadow Lake Formation (OGS 2020), which is supported by well records that list the bedrock as either “sandstone” or “limestone,” which is commonly interchanged for dolostone in the absence of detailed inspection (MECP 2020).

Based on available information, shallow groundwater flow direction is difficult to infer as the site is located at a triple divide point for three local subwatersheds, each flowing is different directions.

2.4.1 Recharge and Discharge Areas

Based on a review of topographic data, geological maps, and Site visits, a larger portion of the central and south-eastern portion of the property slopes slighty downwards to the east, towards an unnamed creek which is tributary of Huntley Creek, while the northern limits drain north towards Corkery Creek and the south-western corner drains west towards Cody Creek. Shallow groundwater and surface water flows are therefore expected to vary depending the exact location of the site. Overall, the majority of the Site appears to be well drained.

No bedrock outcrops were observed at the Site, but it is important to consider that the ground was snow covered at the time of the visit.

Due to shallow bedrock in the area, the Site is therefore considered to be a hydrogeologically sensitive area.

2.4.2 Potential Sources of Contamination

A windshield survey of the surrounding area was conducted in combination with a site walkthrough and review of maps and zoning information. The Site is located in a predominantly rural residential area. This does not appear to pose any significant source of contamination to the proposed development. No obvious potentially contaminating activities (e.g. fuel outlets, improperly maintained bulk fuel storage, salt storage, manure piles, livestock yards, etc.) were observed in the vicinity of the

Site at the time of inspection. However, it was noted in discussions with the City of Ottawa that a retail fuel outlet may have been historically present in the vicinity of the Site, either at the community centre property itself or the adjacent fire hall. A review of aerial photographs from the City of Ottawa's online mapping tool did not identify any evidence of a retail fuel outlet based on 1976 and 1999 aerial photos.

The Site and surrounding properties are not connected to municipal services. As such, there are likely private on-site sewage systems at all nearby residences.

2.4.3 Water Well Record Review

The MECP's WWIS database indicated 61 water wells that are located within 500 m of the Site boundary. 56 of these wells are listed for domestic purposes. The remaining wells are assumed abandoned. The MECP WWIS records are shown on Figure 3, and data are summarized in Appendix D.

All wells were completed in bedrock at final depths ranging from 19.2 – 17.6 m below ground surface (bgs). The average depth to bedrock was reported to be 2.15 m bgs. Driller-reported static groundwater levels ranged from 0.9 – 35.1 m bgs.

Driller-reported well yields ranged from 9.0 – 136.4 L/min, generally at or above the recommended minimum rate of 13.7 L/min for residential occupancies.

3.0 METHODOLOGY – HYDROGEOLOGICAL ASSESSMENT

McIntosh Perry conducted a hydrogeological investigation at the Site to assess the feasibility of servicing the proposed development. The work generally followed the guidance of MECP Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment and the City of Ottawa's Hydrogeological Guidelines.

McIntosh Perry tested the existing community/institutional drilled water supply well located at 3447 Old Almonte Road (Test Well 1, TW1), which is believed to be representative of the hydrogeological conditions across the entire Site.

The pumping test at TW1 used the existing installed plumbing equipment. It is important to note that for the entire duration of the test, the pump cycled on and off, filling the pressure tank, which resulted in oscillating water levels.

A six-hour pumping test was conducted at TW1 by McIntosh Perry staff on February 3, 2022. During the entire duration of the test, the well was effectively taken offline and used solely for purposes of the pumping test. Water was pumped directly from the test well using the existing domestic water well pump, via a hose attached to an outdoor tap. The water discharge was directed away from the building and was allowed to flow overland across the Site. Discharging the water onto potentially thin soils did not appear to affect flow or drawdown during the pumping test.

During the testing period, water levels in the well were measured using an electronic water level tape. Water quality (pH, temperature, conductivity, turbidity, and total dissolved solids) was also monitored and recorded in the field during the test using calibrated instruments (Horiba U-52). Groundwater chemistry had stabilized prior to collecting samples of the well water.

It should be noted that the samples collected at the Site were directly from the outdoor untreated tap. Two samples (TW1-1 and TW1-2) were collected for laboratory analysis, one within the first hour of the pump test (TW1-1) and the second one within the final hour (TW1-2). An additional sample ('TW2') was collected at a neighbouring property, 3449 Old Almonte Road, Ottawa, ON (Ottawa Fire Station 84). These samples were analyzed for the full suite of parameters list in the City of Ottawa's Guidelines for Hydrogeological Studies. Water samples were also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and petroleum hydrocarbons, fractions 1 through 4 (PHC F1-F4), due to the close proximity to the fire station, and anecdotal evidence of a retail fuel outlet in the vicinity.

It is important to note that a water sample was not obtained from an additional residential dwelling in an inferred downgradient direction.

Whenever samples were collected from TW1, confirmation of zero chlorine residual was measured using disposable test strips. All groundwater samples were collected unfiltered and unchlorinated, directly into clean bottles supplied by the analytical laboratories (Paracel Laboratories Ltd., Ottawa,

ON). The samples were kept on ice and shipped directly to Paracel under strict chain of custody procedures. All of the samples were received by the laboratory within 24 hours of collection.

Paracel is fully accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation (SCC/CALA) and has accreditation for Ontario Safe Drinking Water Act (OSDWA) testing.

During the pumping test, water level monitoring consisted of manual readings with an electronic water level tape. Drawdown was measured in the pumped well and measurements were made until at least 95% recovery were achieved, or 24 hours had passed (whichever came first). A data logger could not be used due to the risk of damaging down-hole equipment (pump and associated wiring).

Drawdown and recovery data from the pumping tests were plotted and analyzed using the Cooper-Jacob solution. The hydraulic conductivity (*K*, m/s) and transmissivity (*T*, m^2/d) and long-term yield (Farvolden and Moell Method) of the aquifer were estimated. Storativity cannot be assessed properly without the use of an additional observation well, which was not available at the time of the test.

4.0 RESULTS

A drawdown curve and tabular data from the pumping tests at the Site is available in Appendix A. A summary of groundwater quality data and the official Laboratory Certificates of Analysis are available in Tables 1 and 2 and Appendix B, respectively.

4.1 Static Conditions

Prior to the initiation of pumping, water levels were measured in the well. The static groundwater level was recorded at 32.35 m below top of casing (btoc) at the time of the pumping test (t=0). Assigning an arbitrary site benchmark of 100.00 m (local) to the top of the casing, the static water elevation in the well was 67.65 m above datum (ad). According to the MECP Well Record for TW1 (1530802), the pump was set at a depth of 45.72 m, corresponding to an available drawdown of 13.37 m.

Standing water or evidence of groundwater discharge was not observed at the test well location at the time of the pumping test.

4.2 Pumping Test – TW1

A pumping test was conducted at TW1 (3447 Old Almonte Road) under the supervision of McIntosh Perry on February 3, 2022. Water was pumped directly from the test well using the existing domestic water well pump, and one hose attached to the outdoor tap. The water discharge was directed away from the building and was allowed to flow overland across the Site. At the time of the pumping test, the weather was approximately -6°C and cloudy.

All water level measurement data are presented in Appendix A. Due to the existing installed plumbing, water levels were seen to oscillate throughout the entire duration of the test.

At 9:40 AM, the outdoor tap was turned on and the flow rate adjusted to approximately 32 L/min from the hose. This pumping rate was maintained with minimal variation for the duration of the test (361 minutes total).

The groundwater level ranged between 32.21 – 32.752 m btoc, with a maximum drawdown of 0.402 m observed. Following pump shutoff (361 minutes), drawdown was recorded at 0.02 m within 33.33 minutes (32.37 btoc, 67.63 m ad), representing approximately 95% recovery.

4.2.1 Well Yield

The pumping test undertaken by McIntosh Perry provides a reasonable indication of the yield of the Test Well. During this test, approximately 11,372 L of water was pumped from the well; this volume exceeds the daily demand for water for a typical 4-BR home (2,250 L) as specified in the Guideline Procedure D-5-5 Private Wells: Water Supply Assessment. Since the well will not be used for residential purposes, it was also established that the volume pumped exceeded the expected water demand of

3,600 L/day which has been established for this assessment based the calculated total daily design sanitary sewage flows for the site..

4.2.2 Transmissivity

The transmissivity for TW1 was calculated following the Cooper-Jacob method. The calculations for Transmissivity are presented in Appendix C. Transmissivity was calculated using the following equation:

$$T = \frac{2.3\ Q}{4\ \pi \Delta s}$$

Where:

- T is the transmissivity (m^2/day)
- Q is the pumping rate during the pumping test (L/min); and,
- Δs is the differential for residual drawdown for one log cycle (m)

Using drawdown and recovery data, respective transmissivities of 301 m^2/d and 3375 m^2/day were calculated using the Cooper-Jacob method. The transmissivity of 301 m^2/day calculated from the drawdown was used in the calculations as it is the more conservative value. It is noted that recovery data are likely more representative of aquifer conditions, as drawdown data were complicated by the cycling of TW1's pressure tank.

Assuming an aquifer thickness of 59.74 m (corresponding to the interval between the bottom of the casing and the bottom of the well), the screened formation of TW1 was calculated to have a hydraulic conductivity ranging from 5.8×10^{-5} – 6.5×10^{-4} m/s.

Storativity (S) could not be calculated as no observation wells were available for measurement at the time of the pumping test.

A summary of the well and hydrogeological properties determined during the testing work at the Site are presented in Appendix A. The calculations for Transmissivity are presented in Appendix C.

4.2.3 Long Term Yield

The theoretical long-term safe yield was calculated using both the Farvolden and Moell methods. Drawdown data were used, as they are likely more representative of aquifer conditions (see above Section 4.2.2).

Farvolden Equation

The long-term yield (Q_{20}) was calculated using the following Farvolden equation:

$$Q_{20} = 0.68\, T\, Ha\, S_f$$

Where:

- Q_{20} is the twenty-year safe yield;
- T is the transmissivity;
- Ha is the available water column height (above the pump); and
- S_f is a safety factor (0.7).

Based on the Farvolden Method, calculations indicate that a twenty-year safe yield is in the order of 1332 L/min. This means that TW1 could theoretically sustain continuous pumping for 20 years at this rate, which is improbable as with normal water use; the pump will cycle on and off on a much shorter time scale, allowing the well to recharge.

Moell Method

The Moell Method was also used to calculate the theoretical long-term safe yield for the pumping well. The long-term yield (Q_{20}) was calculated using the following Moell equation:

$$(Q_{20}) = (Q\ Ha\ Sf) / (s100 + 5\ \Delta s)$$

Where:

- Q_{20} is the twenty-year safe yield (m^3/day);
- Ha is the available water column height (m);
- S_f is a safety factor (0.7);
- s100 is the drawdown at 100 minutes (semi-log long-term graph);
- Δs is the change in hydraulic head over one log cycle (drawdown vs. log time, see Appendix D); and
- Q is the pumping rate during the pumping test (L/min.

Using the Moell Method, calculations indicate that a twenty-year safe yield for the well is in the order of 763 L/min.

Accordingly, McIntosh Perry is of the opinion that the aquifer is capable of supplying water at a flow rate which greater than the minimum flow rate of 30 L/min, which assumes that the entire daily water demand of 3,600 occurs for a period of 120 minutes per day.

The calculations for the Farvolden and Moell method are presented in Appendix C.

4.2.4 Water Quality

Laboratory Certificates of Analysis for on-site groundwater testing are presented in Appendix B. A summary of field and laboratory results from the TW1 is presented in Tables 1 and 2. Samples were taken twice during the six-hour pumping test of TW1 on February 2, 2022. Samples were taken directly from the outdoor untreated tap into laboratory supplied containers. The pre-test and post-test samples at TW1 were labelled '-1' and '-2', respectively. A sample was also taken from an untreated bathroom tap at the Fire Station (3449 Old Almonte Road), located immediately west of the Site.

The results of the analytical testing were compared to the Ontario Drinking Water Standards, Objectives, and Guidelines (ODWSOG). Based on the analytical results from February 3, 2022 the following was noted:

- Water from TW1-1 and TW1-2 is considered to be **very hard** in relation to operational guidelines (OG);
- OWDS guidelines for **iron** exceeded in sample TW1-1 for aesthetic objectives (AO);
- Organic Nitrogen's operation guideline (OG) was exceeded in both TW1-1 and TW1-2 samples;
- The health warning limit for sodium (20 mg/L) was exceeded in samples TW1-1, TW1-2, and TW1-3.

Analytical testing indicates that the water quality of TW1 is suitable for potable purposes.

4.2.5 Water Treatment

The groundwater quality at the Site, as indicated by analytical data from TW1 and TW2, is suitable for human consumption. Aesthetic parameters such as hardness and iron can be readily treated. Should water softening be desired, a potassium salt softener (KCl) is recommended to avoid elevated levels of sodium and chloride above those reported in Table 1.

It should be noted that it is expected that this facility's drinking water system would be regulated under Ontario's Small Drinking Water Regulation 319/08 (O.Reg. 319/08) as it would likely be considered a small municipal non-residential drinking water system (even though it might not be capable of supplying water at a rate of more than 2.9 L/s) since it is understood to serve a "public facility" as defined in the regulation. Small drinking water systems that are regulated under O.Reg. 319/08 are assessed by Public Health inspectors (PHI). Should the PHI have issued a directive with respect to treatment requirements that include the requirement to provide disinfection, the organic nitrogen operation guideline exceedance should be reviewed and discussed by both the PHI and the system's

operator to ensure it does not interfere with chlorination should it be required or already used as part of the existing drinking water system on-site.

5.0 TERRAIN ANALYSIS

5.1 Preamble

EXP completed a Geotechnical Investigation in 2021 where four boreholes (BH-01 through BH-04) and three test pits (TP-03, TP-02, and TP-04) were advanced in the area of the proposed addition to the Corkery Community Centre (EXP, 2021). Additionally, as a part of this Hydrogeological Assessment and Terrain Analysis, McIntosh Perry advanced one test pit on December 22, 2021 (MP-TP1-2021), within the contact area of the existing sewage system. See Figure 7 for locations of test pits and boreholes.

The test pits and boreholes mentioned above all detail the depth of overburden and depth to bedrock. Various soil samples were collected for soil characterization.

5.2 General Site Evaluation

5.2.1 Overburden Depth

Where boreholes were advanced to refusal, overburden across the site was found to be relatively shallow (< 2.1 m), having an average overburden thickness of 1.7 m (EXP, 2021).

The test pit advanced by McIntosh Perry staff on December 22, 2021 was advanced to a depth of 0.85 m (refusal was not reached).

5.2.2 Overburden Characterization

The soil and groundwater conditions from the test pits and boreholes advanced by EXP and discussed in the Geotechnical Investigation report (EXP, 2021), with the borehole logs, test pits logs and Soil Particle Size Distribution Analysis included in Appendix E, along with the test pit log for the test pit advanced by McIntosh Perry staff as part of the Sewage System assessment on December 22, 2021.

The logs indicate the subsurface conditions at the specific test pit locations only. Boundaries between zones on the logs are often not discrete but transitional and have been interpreted. Subsurface conditions described have various degrees of precision based on the frequency of test pits, uniformity of subsurface conditions and number of samples collected. Where conditions at locations other than at the test pit locations are reported, these are inferred and may vary from the conditions at the test pits.

The soil descriptions in this report are based on tactile observations by McIntosh Perry staff as well as Grain Size Distribution curves provided in the EXP Geotechnical Investigation report (EXP, 2021).

5.2.2.1 Topsoil

A layer of topsoil was encountered in all of the test pit and borehole locations; the topsoil had a varying thickness between 0.075 m and 0.25 m (EXP, 2021), and 0.10 m in the test pit advanced by McIntosh Perry staff.

5.2.2.2 Silty Sand with Gravel (SM)

A layer of silty sand with gravel was encountered below the topsoil/granular fill layer in all test pits and boreholes with the exception of test pit MP-TP1-2021; the layer had a varying thickness between 0.4m and 1.5 m.

5.2.2.3 Sandy Gravel with Silt, Cobbles and Boulders (GM)

A layer of sandy gravel with silt, cobble and boulders was encountered below the silty sand with gravel layer in BH-01, BH-03, and TP-01 and below the silt gravel with sand layer in MP-TP1-2021; the layer had a varying thickness between 0.6 m and 1.3 m.

5.2.2.4 Silty Gravel with Sand, Cobbles and Boulders (GM)

A layer of silty gravel with sand, cobbles, and boulders was encountered either below the topsoil or below silty sand and gravel in BH-02 and MP-TP1-2021; the layer had a varying thickness between 0.1 m and 0.3 m.

5.2.2.5 Silty Sand to Sandy Silt with Gravel (SM-ML)

A layer of silt sand to sandy silt was encountered below the silty sand and gravel and immediately above the refusal depth in BH-04; the layer had a thickness of 0.6 m.

5.2.3 Soil Classification for Private Sanitary Servicing

Comparison of the soil classification for the Unified Soil Classification as provided in the Ministry of Municipal Affairs and Housing (MMAH) Supplementary Standard SB-6: Time and Soil Descriptions, reveals that the two main soils assessed on-site falls within either the following:

- GM: Silty Gravels, gravel-sand-silt mixtures
    - According to Table 2 of SB-6, the GM group of soils has a coefficient of permeability (K) of 10^{-2} to 10^{-4} with a percolation time (T) between 4-12 min/cm. Due to the permeable to medium permeability nature of the soil type, it is deemed acceptable as native receiving soil for Class 4 sewage systems.
- SM: Silty sands, sand-silt mixtures
    - According to Table 2 of SB-6, the SM group of soils has a coefficient of permeability (K) of 10^{-3} to 10^{-5} with a percolation time (T) of 8 to 20 min/cm. This soil type has a medium to low permeability and is deemed acceptable as native receiving soil for Class 4 sewage systems.

5.2.4 Bedrock

As previously discussed in Section 2.4, on-site bedrock is generally characterized as limestone, dolostone, shale, arkose, and sandstone from the Ottawa and Simcoe Groups, and the Shadow Lake Formation (OGS 2020), which is supported by the geotechnical borehole BH-03 (EXP), in addition to MECP drinking well records that list the bedrock as either "sandstone" or "limestone," which is commonly interchanged for dolostone in the absence of detailed inspection (OGS 2020).

5.2.5 Groundwater

Groundwater was only encountered in the shallow overburden in EXP TP-03 (1.6 m bog) and was encountered in the shallow bedrock in the piezometer installed in the BH-03 (2.6 m bog).

5.3 Contaminant Attenuation

5.3.1 Three-Step Assessment Process

As part of the consent development application process, the City of Ottawa requires that a water quality impact risk assessment be completed as per MECP requirements. The MECP Procedure D-5-4 (Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment) outlines the following steps to be completed as part of a septic impact assessment:

- Step 1 – Lot Size Consideration
- Step 2 – System Isolation Consideration
- Step 3 – Contaminant Attenuation Considerations

The following outlines the results of the sewage system impact assessment as undertaken by McIntosh Perry.

5.3.1.1 Step 1 - Lot Size Consideration

For the purpose of this investigation, McIntosh Perry considered the land parcels upon which the Corkery Community Centre exists (2.60 hectares) and the neighbouring lot with the sports fields (1.16 hectares) as the site, which together combine to be 3.76 hectares. The site appears to have two separate civic addresses (3447 and 3449 Old Almonte Road). Please see Figure 2 for layout of the two adjacent parcels that are considered to be subject site.

As part of the terrain assessment for this site, McIntosh Perry established an equivalent total daily sewage flow loading rate to the 1,000 L/day/ha of domestic waste that is used for residential developments. As the subject site is approximately 3.76 ha and assuming the equivalent of domestic strength waste will be generated for the existing fire hall and proposed expanded community centre, a total daily sewage flow loading rate of 3,760 L/day was calculated based on spatial area to adequately permit development of the Site.

Since the existing fire hall's sewage system appears to have a rated capacity of approximate 1,200 L/day based on a review of available sewage system permit records, and the proposed expanded community centre will be associated with a total daily sewage system flow of 3,600 L/day, the total site-wide daily sewage flow is estimated at 4,800 L/day. Accordingly, McIntosh Perry considered that this total daily sewage flow was not insufficient for the scale of proposed development on the subject site, a therefore a review of Step 2 – System Isolation Consideration was undertaken.

5.3.1.2 Step 2 - System Isolation Consideration

As previously outlined, the existing lot is considered too small for lot size consideration; therefore, McIntosh Perry assessed whether System Isolation Considerations were applicable. If it can be demonstrated that the sewage system effluent is hydrogeologically isolated from the existing or potential drinking water supply aquifer, then the risk to groundwater is considered to be low. The system isolation argument applies to lands that extend up to 500 metres from the Site.

Based on a review of available geological information and mapping, in conjunction with site observations made during the Terrain Analysis and background information review, overburden depth on-site is shallow (< 2.1m). The Site is therefore determined not to be hydrogeologically isolated and, as such, the consideration for system isolation of sewage system effluent from the groundwater supply aquifer is not applicable to this site.

5.3.1.3 Step 3 – Contaminant Attenuation Considerations

Since neither lot size nor system isolation considerations apply to the proposed severances, a predictive nitrate-nitrogen attenuation assessment was undertaken to determine if sufficient attenuation of nitrate-nitrogen could be achieved on the subject site.

The Thorthwaite Water Balance method, in conjunction with local climatic data available from Environment Canada for Ottawa's MacDonald-Cartier International Airport YOW (Site Climate ID: 6106000), was used to estimate the net potential infiltration for the subject site.

As previously discussed, for the purpose of the calculations, both 3447 and 3449 Old Almonte Road properties combined were used for contaminant attenuation considerations as both are owned by the City of Ottawa.

As indicated previously, the information contained in the 2009 sewage system Certificate of Completion No. 09-505 (Appendix G) obtained via a file search with the Ottawa Sewage System Office for the property at 3449 Old Almonte Road, which services the Fire Station, suggest it was designed for a total daily sewage flow of 1,200 L/day. In coordination with the City of Ottawa's project team for the Community Centre expansion project, it was established that a total daily sewage flow of 3,600 L/day would be appropriate for the Community Centre after the expansion based on occupancy for the facility equivalent to 450 people in an assembly hall with no food service, 180 people in public parks with access to toilets only, or 100 people in an assembly hall with food service provided. Combining

the total daily sewage flow for both the fire hall and the expanded Community Centre, a site-wide sewage flow of 4,800 L/day was carried forward for this assessment.

