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Due Diligence Hydrogeological Investigation and Terrain Analysis 11728 Lanark Road

Township of Greater Madawaska, Ontario

GEMTEC Project: 100011.125

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Submitted to:
Rick Rump c/o Q9 Planning and Design
11728 Lanark Road
Township of Greater Madawaska, Ontario
K0J 1H0

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July 23, 2025
GEMTEC Project: 100011.125

experience • knowledge • integrity

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July 23, 2025 File: 100011.125 – R0

Rick Rump c/o Q9 Planning and Design
11728 Lanark Road
Township of Greater Madawaska, Ontario
K0J 1H0

Attention: Rick Rump, Owner

Re: Due Diligence Hydrogeological Investigation and Terrain Analysis
11728 Lanark Road
Township of Greater Madawaska, Ontario

Please find enclosed our report submitted for the scope of work outlined in proposal P100011.125 to Rick Rump.

The contents of this report were written by Jason KarisAllen (Water Resources Engineer; M.A.Sc., P.Eng.) and reviewed by Andrius Paznekas (Hydrogeologist; M.Sc., P.Geo.). We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Jason KarisAllen, M.A.Sc., P.Eng.

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

JKA/AP

Enclosures:
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND TERMINOLOGY

CGVD28 – Canadian Geodetic Vertical Datum of 1928
CGVD2013 – Canadian Geodetic Vertical Datum of 2013
CVC&TRC – Credit Valley Conservation and Toronto and Region Conservation
GEMTEC – GEMTEC Consulting Engineers and Scientists Limited
km – kilometres
L – litres
m – metres
masl – metres above mean sea level (CGVD2013)
mbgs – metres below ground surface
MECP – Ontario Ministry of the Environment, Conservation and Parks
min – minute(s)
MNRF – Ontario Ministry of Natural Resources and Forestry
MRSPR – Mississippi-Rideau Source Protection Region
RVCA – Rideau Valley Conservation Authority
SWMP – Stormwater Management Pond
s – second(s)
USGS – United States geological Survey
VOC – Volatile Organic Compound
WHPA –Wellhead Protection Area

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Rick Rump (c/o Q9) to undertake a due diligence hydrogeological investigation and terrain analysis in support of the proposed development on a portion of 11728 Lanark Road in Township of Greater Madawaska, Ontario (herein referred to as "the Site"; Site location shown on Figure C1). The Site refers specifically to the proposed development area at 11728 Lanark Road indicated as Detail A on the Site Plan Sketch in Appendix B. It is understood that these services were requested to address requirements of the Township of Greater Madawaska outlined during pre-consultations.

This report presents a review of the hydrogeological information gathered from public and private sources of information. The contents of this report will inform decision making and scoping of future field investigations for the Site, if applicable. The findings of this report should be considered preliminary in nature and intrusive field work should be conducted to confirm the assumptions and interpretations herein.

This report is subject to the *Conditions and Limitations of This Report*, which are included as Appendix A and are considered an integral part of this report.

1.1 Project Description

GEMTEC understands that a hydrogeological investigation (i.e., water quantity and quality assessment) and terrain analysis (i.e., septic impact assessment) was identified as a requirement to support a Zoning By-law Amendment and Severance Application. The Site is currently zoned as RU according to the Official Plan for the County of Renfrew (County of Renfrew, 2020, n.d.). The zoning amendment would require an adjustment of the land use to a specific Commercial Zone under the Township's Zoning By-Law 28-2024 (The Corporation of the Township of Greater Madawaska, 2024). The client has requested a due diligence hydrogeological assessment to evaluate the merit of performing a full-scale hydrogeological investigation and terrain analysis for the Site.

The following information is known about the proposed development:

- Access will be from Lanark Road and Wilson Farm Road;
- The Site is approximately 6.3 hectares;
- The development is adjacent to Stones Lake;
- Approximately 9 cabins are proposed;
- A driving range (removed from plans) and hiking trails are proposed;
- A restaurant/ distillery are proposed;
- A cluster of 3 saunas are proposed;

- A reception and treatment centre are proposed;
- A hotel is proposed;
- There are two parking lots and access roads proposed;
- The development will be serviced by private well(s) and septic system(s), and no existing services are present on the Site; and
- It has been assumed that the proposed 40-unit building complex presented in Appendix B on a separate property parcel is out of scope.

The water and septic demands of the proposed development are not currently known.

The scope of work involves a review of public and private resources, the development of a preliminary hydrogeological conceptual model, and an assessment of the hydrogeological constraints and opportunities associated with the proposed development.

1.2 Current Investigations

This report includes the findings of a Site walkthrough to identify indications of shallow soil and the results from two water samples taken from local private wells as a preliminary assessment of the groundwater quality available in the area.

A Phase I Environmental Site Assessment (ESA) is underway by GEMTEC and will be submitted under a separate cover. In addition, GEMTEC is preparing a Preliminary Constraints Assessment and Environmental Impact Statement. Relevant findings of these three reports will be incorporated into the reporting of future (intrusive) hydrogeological investigations.

1.3 Data Limitations of Public Resources

This report reviews and synthesizes numerous sources of information pertaining to the hydrogeological conditions of the Site. The resources utilised are detailed in the references section (Section 6.0), noting that not all of the resources were reviewed exhaustively.

Although efforts were made to ensure that only reputable sources of information were utilised, GEMTEC assumes no responsibility for inaccuracies or omissions in third-party data and the use of this data does not constitute an endorsement of the data or its owner(s) by GEMTEC.

Publicly available data sources involve sources of uncertainty, including but not limited to:

- Databases do not always reflect the newest available data, depending on the update schedule for the database of interest.
- Positional accuracy of point data is often uncertain or poorly constrained.

- Well records have several potential issues that cause uncertainty, including the clarity of drillers notes, accuracy of geological assessments, measurement error, transcription errors during digitizing, data incompleteness and uncertain or inaccurately reported coordinates.
- Surficial and bedrock soil maps infer boundaries based on discrete point data and these boundaries may be inaccurate and/or transitional, rather than distinct. Provincial geology maps only present the anticipated surficial soil and uppermost bedrock units and do not consider layering of soils or underlying bedrock formations. Thus, several unrepresented geological layers (soils or bedrock) may be present underlying the mapped soil or bedrock type.
- Fault lines shown on maps may not be accurate and should only be regarded as indicative of the general area where faults are anticipated.

Elevations withdrawn from datasets are herein reported using the CGVD28 vertical datum.

2.0 HYDROGEOLOGICAL CHARACTERIZATION

2.1 Land Use and Land Cover

The land use of the Site is currently mapped as rural (RU) residential (County of Renfrew, n.d.) with areas designated as Environmental Protection (EP) corresponding with various mapped wetlands on the Site (County of Renfrew, n.d.). Satellite imagery of the Site captured in 2020 suggests that it is primarily forest interspersed with trails and meadows. Numerous areas of unevaluated wetlands are mapped across the Site, which borders Stones Lake to the southeast (MNRF, 2019; Figure C4 in Appendix C).

A Class A pit (APLS ID: 16447) owned by 670703 Ontario Inc. is located approximately 600 m northeast of the Site. This pit is permitted a maximum annual extraction of 1,000,000 tonnes and is 208.8 hectares in extent (MNRF, 2023).