The nitrate concentration at the site boundaries was calculated using the following information (refer to Appendix A for more information):

- A water surplus (Ws) value of **333.88 mm/yr** was calculated based on 1981-2010 Climate Normal data for Ottawa's MacDonald-Cartier International Airport (YOW) (Site Climate ID: 6106000);
- An infiltration factor (I_f) of **0.600** was calculated as per Table 2 of MECP's document titled "MOEE Hydrogeological Technical Requirements for Land Development Applications," dated April 1995. The factors used to calculate the Infiltration Factor (If) and the associated rationale for selection are presented below:
    - A topographic factor of 0.20 was used as the land can be considered relatively flat or 'rolling land'.
    - A soil factor of 0.30 was used due to the silty sand with gravel and silty gravel with sand encountered in the overburden throughout the site (EXP, 2021).
    - A cover factor of 0.10 was used for Cultivated Land (0.1) as the majority of the site is expected to remain as cultivated land/mowed grass.
- Available infiltration (I) was calculated by multiplying the water surplus (Ws) by the infiltration factor (If). This yielded an infiltration value of **0.200 m/yr**.
- The infiltration area (A) was determined to be 3.2218 ha (32,217.82 m^2) or 85.7% of the site, once adjustments were made for the approximately 5,364 m^2 of hard-surfaced areas present on-site (i.e. parking/driving surfaces, roofs, and play structure).
- The dilution water (D_w) available was calculated as 6454.06 m^3/yr (17,682.35 L/day) by multiplying the infiltration area (A) with the available infiltration (I).
- Based on the samples collected from both Test Well 1 and Test Well 2 at 3447 Old Almonte Road, a background nitrate concentration (C_b) of 1.4 mg/L was used. *Note that this background nitrate concentration is expected to be conservative as it would already incorporate a portion of the existing impacts that the fire hall and existing portions of the community centre may have on the nitrate concentrations in the local groundwater supply since both of these facilities have been in operation for extended periods of time during which they would have been discharging sewage effluent to site's subsurface via Class 4 sewage systems.*
- The site-wide sewage system daily flow (Q_e) was set at 4,800 L/day, at a concentration ((C_e) of 40 mg/L.

Based on the above-noted information, the average nitrate concentration at the downgradient property boundary (C_w) would of be 9.94 mg/L, which is below the maximum boundary nitrate concentration of 10 mg/L.

Calculations for the predictive nitrate attenuation are presented in Appendix F.

6.0 RECOMMENDATIONS

6.1 Water Supply

Well Yield

- Well yields in the order of 32 L/min appear to be sustainable based on the pumping test data and calculations performed. Appropriate well yield should be confirmed by the well driller at the time of construction.

Water Quality and Treatment

- No maximum acceptable concentration (MAC) was exceeded in TW1. All applicable health related standards at the present time.
- If water softening is desired, the use of potassium salts (i.e. KCl) is recommended.
- It is noted that the warning level for sodium (20 mg/L) was exceeded in all samples collected as part of this investigation. As such, it is recommended that the Client notify the local Medical Officer of Health of the sodium exceeding the health-related warning limit.
- It is expected that this facility's drinking water system is regulated under Ontario's Small Drinking Water Regulation 319/08 (O.Reg. 319/08) as a small municipal non-residential drinking water system serving a "public facility". Should the local Public Health inspector (PHI) have issued a directive with respect to treatment requirements that include the requirement to provide disinfection, the organic nitrogen operation guideline exceedance should be reviewed and discussed by both the PHI and the system's operator to ensure it does not interfere with chlorination should it be required or already used as part of the existing drinking water system on-site.

6.2 Wastewater Servicing

Private Sewage Systems

- The capacity of the existing sewage system is approximately 3,600 L/day. This was determined to be sufficient for the proposed expansion of the community centre and would translate to equivalent occupancy limits of the facility of 450 people in an assembly hall with no food service, 180 people in public parks with access to toilets only, or 100 people in an assembly hall with food service provided.
- The existing on-site sewage system components appear to be constructed in conformance with applicable stipulations as per applicable Ontario Regulations and sufficiently sized to accommodate the expanded community centre.
- The result of the impact assessment related to the on-site sewage systems indicate that the proposed community centre expansion will not cause unacceptable off-site impacts.

Site Servicing Layout

- Proposed development on the subject site is expected to remain as is due to sufficient capacity of the existing well and sewage system servicing the community centre to accommodate the flows associated with the proposed expansion.

7.0 LIMITATIONS

This report has been prepared and the work referred to in this report has been undertaken by McIntosh Perry Consulting Engineers Ltd. for the applicants and the regulatory authority. It is intended for the sole and exclusive use of the applicants, their affiliated companies and partners and their respective insurers, agents, employees, advisors, and reviewers. The report may not be relied upon by any other person or entity without the express written consent (Reliance Letter) of McIntosh Perry Consulting Engineers Ltd.

Any use which a third party makes of this report, or any reliance on decisions made based on it, without a reliance letter are the responsibility of such third parties. McIntosh Perry Consulting Engineers Ltd. accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The investigation undertaken by McIntosh Perry Consulting Engineers Ltd. with respect to this report and any conclusions or recommendations made in this report reflect McIntosh Perry Consulting Engineers Ltd. judgment based on the Site conditions observed at the time of the site inspection on the date(s) set out in this report and on information available at the time of the preparation of this report.

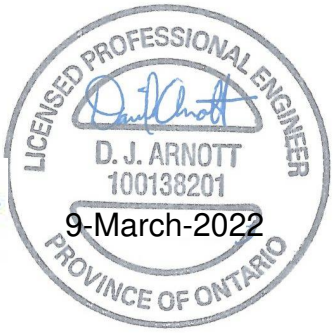
This report has been prepared for specific application to this Site and it is based, in part, upon visual observation of the Site, subsurface investigation at discrete locations and depths, and specific analysis of specific chemical parameters and materials during a specific time interval, all as described in this report. Unless otherwise stated, the findings cannot be extended to previous or future Site conditions, portions of the Site which were unavailable for direct investigation, subsurface locations which were not investigated directly, or chemical parameters, materials or analysis which were not addressed. Substances other than those addressed by the investigation described in this report may exist within the Site, substances addressed by the investigation may exist in areas of the Site not investigated and concentrations of substances addressed which are different than those reported may exist in areas other than the locations from which samples were taken.

If site conditions or applicable standards change or if any additional information becomes available at a future date, modifications to the findings, conclusions and recommendations in this report may be necessary.

We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,

McIntosh Perry Consulting Engineers Ltd.



Monica Black, B.Sc.
Environmental Scientist
(343) 925-0179
m.black@mcintoshperry.com

Dan Arnott, P.Eng.
Geo-Environmental Engineer
(613) 714-4589
d.arnott@mcintoshperry.com

Erin Williams, EIT
Junior Environmental EIT
(613) 714-6796
e.williams@mcintoshperry.com

Patrick Leblanc, P.Eng.
Senior Environmental Engineer (Terrain Analysis)
(613) 714-4586
p.leblanc@mcintoshperry.com

Ref.: U:\Ottawa\01 Project - Proposals\2021 Jobs\CCO\CCO-21-3339 - CSV Corkery Hall - 3447 Old Almonte Road\CCO-21-3339-01\Report\CCO-21-3339-01_3447 Old Almonte Rd_Hydro G_9.Mar.2022.docx

8.0 REFERENCES

EXP, 2021. Geotechnical Investigation – Corkery Community Centre Expansion 3447 Old Almonte Road, Carp, Ontario.

OGS Earth, 2018. Ontario Ministry of Northern Development, Mines and Forestry, - Ontario Geological Survey Earth – for Google Earth. Overburden classification data for Eastern Ontario.

OGS Earth, 2018. Ontario Ministry of Northern Development, Mines and Forestry, - Ontario Geological Survey Earth – for Google Earth. Bedrock classification data for Eastern Ontario.

OGS Earth, 2018. Ontario Ministry of Northern Development, Mines and Forestry, - Ontario Geological Survey Earth – for Google Earth. Karst Study for Southern Ontario.

McIntosh Perry Consulting Engineers Ltd. (McIntosh Perry), 2020. Engineering Services – Corkery Community Centre Sewage System Assessment (0CM-19-0590) 3447 Old Almonte Road, Carp, ON.

MECP, 1995. Procedure D-5-4 Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment.

MECP, 1996. Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment.

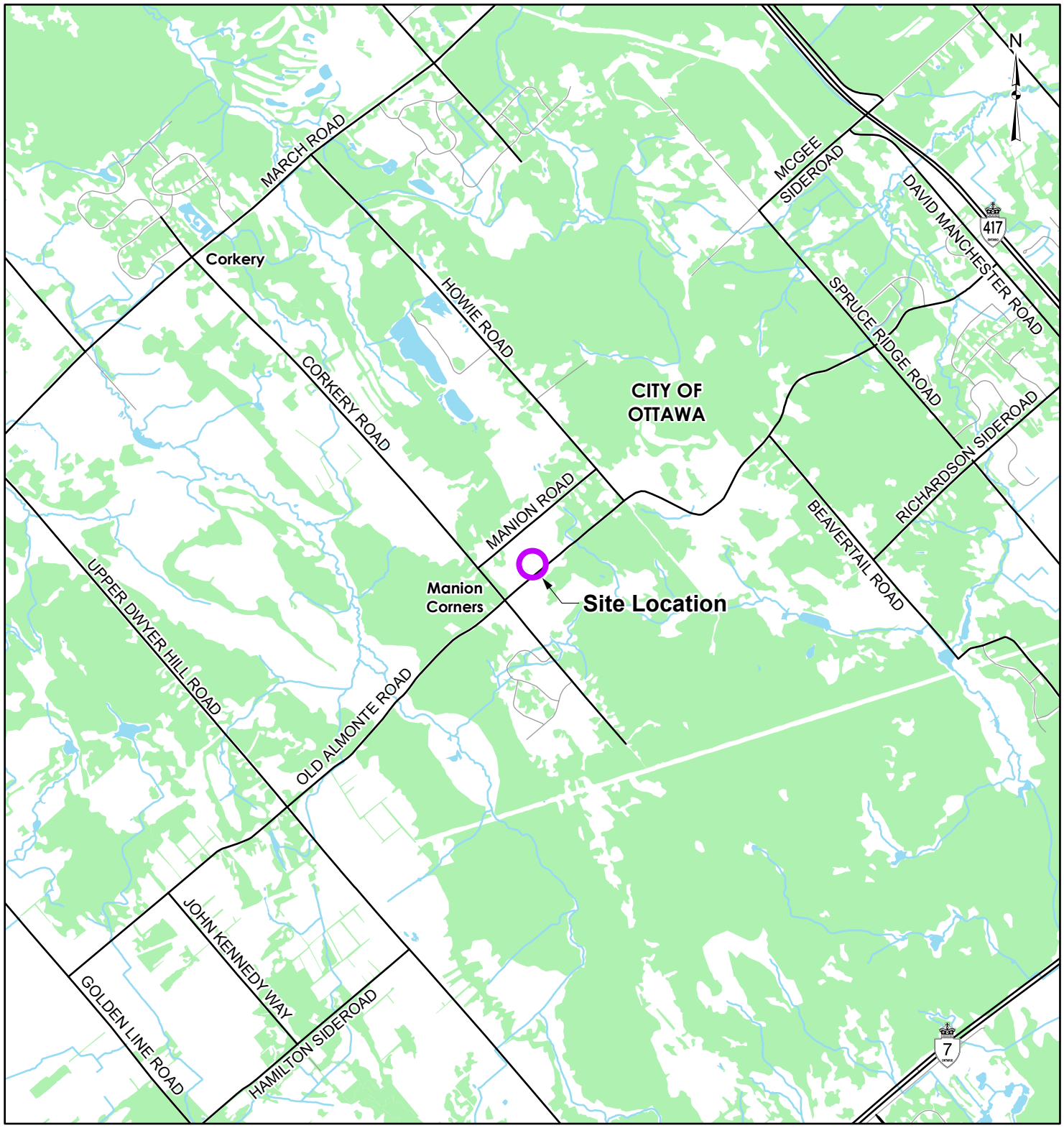
MECP, 2021. Water Supply Wells: Requirements and Best Practices. (online)

MECP (Ontario Ministry of the Environment, Conservation and Parks). 2018. MECP Water Well Record Database (queried 2022).

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

FIGURES

McINTOSH PERRY



LEGEND

- Site Location
- Local Road
- Major Road
- Watercourse
- Waterbody
- Wooded Area

1,000 500 0 1,000

Scale 1:50,000 Metres

REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: SITE LOCATION

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

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Date	Feb., 07, 2022
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FIGURE: 1

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LEGEND

- Site Boundary
- Lot & Concession
- Unevaluated Wetland
- TW1 Location

REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

30 15 0 30
Scale 1:1,250 Metres

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: SITE LAYOUT

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115 Walgreen Road, RR3, Carp, ON K0A1L0
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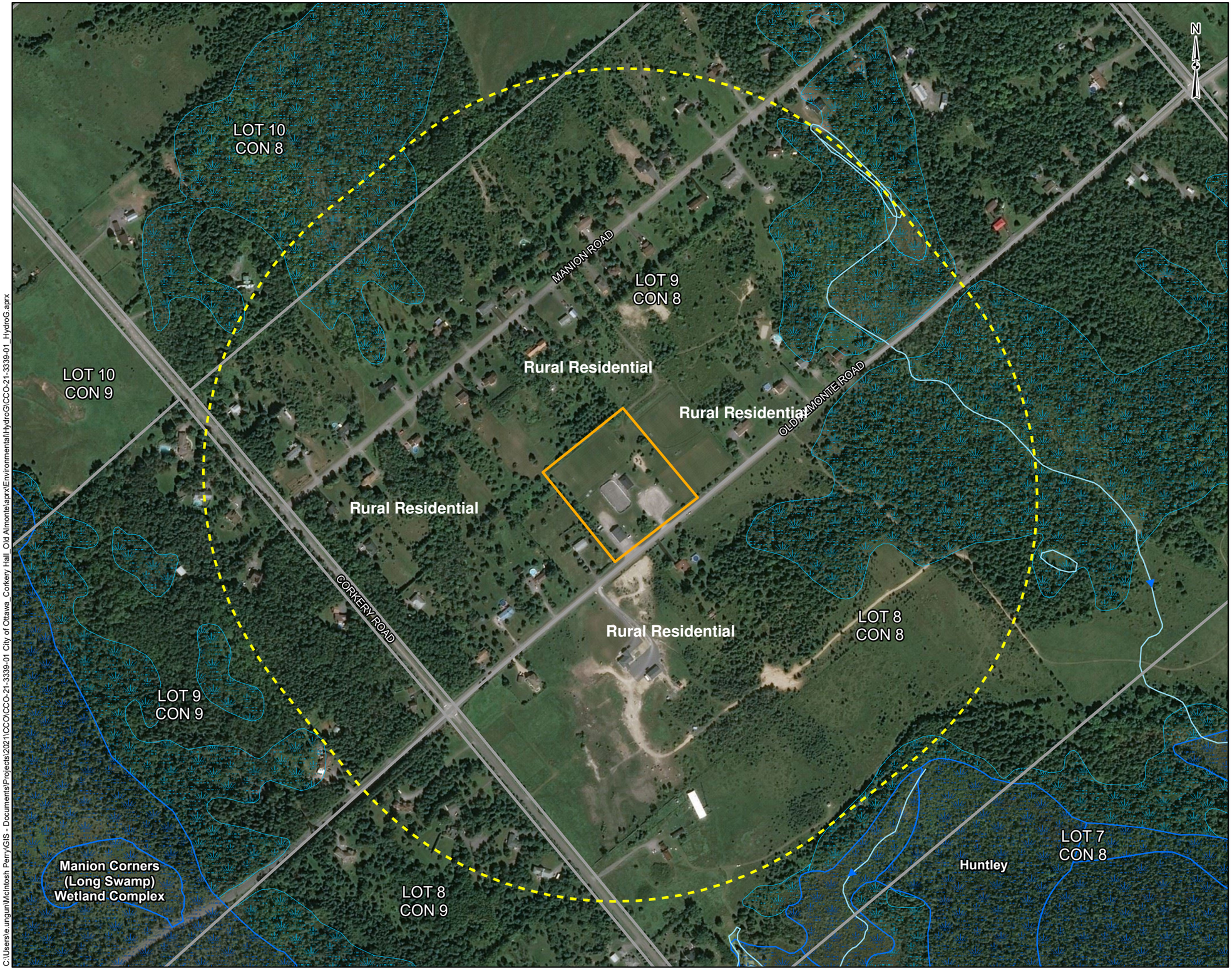

LEGEND

- Site Boundary
- 500m Buffer
- Lot & Concession
- Watercourse
- Waterbody
- Unevaluated Wetland
- Provincially Significant Wetland

REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

150 75 0 150

Scale 1:5,500 Metres

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: SURROUNDING LAND USE

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115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
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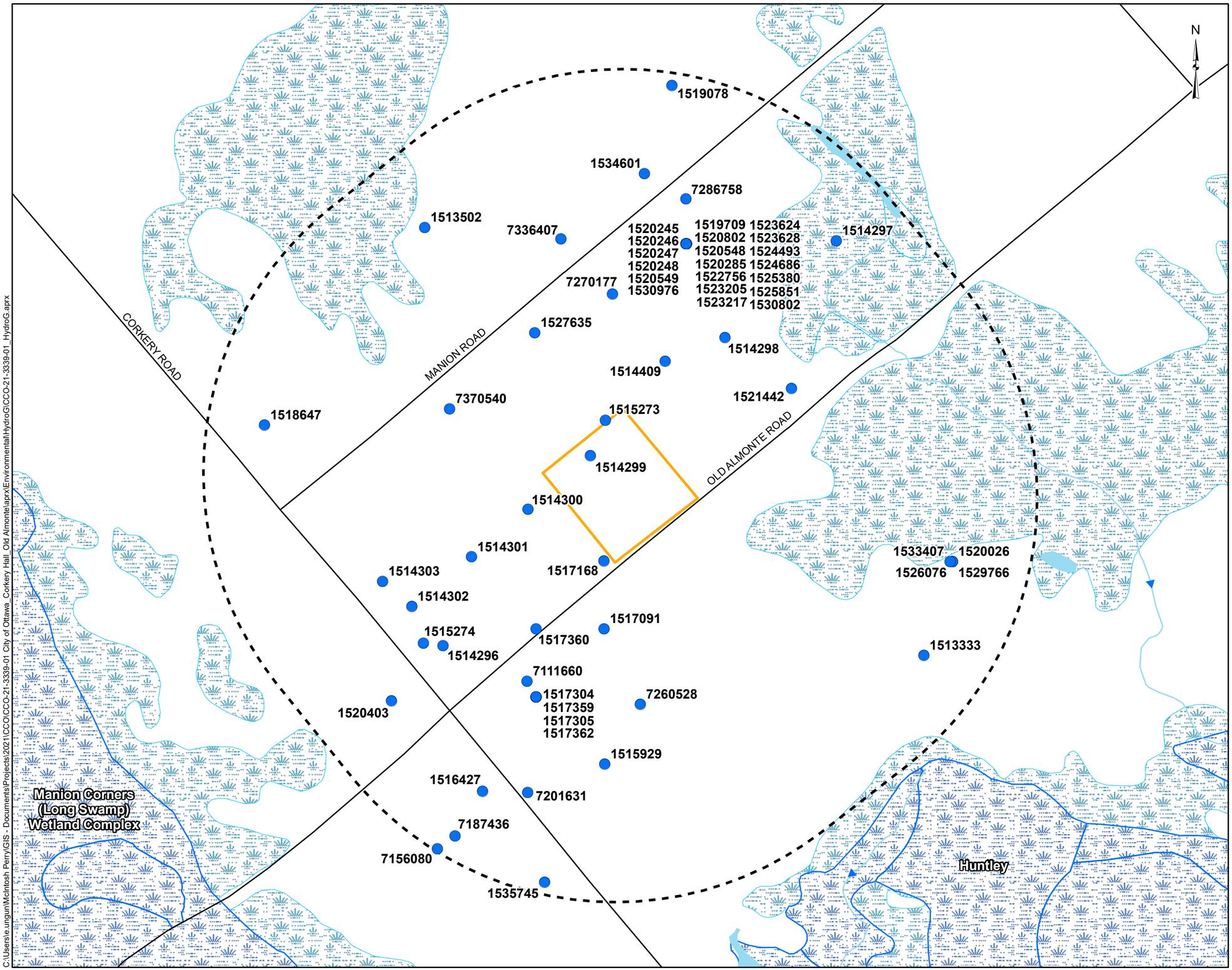

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LEGEND

- Site Boundary
- 500m Buffer
- MECP Well Location
- Local Road
- Major Road
- Waterbody
- Watercourse
- Unevaluated Wetland
- Provincially Significant Wetland

REFERENCE

GIS data provided by the Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry, 2022.