No registered landfills (MECP, 2022) or former landfills (Golder Associates Limited, 2004) are on record within 5 km of the Site.

2.2 Designated Areas and Environmental Approvals

The Site is not located within the regulatory authority of a particular conservation authority. Accordingly, regulatory oversight of the on-site wetlands and the adjacent Stones Lake will differ to different government regulators (e.g., Ministry of the Environment, Conservation and Parks (MECP), Renfrew County, Township of Greater Madawaska) through provincial policies and regulations, and/or local/regional by-laws. For example, the Provincial Planning Statement (2024) regulates activities surrounding significant wetlands and sensitive water features in particular ecoregions under the Planning Act. Similarly, the County of Renfrew Official Plan (2020) indicates that development shall not be permitted in local wetlands but is permitted on lands adjacent to local wetlands (buffer distance undefined), and The Corporation of the Township of Greater

Madawaska (2024) Comprehensive Zoning By-law 28-2024 includes some provisions regarding wetlands, putting the County of Renfrew's Official Plan into effect. A technical pre-consultation with the regulators is recommended before conducting the full-scale investigation to ensure that all regulatory requirements are effectively identified and addressed.

The Grassy Bay bog is a provincially significant wetland (MNRF, 2019) located about 850 m southwest and downgradient of the nearest Site boundary. Conversely, no Areas of Natural and Scientific Interest are located within 1000 m of the Site (MECP, 2012a).

The Site is not located within a Wellhead Protection Area (WHPA) or intake protection zone (MECP, 2024b).

It is inferred that the aquifer would likely be considered vulnerable due to shallow bedrock, and not considered a significant groundwater recharge area for the same reason.

The Environmental Site Registry database (MECP, 2025a) was reviewed. No Permits to Take Water (PTTW), Environmental Activity and Sector Registrations (EASR) for water taking or Record of Site Conditions are mapped within 2 km of the Site. However, one EASR for a waste management system storage yard is located nearby at 11812 Lanark Road, Calabogie, Ontario. The EASR is registered to W. Price Trucking Limited under registration number R-004-6110199225. It is noted that there are surface water users withdrawing from the downgradient Calabogie Lake at distances greater than 2 km.

Concerning Sensitive Lakes in the County of Renfrew, "all buildings and structures and associated private waste disposal systems shall have a minimum setback of 30 metres from the high water mark of the lake, or in the case of existing lots, where this setback cannot be met, the setback shall be as remote from the high water mark as the lot will permit to the satisfaction of the Local Council and the Renfrew County and District Health Unit or the applicable approval authority for the private waste disposal system" (County of Renfrew, 2002). It is understood that the County of Renfrew has not designated Stones Lake as a Sensitive Lake under their official plan (County of Renfrew, 2002).

2.3 Topography and Water Flow

The elevation of the Site ranges from approximately 164 to 185 metres above mean sea level (masl; Figure B9). The Site boundary encompasses local topographical divides and is found within the Calabogie Lake – Madawaska River subwatershed of the Great Lakes – St. Lawrence River watershed, in which regional surficial drainage flows southwest. Runoff is anticipated to flow to Stones Lake and/or the tributary that crosses the north of the Site, both of which flow west to the Grassy Bay swamp.

Shallow subsurface and overland flows on Site are anticipated to conform to local topographical and bedrock divides. Shallow bedrock flow paths are anticipated to flow south to southwest,

whereas the deeper groundwater flow direction is anticipated to flow east to northeast towards the Ottawa River.

2.4 Mapped Surficial Deposits and Bedrock Geology (OGS, 2010)

The surficial geology maps distributed by the province (Figure C2; OGS, 2010) indicate that the Site surficial geology consists of bedrock of variable permeability discontinuously overlain by a veneer of clay, silt, sand and/or gravel. The surficial geology of the Site is within the physiographic region described as shallow till and rock ridges (Chapman & Putnam, 2007).

The Paleozoic bedrock geology maps distributed by the province (Figure C3; Armstrong & Dodge, 2007) indicate that the uppermost bedrock layers of the Site consist of undifferentiated metamorphic and igneous rock of the Precambrian Formation. The depth of bedrock is reported to range from ground surface to about 1 metre below ground surface (mbgs), sloping downward towards the southwest (Gao et al., 2006).

Available mapping (Brunton & Dodge, 2008) does not suggest karstic features will be present at the Site.

2.5 In Situ Bedrock Observations

GEMTEC performed Site walkthroughs on June 2 and 4, 2025. Numerous bedrock outcrops were photographed along the existing trails system on-site. Further, an exposed rock face was noted at the location of the proposed spa footprint. Shallow bedrock is consistent with the regional geological mapping of the Site, and field observations suggest that the Site is hydrogeological sensitive.

2.6 Public Well Records Review

Public water well records managed and distributed by the MECP (2024c), reportedly within 1,000 m of the Site, were reviewed and their approximate as-reported locations are shown on Figure C4. A summary table of their as-reported information is presented in Appendix D. Table 2.1 (below) summarizes the well uses and depths; wells are divided into wells that are reportedly screened in the bedrock (Well Type = Bedrock) or well records reportedly screened in the overburden (Well Type = Overburden). The findings of the well record review are summarized below:

- Well uses in the area are mainly domestic (17), although a relatively small amount are reported for commercial (3) and livestock (1). One well record is reported as other (water well fracking record), and one well is no longer in use (decommissioned).
- Reported static water level measurements ranged from about 1.2 mbgs to about 13.6 mbgs, with a median value of about 4.0 mbgs (based on the records of 21 wells, or n =21).

- Reported bedrock depths ranged from ground surface to about 4.3 mbgs, with a median value of about 1.6 mbgs (n = 21). This is generally consistent with geological mapping for the Site (Gao et al., 2006), which suggests overburden thicknesses between 0 and 1 m across the Site.
- The well records report bedrock geology as primarily limestone, granite, and/or conglomerate. Descriptions of overburden are primarily sand and gravel.
- No dug or bored wells were identified within about 1,000 m of the Site boundary.
- No wells on record were completed in the overburden, and all 23 drilled supply wells were completed in the bedrock aquifer.
- Water bearing zone depths ranged from 8.8 to 79.2 mbgs.
- No reported wells are shallower than 13 m deep within about 1,000 m of the Site.
- Wells have diameters ranging between 100 and 150 mm.

Table 2.1 – Summary of MECP Water Well Records Within 1000 Metres

Well Use	Well Type		Well Depth (m)		
	Overburden	Bedrock	Min.	Max.	Median
Domestic (only)	0	17	13.7	97.5	41.1
Commercial	0	3	49.6	82.3	77.5
Industrial	0	0	–	–	–
Irrigation	0	0	–	–	–
Public	0	0	–	–	–
Livestock	0	1	26.8	26.8	-
Air Conditioning	0	0	–	–	–
Test / Monitoring	0	0	–	–	–
Not Used / Other	0	2	NA	NA	–
OVERALL	**0**	**23**	**13.7**	**97.5**	**42.7**

2.6.1 Specific Capacity Assessment

Of the 23 well records available within 1,000 m of the Site, 19 reported the pumping test parameters of static water level, final water level, pumping rate, and test duration. These parameters were leveraged to estimate the specific capacity of the wells and qualitatively review the yields of the wells. The tests were of short duration (i.e., 1 to 4 hours) so the specific capacity

was adjusted to remove well storage effects following the method proposed by the USGS (2010). Select parameter statistics are presented in Table 2.2.

Table 2.2 – Pumping Test Statistics for Public Well Records Within 1000 m

Pumping Test Parameter	Min.	Max.	Median
Pumping Test Rate (L/min)	11.4	90.8	18.9
Static Water Level (m)[a]	1.2	13.7	4.3
Drawdown (m)	0.6	87.8	19.2
Duration (hours)	1.0	4	1.0
Specific Capacity (m^3/day/m)	0.2	107.3	1.6
Specific Capacity Adjusted (m^3/day/m)	0	106.9	2.0

a. Negative water level values suggest water levels in a well above ground surface. These wells are commonly referred to as artesian or flowing wells.

The pumping test data in Table 2.2 primarily represent water-yielding fractures in the limestone and granite bedrock. According to MECP Procedure D-5-5 for water supply assessments (MECP, 2021), a typical residential well supply for a 3 to 4-bedroom household requires a yield of about 15 to 19 L/min. The median pumping test rate listed in pumping well records was approximately 19 L/min, the minimum rate to supply a 4-bedroom residential dwelling.

2.7 Aquifer Vulnerability

The Clean Water Act (O. Reg. 287/07) defines highly vulnerable aquifers as aquifers “on which external sources have or are likely to have a significant adverse effect, including the land above the aquifer”. An aquifer is most generally a zone of soil or rock that can store and transmit water at a sufficient rate to be considered significant in a given context. Aquifer vulnerability may be considered through the lens of hydrogeological sensitivity, some examples of which are karstic areas, areas of fractured bedrock exposed at surface, areas of thin soil cover (i.e., less than 2 m of soil above bedrock), or areas of highly permeable soils/significant recharge areas (MECP, 2019) due to their association with high potential for contaminant transport into the subsurface. Accordingly, the Site is considered a vulnerable aquifer due to thin soil cover and near surface bedrock.

2.8 Preliminary Groundwater Quality Sampling Results

Groundwater quality samples were taken from untreated taps withdrawing from two private wells (i.e., PW-11728 and PW-11765) located within 300 m of the proposed development area. Samples were collected once relative stabilisation of field parameters was observed. The field equipment was calibrated by GEMTEC, and the details of the field equipment are provided in

Table 2.4. Total chlorine tests were conducted in the field to verify that chlorine levels were at non-detectable concentrations prior to bacteriological testing.

Table 2.4: Field Equipment

Field Parameters	Manufacturer	Model No.	Detection Limit
Total and Free Chlorine	Hach	DR 900	0.02 mg/L
pH, temperature, Conductivity	Hanna	HI 98129	-
Turbidity	Hanna	HI 98703	0.05 NTU
Colour	Hach	DR 900	5 TCU

Notes:
1. Hach DR900: colour and chlorine zeroed using distilled water prior to measuring field parameters.
2. Hanna HI 98129 calibration check using 4.0 and 7.0 pH solutions (within 5%).
3. Hanna HI98703 calibration check using <0.10, 15.0, 100 NTU (within 5%).

Field parameters measured before samples were collected are presented in Table 2.5.

Table 2.5: Field Parameters of Private Well Water

Well ID	pH	Temp (°C)	Electrical Conductivity (µS/cm)	TDS (ppm)	Turbidity (NTU)	Chlorine (mg/L)	Colour (ACU)
PW-11728	7.2	7.9	499	245	0.7	<0.02	<5
PW-11765	7.8	10.9	450	225	0.2	<0.02	NA

All groundwater samples were unfiltered, collected in laboratory supplied bottles, and store in coolers with ice packs during transport. Samples were submitted to a CALA-accredited laboratory (Paracel Laboratories Limited in Ottawa, Ontario) for the analysis of “subdivision package” = “trace metals” parameters.

Certificates of Analysis for samples from PW-11728 and PW-11765 are provided in Appendix E. Groundwater quality analytical results were reviewed for exceedances of the Ontario Drinking Water Quality Standards, Objective and Guidelines (ODWQS). No aesthetic objectives, operational guidelines, or maximum allowable concentrations prescribed by the ODWQS were exceeded, apart from organic nitrogen in PW-11728 (calculated as Total Kjeldahl Nitrogen minus Ammonia as N) of 0.2 mg/L. Taste and odour problems are common with organic nitrogen levels greater than the operational guideline of 0.15 mg/L.

Indicators of surface water impacts are inconclusive, but some results may reflect the vulnerability of the source aquifer(s). These potential indicators include low levels of nitrate in both wells, the organic nitrogen in PW-11728, dissolved organic carbon in both wells, and the relatively low electrical conductivity for groundwater (450-574 µS/cm) that is towards the lower end of what might be expected from groundwater if recent mixing with fresh water was not taking place. To note, heterotrophic plate count in PW-11765 was >2000 CFU/mL of sample, but this likely reflects the well or distribution system (unconfirmed) rather than the source water.

In summary, the water quality results suggest that the groundwater aquifer(s) supplying the sampled wells have acceptable water quality. The source aquifer(s) supplying the wells may or may not be under the direct influence of surface water, but there is no conclusive evidence to suggest a rapid connection at this time. Generally, it would be expected that the deeper the water bearing unit, the greater the mineral content, which may result in a reduction in water quality.

2.9 Groundwater Recharge

Groundwater recharge refers to the process by which water from precipitation, surface water or irrigation infiltrates into the ground, replenishing aquifers. Publicly available mapping of significant groundwater recharge areas (SGRA) does not extend to the Site. Delineation is typically based on OGS (2010) mapping of high permeability deposits and watershed scale numerical modelling. Bedrock is conventionally excluded from SGRA due to substantial variability in its permeability, being primarily dependent on secondary porosity at surface (i.e., fracturing or karstic features), but may provide significant recharge, depending on the near-surface conditions. An area of a watershed is determined to be a SGRA as per the 2017 technical rules under the Clean Water Act if:

- The area annually recharges water to the underlying aquifer at a rate that is greater than the rate of recharge across the whole of the related groundwater recharge area by 15% or more; or
- The area annually recharges a volume of water to the underlying aquifer that is 55% or more of the volume determined by subtracting the annual evapotranspiration for the whole of the related groundwater recharge area from the annual precipitation for the whole of the related groundwater recharge area.
- In addition, a SGRA must either be connected to a surface water feature or an aquifer that is (or could potentially in the future) be used as a source of drinking water.

The entire Site is likely shallow bedrock; therefore, although there may be significant recharge occurring across the Site, it would typically not be considered a SGRA. Nonetheless, the Site is near the top of a regional watershed divide and is most likely a regional recharge area.