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Scale 1:5,500 Metres

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: MECP WWIS SUMMARY

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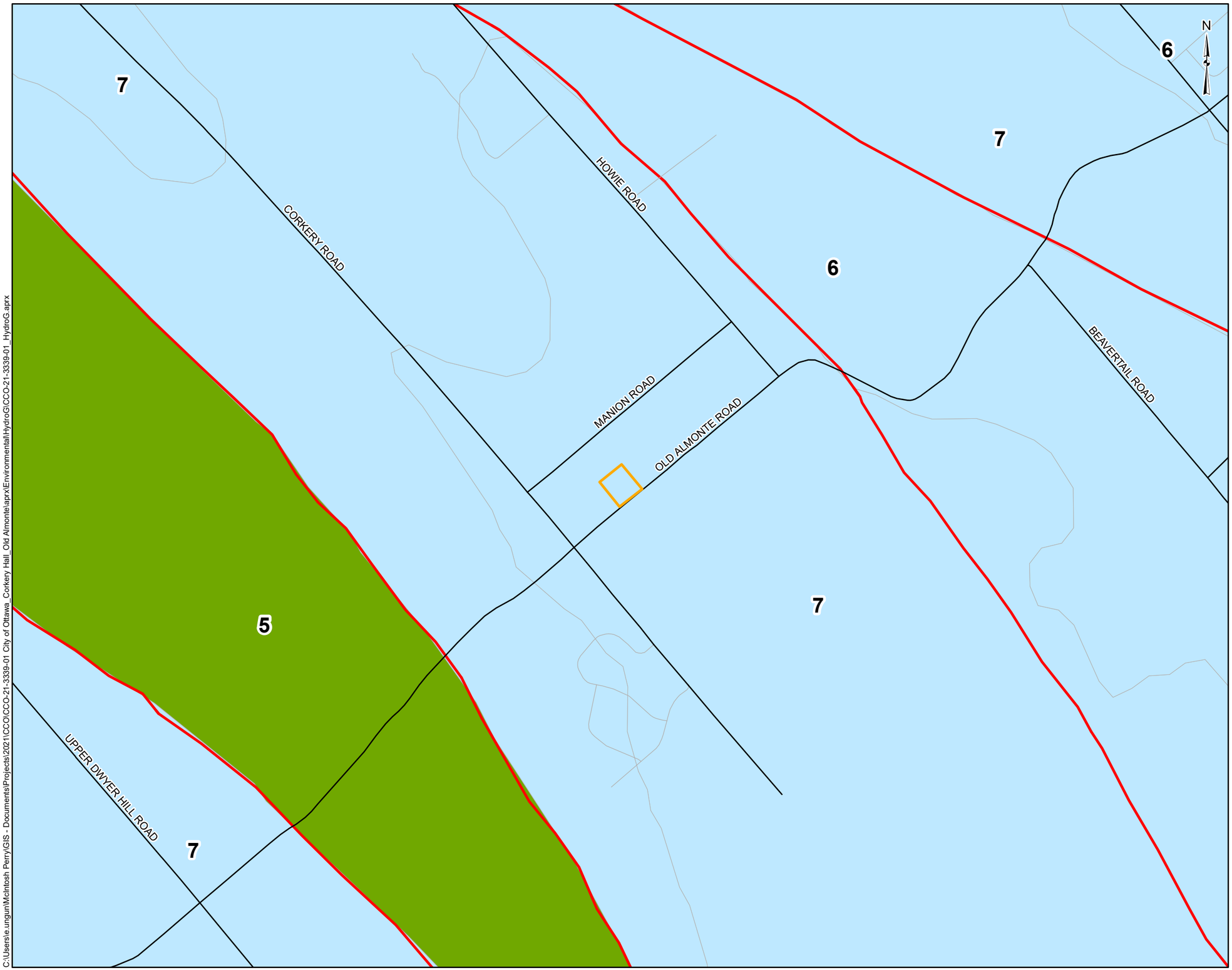

LEGEND

- Site Boundary
- Local Road
- Major Road
- Fault

Middle to Upper Ordovician

7 — Bobcaygeon Formation: Interbedded sitly dolomite, lithographic to fine crystalline limestone,oolitic limestone, shale, and fine-grained calcareous quartz sandstone

6 — Gull River Formation: Interbedded silty dolomite,lithographic to fine crystalline limestone, oolitic limestone, shale, and fine-grained calcareous quartz sandstone

5 — Rockliffe Formation: Interbedded fine-grained light greenish grey quartz sandstone, shaley limestone and shale, locally congomerate at base, interbeds of calcarenite and silty dolostone in upper part

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.
Urban Geology of the National Captial Area, Bélanger, R; Geological Survey of Canada, Open File 5311, 2008

500 250 0 500
Scale 1:20,000 Metres

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: BEDROCK FORMATION

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115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

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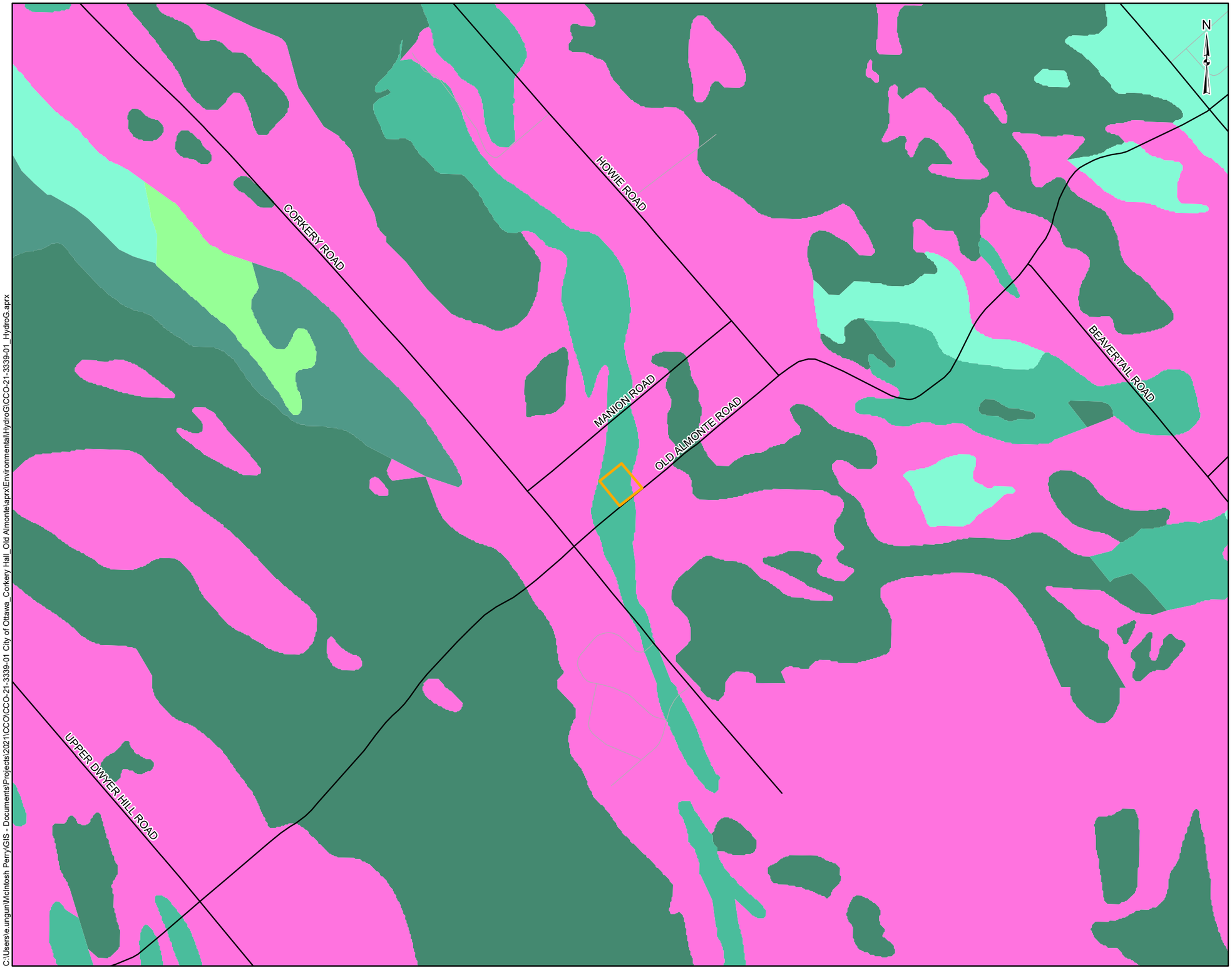

LEGEND

- Site Boundary
- Local Road
- Major Road

Surficial geology

- Organic Deposits
- Beach Formations
- Sand, reworked glaciofluvial
- Marine Deposits, clay, silt
- Till, plain
- Paleozoic Bedrock

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2022.
Surficial Geology of Southern Ontario provided by the Ontario Geological Survey, Miscellaneous Release - Data 128 - Revised

500 250 0 500
Scale 1:20,000 Metres

CLIENT: CITY OF OTTAWA

PROJECT: HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE

TITLE: SURFICIAL GEOLOGY

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115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
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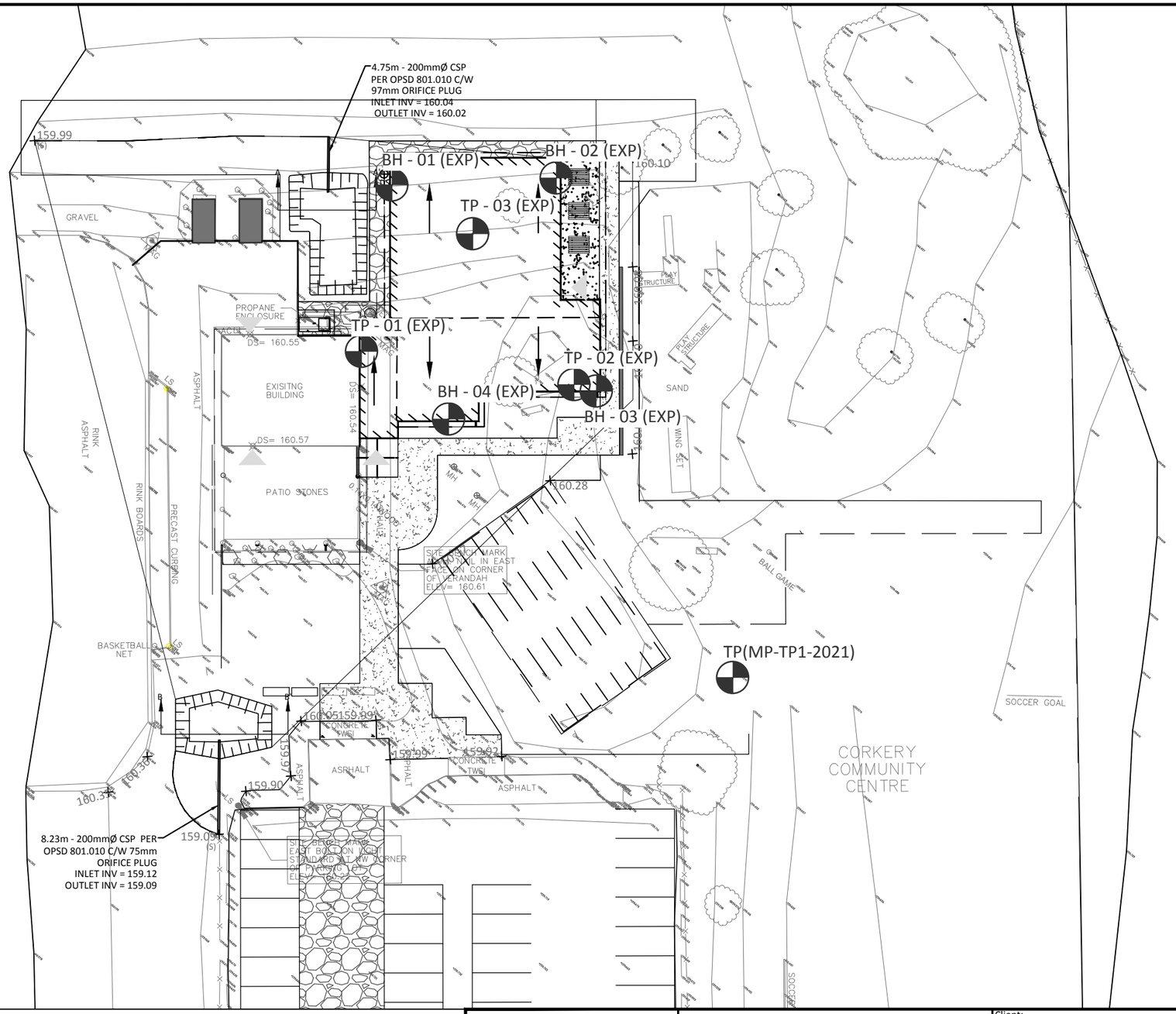

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Client:
CSV Architects
190 O'CONNOR STREET, OTTAWA, ON, K2P 2R3

Project:
CORKERY COMMUNITY CENTRE
3447 OLD ALMONTE ROAD

Drawing Title:
TEST PIT INVESTIGATION

Drawn by:	Checked By:			Drawing Number:
E.Ws.	P.L.			7
Scale:	Project Number:	1	ISSUED FOR REVIEW	03/07/2022
	CCO-21-3339-01	No.	Revisions	Date

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LAST SAVED: Monday, March 07, 2022 LAST SAVED BY: e.williams
LAST PLOTTED: Monday, March 07, 2022 CTB FILE USED: ----

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

TABLES

McINTOSH PERRY

Table 1
Summary of Laboratory Results
3447 Old Almonte Road, Ottawa ON
Corkery Community Centre

Sample ID	Units	MDL	ODWSOG	Limit Type	TW1-01	TW1-02	TW2
Sample Date					03-Feb-22		
Location					3447 Old Almonte Road		3449 Old Almonte Road (Fire Station)
Parameter:							
Microbiological Parameters							
E. Coli	CFU/100 mL	1	0	MAC	ND (1)	ND (1)	ND (1)
Fecal Coliforms	CFU/100 mL	1	-	-	ND (1)	ND (1)	ND (1)
Total Coliforms	CFU/100 mL	10	0	MAC	ND (1)	ND (1)	ND (1)
Heterotrophic Plate Count	CFU/mL	10	-	-	-	-	810
General Inorganics							
Alkalinity, total	mg/L	5	500	OG	280	279	310
Ammonia as N	mg/L	0.01	-	-	0.03	0.02	0.05
Dissolved Organic Carbon	mg/L	0.5	5	AO	ND (0.5)	1.1	0.6
Colour	ACU	2	5	AO	ND (2)	2	ND (2)
Conductivity	uS/cm	5	-	-	834	809	900
Hardness	mg/L	100	-	OG	380	377	32.2
pH	pH Units	0.1	-	-	7.9	7.9	9.1
Phenolics	mg/L	0.001	-	-	ND (0.001)	ND (0.001)	ND (0.001)
Total Dissolved Solids	mg/L	10	500	AO	424	452	498
Sulphide	mg/L	0.02	0.05	AO	ND (0.02)	ND (0.02)	ND (0.02)
Tannin & Lignin	mg/L	0.1	-	-	ND (0.1)	ND (0.1)	ND (0.1)
Total Kjeldahl Nitrogen	mg/L	0.1	-	-	0.2	0.200	0.1
Turbidity	NTU	0.1	5	AO	3.2	1.9	0.3
Anions							
Chloride	mg/L	1	250	AO	70	70	70
Fluoride	mg/L	0.1	1.5	MAC	0.2	0.2	0.3
Nitrate as N	mg/L	0.1	10	MAC	1.4	1.4	1.1
Nitrite as N	mg/L	0.05	1	MAC	ND (0.05)	ND (0.05)	ND (0.05)
Sulphate	mg/L	0.02	-	-	40	37	35
Metals							
Aluminum	mg/L	0.001	0.1	AO	ND (0.001)	ND (0.001)	-
Antimony	mg/L	0.0005	0.006	MAC	ND (0.0005)	ND (0.0005)	-
Arsenic	mg/L	0.001	0.01	MAC	ND (0.001)	ND (0.001)	-
Barium	mg/L	0.001	1	MAC	0.077	0.077	-
Beryllium	mg/L	0.0005	-	-	ND (0.0005)	ND (0.0005)	-
Boron	mg/L	0.01	5	MAC	0.07	0.07	-
Cadmium	mg/L	0.0001	0.005	MAC	ND (0.0001)	ND (0.0001)	-
Calcium	mg/L	0.1	-	-	109	108	0.932
Chromium	mg/L	0.001	0.05	MAC	ND (0.001)	ND (0.001)	-
Cobalt	mg/L	0.0005	-	-	0.0007	ND (0.0005)	-
Copper	mg/L	0.0005	1	AO	0.0006	0.0007	-
Iron	mg/L	0.1	0.3	AO	0.5	0.3	ND (0.1)
Lead	mg/L	0.0001	0.01	MAC	0.0001	ND (0.0001)	-
Magnesium	mg/L	0.2	-	-	26.2	26.3	7.26
Manganese	mg/L	0.005	0.05	AO	0.043	0.020	ND (0.005)
Molybdenum	mg/L	0.0005	-	-	ND (0.0005)	ND (0.0005)	-
Nickel	mg/L	0.001	-	-	0.003	0.002	-
Potassium	mg/L	0.1	-	-	2.5	2.5	ND (0.1)
Selenium	mg/L	0.001	0.05	MAC	ND (0.001)	ND (0.001)	-
Silver	mg/L	0.0001	-	-	ND (0.0001)	ND (0.0001)	-
Sodium	mg/L	0.2	20	MAC	30.6	27.3	171
Strontium	mg/L	0.01	-	-	3.08	2.64	-
Thallium	mg/L	0.001	-	-	ND (0.001)	ND (0.001)	-
Tin	mg/L	0.01	-	-	ND (0.01)	ND (0.01)	-
Titanium	mg/L	0.005	-	-	ND (0.005)	ND (0.005)	-
Tungsten	mg/L	0.01	-	-	ND (0.01)	ND (0.01)	-
Uranium	mg/L	0.0001	0.02	MAC	0.0005	0.0005	-
Vanadium	mg/L	0.0005	-	-	ND (0.0005)	ND (0.0005)	-
Zinc	mg/L	0.005	5	AO	0.007	ND (0.005)	-
Volatile Organic Compounds (VOC)							
Benzene	mg/L	0.0005	0.001	MAC	ND (0.0005)	ND (0.0005)	ND (0.0005)
Ethylbenzene	mg/L	0.0005	0.14	MAC	ND (0.0005)	ND (0.0005)	ND (0.0005)
Toluene	mg/L	0.0005	0.06	MAC	ND (0.0005)	ND (0.0005)	ND (0.0005)
m/p-Xylene	mg/L	0.0005	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)
o-Xylene	mg/L	0.0005	-	-	ND (0.0005)	ND (0.0005)	ND (0.0005)
Xylenes, total	mg/L	0.0005	0.09	MAC	ND (0.0005)	ND (0.0005)	ND (0.0005)
Petroleum Hydrocarbons (PHCs)							
F1 PHCs (C6-C10)	mg/L	0.025	-	-	ND (0.0250)	ND (0.0250)	ND (0.0250)
F2 PHCs (C10-C16)	mg/L	0.1	-	-	ND (0.1)	ND (0.1)	ND (0.1)
F3 PHCs (C16-C34)	mg/L	0.1	-	-	ND (0.1)	ND (0.1)	ND (0.1)
F4 PHCs (C34-C50)	mg/L	0.1	-	-	ND (0.1)	ND (0.1)	ND (0.1)

Notes:

1050	Exceeds Ontario Drinking Water Standards, Objectives, and Guidelines
*	Detection limits were elevated due to excessive turbidity in samples
MDL	Method Detection Limit
ODWSOG	Ontario Drinking Water Standards, Objectives, and Guidelines (MOECC, 2003 rev. 2006; PIBs 4449e01)
AO	Aesthetic Objective
MAC	Maximum Allowable Concentration (Health-Related Parameter)
OG	Operational Guideline
ND	Non detectable (below MDL)
mg/L	Milligrams per litre
TCU	True Colour Units
uS/cm	Microsemens per centimeter
NTU	Nephelometric Turbidity Units
CFU/100 mL	Number of bacteria-forming colonies per 100 mL

Table 2
Summary of Field Parameters
3447 Old Almonte Road, Ottawa ON
Corkery Community Centre

Pumping Test at:	Corkery Community Centre			**Date:**	03-Feb-22	
Time Elapsed (min)	Turbidity (NTU)	pH	Conductivity (ms/cm)	Temperature (^{o}C)	TDS (g/L)	Flow Rate (L/min)
Pump On						
16	14.7	7.03	0.967	10.38	0.619	33
27	19.9	7.73	0.909	8.63	0.581	
40	16.2	7.47	0.899	8.15	0.575	
50	11.4	7.49	0.893	7.74	0.571	
60	7.7	7.41	0.901	7.8	0.577	
120	5.5	7.64	0.892	7.56	0.571	
180	4.9	7.88	0.885	8.25	0.566	
240	5.2	7.89	0.88	8.25	0.564	31
300	3.6	8.09	0.873	8.52	0.558	
360	3.2	8.21	0.862	8.66	0.551	
Notes:	*Flow rate measured with bucket and stopwatch*					

NOTES:

min	Minutes
NTU	Nephelometric Turbidity Units
(ms/cm)	Millisiemens per centimeter
(^{o}C)	Degrees celsius
g/L	Grams per litre
L/min	Litres per minute