2.10 Groundwater Discharge

Groundwater discharge is the movement of groundwater from aquifers to the surface, which can occur through natural springs, seepage into streams, or wells (i.e., where artesian conditions are present). Local wetlands and watercourses are likely fed by precipitation, runoff, and local-scale recharge areas. Areas of regional-scale groundwater discharge are not anticipated on the Site, as the Site is located near a regional watershed divide (i.e., a regional topographic high).

2.11 Preliminary Nitrate Dilution Calculations

The septic demands of the development are not known currently. This report considers the circumstances where total septic flows for the development remain below 10,000 L/day, which means that the septic systems would be regulated by Part 8 of Division B of the Building Code (*O. Reg. 350/06*) made under the *Building Code Act, 1992*. For these small subsurface septic systems, the maximum allowable concentration of nitrate-nitrogen in the groundwater at the boundaries of the development area boundary is 10 mg/L, as per Procedure D-5-4 (MECP, 2019).

Following the predictive assessment for industrial/commercial developments (MECP, 2019), the preliminary nitrate concentration at the Site boundaries was calculated using the following assumptions (to be reviewed and confirmed after intrusive investigations and the development plans are more clearly defined):

- Proposed development area of 63,000 m^2 (Detail A, Site Plan Sketch in Appendix B)
- Hard surface areas of 5, 10 and 15%.
- Soil infiltration factor and water holding capacity inferred from MECP (2003):
    - Soil factor of 0.2, for soils with medium combinations of clay and loam (0.2) as a proxy for shallow bedrock with coarse grained materials at variable depths.
    - Cover factor of 0.15 for cultivated land (0.1) and woodland (0.2).
    - Topography factor of 0.15, for land slopes between rolling and hilly land (i.e., average slope between 3.8 m/km and 28 m/km).
    - Water holding capacity of 75 mm for urban lawns / shallow rooted crops in clay as a surrogate for shallow bedrock with coarse grained materials at variable depths (i.e., high runoff potential and low water holding capacity).
- Non-detectable background nitrate concentrations.
- Annual water surplus of 0.311 metres/year for soils with a water holding capacity of 75 mm, as per data between 1968 – 1996 from the Renfrew Weather Station procured from the MECP. Water surplus datasheet provided in Appendix H.
- The use of conventional or advanced treatment systems in the construction of the septic systems at the commercial lot.
    - Advanced systems were assumed to be capable of reducing the concentration of nitrate in the effluent exiting the treatment unit to a maximum of 20 mg/L.

The maximum allowable daily design septic flows for the Site are summarized in Table 2.3 and provided in Appendix F. The septic flow for the commercial lot is based on information provided in Section 5.6.3 of Procedure D-5-4 and MECP (2003).

Table 2.3: Preliminary Calculated Maximum Septic Flows

	Maximum allowable septic flow	
Hard Surface Area (%)	Conventional Septic (L/day)	Advanced Septic[1] (L/day; 50% nitrate reduction)
5	8,499	9,999[2]
10	8,052	9,999[2]
15	7,605	9,999[2]

Notes:
1. The advanced treatment septic system should be BNQ certified for a minimum nitrate reduction of 50%.
2. Where calculated to be over 10,000 L/day, the maximum allowable septic flows are limited to 9,999 L/day as septic flows over 10,000 L/day governed by MECP Procedure B7 and other considerations apply.

For reference, the maximum septic flows using advanced septic systems are also included; however, their use to support development approvals is subject to review and authorization by the appropriate agency (e.g., County or Town).

Septic systems with design flows exceeding 10,000 L/day are considered a large subsurface sewage disposal system and are subject to the requirements of Section 53 of the *Ontario Water Resources Act* (OWRA) administered by the Ontario Ministry of the Environment. With consideration of the proposed site sketch (Appendix B), daily design sewage flows may exceed 10,000 litres per day and should be determined by the septic designer. Procedure B-7 is typically applied to larger systems, which typically involves a more restrictive assessment criteria (e.g., 2.5 mg/L at the property boundary, contaminant attenuation zone, lake loading calculations).

3.0 PRELIMINARY HYDROGEOLOGICAL CONCEPTUAL MODEL

Available data were synthesized to develop a preliminary hydrogeological conceptual model for the Site. Description of this conceptual model is supported by regional mapping, well records, and natural features across the Site. These preliminary interpretations are based on a desktop review of available data, and future field investigations, if applicable, should be used to update the hydrogeological conceptual model. Layer thicknesses and boundaries between zones have been interpreted based on available information and may differ from on-site conditions.

The following generalised description of the existing hydrogeological conditions across the Site is proposed:

- Regional surficial drainage flows southwest. Runoff flows to Stones Lake and/or the tributary that crosses the north of the Site, both of which flow west to the Grassy Bay swamp. Shallow subsurface flow is anticipated to follow topographical divides.

- The Site is located towards the upper elevation of its watershed, so it is likely a recharge area. The significance and distribution of recharge is uncertain as it would largely depend on bedrock secondary porosity at bedrock surface. Runoff would otherwise be directed to Stones Lake or local wetlands and tributaries.

- Thin veneer of coarse glacial materials and organics (wetlands) over igneous and metamorphic Precambrian bedrock. Depth to bedrock ranges from 0 (outcropping at ground surface) to 2 mbgs. Accordingly, the Site is considered hydrogeologically sensitive.

- Available groundwater supply consists of fractures in Precambrian bedrock. Well yield is anticipated to be highly variable at the local scale and dependent on the intersection of productive faults or fractures zones. Well interference effects may travel large distances, depending on the connectivity, storage, and orientations of fractures/faults.

- The water quality from the groundwater aquifer is anticipated to be suitable, but its susceptibility to surface impacts is uncertain.

- Groundwater level measurements from well records are generally considered unreliable, in part due to measurement errors, but also because it is unclear whether they represent piezometric surfaces or the water table in this fractured rock setting. Nonetheless, groundwater levels are anticipated to reflect surface water features in/around wetlands and Stones Lake.

4.0 HYDROGEOLOGICAL CONSTRAINTS AND OPPORTUNITIES

The constraints and opportunities presented herein are based on the results of the desktop study and preliminary field investigations. Intrusive investigations will be required to confirm the reported findings for design purposes. A summary of the key findings is presented in Table 4.1, and the hydrogeological and geotechnical opportunities and constraints are detailed in greater detail in Section 4.1 to 4.9.

Table 4.1 – Key Findings Summary

Key Points	Opportunities and Constraints
Conceptual Site Model	- Thin veneer of coarse glacial materials and organics (wetlands) over igneous and metamorphic Precambrian bedrock. - Depth to bedrock ranges from 0 (at ground surface) to 2 m. - Regional surficial drainage flows southwest. Runoff flows to Stones Lake and/or the tributary that crosses the north of the Site, both of which flow west to the Grassy Bay swamp. Shallow subsurface flow is anticipated to follow topographical divides. - Available groundwater supply consists of fractures in Precambrian bedrock. Well yield is anticipated to be highly variable at the local scale. -Well interference effects may travel large distances, depending on the connectivity, storage, and orientations of fractures/faults. -The water quality from the groundwater aquifer is anticipated to be good, but its susceptibility to surface impacts is uncertain. - Groundwater levels are anticipated to reflect surface water features in/around wetlands and Stones Lake but are more uncertain elsewhere.
Aquifer Vulnerability	- The water supply aquifer underlying the Site is hydrogeologically sensitive due to thin soils (vulnerable). - This vulnerability should be taken into consideration when managing septic effluents, stormwater management, fertiliser or pesticide application and storage, treatment system effluents (e.g., water softeners), road salt application and storage, etc.
Aquifer Recharge and Infiltration	- Significant groundwater recharge areas are unlikely to be present on Site. Accordingly, recharge is not likely to be significantly affected by the proposed development. - The Site is unlikely to meet the generally recommendations for infiltration LIDs due to shallow bedrock.
Long-Term Foundation Drainage	- If buildings are constructed with basements, long-term foundation drainage may be required. - There is potential for a surface water or water table impacts.

Key Points	Opportunities and Constraints
	- The need for foundation drainage will depend on Site conditions.
Construction Dewatering	- Highly fractured bedrock, if present, can transmit significant volumes of groundwater. Construction dewatering may be required for the installation of foundations if basements are proposed. - Construction dewatering may require water taking permit support. - Depending on the location of excavation(s), there is potential for a surface water connection.
Existing Groundwater Users	- No active permits for water use within 1000 m (i.e., EASR or PTTW). - Nearby private well users are for commercial and residential properties. - Shallowest drilled well (13.7 m deep) on record is located approximately 70 metres away from the nearest Site boundary. This shallow well may be most susceptible to well interference effects. - Fractures or faults in low permeability bedrock may connect wells over great distances; thus, the impacts to well users in the area that will coexist with the development should be considered.
Private Water Well and Septic Services	- See Sections 4.5 and 4.6 for general recommendations on well and septic placement and construction.
Soil Settlement (due to groundwater lowering)	- No risk of soil settlement is inferred due to shallow bedrock.
Karst Mapping	- Karst features (i.e. underground caves, voids, or crevices, occurring because of the dissolution of carbonate bedrock in water) are not mapped within the study area.

4.1 Potential Water Supply Aquifers

Based on regional mapping and well records, it is anticipated that the Precambrian-era bedrock (perhaps granite and/or limestone as reported in the well records) are the target supply aquifer of nearby residences and commercial properties in the area. The water bearing zones in this aquifer are likely to be associated with areas of more extensive secondary porosity. Well records report water bearing zones between 8.8 and 79.2 mbgs. Reported water bearing fractures do not clearly

indicate a depth at which fractures are most productive; this variability and/or uncertainty relating to the subsurface may make it difficult to reliably design and Site a productive well. Over half of the wells (11) with specific capacity measurements had relatively low specific conductivity (i.e., <6 m^3/day/m), whereas another 6 wells had higher yields ranging between 9 and 107 m^3/day/m.

The water quality from the groundwater aquifer is anticipated to be good, but its susceptibility to surface impacts is uncertain; Susceptibility to surface water impacts may involve additional treatment recommendations (e.g., ultraviolet disinfection). Generally, the mineralisation of water yielded by fractures and faults would be expected to increase with increasing depth.

4.2 Aquifer Vulnerability

Functionally, the entire Site may be hydrogeologically sensitive/vulnerable at surface due to shallow bedrock overlain by a coarse veneer of sand and/or gravel. Discrete areas of low-permeability soils thicker than 2 m on Site, if they exist, are likely functionally negligible in protecting the underlying aquifer from contamination. The source aquifer(s) supplying the wells may or may not be under the direct influence of surface water, but there is no conclusive evidence to suggest a rapid connection at this time.

The vulnerability of an aquifer to contamination is generally expected to decline with depth from ground surface due to increased travel time, opportunity for horizontal flow, and level of confinement. The vulnerability of the underlying bedrock aquifers at Site may be exacerbated by vertical fractures, if present. This vulnerability should be taken into consideration when managing septic effluents, stormwater management, fertiliser or pesticide application and storage, treatment system effluents (e.g., water softeners), road salt application and storage, etc.

4.3 Groundwater Recharge

The area is unlikely considered a SGRA. Nonetheless, there is potential for recharge across the Site owing to vertical fractures or faults (unconfirmed) and isostatic rebound fracturing at bedrock surface (unconfirmed). Tree species are typically a reflection of subsurface conditions (e.g., soil properties, nutrients, pH, and groundwater), and wetlands and watercourses may be connected to shallow groundwater systems (i.e., surface-water-groundwater interactions). Thus, recharge areas supporting groundwater levels and surface runoff may influence local terrestrial and aquatic habitats on and off the Site. Local tree stands, wetlands, and watercourses may be affected by significant changes to the shallow groundwater regime.

4.4 Existing Groundwater Users

Approximately 23 well users are located within 1,000 m of the Site serving residential, commercial, and livestock applications. Based on the Water Well Records, short-duration yield tests within these wells suggest that they are sufficient to support these uses in most cases. No significant

groundwater users (water takings over 50,000 litres per day) were identified (i.e., no active PTTW approvals nearby).

No dug or bored wells were on record within 1,000 m of the site, and the shallowest drilled well (13.7 m deep) on record is located approximately 70 metres away from the nearest Site boundary. This shallow well may be most susceptible to well interference effects and decreases in local scale recharge relating to increases in impermeable surface area. Fractures or faults in low permeability bedrock may connect wells over great distances; thus, the impacts to well users in the area that will coexist with the development should be considered.

4.5 Supply Well(s)

The following should be considered for the new private well(s):

- Well construction must adhere with the Ontario Wells Regulation (R.R.O. 1990, Reg. 903: WELLS; MECP, 2025b).
- Minimum separation distance between drilled wells to small septic systems (septic loads of less than 10,000 L/day) and surface water features is 15 m (King's Printer for Ontario, 2024). However, the Site is likely hydrogeologically sensitive, so it is recommended that these distances are maximized (within reason) with minimum recommended setbacks of 30 m, where possible.
- Wells should be sited upgradient or cross-gradient of septic systems and other sources of contamination (e.g. fuel storage tanks), where possible.
- Increasing the minimum well casing depths is recommended to reduce the potential for surface impacts.
- The depths of water bearing zones (fracture or fault zones) may vary locally, so the well depths and locations that are likely to be productive in the Site are impractical to determine.
- The specific capacity of wells may vary significantly at the local scale; thus, hydrofracturing, multiple wells, or water storage may be needed or desirable to sustainably accommodate the water needs of the proposed development. Second and/or third wells should be distributed strategically based on the results of the pumping test in an initial on-site well.

4.6 Septic System(s)

The following should be considered for the private septic system(s):

- Due to the shallow bedrock environment, it is anticipated that the septic leaching bed will be fully raised and built with suitable imported soils. It is recommended that a clay liner overlying the bedrock is installed as a means to mitigate potential impacts to the vulnerable water supply aquifer.

- The septic bed should be located upgradient or cross-gradient of on-site or off-site supply wells, where possible. The distance from septic bed(s) to downgradient property lines and sensitive receivers (e.g., surface water bodies, wetlands, etc.) should be maximized, where possible.

- Nitrate dilution calculations are favourable for a system under 10,000 L/day, as the Site is quite large (See Table 2.3). Further, advanced treatment systems are typically an accepted option for commercial properties. Nonetheless, an impact assessment will need to occur due to the vulnerability of the Site.