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

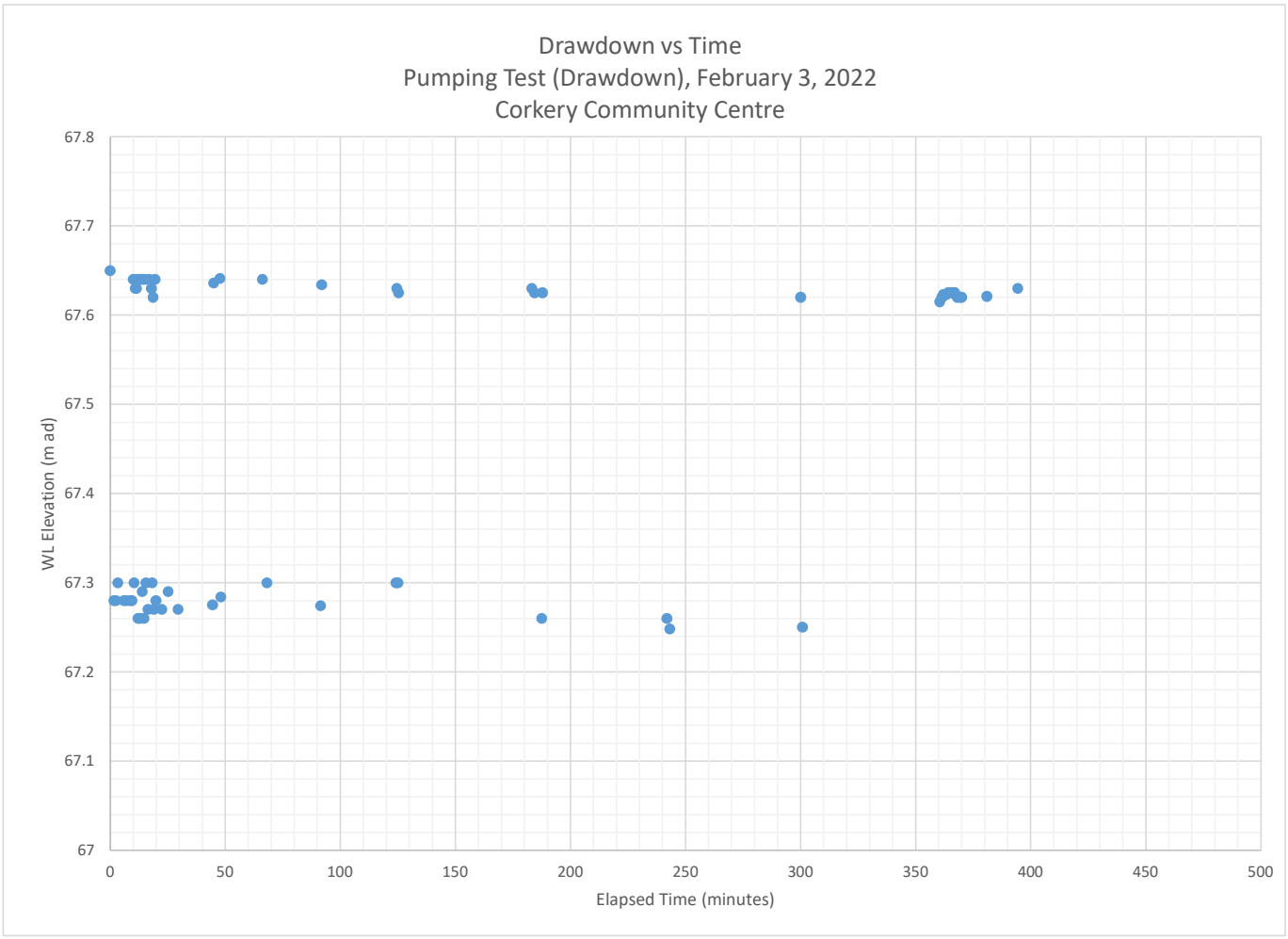
APPENDIX A: WATER LEVEL DATA AND PUMPING TEST ANALYSIS

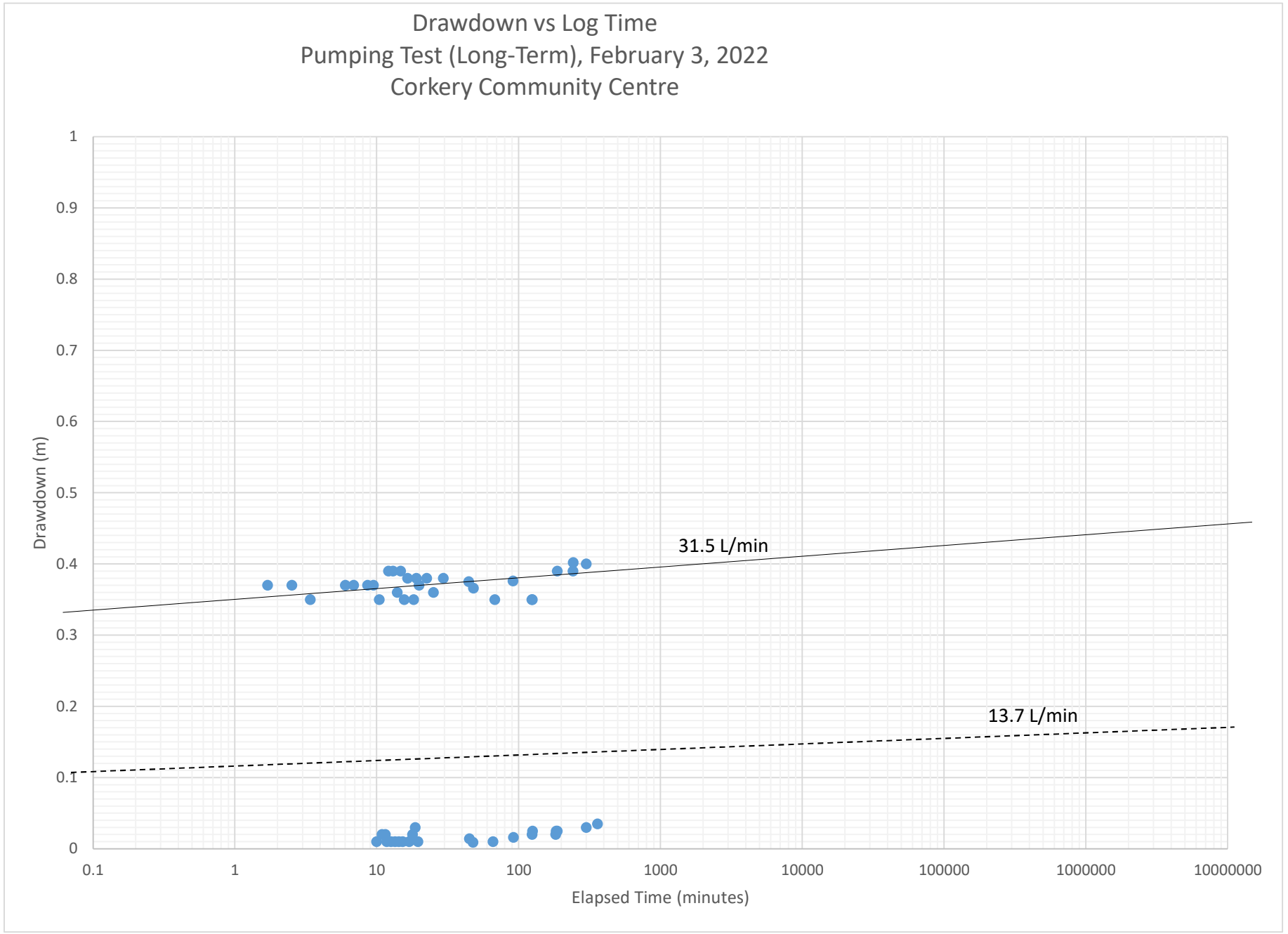
McINTOSH PERRY

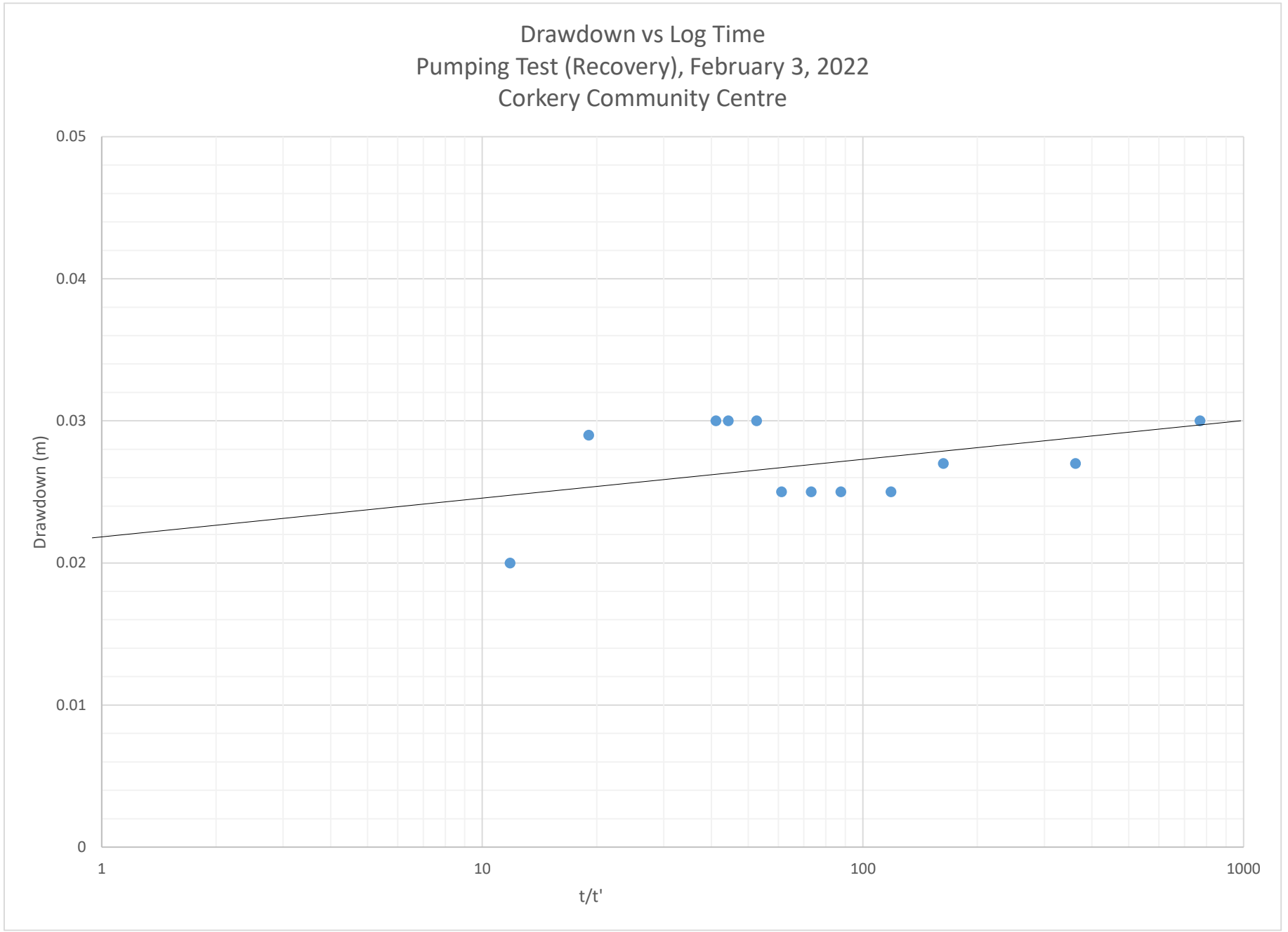
Summary of Water Level Data
Pumping Test - TW1 February 3, 2022

TOC Elevation (assumed)	100	m AD (Above Datum)
Static Water Level	32.35	m BTOC
Static Water Elevation	67.65	m AD (Above Datum)
95% Recovery	32.3695	m BTOC
	67.6305	m AD (Above Datum)

Elapsed Time (minutes)	Elapsed Time (Recovery)	T/T'	Water Level (m BTOC)	Water Level (m Datum)	Drawdown (m)	Notes
0			32.35	67.65	0	
1.7			32.72	67.28	0.37	
2.52			32.72	67.28	0.37	
3.4			32.7	67.3	0.35	
6.02			32.72	67.28	0.37	
6.88			32.72	67.28	0.37	
8.63			32.72	67.28	0.37	
9.5			32.72	67.28	0.37	
10			32.36	67.64	0.01	
10.42			32.7	67.3	0.35	
10.9			32.37	67.63	0.02	
11.5			32.37	67.63	0.02	
11.75			32.36	67.64	0.01	
12.13			32.74	67.26	0.39	
12.6			32.36	67.64	0.01	
13.02			32.74	67.26	0.39	
13.48			32.36	67.64	0.01	
13.97			32.71	67.29	0.36	
14.35			32.36	67.64	0.01	
14.75			32.74	67.26	0.39	
15.22			32.36	67.64	0.01	
15.62			32.7	67.3	0.35	
16.5			32.73	67.27	0.38	
16.97			32.36	67.64	0.01	
17.92			32.37	67.63	0.02	
18.23			32.7	67.3	0.35	
18.67			32.38	67.62	0.03	
19.05			32.73	67.27	0.38	
19.52			32.36	67.64	0.01	
19.92			32.72	67.28	0.37	
22.5			32.73	67.27	0.38	
25.17			32.71	67.29	0.36	
29.52			32.73	67.27	0.38	
44.53			32.725	67.275	0.375	
45.03			32.364	67.636	0.014	
47.77			32.359	67.641	0.009	
48.17			32.716	67.284	0.366	
66.13			32.36	67.64	0.01	
68.13			32.7	67.3	0.35	
91.45			32.726	67.274	0.376	
91.95			32.366	67.634	0.016	
124.12			32.7	67.3	0.35	
124.58			32.37	67.63	0.02	
125			32.7	67.3	0.35	
125.38			32.375	67.625	0.025	
183.22			32.37	67.63	0.02	
184.38			32.375	67.625	0.025	
187.5			32.74	67.26	0.39	
187.85			32.375	67.625	0.025	
241.97			32.74	67.26	0.39	
243.17			32.752	67.248	0.402	
300			32.38	67.62	0.03	
300.83			32.75	67.25	0.4	
360.47			32.385	67.615	0.035	
361.47	0.47	769.0851	32.38	67.62	0.03	Pump off at 361 min
362	1	362	32.377	67.623	0.027	
363.23	2.23	162.8834	32.377	67.623	0.027	
364.07	3.07	118.5896	32.375	67.625	0.025	
365.17	4.17	87.57074	32.375	67.625	0.025	
366	5	73.2	32.375	67.625	0.025	
367	6	61.16667	32.375	67.625	0.025	
368	7	52.57143	32.38	67.62	0.03	
369.33	8.33	44.33733	32.38	67.62	0.03	
370	9	41.11111	32.38	67.62	0.03	
381	20	19.05	32.379	67.621	0.029	
394.33	33.33	11.83108	32.37	67.63	0.02	


Drawdown vs Time
Pumping Test (Drawdown), February 3, 2022
Corkery Community Centre
WL Elevation (m ad)
67.8
67.7
67.6
67.5
67.4
67.3
67.2
67.1
67
0
50
100
150
200
250
300
350
400
450
500
Elapsed Time (minutes)


Drawdown vs Log Time
Pumping Test (Long-Term), February 3, 2022
Corkery Community Centre
Drawdown (m)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.1
1
10
100
1000
10000
100000
1000000
10000000
Elapsed Time (minutes)
31.5 L/min
13.7 L/min


Drawdown vs Log Time
Pumping Test (Recovery), February 3, 2022
Corkery Community Centre
0.05
0.04
0.03
0.02
0.01
0
Drawdown (m)
1
10
100
1000
t/t'

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX B: LABORATORY CERTIFICATES OF ANALYSIS

McINTOSH PERRY

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

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

Certificate of Analysis

McIntosh Perry Consulting Eng. (Carp)

115 Walgreen Rd.
Carp, ON K0A 1L0
Attn: Dan Arnott

Client PO:
Project: CC0-21-3339-01
Custody: 41250

Report Date: 10-Feb-2022
Order Date: 3-Feb-2022

Order #: 2206415

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

Paracel ID	Client ID
2206415-01	Fire Stn

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 3-Feb-2022

Client PO:

Project Description: CC0-21-3339-01

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	4-Feb-22	4-Feb-22
Ammonia, as N	EPA 351.2 - Auto Colour	7-Feb-22	7-Feb-22
Anions	EPA 300.1 - IC	4-Feb-22	4-Feb-22
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	7-Feb-22	7-Feb-22
Colour	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Conductivity	EPA 9050A- probe @25 °C	4-Feb-22	4-Feb-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	9-Feb-22	9-Feb-22
E. coli	MOE E3407	3-Feb-22	3-Feb-22
Fecal Coliform	SM 9222D	3-Feb-22	3-Feb-22
Heterotrophic Plate Count	SM 9215C	3-Feb-22	3-Feb-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	4-Feb-22	7-Feb-22
pH	EPA 150.1 - pH probe @25 °C	4-Feb-22	4-Feb-22
PHC F1	CWS Tier 1 - P&T GC-FID	7-Feb-22	7-Feb-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	7-Feb-22	7-Feb-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	4-Feb-22	7-Feb-22
Hardness	Hardness as CaCO3	4-Feb-22	7-Feb-22
Sulphide	SM 4500SE - Colourimetric	3-Feb-22	3-Feb-22
Tannin/Lignin	SM 5550B - Colourimetric	7-Feb-22	7-Feb-22
Total Coliform	MOE E3407	3-Feb-22	3-Feb-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	7-Feb-22	8-Feb-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	4-Feb-22	4-Feb-22
Turbidity	SM 2130B - Turbidity meter	4-Feb-22	4-Feb-22

PARACEL LABORATORIES LTD.

Order #: 2206415

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 3-Feb-2022

Client PO:

Project Description: CC0-21-3339-01

	Client ID:	Fire Stn	-	-	-
	Sample Date:	03-Feb-22 09:00	-	-	-
	Sample ID:	2206415-01	-	-	-
	MDL/Units	Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	810	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	310	-	-	-
Ammonia as N	0.01 mg/L	0.05	-	-	-
Dissolved Organic Carbon	0.5 mg/L	0.6	-	-	-
Colour	2 TCU	<2	-	-	-
Conductivity	5 uS/cm	900	-	-	-
Hardness	mg/L	32.2	-	-	-
pH	0.1 pH Units	9.1	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	498	-	-	-
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	0.3	-	-	-
Anions					
Chloride	1 mg/L	70	-	-	-
Fluoride	0.1 mg/L	0.3	-	-	-
Nitrate as N	0.1 mg/L	1.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	35	-	-	-
Metals					
Calcium	100 ug/L	932	-	-	-
Iron	100 ug/L	<100	-	-	-
Magnesium	200 ug/L	7260	-	-	-
Manganese	5 ug/L	<5	-	-	-
Potassium	100 ug/L	<100	-	-	-
Sodium	200 ug/L	171000	-	-	-
Volatiles					
Benzene	0.5 ug/L	<0.5	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 3-Feb-2022

Client PO:

Project Description: CC0-21-3339-01

	Client ID:	Fire Stn	-	-	-
	Sample Date:	03-Feb-22 09:00	-	-	-
	Sample ID:	2206415-01	-	-	-
	MDL/Units	Water	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-
Toluene-d8	Surrogate	103%	-	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	25 ug/L	<25	-	-	-
F2 PHCs (C10-C16)	100 ug/L	<100	-	-	-
F3 PHCs (C16-C34)	100 ug/L	<100	-	-	-
F4 PHCs (C34-C50)	100 ug/L	<100	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L						
F2 PHCs (C10-C16)	ND	100	ug/L						
F3 PHCs (C16-C34)	ND	100	ug/L						
F4 PHCs (C34-C50)	ND	100	ug/L						
Metals									
Calcium	ND	100	ug/L						
Iron	ND	100	ug/L						
Magnesium	ND	200	ug/L						
Manganese	ND	5	ug/L						
Potassium	ND	100	ug/L						
Sodium	ND	200	ug/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						
Volatiles									
Benzene	ND	0.5	ug/L						
Ethylbenzene	ND	0.5	ug/L						
Toluene	ND	0.5	ug/L						
m,p-Xylenes	ND	0.5	ug/L						
o-Xylene	ND	0.5	ug/L						
Xylenes, total	ND	0.5	ug/L						
Surrogate: Toluene-d8	*83.7*		*ug/L*		*105*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	69.1	1	mg/L	69.7			0.9	10	
Fluoride	0.26	0.1	mg/L	0.28			6.9	10	
Nitrate as N	1.14	0.1	mg/L	1.14			0.2	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	34.7	1	mg/L	35.1			1.0	10	
General Inorganics									
Alkalinity, total	306	5	mg/L	310			1.1	14	
Ammonia as N	0.019	0.01	mg/L	0.021			7.2	18	
Dissolved Organic Carbon	2.9	0.5	mg/L	3.3			13.9	37	
Colour	ND	2	TCU	ND			NC	12	
Conductivity	898	5	uS/cm	900			0.3	5	
pH	9.1	0.1	pH Units	9.1			0.1	3.3	
Phenolics	ND	0.001	mg/L	0.001			NC	10	
Total Dissolved Solids	242	10	mg/L	230			5.1	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	8.78	0.4	mg/L	9.22			4.9	16	
Turbidity	0.3	0.1	NTU	0.3			7.4	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	25	ug/L	ND			NC	30	
Metals									
Calcium	34000	100	ug/L	35000			3.1	20	
Iron	ND	100	ug/L	ND			NC	20	
Magnesium	8790	200	ug/L	8690			1.1	20	
Manganese	ND	5	ug/L	ND			NC	20	
Potassium	1620	100	ug/L	1680			3.8	20	
Sodium	15700	200	ug/L	16300			3.4	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	770	10	CFU/mL	810			5.0	30	
Volatiles									
Benzene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: Toluene-d8	*81.8*		*ug/L*		*102*	*50-140*			

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 3-Feb-2022

Client PO:

Project Description: CC0-21-3339-01

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	78.9	1	mg/L	69.7	92.0	77-123			
Fluoride	1.13	0.1	mg/L	0.28	84.9	79-121			
Nitrate as N	2.16	0.1	mg/L	1.14	102	79-120			
Nitrite as N	1.01	0.05	mg/L	ND	101	84-117			
Sulphate	44.0	1	mg/L	35.1	89.0	74-126			
General Inorganics									
Ammonia as N	0.278	0.01	mg/L	0.021	103	81-124			
Dissolved Organic Carbon	14.0	0.5	mg/L	3.3	106	60-133			
Phenolics	0.028	0.001	mg/L	0.001	109	67-133			
Total Dissolved Solids	114	10	mg/L	ND	114	75-125			
Sulphide	0.52	0.02	mg/L	ND	104	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	94.7	71-113			
Total Kjeldahl Nitrogen	1.85	0.1	mg/L	ND	92.7	81-126			
Hydrocarbons									
F1 PHCs (C6-C10)	1650	25	ug/L	ND	82.3	68-117			
F2 PHCs (C10-C16)	1060	100	ug/L	ND	66.1	60-140			
F3 PHCs (C16-C34)	2550	100	ug/L	ND	65.0	60-140			
F4 PHCs (C34-C50)	1690	100	ug/L	ND	68.1	60-140			
Metals									
Calcium	8950	100	ug/L	ND	89.5	80-120			
Iron	2300	100	ug/L	ND	89.5	80-120			
Magnesium	16600	200	ug/L	8690	79.4	80-120			QM-07
Manganese	47.1	5	ug/L	ND	90.0	80-120			
Potassium	11100	100	ug/L	1680	94.4	80-120			
Sodium	8980	200	ug/L	ND	89.8	80-120			
Volatiles									
Benzene	32.4	0.5	ug/L	ND	81.0	60-130			
Ethylbenzene	40.9	0.5	ug/L	ND	102	60-130			
Toluene	39.0	0.5	ug/L	ND	97.4	60-130			
m,p-Xylenes	79.8	0.5	ug/L	ND	99.8	60-130			
o-Xylene	39.7	0.5	ug/L	ND	99.3	60-130			
Surrogate: Toluene-d8	*79.1*		*ug/L*		*98.8*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - PHC, Voc bottles read: "Fire Stn", COC reads: "Fire Hall."