- The Ontario building code (King's Printer for Ontario, 2024) requires a minimum 15 m setback from surface water features, and a 30 m setback is often recommended or required in many jurisdictions. Stones Lake is not considered a Sensitive Lake by the County of Renfrew, so no special regulatory conditions apply.

- Despite the aforementioned, shallow bedrock can be problematic for phosphorus loading to lakes due to fracture flow generally driving high water velocities and low attenuation potential (MECP, 2024a). "The potential for surface water impact increases as the distance to the point of plume discharge to the surface water decreases. In most cases, a separation distance of 300 metres (980 feet) between the area of sewage infiltration and the surface water body should be sufficient to ensure that there are no appreciable effects to surface water quality", with some exceptions (MECP, 2024a).

    - If cumulative septic loading of the Site exceeds 10,000 L/day, this will prompt the need for an Environmental Compliance Approval (ECA), a B-7 Reasonable Use Assessment, MECP consultation and review, a potentially a detailed phosphorous loading assessment, etc.

    - Accordingly, it would be favourable to avoid septic loading above 10,000 L/day due to significant cost increases and expanded project timelines (i.e., typically a multi-year process).

    - Some mitigative options for phosphorus loading include, increasing separation distance to surface water features, enhanced septic leaching bed design, using advanced septic treatment units that augment phosphorus attenuation, use of phosphate-free detergents/soaps, and/or avoiding the input of other contaminants to the septic system.

- A surface water impact assessment may be required by the reviewing agency, which would identify the minimum separation distance between on-site septic systems and surface water features.

4.7 Construction Dewatering and Sump Pumps

Public well records are likely to systematically underestimate how deep static water levels are; accordingly, the range of water levels presented in Section 2.5 should be considered carefully (i.e., .1.2 to 13.7 mbgs, median of 4.3 mbgs). Water levels may be higher than well records suggest, and groundwater levels in shallow fracture systems with low primary porosity, if they are present, may be flashy (meaning water level may increase and decrease rapidly) owing to low storage capacity and rapid transport through fractures. Fracture frequency and size may be altered depending on the method of bedrock excavation (e.g., blasting).

The area of the Site is at a relatively high elevation in its watershed, which implies a general potential for lower average groundwater tables than elsewhere in the watershed. However, wetlands distributed across the Site (likely swamps), the adjacent Stones Lake, and vertical bedrock fractures (if present) may contribute recharge that maintains an elevated water table (unconfirmed). A connection with these surface water features during dewatering could be unfavourable ecologically and economically.

Thus, it is possible that construction dewatering will be required in shallow excavations (e.g., 3 mbgs) depending on the groundwater conditions during construction. Excavation dewatering could vary significantly depending on the degree of fracturing over the excavation depth and groundwater level over the period of construction. Dewatering efforts may increase significantly if a connection to an adjacent surface water feature is produced.

Sump pump(s) may be required if basements are proposed. Long-term dewatering could be costly and may theoretically have an impact on groundwater levels and surface water features. Intrusive investigations are recommended to confirm seasonal conditions if basements are proposed.

An Environmental Activity Sector Registry(EASR) is required to support construction dewatering for groundwater takings over 50,000 L/day. Conversely, a Category 3 Permit to Take Water (PTTW) is required for long-term water takings above 50,000 L/day. Permits will include an impact assessment regarding water taking and discharge plans.

4.8 Soil Settlement Relating to Changes to Groundwater Level

Generally, loose clays and organics are susceptible to settlement in instances where groundwater lowering occurs, which can potentially result from reductions in recharge, construction dewatering, or well drawdown. The shallow bedrock anticipated on Site suggest that soil settlement is unlikely to be a significant issue for this Site.

4.9 Low Impact Developments and Stormwater Management Ponds

It is conventional to offset impacts to recharge using engineered infiltration features to emulate some functions of natural recharge areas (e.g., groundwater infiltration, maintenance of natural habitat, flood attenuation). In many jurisdictions, offsetting impacts to recharge is built into policies regarding land use planning. Measures taken to reduce the impact of developments are generally referred to as Low Impact Development (LID) features. Infiltration LID features (e.g., soakaways, infiltration trenches, and chambers) require several conditions be met for their effective implementation (CVC&TRC, 2010):

- Seasonally high groundwater levels and bedrock surface must be at least one metre below the bottom of the facility;
- Natural ground slopes must be less 15%;
- Facilities receiving road or parking lot runoff should not be located within 2 year time-of-travel WHPAs;
- Suitable treatment and design to address the water quality of the source or restrictions on the type of runoff that is directed to the infiltration feature; and
- Strategic placement of facilities regarding sources of potential pollution, building foundations, existing utilities, and high-conductivity soils.

The Site is unlikely to meet the generally recommendations for infiltration LIDs due to shallow bedrock.

5.0 FUTURE WORK

The desktop due diligence report was prepared to inform decision making by presenting the inferred potential hydrogeological opportunities and constraints of the Site. This report does not meet all of the requirements of MECP Procedures D-5-4 and D-5-5. Accordingly, intrusive field investigations will be required to confirm Site geological conditions and water quality and quantity. Future work may include, but is not limited to:

- Confirming the water and septic demands and areal extent of the proposed development (completed by others).
- A technical pre-consultation with the Township of Greater Madawaska and their hydrogeological technical reviewer. GEMTEC will present their proposed scope of work and confirm the proposed hydrogeological scope will satisfy the Township's requirements. This is also an opportunity to receive any relevant data they may have for the area.
- A survey of overburden soil thickness, likely performed with a hand auger and/or shovel.
- Performing a constant rate pumping test with water quality sampling in a technically representative test well. This will assess the water quality and quantity available and potential for interference. The duration and pumping rate of the test will depend on the proposed water demand. If the water demand of the development exceeds 50,000 L/day, then permitting requirements may apply for the pumping test and/or long-term water taking (i.e., EASR to support pumping test and Category 3 PTTW to support long-term water takings. To support large water takings, additional field studies are anticipated, which may include:
    - The installation of a new on-site test well and a monitoring well.
    - Additional test wells and/or hydrofracking if the water demand cannot be met using the new test well.
    - The instrumentation of a nearby homeowner well, if available.
- Review the findings of the desktop analyses (e.g., conceptual model and nitrate dilution calculation), if required.
- Detailed terrain analysis and septic impact assessment, the scope of which will be based on the total septic flows and may include intrusive field investigations (i.e., test pits, boreholes, monitoring wells, long term water quality monitoring, etc).
- Propose a conceptual lot layout plan for the private services relative to the buildings.

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APPENDIX A

Conditions and Limitations of this Report

GEMTEC
Consulting Engineers and Scientists

CONDITIONS AND LIMITATIONS OF THIS REPORT

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

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in Property Value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions,

misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

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

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

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

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

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Site Plan Sketch

Adam Kasprzak Surveying Limited (2024)

SITE PLAN SKETCH
IN SUPPORT OF

APPLICATION FOR A ZONING BY-LAW AMENDMENT TOWNSHIP OF GREATER MADAWASKA

COUNTY OF RENFREW

SCALE 1 : 2500

METRES 25 0 50 100 150 200 250

GEOGRAPHIC FABRIC NOTE:

THE LANDS SHOWN ON THIS SKETCH ARE PART OF LOTS 11 & 12 CONCESSION 9, GEOGRAPHIS TOWNSHIP OF BAGOT, TOWNSHIP OF GREATER MADAWASKA.

METRIC NOTE:

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

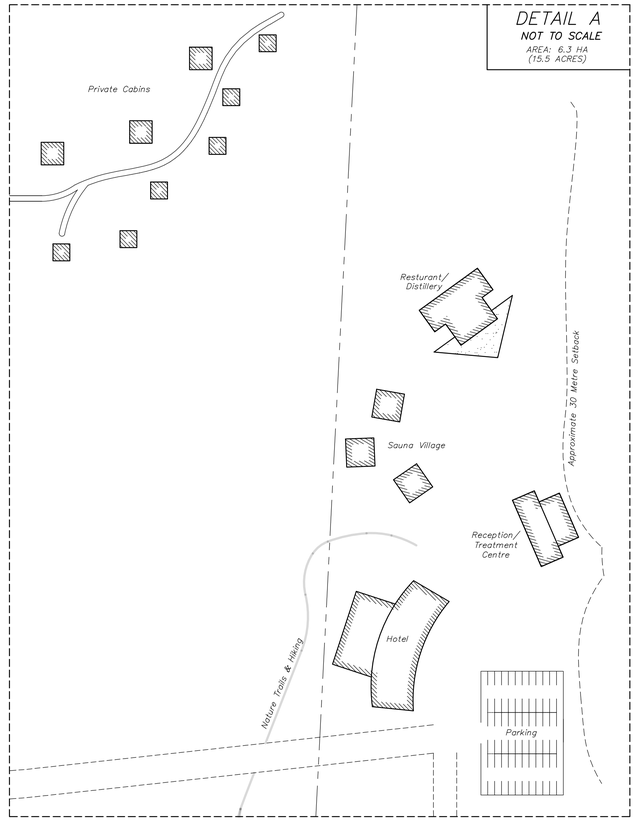
CAUTION NOTE:

THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK.

NO FIELD WORK WAS CARRIED OUT TO VERIFY OR CONFIRM ANY BOUNDARIES OR PROPERTY LIMITS SHOWN ON THIS SKETCH.

BOUNDARIES AND PROPERTY LIMITS THAT ARE APPROXIMATE LEGAL BOUNDARIES AND ARE SHOWN FOR REFERENCE PURPOSES ONLY.

ALL MEASUREMENTS SHOWN ON THIS SKETCH ARE FROM TITLE RECORDS & RENFREW COUNTY GIS MAPPING AND SHOULD BE INTERPRETED AS BEING +/- ACCURACY.



LEDGEND:

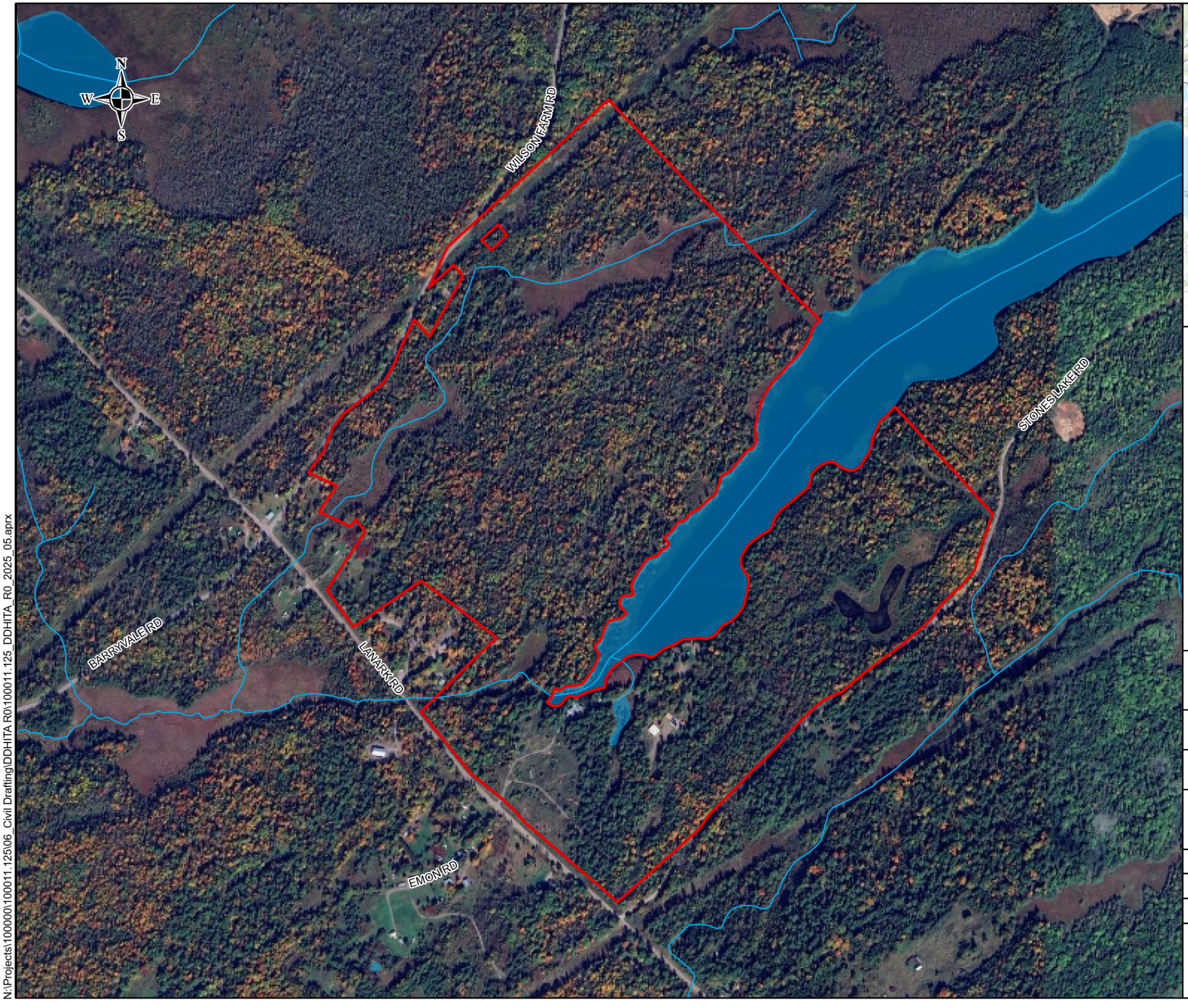
DENOTES WETLANDS

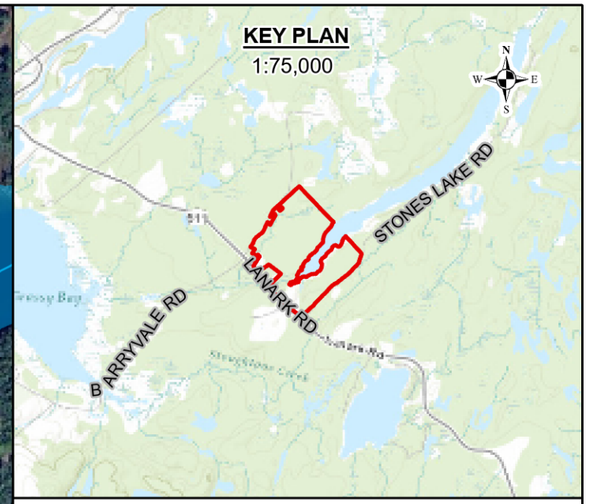
ADAM KASPRZAK SURVEYING LTD.
ONTARIO LAND SURVEYORS
29 BRIDGE ST., P.O. BOX 633
RENFREW ONTARIO K7V 4E7
PHONE (613) 432-3048