Applies to samples: Fire Stn

Sample - Filtered and preserved by Paracel upon receipt at the laboratory - Metals 125ml subsampled from General bottle.

Applies to samples: Fire Stn

Sample Qualifiers :

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

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Paracel ID: 2206415

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Chain of Custody
(Lab Use Only)
№ 41250

Page 1 of 1

Client Name: McIntosh Perry	Project Reference: CCO-21-3339-01
Contact Name: Dan Arnott	Quote #
Address: 115 Walgreen Rd Carp, ON K0A 1L0	PO #
Telephone: (613) 714-4599	Email Address: d.arnott@mcintoshperry.com

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☒ Regular
Date Required: _____

Criteria: ☐ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☒ Other: Ottawa Sub.

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

Required Analyses

Paracel Order Number: 2206415

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Ottawa Sub	PHC F1-F4	BTEX
1	Fire Hall	GW		11	3-Feb-2022		X	X	X
2									
3									
4									
5									
6									
7									
8									
9									
10									

Comments:

Method of Delivery: Drop box

Relinquished By (Sign): D. Arnott	Received by Driver/Depot:	Received at Lab: T	Verified By:
Relinquished By (Print): Dan Arnott	Date/Time:	Date/Time: Feb 3 2022 1:15	Date/Time: Feb 3 2022 21:19
Date/Time: 3-Feb-2022 13:10	Temperature: ___ °C	Temperature: 4.6 °C	pH Verified ☐ By:

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Certificate of Analysis

McIntosh Perry Consulting Eng. (Carp)

115 Walgreen Rd.
Carp, ON K0A 1L0
Attn: Monica Black

Client PO: Corkery Community Centre
Project: 21-3339
Custody: 14958

Report Date: 10-Feb-2022
Order Date: 4-Feb-2022

Order #: 2206476

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

Paracel ID	Client ID
2206476-01	TW1-1
2206476-02	TW1-2

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 4-Feb-2022

Client PO: Corkery Community Centre

Project Description: 21-3339

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	4-Feb-22	4-Feb-22
Ammonia, as N	EPA 351.2 - Auto Colour	7-Feb-22	7-Feb-22
Anions	EPA 300.1 - IC	4-Feb-22	4-Feb-22
BTEX by P&T GC-MS	EPA 624 - P&T GC-MS	9-Feb-22	9-Feb-22
Colour	SM2120 - Spectrophotometric	4-Feb-22	4-Feb-22
Conductivity	EPA 9050A- probe @25 °C	4-Feb-22	4-Feb-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	9-Feb-22	9-Feb-22
E. coli	MOE E3407	4-Feb-22	4-Feb-22
Fecal Coliform	SM 9222D	4-Feb-22	4-Feb-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	7-Feb-22	7-Feb-22
pH	EPA 150.1 - pH probe @25 °C	4-Feb-22	4-Feb-22
PHC F1	CWS Tier 1 - P&T GC-FID	9-Feb-22	9-Feb-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-Feb-22	9-Feb-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	7-Feb-22	8-Feb-22
Hardness	Hardness as CaCO3	7-Feb-22	7-Feb-22
Sulphide	SM 4500SE - Colourimetric	9-Feb-22	10-Feb-22
Tannin/Lignin	SM 5550B - Colourimetric	7-Feb-22	7-Feb-22
Total Coliform	MOE E3407	4-Feb-22	4-Feb-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	8-Feb-22	9-Feb-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	7-Feb-22	8-Feb-22
Turbidity	SM 2130B - Turbidity meter	4-Feb-22	4-Feb-22

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Order #: 2206476

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 4-Feb-2022

Client PO: Corkery Community Centre

Project Description: 21-3339

	Client ID:	TW1-1	TW1-2	-	-
	Sample Date:	03-Feb-22 10:40	03-Feb-22 15:10	-	-
	Sample ID:	2206476-01	2206476-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-
General Inorganics					
Alkalinity, total	5 mg/L	280	279	-	-
Ammonia as N	0.01 mg/L	0.03	0.02	-	-
Dissolved Organic Carbon	0.5 mg/L	<0.5	1.1	-	-
Colour	2 TCU	<2	2	-	-
Conductivity	5 uS/cm	834	809	-	-
Hardness	mg/L	380	377	-	-
pH	0.1 pH Units	7.9	7.9	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	424	452	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.2	-	-
Turbidity	0.1 NTU	3.2	1.9	-	-
Anions					
Chloride	1 mg/L	70	70	-	-
Fluoride	0.1 mg/L	0.2	0.2	-	-
Nitrate as N	0.1 mg/L	1.4	1.4	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	40	37	-	-
Metals					
Aluminum	0.001 mg/L	<0.001	<0.001	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-
Barium	0.001 mg/L	0.077	0.077	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-
Boron	0.01 mg/L	0.07	0.07	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-
Calcium	0.1 mg/L	109	108	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-
Cobalt	0.0005 mg/L	0.0007	<0.0005	-	-
Copper	0.0005 mg/L	0.0006	0.0007	-	-

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 4-Feb-2022

Client PO: Corkery Community Centre

Project Description: 21-3339

	Client ID:	TW1-1	TW1-2	-	-
	Sample Date:	03-Feb-22 10:40	03-Feb-22 15:10	-	-
	Sample ID:	2206476-01	2206476-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Iron	0.1 mg/L	0.5	0.3	-	-
Lead	0.0001 mg/L	0.0001	<0.0001	-	-
Magnesium	0.2 mg/L	26.2	26.3	-	-
Manganese	0.005 mg/L	0.043	0.020	-	-
Molybdenum	0.0005 mg/L	<0.0005	<0.0005	-	-
Nickel	0.001 mg/L	0.003	0.002	-	-
Potassium	0.1 mg/L	2.5	2.5	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-
Sodium	0.2 mg/L	30.6	27.3	-	-
Strontium	0.01 mg/L	3.08	2.64	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-
Tin	0.01 mg/L	<0.01	<0.01	-	-
Titanium	0.005 mg/L	<0.005	<0.005	-	-
Tungsten	0.01 mg/L	<0.01	<0.01	-	-
Uranium	0.0001 mg/L	0.0005	0.0005	-	-
Vanadium	0.0005 mg/L	<0.0005	<0.0005	-	-
Zinc	0.005 mg/L	0.007	<0.005	-	-
Volatiles					
Benzene	0.0005 mg/L	<0.0005	<0.0005	-	-
Ethylbenzene	0.0005 mg/L	<0.0005	<0.0005	-	-
Toluene	0.0005 mg/L	<0.0005	<0.0005	-	-
m,p-Xylenes	0.0005 mg/L	<0.0005	<0.0005	-	-
o-Xylene	0.0005 mg/L	<0.0005	<0.0005	-	-
Xylenes, total	0.0005 mg/L	<0.0005	<0.0005	-	-
Toluene-d8	Surrogate	105%	105%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	0.0250 mg/L	<0.0250	<0.0250	-	-
F2 PHCs (C10-C16)	0.1 mg/L	<0.1	<0.1	-	-
F3 PHCs (C16-C34)	0.1 mg/L	<0.1	<0.1	-	-
F4 PHCs (C34-C50)	0.1 mg/L	<0.1	<0.1	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.0250	mg/L						
Metals									
Aluminum	ND	0.001	mg/L						
Antimony	ND	0.0005	mg/L						
Arsenic	ND	0.001	mg/L						
Barium	ND	0.001	mg/L						
Beryllium	ND	0.0005	mg/L						
Boron	ND	0.01	mg/L						
Cadmium	ND	0.0001	mg/L						
Calcium	ND	0.1	mg/L						
Chromium	ND	0.001	mg/L						
Cobalt	ND	0.0005	mg/L						
Copper	ND	0.0005	mg/L						
Iron	ND	0.1	mg/L						
Lead	ND	0.0001	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Molybdenum	ND	0.0005	mg/L						
Nickel	ND	0.001	mg/L						
Potassium	ND	0.1	mg/L						
Selenium	ND	0.001	mg/L						
Silver	ND	0.0001	mg/L						
Sodium	ND	0.2	mg/L						
Strontium	ND	0.01	mg/L						
Thallium	ND	0.001	mg/L						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	mg/L						
Uranium	ND	0.0001	mg/L						
Vanadium	ND	0.0005	mg/L						
Zinc	ND	0.005	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Volatiles									
Benzene	ND	0.0005	mg/L						
Ethylbenzene	ND	0.0005	mg/L						
Toluene	ND	0.0005	mg/L						

Certificate of Analysis

Report Date: 10-Feb-2022

Client: McIntosh Perry Consulting Eng. (Carp)

Order Date: 4-Feb-2022

Client PO: Corkery Community Centre

Project Description: 21-3339

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.0005	mg/L						
o-Xylene	ND	0.0005	mg/L						
Xylenes, total	ND	0.0005	mg/L						
Surrogate: Toluene-d8	*0.0848*		*mg/L*		*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	4.32	1	mg/L	4.38			1.3	10	
Fluoride	0.83	0.1	mg/L	0.83			0.4	10	
Nitrate as N	0.21	0.1	mg/L	0.21			1.4	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	24.4	1	mg/L	24.3			0.3	10	
General Inorganics									
Alkalinity, total	278	5	mg/L	280			0.7	14	
Ammonia as N	0.332	0.01	mg/L	0.334			0.5	17.7	
Dissolved Organic Carbon	ND	0.5	mg/L	ND			NC	37	
Colour	ND	2	TCU	ND			NC	12	
Conductivity	829	5	uS/cm	834			0.6	5	
pH	7.9	0.1	pH Units	7.9			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	98.0	10	mg/L	92.0			6.3	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.49	0.1	mg/L	0.55			11.4	16	
Turbidity	15.7	0.1	NTU	15.7			0.0	10	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	0.0250	mg/L	ND			NC	30	
Metals									
Aluminum	0.099	0.001	mg/L	0.098			1.8	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.011	0.001	mg/L	0.011			0.3	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	7.3	0.1	mg/L	7.4			1.2	20	
Chromium	ND	0.001	mg/L	ND			NC	20	
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0572	0.0005	mg/L	0.0574			0.3	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0002	0.0001	mg/L	0.0002			1.8	20	
Magnesium	1.7	0.2	mg/L	1.7			3.2	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	ND	0.0005	mg/L	ND			NC	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	0.6	0.1	mg/L	0.6			2.9	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	0.0003	0.0001	mg/L	0.0003			NC	20	
Sodium	15.3	0.2	mg/L	15.9			3.9	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Tin	ND	0.01	mg/L	ND			NC	20	
Titanium	ND	0.005	mg/L	ND			NC	50	
Tungsten	ND	0.01	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	0.005			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Volatiles									
Benzene	ND	0.0005	mg/L	ND			NC	30	

Certificate of Analysis

Client: McIntosh Perry Consulting Eng. (Carp)

Client PO: Corkery Community Centre

Report Date: 10-Feb-2022

Order Date: 4-Feb-2022

Project Description: 21-3339

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	ND	0.0005	mg/L	ND			NC	30	
Toluene	ND	0.0005	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: Toluene-d8	*0.0834*		*mg/L*		*104*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	14.1	1	mg/L	4.38	97.3	77-123			
Fluoride	1.73	0.1	mg/L	0.83	89.3	79-121			
Nitrate as N	1.37	0.1	mg/L	0.21	116	79-120			
Nitrite as N	0.876	0.05	mg/L	ND	87.6	84-117			
Sulphate	34.0	1	mg/L	24.3	97.0	74-126			
General Inorganics									
Ammonia as N	0.592	0.01	mg/L	0.334	103	81-124			
Dissolved Organic Carbon	12.4	0.5	mg/L	ND	124	60-133			
Phenolics	0.028	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	104	10	mg/L	ND	104	75-125			
Sulphide	0.51	0.02	mg/L	ND	102	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	96.8	71-113			
Total Kjeldahl Nitrogen	2.46	0.1	mg/L	0.55	95.7	81-126			
Hydrocarbons									
F1 PHCs (C6-C10)	1.62	0.0250	mg/L	ND	81.1	68-117			
Metals									
Aluminum	43.3	0.001	mg/L	ND	86.6	80-120			
Antimony	46.1	0.0005	mg/L	0.0126	92.3	80-120			
Arsenic	45.3	0.001	mg/L	0.162	90.3	80-120			
Barium	53.1	0.001	mg/L	10.8	84.7	80-120			
Beryllium	40.9	0.0005	mg/L	0.0096	81.8	80-120			
Boron	40.3	0.01	mg/L	3.86	72.8	80-120			QM-07
Cadmium	44.8	0.0001	mg/L	0.0101	89.7	80-120			
Calcium	15400	0.1	mg/L	7370	80.4	80-120			
Chromium	43.6	0.001	mg/L	0.120	87.0	80-120			
Cobalt	43.7	0.0005	mg/L	0.0198	87.5	80-120			
Copper	96.2	0.0005	mg/L	57.4	77.5	80-120			QM-07
Iron	2170	0.1	mg/L	11.0	86.3	80-120			
Lead	40.5	0.0001	mg/L	0.189	80.6	80-120			
Magnesium	10700	0.2	mg/L	1750	89.9	80-120			
Manganese	45.5	0.005	mg/L	1.80	87.5	80-120			
Molybdenum	41.2	0.0005	mg/L	0.175	82.1	80-120			
Nickel	43.5	0.001	mg/L	0.483	86.0	80-120			
Potassium	9640	0.1	mg/L	624	90.1	80-120			
Selenium	42.6	0.001	mg/L	0.022	85.2	80-120			
Silver	43.8	0.0001	mg/L	0.261	87.1	80-120			
Sodium	23700	0.2	mg/L	15900	77.5	80-120			QM-07
Thallium	43.9	0.001	mg/L	0.006	87.7	80-120			
Tin	42.0	0.01	mg/L	0.12	83.7	80-120			
Titanium	47.6	0.005	mg/L	ND	95.1	70-130			
Tungsten	44.3	0.01	mg/L	0.04	88.5	80-120			
Uranium	42.1	0.0001	mg/L	0.0060	84.2	80-120			
Vanadium	44.1	0.0005	mg/L	0.0918	88.1	80-120			
Zinc	48.0	0.005	mg/L	5.05	85.9	80-120			
Volatiles									
Benzene	0.0353	0.0005	mg/L	ND	88.3	60-130			
Ethylbenzene	0.0376	0.0005	mg/L	ND	94.0	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Toluene	0.0391	0.0005	mg/L	ND	97.8	60-130			
m,p-Xylenes	0.0748	0.0005	mg/L	ND	93.5	60-130			
o-Xylene	0.0376	0.0005	mg/L	ND	93.9	60-130			
Surrogate: Toluene-d8	*0.0809*		*mg/L*		*101*	*50-140*			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Sample time on bottles read: "AM", COC reads "10:40".

Applies to samples: TW1-1

Container(s) - Labeled improperly/insufficient information - Sample time on bottles read: "PM". COC reads: "15:10".

Applies to samples: TW1-2

Sample Qualifiers :

QC Qualifiers :

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

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

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

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.

PARACEL LABORATORIES LTD

Paracel ID: 2206476

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 14958
2206476	

Client Name:	McIntosh Perry	Project Ref:	Corkery Community Centre	Waterworks Name:	Samples Taken By:	
Contact Name:	Monica Black	Quote #:		Waterworks Number:	Name:	Monica Black
Address:	115 Walgreen Rd, Carp ON	PO #:	21-3339	Address:	Signature:	
After Hours Contact:		E-mail:	m.black@mcintoshperry.com p.munro@mcintoshperry.com		Page 1 of 1	
Telephone:		Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day	

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

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Sub. div SUPPLY list	BTEX	PHC	trace metals
1		TW1-1	R	G	N	N	03-02-22	10:40 AM	11							X	X	X	X
2		TW1-2	R	G	N	N	03-02-22	3:10 pm	11							X	X	X	X
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: trace metals = aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, zinc

Method of Delivery: walk

Relinquished By (Sign): Monica Black	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Monica Black	Date/Time: Feb 4/22	Date/Time: Feb 4 2022 10:55	Date/Time: Feb 4 2022 11:27
Date/Time: 03-02-22 5:15 pm	Temperature: 10.3 °C	Temperature: 1.8 °C	pH Verified: ☑ By: E

Chain of Custody (Drinking Water).xlsx

8:30

Revision 5.0

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX C: CALCULATIONS

McINTOSH PERRY

Cooper-Jacob Analysis - Calculations

Pumping Rate

12 min	33	L/min
16 min	31	L/min
AVERAGE	32.0	L/min

Transmissivity

$$T = \frac{2.3\,Q}{4\,\pi\Delta s}$$

T is the transmissivity (m2/day)
Q is the pumping rate during the pumping test (L/min); and,
Δs is the differential for residual drawdown for one log cycle (m)

Well @ Corkery Community Centre (Drawdown)

T= 2.3 Q / 4π ΔS
T= 2.3 (46.08 m3/day)/4π (0.028 m)
T= 301.4 m2/day
0.003488019 m2/s

Q = 32 L/min
Q=((32 L/min)/(1000L))*(60 min)(24 hour)
46.08 m3/day

Δs = 0.028m

Well @ Corkery Community Centre (Recovery)

T= 2.3 Q / 4π ΔS
T= 2.3 (46.08 m3/day)/4π (0.0025 m)
T= 3375.3 m2/day
0.039065817 m2/s

Q = 32 L/min
Q=((32 L/min)/(1000L))*(60 min)(24 hour)
46.08 m3/day

Δs =0.0025m

Farvolden

Q20= 0.68 T Ha Sf

Ha= the available water column height (m)
Sf= safety factor
T= Transmissivity (m2/day)

T= 301.4 m2/day Drawdown
T= 3375.3 m2/day Recovery

Well @ Corkery Community Centre (drawdown)
Q20= 0.68 (301.4 m2/day)(13.37 m)(0.7)

Safety Factor 0.7

Rec'd Pump Setting (pump at 150 ft) 45.72 m
static WL 32.35 m
Ha (avail. head)= 13.37 m

Q20= 1917.922242 m3/day
Q20= 1917922.242 L/day
Q20= 1331.890446 L/min

Moell

Q20 = (Q Ha Sf) / (s100 + 5 Δs)

Q= the pumping rate (m3/day)
Ha= the available water column height (m)
Sf= safety factor
s100= the drawdown at 100 minutes (semi-log long-term graph)
Δs= the change in hydraulic head over one log cycle (drawdown vs. long time)

Well @ 999 Matheson (drawdown)

Q= 46.08 m3/day
Ha= 13.37 m
Safety Factor 0.7
s100 0.38
Δs 0.0025

Q20= ((46.08 m3/day)(13.37 m)(0.7))/(0.38 m + 5(0.028 m)
Q20= 1098.758522 m3/day
Q20= 1098758.522 L/day
Q20= 763.0267516 L/min

Hydraulic Conductivity

b = aquifer thickness
T = transmissivity
K = hydraulic conductivity

b= 42 ft of pipe
open hole until 238 ft
total = 196 ft
59.74 m

K=T/b

K= 5.84E-05 m/s Drawdown
6.54E-04 m/s Recovery

Comments: Aquifer thickness of X m corresponds to open hole in bedrock below casing
(casing to X m BGS, WL at X mBTOC and end of hole at X)

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX D: MECP WATER WELL INFORMATION SYSTEM DATA

McINTOSH PERRY

WELL_ID	COMPLETED	WELL DEPTH (m)	STATIC WATER LEVEL (m)	DEPTH TO BEDROCK (m)	FINAL STATUS	USE1	GEOLOGY	FORMATION_TOP_DEPTH	FORMATION_END_DEPTH	UNITS OF MEASUREMENT
1513333	12-Jul-73	32	3.7	0.9144	Water Supply	Domestic	LIMESTONE,,	80	100	ft
1513333	12-Jul-73	32	3.7	0.9144	Water Supply	Domestic	SAND,GRAVEL,	0	3	ft
1513333	12-Jul-73	32	3.7	0.9144	Water Supply	Domestic	LIMESTONE,,	65	80	ft
1513333	12-Jul-73	32	3.7	0.9144	Water Supply	Domestic	LIMESTONE,,	3	65	ft
1513333	12-Jul-73	32	3.7	0.9144	Water Supply	Domestic	LIMESTONE,,	100	105	ft
1513502	03-Aug-73	41.1	27.4	1.8288	Water Supply	Domestic	GRAVEL,SAND,	0	6	ft
1513502	03-Aug-73	41.1	27.4	1.8288	Water Supply	Domestic	LIMESTONE,,	6	24	ft
1513502	03-Aug-73	41.1	27.4	1.8288	Water Supply	Domestic	LIMESTONE,,	24	53	ft
1513502	03-Aug-73	41.1	27.4	1.8288	Water Supply	Domestic	LIMESTONE,,	53	135	ft
1515273	06-Aug-75	45.7	24.4	2.1336	Water Supply	Domestic	SANDSTONE,SAND,LAYERED	7	16	ft
1515273	06-Aug-75	45.7	24.4	2.1336	Water Supply	Domestic	LIMESTONE,DENSE,	16	128	ft
1515273	06-Aug-75	45.7	24.4	2.1336	Water Supply	Domestic	LIMESTONE,SAND,LAYERED	128	150	ft
1515273	06-Aug-75	45.7	24.4	2.1336	Water Supply	Domestic	SAND,STONES,LOOSE	0	7	ft
1515274	11-Aug-75	39.6	21.3	0.9144	Water Supply	Domestic	SAND,STONES,LOOSE	0	3	ft
1515274	11-Aug-75	39.6	21.3	0.9144	Water Supply	Domestic	LIMESTONE,DENSE,	9	114	ft
1515274	11-Aug-75	39.6	21.3	0.9144	Water Supply	Domestic	LIMESTONE,SAND,LAYERED	114	130	ft
1515274	11-Aug-75	39.6	21.3	0.9144	Water Supply	Domestic	SANDSTONE,LAYERED,	3	9	ft
1514296	04-Jul-74	53.3	18.9	2.7432	Water Supply	Domestic	SAND,,	0	9	ft
1514296	04-Jul-74	53.3	18.9	2.7432	Water Supply	Domestic	LIMESTONE,,	9	175	ft
1514297	04-Jul-74	42.1	27.4	1.524	Water Supply	Domestic	CLAY,,	0	5	ft
1514297	04-Jul-74	42.1	27.4	1.524	Water Supply	Domestic	LIMESTONE,,	5	138	ft
1514298	02-Jul-74	71.9	27.4	0.6096	Water Supply	Domestic	LIMESTONE,,	2	236	ft
1514298	02-Jul-74	71.9	27.4	0.6096	Water Supply	Domestic	SAND,,	0	2	ft
1514299	03-Jul-74	48.2	21	1.524	Water Supply	Domestic	SAND,,	0	5	ft
1514299	03-Jul-74	48.2	21	1.524	Water Supply	Domestic	LIMESTONE,,	5	158	ft
1514300	03-Jul-74	47.2	19.8	1.2192	Water Supply	Domestic	SAND,,	0	4	ft
1514300	03-Jul-74	47.2	19.8	1.2192	Water Supply	Domestic	LIMESTONE,,	4	155	ft
1514301	03-Jul-74	34.7	20.7	1.2192	Water Supply	Domestic	FILL,,	0	4	ft
1514301	03-Jul-74	34.7	20.7	1.2192	Water Supply	Domestic	LIMESTONE,,	4	114	ft
1514302	05-Jul-74	47.2	20.1	2.4384	Water Supply	Domestic	FILL,,	0	8	ft
1514302	05-Jul-74	47.2	20.1	2.4384	Water Supply	Domestic	LIMESTONE,,	8	155	ft
1514303	05-Jul-74	28.7	18.6	1.8288	Water Supply	Domestic	FILL,,	0	6	ft
1514303	05-Jul-74	28.7	18.6	1.8288	Water Supply	Domestic	LIMESTONE,,	6	94	ft
1514409	10-Oct-74	45.1	15.2	1.542	Water Supply	Domestic	GRAVEL,,	0	5	ft
1514409	10-Oct-74	45.1	15.2	1.542	Water Supply	Domestic	LIMESTONE,,	5	148	ft
1515929	17-May-77	41.1	26.8	2.1336	Water Supply	Domestic	LIMESTONE,,	7	130	ft
1515929	17-May-77	41.1	26.8	2.1336	Water Supply	Domestic	LIMESTONE,,	130	135	ft
1515929	17-May-77	41.1	26.8	2.1336	Water Supply	Domestic	SAND,GRAVEL,BOULDERS	0	7	ft
1516427	09-Aug-77	22.3	16.2	2.1336	Water Supply	Domestic	LIMESTONE,,	7	65	ft
1516427	09-Aug-77	22.3	16.2	2.1336	Water Supply	Domestic	SANDSTONE,,	65	73	ft
1516427	09-Aug-77	22.3	16.2	2.1336	Water Supply	Domestic	SAND,,	0	7	ft
1517091	20-Aug-79	25.9	7.6	1.2336	Water Supply	Domestic	SAND,,	0	4	ft
1517091	20-Aug-79	25.9	7.6	1.2336	Water Supply	Domestic	LIMESTONE,,	4	85	ft
1517168	14-Sep-79	27.7	6.1	2.4384	Water Supply	Domestic	SAND,GRAVEL,	0	8	ft
1517168	14-Sep-79	27.7	6.1	2.4384	Water Supply	Domestic	LIMESTONE,,	8	91	ft
1517304	10-Apr-80	29	9.1	2.7432	Water Supply	Domestic	SAND,,	0	9	ft
1517304	10-Apr-80	29	9.1	2.7432	Water Supply	Domestic	LIMESTONE,,	9	95	ft
1517305	14-May-80	39.3	25.9	0.6144	Water Supply	Domestic	LIMESTONE,,	3	129	ft
1517305	14-May-80	39.3	25.9	0.6144	Water Supply	Domestic	SAND,,	0	3	ft
1517359	30-Sep-80	34.7	13.7	2.1336	Water Supply	Domestic	GRAVEL,,	0	7	ft
1517359	30-Sep-80	34.7	13.7	2.1336	Water Supply	Domestic	LIMESTONE,,	7	114	ft
1517360	22-Oct-80	36.9	0.9	0	Water Supply	Domestic	LIMESTONE,,	0	121	ft
1517362	13-Aug-80	37.8	27.4	1.524	Water Supply	Domestic	SAND,,	0	5	ft
1517362	13-Aug-80	37.8	27.4	1.524	Water Supply	Domestic	LIMESTONE,,	5	124	ft
1518647	03-Aug-83	45.7	9.1	0	Water Supply	Domestic	LIMESTONE,,	0	25	ft
1518647	03-Aug-83	45.7	9.1	0	Water Supply	Domestic	LIMESTONE,,	25	110	ft
1518647	03-Aug-83	45.7	9.1	0	Water Supply	Domestic	LIMESTONE,,	110	150	ft
1519078	12-Jul-84	59.4	12.2	1.8288	Water Supply	Domestic	SAND,STONES,LOOSE	0	6	ft
1519078	12-Jul-84	59.4	12.2	1.8288	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	188	195	ft
1519078	12-Jul-84	59.4	12.2	1.8288	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	6	188	ft
1519709	23-May-85	43	27.1	0.9144	Water Supply	Domestic	SHALE,,	139	141	ft
1519709	23-May-85	43	27.1	0.9144	Water Supply	Domestic	TOPSOIL,SAND,STONES	0	3	ft
1519709	23-May-85	43	27.1	0.9144	Water Supply	Domestic	LIMESTONE,,	3	139	ft
1520026	12-Jun-85	19.2	7.6	1.2192	Water Supply	Domestic	GRAVEL,,	0	4	ft
1520026	12-Jun-85	19.2	7.6	1.2192	Water Supply	Domestic	LIMESTONE,,	4	63	ft
1520285	18-Nov-85	45.7	35.1	1.8288	Water Supply	Domestic	SAND,GRAVEL,	0	6	ft
1520285	18-Nov-85	45.7	35.1	1.8288	Water Supply	Domestic	SHALE,,	6	10	ft
1520285	18-Nov-85	45.7	35.1	1.8288	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	10	150	ft
1520403	27-Nov-85	32	9.4	1.2192	Water Supply	Domestic	FILL,PACKED,	0	4	ft
1520403	27-Nov-85	32	9.4	1.2192	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	8	105	ft
1520403	27-Nov-85	32	9.4	1.2192	Water Supply	Domestic	LIMESTONE,SOFT,FRACTURED	4	8	ft
1520545	14-May-86	34.1	2.4	0.6096	Water Supply	Domestic	LIMESTONE,,	2	83	ft
1520545	14-May-86	34.1	2.4	0.6096	Water Supply	Domestic	SHALE,SANDSTONE,	83	91	ft
1520545	14-May-86	34.1	2.4	0.6096	Water Supply	Domestic	TOPSOIL,,	0	2	ft

1520545	14-May-86	34.1	2.4	0.6096	Water Supply	Domestic	LIMESTONE,,	91	112	ft
1520546	30-Apr-86	27.7	4.9	0.6096	Test Hole	Domestic	TOPSOIL,SAND,	0	2	ft
1520546	30-Apr-86	27.7	4.9	0.6096	Test Hole	Domestic	LIMESTONE,SHALE,TOPSOIL	2	84	ft
1520546	30-Apr-86	27.7	4.9	0.6096	Test Hole	Domestic	SHALE,SANDSTONE,	84	91	ft
1520547	19-Mar-86	62.8	21.3	0.6096	Test Hole	Domestic	TOPSOIL,SAND,	0	2	ft
1520547	19-Mar-86	62.8	21.3	0.6096	Test Hole	Domestic	LIMESTONE,SHALE,	2	177	ft
1520547	19-Mar-86	62.8	21.3	0.6096	Test Hole	Domestic	SHALE,SANDSTONE,	177	206	ft
1520548	05-Feb-86	33.5	4.3	4.572	Test Hole	Domestic	GRAVEL,SAND,	0	10	ft
1520548	05-Feb-86	33.5	4.3	4.572	Test Hole	Domestic	CLAY,,	10	15	ft
1520548	05-Feb-86	33.5	4.3	4.572	Test Hole	Domestic	LIMESTONE,SHALE,	15	110	ft
1520549	22-Jan-86	45.7	0.9	0.6096	Water Supply	Domestic	GRAVEL,TOPSOIL,SANDY	0	2	ft
1520549	22-Jan-86	45.7	0.9	0.6096	Water Supply	Domestic	LIMESTONE,,	6	150	ft
1520549	22-Jan-86	45.7	0.9	0.6096	Water Supply	Domestic	SHALE,,	2	6	ft
1520802	25-Mar-86	50.3	19.8	0.9144	Water Supply	Domestic	CLAY,THICK,	0	3	ft
1520802	25-Mar-86	50.3	19.8	0.9144	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,HARD	3	165	ft
1521442	02-Jun-87	56.4	18.3	0.9144	Water Supply	Domestic	CLAY,,	0	3	ft
1521442	02-Jun-87	56.4	18.3	0.9144	Water Supply	Domestic	SANDSTONE,,	3	185	ft
1522756	14-Oct-88	43.6	25.9	2.1336	Water Supply	Domestic	LIMESTONE,SHALE,SANDSTONE	13	143	ft
1522756	14-Oct-88	43.6	25.9	2.1336	Water Supply	Domestic	SHALE,FRACTURED,FRACTURED	7	13	ft
1522756	14-Oct-88	43.6	25.9	2.1336	Water Supply	Domestic	CLAY,SANDY,STONES	0	7	ft
1523205	12-Oct-88	44.2		3.3528	Water Supply	Domestic	LIMESTONE,LIMESTONE,LAYERED	128	145	ft
1523205	12-Oct-88	44.2		3.3528	Water Supply	Domestic	SAND,BOULDERS,FILL	0	5	ft
1523205	12-Oct-88	44.2		3.3528	Water Supply	Domestic	MUCK,PACKED,	5	7	ft
1523205	12-Oct-88	44.2		3.3528	Water Supply	Domestic	SAND,GRAVEL,CLAY	7	11	ft
1523205	12-Oct-88	44.2		3.3528	Water Supply	Domestic	LIMESTONE,LIMESTONE,LAYERED	11	128	ft
1523217	26-May-88	39.6	2.1	0.3048	Water Supply	Domestic	LIMESTONE,LIMESTONE,MEDIUM-GRAINED	1	130	ft
1523217	26-May-88	39.6	2.1	0.3048	Water Supply	Domestic	SAND,LOOSE,	0	1	ft
1523624	28-Jul-89	61		3.3528	Water Supply	Not Used	SAND,CLAY,PACKED	0	11	ft
1523624	28-Jul-89	61		3.3528	Water Supply	Not Used	LIMESTONE,MEDIUM-GRAINED,	11	165	ft
1523624	28-Jul-89	61		3.3528	Water Supply	Not Used	LIMESTONE,SANDSTONE,LAYERED	165	200	ft
1523628	27-Jul-89	45.7	11	2.7432	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	40	150	ft
1523628	27-Jul-89	45.7	11	2.7432	Water Supply	Domestic	SAND,PACKED,	0	3	ft
1523628	27-Jul-89	45.7	11	2.7432	Water Supply	Domestic	LIMESTONE,SOFT,	9	40	ft
1523628	27-Jul-89	45.7	11	2.7432	Water Supply	Domestic	SAND,CLAY,PACKED	3	9	ft
1524493	14-May-90	22.9		2.1336	Water Supply	Domestic	CLAY,SAND,PACKED	0	7	ft
1524493	14-May-90	22.9		2.1336	Water Supply	Domestic	HARDPAN,STONES,PACKED	7	13	ft
1524493	14-May-90	22.9		2.1336	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	13	75	ft
1524686	01-Aug-90	45.7		1.524	Water Supply	Domestic	SAND,FILL,LOOSE	0	5	ft
1524686	01-Aug-90	45.7		1.524	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	5	130	ft
1524686	01-Aug-90	45.7		1.524	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	130	138	ft
1524686	01-Aug-90	45.7		1.524	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,	138	150	ft
1525380	12-Mar-91	38.1	6.1	3.048	Water Supply	Domestic	CLAY,SANDY,	0	10	ft
1525380	12-Mar-91	38.1	6.1	3.048	Water Supply	Domestic	LIMESTONE,,	10	125	ft
1525851	12-Jul-91	47.5	29.9	0	Water Supply	Domestic	LIMESTONE,SHALE,	0	156	ft
1526076	16-Nov-91	22.9	2.4	0	Water Supply	Domestic	CLAY,STONES,HARDPAN	0	4	ft
1526076	16-Nov-91	22.9	2.4	0	Water Supply	Domestic	LIMESTONE,MEDIUM-GRAINED,HARD	4	75	ft
1527635	19-Aug-93	45.7	28	1.524	Water Supply	Domestic	SAND,GRAVEL,STONES	0	5	ft
1527635	19-Aug-93	45.7	28	1.524	Water Supply	Domestic	SHALE,SANDSTONE,	90	150	ft
1527635	19-Aug-93	45.7	28	1.524	Water Supply	Domestic	LIMESTONE,SHALE,	5	90	ft
1529766	11-Nov-97	51.8	4.6	1.2192	Water Supply	Domestic	SAND,FILL,	0	4	ft
1529766	11-Nov-97	51.8	4.6	1.2192	Water Supply	Domestic	SHALE,LIMESTONE,	4	170	ft
1530802	09-Sep-99	72.5	25	0	Water Supply	Domestic	LIMESTONE,SHALE,	0	238	ft
1530976	08-Nov-99	61		2.4384	Water Supply	Domestic	LIMESTONE,LAYERED,	8	200	ft
1530976	08-Nov-99	61		2.4384	Water Supply	Domestic	SAND,STONES,PACKED	0	8	ft
1533407	07-Nov-02	53.9	21.3	3.048	Water Supply	Domestic	SAND,GRAVEL,	0	10	ft
1533407	07-Nov-02	53.9	21.3	3.048	Water Supply	Domestic	LIMESTONE,CLAY,LAYERED	10	175	ft
1533407	07-Nov-02	53.9	21.3	3.048	Water Supply	Domestic	LIMESTONE,CLAY,LAYERED	175	177	ft
1534601	17-Mar-04	46.6	15	0.9144	Water Supply	Domestic	LIMESTONE,,	3	147	ft
1534601	17-Mar-04	46.6	15	0.9144	Water Supply	Domestic	GRANITE,,	147	153	ft
1534601	17-Mar-04	46.6	15	0.9144	Water Supply	Domestic	TOPSOIL,,	0	3	ft
1535745	09-Aug-05	76.2		1.524	Water Supply	Domestic	SAND,GRAVEL,	0	1.524	m
1535745	09-Aug-05	76.2		1.524	Water Supply	Domestic	LIMESTONE,,	1.524	22.56	m
1535745	09-Aug-05	76.2		1.524	Water Supply	Domestic	SANDSTONE,,	22.56	24.69	m
1535745	09-Aug-05	76.2		1.524	Water Supply	Domestic	LIMESTONE,,	24.69	70.71	m
1535745	09-Aug-05	76.2		1.524	Water Supply	Domestic	SANDSTONE,,	70.71	76.2	m

7111660	12-Aug-08				Abandoned-Other		,,			
7156080	11-Nov-10	76.2	13.9	25.9	Water Supply		,,	0	25.9	m
7156080	11-Nov-10	76.2	13.9	25.9	Water Supply		LIMESTONE,,	25.9	54.86	m
7156080	11-Nov-10	76.2	13.9	25.9	Water Supply		SANDSTONE,,	54.86	76.19	m
7187436	05-Jun-12				Abandoned-Supply		,,			
7201631	26-Apr-13				Abandoned-Other	Monitoring and Test Hole	,,			
7260528	16-Dec-15	33.5	3.7	8.5344	Water Supply	Domestic	TOPSOIL,,	0	28	ft
7260528	16-Dec-15	33.5	3.7	8.5344	Water Supply	Domestic	LIMESTONE,,	28	110	ft
7270177	28-Jul-16	53.3	32.3	1.82	Water Supply	Domestic	SAND,GRAVEL,LOOSE	0	1.82	m
7270177	28-Jul-16	53.3	32.3	1.82	Water Supply	Domestic	LIMESTONE,,	1.82	14.62	m
7270177	28-Jul-16	53.3	32.3	1.82	Water Supply	Domestic	SHALE,,SOFT	14.62	53.33	m
7286758	11-May-17				Water Supply	Domestic	,,			ft
7336407	03-Jun-19	51.8	27.1	1.524	Water Supply	Domestic	SAND,GRAVEL,	0	5	ft
7336407	03-Jun-19	51.8	27.1	1.524	Water Supply	Domestic	SHALE,LIMESTONE,	5	170	ft

Average (m)			2.20488
Max (m)	76.2	35.1	
Min (m)	19.2	0.9	

WELL_ID	COMPLETED	WELL DEPTH (m)	STATIC WATER LEVEL (m)	DEPTH TO BEDROCK (m)	FINAL STATUS	USE1	PUMPING RATE	LPM	RECOM RATE
1513333	12-Jul-73	32	3.7	0	Water Supply	Domestic	15 GPM	68.19	5GPM
1513502	03-Aug-73	41.1	27.4	0	Water Supply	Domestic	10 GPM	45.46	5GPM
1515273	06-Aug-75	45.7	24.4	0	Water Supply	Domestic	15 GPM	68.19	5GPM
1515274	11-Aug-75	39.6	21.3	0	Water Supply	Domestic	15 GPM	68.19	5GPM
1514296	04-Jul-74	53.3	18.9	0	Water Supply	Domestic	2 GPM	9	3GPM
1514297	04-Jul-74	42.1	27.4	0	Water Supply	Domestic	12 GPM	54.55	8GPM
1514298	02-Jul-74	71.9	27.4	0	Water Supply	Domestic	6 GPM	27.28	6GPM
1514299	03-Jul-74	48.2	21	0	Water Supply	Domestic	16 GPM	72.74	10GPM
1514300	03-Jul-74	47.2	19.8	0	Water Supply	Domestic	15 GPM	68.19	10GPM
1514301	03-Jul-74	34.7	20.7	0	Water Supply	Domestic	10 GPM	45.46	10GPM
1514302	05-Jul-74	47.2	20.1	0	Water Supply	Domestic	15 GPM	68.19	10GPM
1514303	05-Jul-74	28.7	18.6	0	Water Supply	Domestic	10 GPM	45.46	8GPM
1514409	10-Oct-74	45.1	15.2	0	Water Supply	Domestic	25 GPM	113.65	5GPM
1515929	17-May-77	41.1	26.8	0	Water Supply	Domestic	20 GPM	90.92	5GPM
1516427	09-Aug-77	22.3	16.2	0	Water Supply	Domestic	7 GPM	31.82	7GPM
1517091	20-Aug-79	25.9	7.6	0	Water Supply	Domestic	12 GPM	54.55	GPM
1517168	14-Sep-79	27.7	6.1	0	Water Supply	Domestic	12 GPM	54.55	GPM
1517304	10-Apr-80	29	9.1	0	Water Supply	Domestic	12 GPM	54.55	GPM
1517305	14-May-80	39.3	25.9	0	Water Supply	Domestic	10 GPM	45.46	GPM
1517359	30-Sep-80	34.7	13.7	0	Water Supply	Domestic	10 GPM	45.46	GPM
1517360	22-Oct-80	36.9	0.9	0	Water Supply	Domestic	6 GPM	27.28	GPM
1517362	13-Aug-80	37.8	27.4	0	Water Supply	Domestic	10 GPM	45.46	GPM
1518647	03-Aug-83	45.7	9.1	0	Water Supply	Domestic	10 GPM	45.46	5GPM
1519078	12-Jul-84	59.4	12.2	0	Water Supply	Domestic	10 GPM	45.46	5GPM
1519709	23-May-85	43	27.1	0	Water Supply	Domestic	10 GPM	45.46	5GPM
1520026	12-Jun-85	19.2	7.6	0	Water Supply	Domestic	5 GPM	22.73	5GPM
1520285	18-Nov-85	45.7	35.1	0	Water Supply	Domestic	8 GPM	36.37	5GPM
1520403	27-Nov-85	32	9.4	0	Water Supply	Domestic	10 GPM	45.46	8GPM
1520545	14-May-86	34.1	2.4	0	Water Supply	Domestic	7 GPM	31.82	7GPM
1520546	30-Apr-86	27.7	4.9	0	Test Hole	Domestic	4 GPM	18.18	4GPM
1520547	19-Mar-86	62.8	21.3	0	Test Hole	Domestic	10 GPM	45.46	10GPM
1520548	05-Feb-86	33.5	4.3	0	Test Hole	Domestic	4 GPM	18.18	4GPM
1520549	22-Jan-86	45.7	0.9	0	Water Supply	Domestic	2 GPM	9	2GPM
1520802	25-Mar-86	50.3	19.8	0	Water Supply	Domestic	20 GPM	90.92	5GPM
1521442	02-Jun-87	56.4	18.3	0	Water Supply	Domestic	4 GPM	18.18	4GPM
1522756	14-Oct-88	43.6	25.9	0	Water Supply	Domestic	10 GPM	45.46	10GPM
1523205	12-Oct-88	44.2	0	0	Water Supply	Domestic	8 GPM	36.37	6GPM
1523217	26-May-88	39.6	2.1	0	Water Supply	Domestic	8 GPM	36.37	6GPM
1523624	28-Jul-89	61	0	0	Water Supply	Not Used	12 GPM	54.55	5GPM
1523628	27-Jul-89	45.7	11	0	Water Supply	Domestic	20 GPM	90.92	5GPM
1524493	14-May-90	22.9	0	0	Water Supply	Domestic	10 GPM	45.46	5GPM
1524686	01-Aug-90	45.7	0	0	Water Supply	Domestic	5 GPM	22.73	4GPM
1525380	12-Mar-91	38.1	6.1	0	Water Supply	Domestic	8 GPM	36.37	5GPM
1525851	12-Jul-91	47.5	29.9	0	Water Supply	Domestic	10 GPM	45.46	10GPM
1526076	16-Nov-91	22.9	2.4	0	Water Supply	Domestic	30 GPM	136.38	10GPM
1527635	19-Aug-93	45.7	28	0	Water Supply	Domestic	12 GPM	54.55	12GPM
1529766	11-Nov-97	51.8	4.6	0	Water Supply	Domestic	3 GPM	13.64	3GPM
1530802	09-Sep-99	72.5	25	0	Water Supply	Domestic	12 GPM	54.55	10GPM
1530976	08-Nov-99	61	0	0	Water Supply	Domestic	6 GPM	27.28	6GPM
1533407	07-Nov-02	53.9	21.3	0	Water Supply	Domestic	8 GPM	36.37	5GPM
1534601	17-Mar-04	46.6	15	0	Water Supply	Domestic	10 LPM	45.46	10LPM
1535745	09-Aug-05	76.2	0	0	Water Supply	Domestic	43 LPM	43	30LPM
7111660	12-Aug-08	0	0	0	Abandoned-Other				
7156080	11-Nov-10	76.2	13.9	0	Water Supply		68.25 LPM	68.25	45.5LPM
7187436	05-Jun-12	0	0	0	Abandoned-Supply				
7201631	26-Apr-13	0	0	0	Abandoned-Other	Monitoring and Test Hole			
7260528	16-Dec-15	33.5	3.7	0	Water Supply	Domestic	10 GPM	45.46	10GPM
7270177	28-Jul-16	53.3	32.3	0	Water Supply	Domestic	54.6 LPM	54.6	45.5LPM
7286758	11-May-17	0	0	0	Water Supply	Domestic			
7336407	03-Jun-19	51.8	27.1	0	Water Supply	Domestic	10 GPM	45.46	10GPM
							MAX	136.38	
							MIN	9	

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX E: BOREHOLE LOGS, TEST PIT LOGS, AND SOIL PARTICLE SIZE DISTRIBUTION ANALYSIS

McINTOSH PERRY

Log of Borehole BH-01

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 3

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value (20 40 60 80) / Shear Strength kPa (50 100 150 200)	Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	160.37	0				
		FILL Silty sand with gravel, rootlets, brown, moist, (compact)	160.3		15 ○	×	SS1	
		FILL Sandy gravel with silt, cobbles and boulders, light brown, damp, (compact)	159.7	1	20 ○	×	SS2	
					22 + 50 for 130 mm ○	×	SS3	
		Auger Refusal at 2.0 m Depth	158.4					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-02

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 4

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	160.09	0				
		FILL Silty sand and gravel, light brown, damp, (compact)	160.0		15	×	SS1	
				1	18	×	SS2	
		FILL Silty gravel with sand, cobbles and boulders, light brown, damp, (loose)	158.6		4 + 50 for 100 mm	×	SS3	
		Auger Refusal at 1.8 m Depth	158.3					

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-03

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 5

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test — | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~75 mm thick	160 / 159.9	0
		FILL Silty sand with gravel, with organic stains and topsoil inclusions, mottled brown to yellow brown, moist, (compact)		
			159.3	
		FILL Sandy gravel with silt, cobbles and boulders, piece of plastic polyethylene sheet, light brown, damp, (compact)		1
			158.5	
		CONCRETE Light grey, heavily fractured, heavily weathered, ~100 mm	158.4	
		LIMESTONE BEDROCK Moderately to lightly weathered, contains minor shaley laminations & turbidites, widely to moderately spaced wavy subhorizontal fractures, light grey		2
			157.4	3
		Borehole Terminated at 3.3 m Depth	156.7	

Standard Penetration Test N Value: 20 40 60 80; Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

15 (SS1) | 34 (SS2) | 18 + 50/25 mm (SS3) | 200.8 MPa | 122.4 MPa

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
RUN 1	24.9
RUN 2	24.3

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 25 mm piezometer installed in borehole upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open
`July 14, 2021	2.6	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	1.5 - 2	90	60
2	2 - 3.3	100	42

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole BH-04

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 6

Page. 1 of 1

Date Drilled: 'June 17, 2021

Drill Type: CME 45 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
			160.49	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		TOPSOIL ~75 mm thick	160.4					
		FILL Silty sand with gravel, with topsoil inclusions and organic stains, brown, moist, (compact)			18	×	SS1	
				1	18	×	SS2	
			159.0					
		SILTY SAND TO SANDY SILT with gravel, brown, moist, (compact)			11	×	SS3	
			158.4	2				
		Auger Refusal at 2.1 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. 25 mm piezometer installed in borehole upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 17, 2021	Dry	Open
`July 14, 2021	Dry	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BH LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

Log of Borehole TP-01

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 7

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
			160.43	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
		ASPHALT ~75 mm thick	160.4					
		GRANULAR FILL crusher run limestone, ~210 mm thick	160.2			×	GS1	
		FILL Silty sand with gravel, brown, moist				×	GS2	
			159.8					
		FILL Sandy gravel with silt, numerous cobbles and boulders, light brown, damp		1		×	GS3	
			158.8					
		Bucket Refusal at 1.6 m Depth						

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	Dry	Open

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole TP-02

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 8

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~250 mm thick	160.09	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			159.8					
		FILL Silty sand with gravel, with rootlets and topsoil inclusions, contains plastic debris, mottled brown to grey, moist				×	GS1	
		- changes to orange brown below 0.7 m depth	159.2			×	GS2	
		FILL Silty sand with gravel, numerous cobbles and boulders, light brown, damp		1		×	GS3	
			158.8					
		Bucket Refusal at 1.3 m Depth						

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	Dry	Open

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole TP-03

Project No: OTT-21010977-A0

Project: Corkery Community Centre Expansion

Location: 3447 Old Almonte Road, Carp, ON

Figure No. 9

Page. 1 of 1

Date Drilled: 'June 23, 2021

Drill Type: Caterpillar 415 Backhoe

Datum: Geodetic Elevation

Logged by: G.C. Checked by: I.T.

Split Spoon Sample ☒
Auger Sample ◧
SPT (N) Value ○
Dynamic Cone Test ——
Shelby Tube ■
Shear Strength by Vane Test +S

Combustible Vapour Reading □
Natural Moisture Content ×
Atterberg Limits |—○
Undrained Triaxial at % Strain at Failure ⊕
Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~200 mm thick	160.24	0	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60		
			160.0					
		FILL Silty sand with gravel, cobbles and boulders, light brown, damp				×	GS1	
▼		- wet below 1.6 m depth	158.64	1				
			158.5					
		Bucket Refusal at 1.7 m Depth						

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Test pit backfilled upon completion of excavation.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-21010977-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
'June 23, 2021	1.6 m	Open

CORE DRILLING RECORD

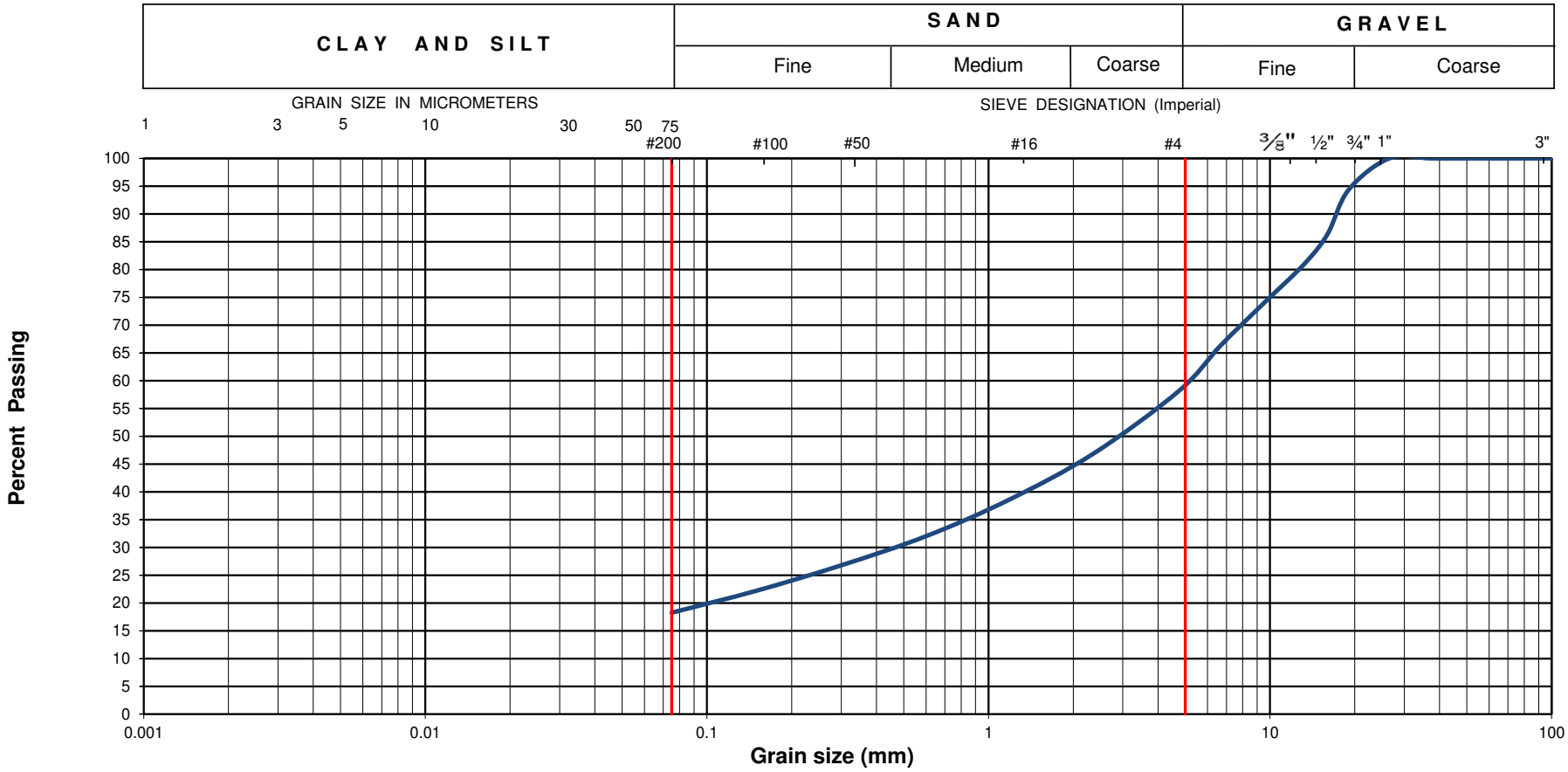
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE TP LOGS - 21010977.GPJ TROW OTTAWA.GDT 7/20/21

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System

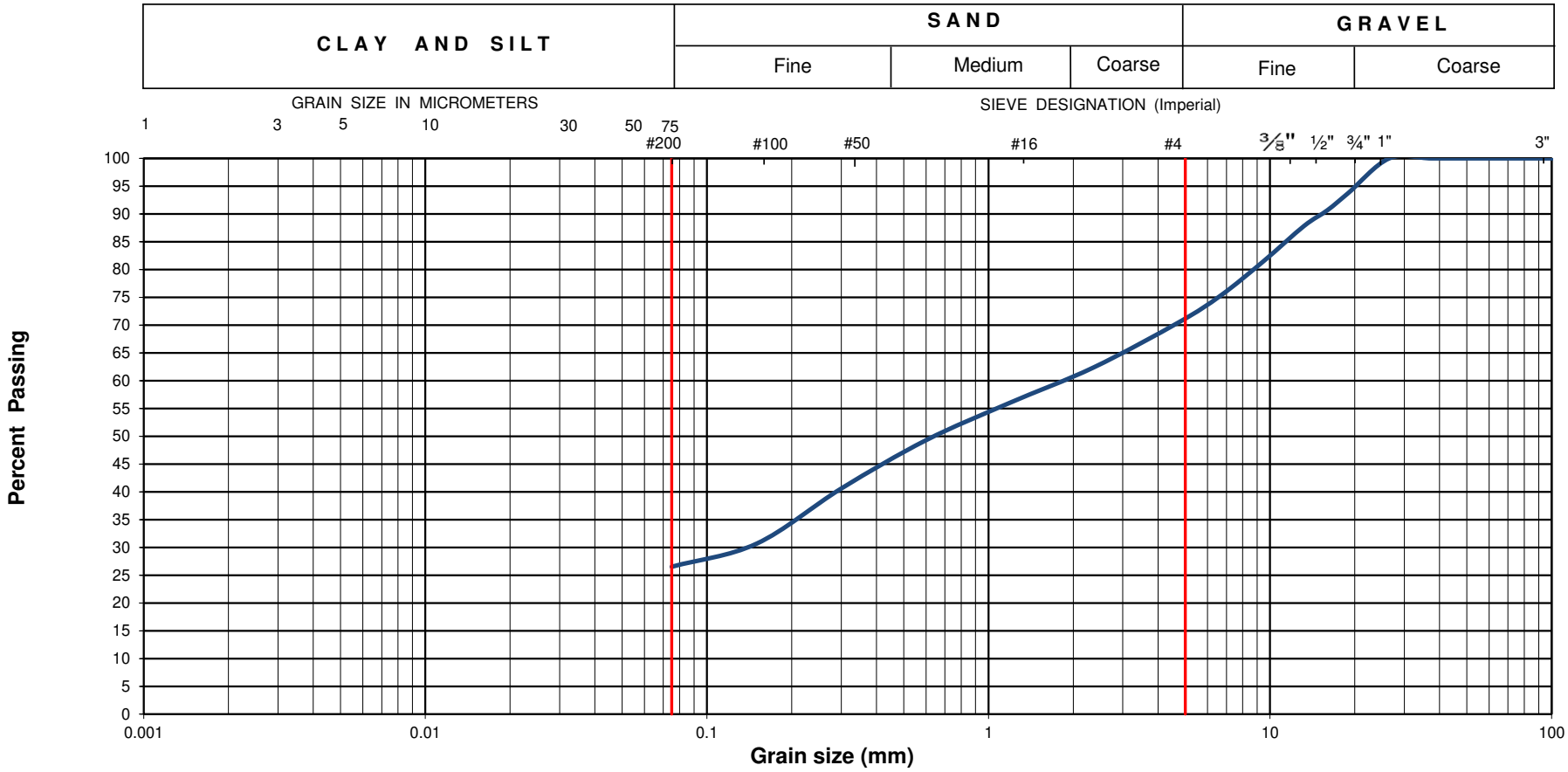


EXP Project No.:	**OTT-21010977-A0**	**Project Name :**	**Corkery Community Centre Expansion**						
Client :	**City of Ottawa**	**Project Location :**	**3447 Old Almonte Road. Carp, Ottawa, ON**						
Date Sampled :	**June 17, 2021**	**Borehole No:**	**BH2**	**Sample:**	**SS3**	**Depth (m) :**	**1.5-1.8**		
Sample Composition :		**Gravel (%)**	**42**	**Sand (%)**	**40**	**Silt & Clay (%)**	**18**	**Figure :**	**10**
Sample Description :		**FILL: Silty Gravel with Sand (GM)**							

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Sieve Analysis of Aggregate
ASTM C-136

Unified Soil Classification System



EXP Project No.:	**OTT-21010977-A0**	**Project Name :**	**Corkery Community Centre Expansion**						
Client :	**City of Ottawa**	**Project Location :**	**3447 Old Almonte Road. Carp, Ottawa, ON**						
Date Sampled :	**June 17, 2021**	**Borehole No:**	**BH4**	**Sample:**	**SS2**	**Depth (m) :**	**1.1 - 1.4**		
Sample Composition :		**Gravel (%)**	**30**	**Sand (%)**	**43**	**Silt & Clay (%)**	**27**	**Figure :**	**11**
Sample Description :		**FILL: Silty Sand with Gravel (SM)**							

BORING NUMBER MP - TP1 - 2021

Mcintosh Perry
115 Walgreen Road
Carp K0A 1L0

CLIENT City of Ottawa
PROJECT NAME Terrain Analysis
PROJECT NUMBER CCO-21-3339
PROJECT LOCATION 3447 Old Almonte Road, Ottawa, ON
DATE STARTED 21-12-22 **COMPLETED** 21-12-22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR McIntosh Perry
GROUND WATER LEVELS:
DRILLING METHOD Hand shovel and hand auger
AT TIME OF DRILLING ---
LOGGED BY E.Ws. **CHECKED BY** PL
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	ENVIRONMENTAL DATA	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
					Topsoil	
					0.10	
					Silty Gravel with Sand, Cobbles and Boulders	
					0.20	
					Sandy Gravel with Silt, Cobbles and Boulders	
0.5						
					0.70	
					Sandy Gravel with Silt, Cobbles and Boulders, very dense	
					0.85	
					Bottom of hole at 0.85 m.	

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX F: NITRATE ATTENUATION CALCULATIONS

McINTOSH PERRY

CCO-21-3339
Corkery Community Centre, 3447 Old Almonte Rd.
Nitrate Loading Calculations Mar.9.2022

Land Area

	A_{total}	37582.22	m2
	A_{imperv}	5364.4	m2
	Infiltrating Area	85.7%	
	A_{perv}	32217.82	m2

Water Surplus (W_s)

Precipitation		943.4	mm/yr
Evapotranspiration		609.5239	mm/yr
W_s = Precipitation - Evapotranspiration	W_s	333.8761	mm/yr
		0.333876	m/yr

Infiltration Factor (I_f) per MOEE 1995

Topo	Rolling Land	0.2	
Soil	Silty sand	0.3	
Cover	Cultivated lands	0.1	
	I_f =	0.600	

Infiltration (I)

$I=W_s * I_f$	I =	0.200326	m/yr
Runoff = W_s - I	Runoff =	0.133550	m/yr

Dilution Water Available (D_w)

$D_{w,perv} = A_{perv} * I$	D_w =	6454.06	m3/yr	
		17682.35	L/day	
$Runoff_{perv} = A_{perv} * W_s * (1-I_f)$	$Runoff_{perv}$ =	4302.70	m3/yr	
$Runoff_{imperv} = A_{imper} * Ws$	$Runoff_{imperv}$ =	1791.05	m3/yr	
$Runoff_{total} = Runoff_{perv} + Runoff_{imper}$	$Runoff_{total}$ =	6093.75	m3/yr	
	Runoff Reduction % =	0%		*(if using LID for stormwater management)*
	Runoff Reduction =	0.00	m3/yr	
$D_{w\,(final)} = D_{w,perv}$ + Runoff Reduction	$D_{w\,(final)}$ =	6454.06	m3/yr	
	$D_{w\,(final)}$ =	17682.35	L/day	

Nitrate Concentrations

Background Nitrate Concentration (C_b)	C_b =	1.4	mg/L	
Max Boundary Nitrate Concentration (C_{boun})	C_{boun} =	10	mg/L	
Effluent Nitrate Concentration (C_e)	C_e =	40	mg/L	
	Nitrate Reduction	0%		*(if CAN/BNQ 3680-600 N-I or NSF/ANSI 245 applies)*
	$C_{e\,(final)}$ =	40	mg/L	

Effluent Loading (Q_e)

Q_e = 4800 L/day/Residential Lot

Maximum Allowable Number of Lots (N)

$N = [D_w * (C_b - C_{boun})] / [Q_e * (C_{boun} - C_b - C_e)]$

N = 1.009

or

Calculated Nitrate Concentration (C_w)

N= 1 lots

$C_w = [(C_e * Q_e * N) / ((Q_e * N) + D_w)] + C_b$

C_w = 9.940

$C_w <= C_{boun}$, therefore proposed development will not exceed ODWO at property limit

Potential Evapotranspiration

Thornthwaite Method, "Hydrology & Hydraulic Systems", Gupta

Etmonth = 1.62 (10*Tm)/I)^a

where:

a = 675*10^-9*I^3 - 771 *10^-7*I^2 +179*10^-4 * I + 492*10^-3

I = sum (Tm/5)^1.514

Stn: Ottawa MacDonald -Cartier Int'l A (YOW)
Site Climate ID: 6106000

Month	Temp C	I	ET (cm) unadjusted	Daylight Factor	ET (cm) adjusted
January	-10.3				
Feb	-8.1				
March	-2.3				
April	6.3	1.4189	2.8610	1.13	3.2330
May	13.3	4.3982	6.4518	1.28	8.2583
June	18.5	7.2487	9.2396	1.29	11.9191
July	21	8.7821	10.6062	1.31	13.8942
Aug	19.8	8.0336	9.9484	1.21	12.0375
Sept	15	5.2767	7.3542	1.04	7.6483
Oct	8	2.0372	3.7105	0.94	3.4879
Nov	1.5	0.1616	0.6001	0.79	0.4741
Dec	-6.2				
I		37.35695	50.7719		**60.9524**
thus a =		1.0883			

Notes:

-Daylight Factor is an adjustment Factor for possible hours of sunshine based on latitude for Ottawa.

-Monthly temperatures from Environment Canada Climate Normals (1981-2010)

	Input data from user
	Set value
	Site Constant (adjustment for latitude)
	Calculated by worksheet

HYDROGEOLOGICAL ASSESSMENT AND TERRAIN ANALYSIS, CORKERY COMMUNITY CENTRE, 3447 OLD ALMONTE ROAD, OTTAWA, ON

APPENDIX G: SEWAGE SYSTEM CERTIFICATE OF COMPLETION FOR FIRE HALL

McINTOSH PERRY

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

File Search Reply – Match Found File

Information per applicant

Requester:	Brandon Aubin	**Date:**	02 Dec 2019
Email:	b.aubin@mcintoshperry.com	**Phone:**	**613.806.0336**

From: Ottawa Septic System Office – Sarah F
Phone: 613.692.3571 – Press "4" for the Septic office
Email: septic@rvca.ca

Follow up Inquiries Please Reference:	**FS-19-27** **Archive file (s): 09-505 (City Of Ottawa)**	
Civic Address:	**3449 Old Almonte**	
Former Township:	Huntley	
Property Owner Last Name:	**City of Ottawa**	
Lot 20	**Con: --** **Sublot/Part: -** **Plan: M248**	
	Septic system designed per the attached records for:	**Real estate feature listing obtained via the internet:**
Bedrooms		
Bathrooms	Fire Station	
Square M		

Attachment(s):

Archive file: 09-505 (City Of Ottawa)

- ✓ Copy of approval
- ✓ Use Permit/Certificate of Completion issued by regulator at time of construction
- NA Tertiary Treatment unit:

The foregoing information is given for your convenience only. Supplementary requests are necessary for conformity with other legislation such as flood plain or shoreline works. ***It should be clearly understood that you must satisfy yourself as to whether the premises and the existing or proposed use thereof is or would be in conformity with all applicable regulations.*** *For further information please contact Sarah Fletcher at the number listed above. Thank you for contacting the Ottawa Septic System Office.*

Jason Hutton

Part 8 Inspector – Jason Hutton

Visit our website – ottawasepticsystemoffice.ca

Ver. 2018 June

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Main Phone: 613-692-3571 x 1123
Fax: 613-692-1507
E-mail: septic@rvca.ca
Mailing Address: 3889 Rideau Valley Drive
P.O box 599, Manotick, ON K4M 1A5

Septic Records Search Form (1977 to present)

Complete and fax, mail or e-mail form → **NOTE: NON-REFUNDABLE FEE REQUIRED UPON SUBMISSION**

Form is to be completed in full. Incomplete information may cause delays or inaccurate file searches. Requests that have been processed and returned to clients are considered to be closed.

Requestor Information			**Section 1**
Requested by	**Brandon Aubin (McIntosh Perry)**		
Telephone	(613) 806-0336	**Date:** (mm/dd/yyyy)	11/29/2019
File Search Response & Attached Septic Records to be	**E-mailed to:** b.aubin@mcintoshperry.com		
	Mailed to:		
	Faxed to:		
Present Owner's Name	**City of Ottawa**		
Applicant's Reference	CM-19-0590 City of Ottawa_Corkery Community Centre		

File Search Property Information - Reference title and deed			**Section 2**
Municipal Address	3449 Old Almonte Rd, Carp, ON KOA 1L0		
Lot		**Concession:**	
Subdivision Lot/Parts	BLK 'A' AND LOT 20	**Plan:**	M248
Approximate Date of System Installation and/or Replacement	Original building in 1996 serviced by holding tanks. Believed to be converted to Class IV around 2001 with installation of leaching bed. Tanks were retrofitted.		
Owner at Time of Installation	**City of Ottawa**		

Payment Information			**Section 3**
Payment Type (Check one)	☒ [redacted] ☐ **Visa**	☐ **Cheque Attached***	
Card Number	[redacted]	**Exp. Date:** (mm/yyyy)	02/21
Cardholder Name	**Janet Mousseau**		
Receipt Issued to	Janet Mousseau (McIntosh Perry)		

*Cheques can be made payable to **Rideau Valley Conservation Authority**

Ottawa Septic System Office Use ONLY	
File Search Request #	
Invoice #	19-227
Date	

Response		**Section 4**
☐	Based on the above information, we were unable to locate a record of the related sewage disposal system in our files. We recommend contacting a consulting engineer to conduct an assessment. Please check with the Environment and Health Protection Branch for files dated between January 1960 to June 1977, Phone: 613-580-6744 ext. 23806	
☒	To our knowledge there are no outstanding work orders against this system	
☐	Outstanding work orders against this system exist - see fax cover for details.	

NOTE: Life Expectancy of a sewage system is dependent on past usage and maintenance.

Personal information on this form is collected under the authority of the *Health Protection and Promotion Act S.O. 1983 C 10* and the *Environmental Protection Act R.S.O. 1980 C141* and will be used for the provision of the recording Environmental Health Services. Questions concerning the collection of this information should be directed to the Ottawa Septic System Office, 3889 Rideau Valley Drive, P.O. Box 599, Manotick, ON K4M 1A5. The forgoing information is given for your convenience only. It should be clearly understood that you must satisfy yourself as to whether the premises and existing or proposed use thereof is or would be in conformity with all applicable regulations.

PLEASE SAVE THIS FORM AND ATTACH THE PDF TO AN EMAIL

Batch # 13727
Entry #: 5

RECEIPT CONFIRMATION

Rideau Valley C. A.
P.O. Box 599
Manotick, Ontario K4M 1A5
Canada
Phone: (613) 692-3571
Fax: (613) 692-0831

DOCUMENT NO.: PY000035993

DATE: 12/2/2019

AMOUNT RECEIVED 150.00 CAD

FROM Janet Mousseau

SF

SIGNATURE

PAID BY: VISA **CHECK/RECEIPT NO.:** 000013727-00005 **DATE RECEIVED:** 12/2/2019

	DESCRIPTION	AMOUNT
4300-20-20600	File Search 3449 Old Almonte (HUN) Septic FS-19-227	150.00
	SUB-TOTAL:	150.00
	TOTAL:	150.00

3449 OLD ALMONTE RD

PIN: 045400186

LEGAL DESCRIPTION / DESCRIPTION OFFICIELLE

PIN	LEGAL DESCRIPTION / DESCRIPTION OFFICIELLE
045400186	PLAN M248 BLK 'A' AND LOT 20
045400187	PLAN M248 BLK 'A' AND LOT 20

PROPERTY DIMENSIONS / DIMENSIONS DE LA PROPRIÉTÉ

	045400186
FRONTAGE - ft / FAÇADE - pi:	750.12
DEPTH - ft / PRONFONDEUR - pi:	0.00
PROPERTY AREA - acre / SUPERFICIE - acre:	9.2900

SERVICES / SERVICES

PIN	WASTE COLLECTION PICK-UP DAY AND ZONE / JOUR ET ZONE DE LA COLLECTE DES ORDURES
045400186	Z1 WMI TUE A-Apt (GMP-Fbr)

WARD INFORMATION / INFORMATIONS WARD

PIN	WARD NUMBER / NUMÉRO DU QUARTIER	WARD NAME / NOM DU QUARTIER	COUNCILLOR NAME / NOM DU CONSEILLER - (ÈRE)
045400186	5	WEST CARLETON-MARCH	Eli El-Chantiry

Ottawa Septic System Office

From: Brandon Aubin <b.aubin@McIntoshPerry.com>
Sent: Friday, November 29, 2019 8:16 AM
To: Ottawa Septic System Office
Cc: Janet Mousseau
Subject: 3449 Old Almonte Road - Corkery Community Centre - File Search Request
Attachments: OSSO_Corkery Community Centre_Septic Records Search Form_11.29.19.pdf; 3449 Old Almonte Road_PropertyInformation.pdf

Good morning,

Please find attached a file search request form along with the additional submission requirements. Can you please send over the receipt of payment and include Janet from our office who I have cc'd in this email. If you need anything else let me know.

Regards,

Brandon Aubin
Civil Engineering Technologist
115 Walgreen Road, Carp, ON K0A 1L0
T. 613.903.5827 | **C.** 613.806.0336
b.aubin@McIntoshPerry.com | www.mcintoshperry.com

McINTOSH PERRY

If you are using a web browser other than Microsoft Internet Explorer, please use the Export button to save this report as Word or pdf. You can then print the saved document.

PROPERTY INFORMATION
INFORMATION SUR LA PROPRIÉTÉ

Run On: 12/2/2019 9:23:06 AM

3449 OLD ALMONTE RD

PIN: 045400186

LEGAL DESCRIPTION / DESCRIPTION OFFICIELLE

PIN	LEGAL DESCRIPTION / DESCRIPTION OFFICIELLE
045400186	PLAN M248 BLK 'A' AND LOT 20
045400187	PLAN M248 BLK 'A' AND LOT 20

PROPERTY DIMENSIONS / DIMENSIONS DE LA PROPRIÉTÉ

	045400186
FRONTAGE - ft / FAÇADE - pi:	750.12
DEPTH - ft / PRONFONDEUR - pi:	0.00
PROPERTY AREA - acre / SUPERFICIE - acre:	9.2900

SERVICES / SERVICES

PIN	WASTE COLLECTION PICK-UP DAY AND ZONE / JOUR ET ZONE DE LA COLLECTE DES ORDURES
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PIN	WARD NUMBER / NUMÉRO DU QUARTIER	WARD NAME / NOM DU QUARTIER	COUNCILLOR NAME / NOM DU CONSEILLER - (ÈRE)
045400186	5	WEST CARLETON-MARCH	Eli El-Chantiry

Certificate of Completion

Ottawa Septic System Office / Bureau des systèmes septiques d'Ottawa

For the use and operation of an on-site sewage disposal system in accordance with the **Sewage System Permit**.
This certifies that the on-site sewage system conforms to the *Ontario Building Code* and *Ontario Regulation 350/06* as amended by *Ontario Regulation 137/07*

Sewage System Permit Number 09-505 | **Issued to** City of Ottawa

Legal Description | Lot 20 | Concession | Sub. Lot | Registered/Reference Plan M 248

Municipal Address: 3449 Old Almonte Rd

In the former Township/~~City~~ of West Carleton, Huntley | Within the City of Ottawa

Details Pertaining to System

❑ new installation ☒ replacement ❑ alteration/repair

a) Type of System: Class 4 sewage system ☒ trench ❑ filter media ❑ SBT ❑ area bed ❑ other

b) ☒ New ❑ Existing septic/~~holding~~/~~pre-treatment~~ tank with a working capacity of 3600 litres constructed of ☒ concrete ❑ fibreglass ❑ plastic

c) Trench bed: 48 metres of [76 mm diameter pipe, or _____ chambers] laid in 4 runs of 12 m and fed by ☒ gravity ❑ pump

d) Filter bed: Stone _____ m² Pipe _____ Fed by ❑ gravity ❑ pump

e) Shallow Buried Trench: _____ metres of _____ millimetre diameter distribution pipe laid in _____ runs at _____ metres

f) Area Bed: Stone _____ m² Sand _____ m² Pipe _____ Fed by ❑ gravity ❑ pump

g) Effluent Filter: Manufacturer Zabel Model A-100

h) Sewage Treatment Unit(s):* Manufacturer _____ Model _____

i) Maintenance Contract:* _____ Expiry Date* _____

j) Other: _____

Service provider must have Manufacturer Certification

Certificate Issued By:

Director of Regulations
Ottawa Septic System Office Jay K Davidson Date Issued DECEMBER 21, 2009

06/0/2009
2K9-1152-OSSO

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

SEPTIC PERMIT NO. 09-505

AS-BUILT COMPONENTS

(required prior to installation inspection)

Elevations of installed system must be supplied with this report (in reference to the TBM).
Exact size and location of all structures, well(s) and system(s) and its components must be shown (including neighbouring lots).

Septic/Holding Tank: 3600 L
Manufacturer: MacGregor
☑ concrete ☐ polyethylene ☐ other
Filter: ☐ no ☑ yes A100 make
Treatment: Make: /
Unit: Model: /
Diameter of pipes: 3" mm/inches
Make of pipes: Royal
Ends: ☐ capped ☑ interconnected
Number of runs: 4 m
Length of runs: 12 m

Filter media:
Amount Purchased: / kg
Date Purchased: /
Supplier: /
Grain/size analysis by: /
Analysis dated: /

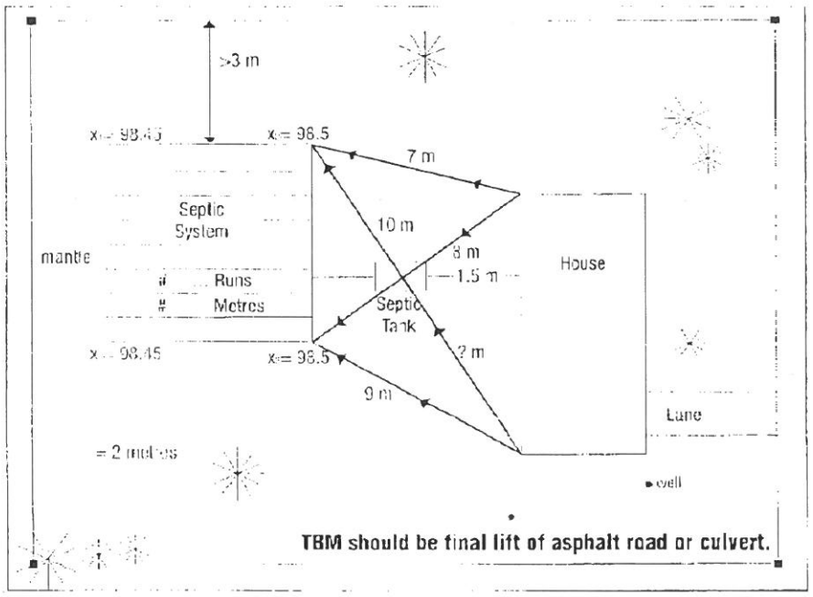
Name of owner: City of Ottawa
Installer: Lorne Montgomery Equip Rentals
Installer Signature: Nancy Montgomery
License Number: 37364
Date of Installation: Oct 29/09
Civic Address or Legal Description of Property:
3449 Old Almonte Rd.
Township: Huntley

Pump Systems:
Volume discharge rates: /15 min
Alarm location: /
Dimension of Pump Chamber: /
Height of Float Switch: /

Grease Interceptor:
☐ no ☐ yes Size: /
Location: /

***Grain Size Analysis and weight bills must be supplied with this report.**

NOTE: All as-built drawings must be cross-referenced to the house in two (2) locations.

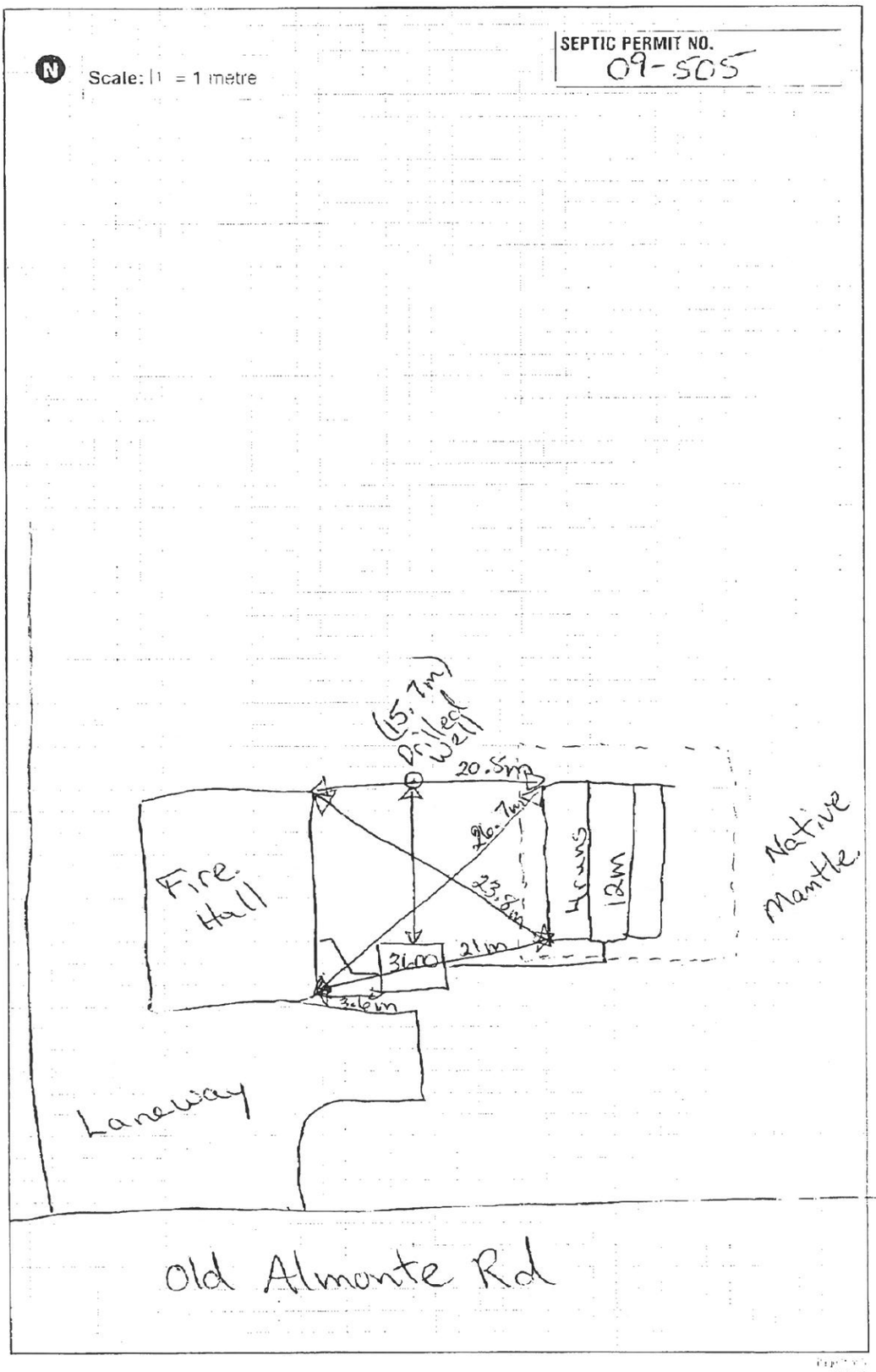


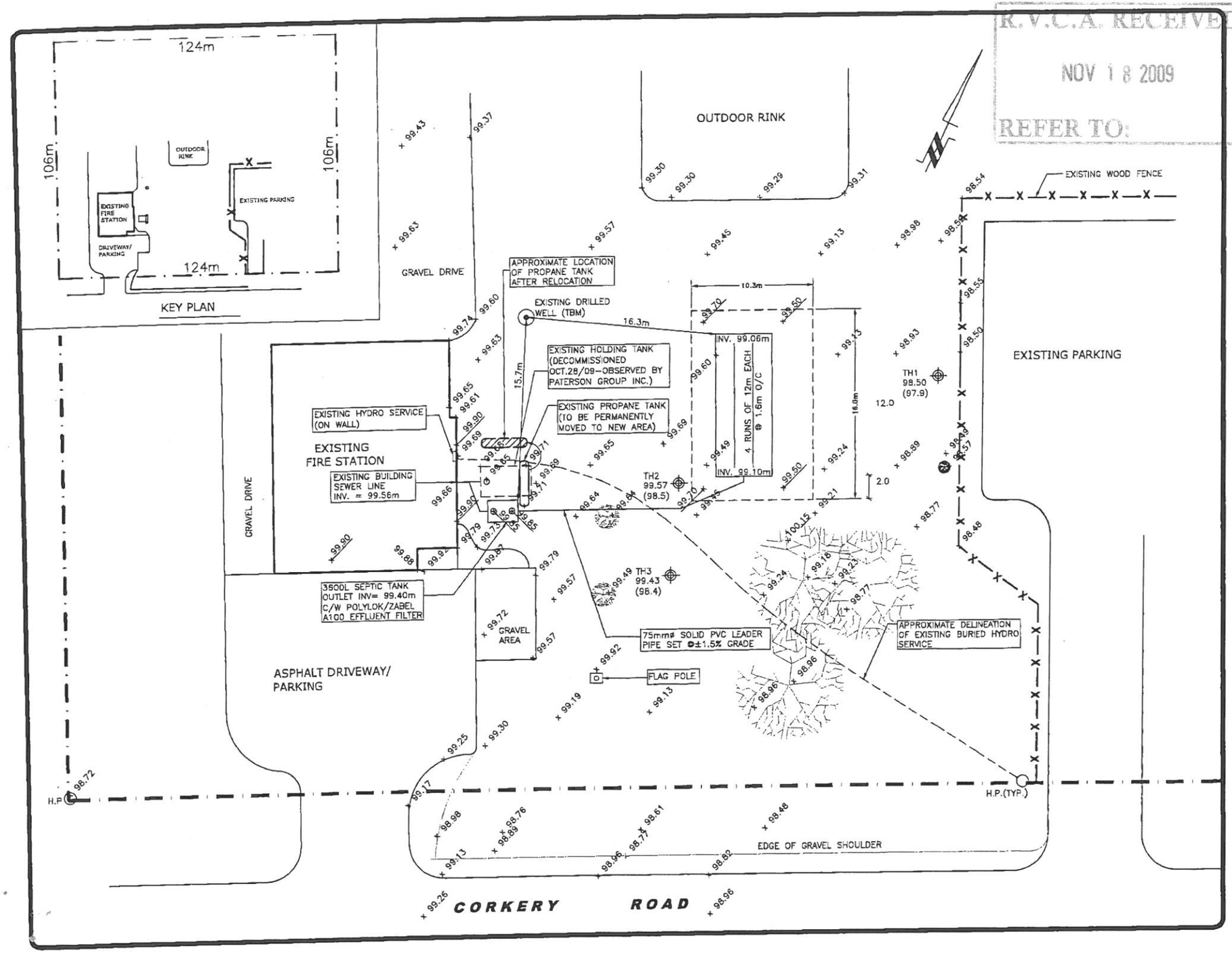
NOTE
Drilled well • 15 metres to septic tank
• 15 – 18 metres to distribution pipes
Dug well • 15 metres septic tank
• 30 – 33 metres to distribution pipes

AS-BUILT DRAWING

SEPTIC PERMIT NO. 09-505

N Scale: 1 = 1 metre





LEGEND:

- TEST HOLE LOCATION
- 98.54 EXISTING GROUND SURFACE ELEV. (m)
- 99.00 PROPOSED GROUND SURFACE ELEV. (m)
- (98.5) INFERRED BEDROCK ELEVATION (m)

BENCHMARK INFORMATION:

TBM – TOP OF EXISTING DRILLED WELL
ASSUMED ELEVATION = 100.00m

Date	Description	Rev.
28/10/09	REVISED BED LAYOUT	1
17/09/09	ISSUED FOR APPROVAL	0

Client:

CITY OF OTTAWA

Consultant:

patersongroup
consulting engineers

Project:

CORKERY FIRE STATION NO. 84
3449 OLD ALMONTE ROAD OTTAWA, ONTARIO

Drawing:

SEWAGE SYSTEM LAYOUT PLAN (AS-BUILT DRAWING)

Scale: 1:300	Seal:
Date: 09/2009	
Drawn by: BAA	
Checked by: RAP	
File: PH1211	

Drawing No.:

PH1211-3