SCALE: 1 : 250	REF: 24-2166
FILE No :24-2166 H.dwg	

APPENDIX C

GEMTEC Site Maps





LEGEND

- APPROXIMATE SITE BOUNDARY
- WATERCOURSE
- WATERBODY

GENERAL NOTES:

1. Coordinate system: NAD83 UTM zone 18N.
2. Geographic dataset source: Ontario GeoHub.
3. Contains information licensed under the Open Government Licence – Ontario.
4. Service Layer Credits: @2024 Google Maps, CNES / Airbus, First Base Solutions, Maxar TechnologiesGoogle Earth: © OpenStreetMap (and) contributors, CC-BY-SA, World Topographic Map: Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA, AAFC, NRCan

Scale:

1:8,000 Meters

0 175 350 700

Drawing: SITE PLAN

Client: RICK RUMP C/O Q9

Project: DUE DILIGENCE HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS
11728 LANARK ROAD
TOWNSHIP OF GREATER MADAWASKA, ONTARIO

Drwn By:	S.L.	Chkd By:	J.KA.
Project No.	100011.125	Revision No.	0
Date	JULY 2025		**FIGURE C1**

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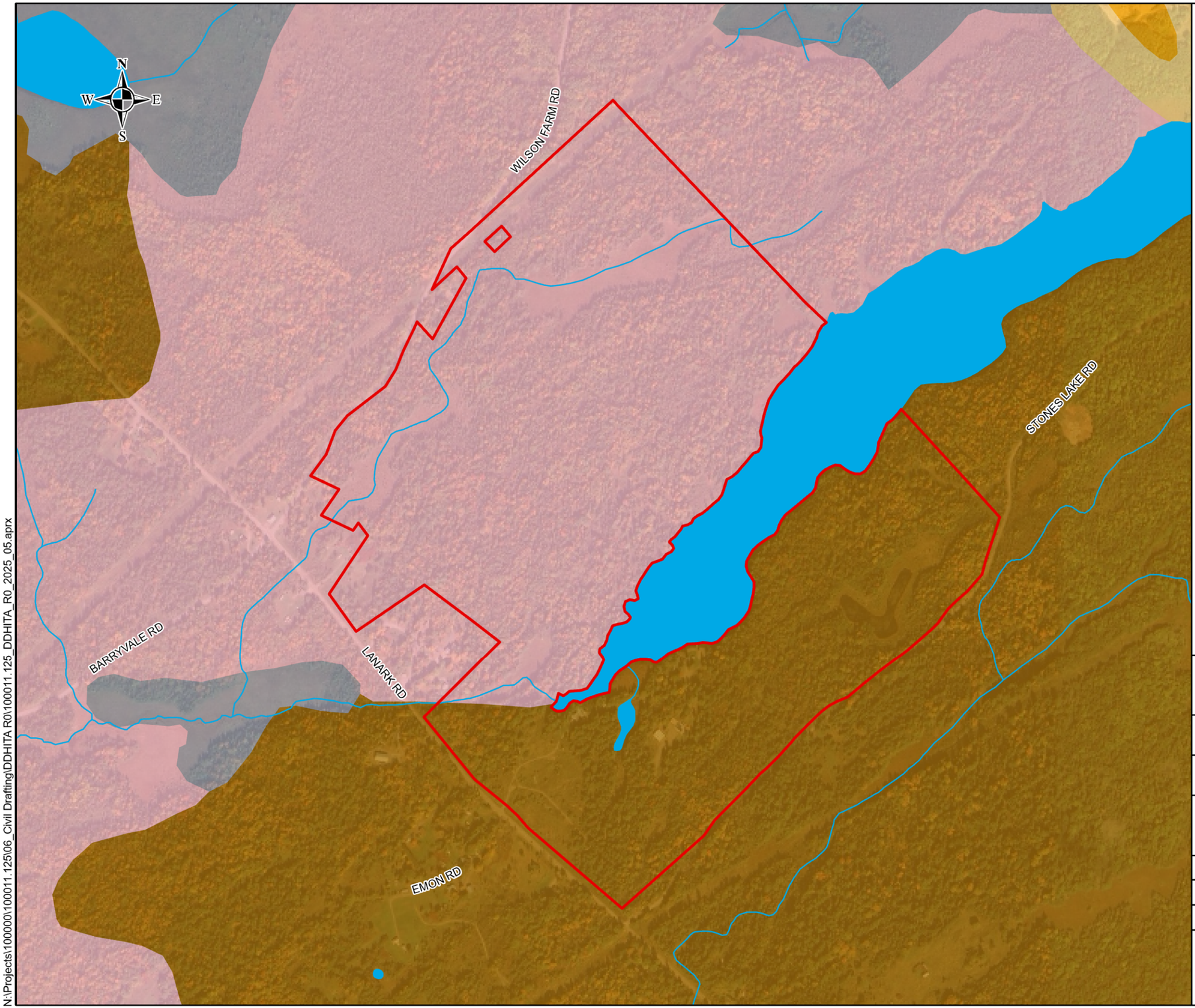

LEGEND

- APPROXIMATE SITE BOUNDARY
- WATERBODY
- WATERCOURSE

SURFICIAL GEOLOGY

- 1: PRECAMBRIAN BEDROCK
- 2: PRECAMBRIAN BEDROCK-DRIFT COMPLEX
- 6A: IN MORAINES, KAMES, ESKERS AND CREVASSE FILLS
- 7: GLACIOFLUVIAL DEPOSITS
- ORGANIC DEPOSITS

GENERAL NOTES:

1. Coordinate system: NAD83 UTM zone 18N.
2. Geographic dataset source: Ontario GeoHub.
3. Contains information licensed under the Open Government Licence – Ontario.
4. Ontario Geological Survey 2010. Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV.
5. Service Layer Credits: @2024 Google Maps, CNES / Airbus, First Base Solutions, Maxar TechnologiesGoogle Earth: © OpenStreetMap (and) contributors, CC-BY-SA

Scale:

1:8,000 Meters

0 175 350 700

Drawing: SURFICIAL GEOLOGY (CURRENT PROVINCIAL MAP)

Client: RICK RUMP C/O Q9

Project: DUE DILIGENCE HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS
11728 LANARK ROAD
TOWNSHIP OF GREATER MADAWASKA, ONTARIO

Drwn By:	S.L.	Chkd By:	J.KA.
Project No.	100011.125	Revision No.	0
Date	JULY 2025		**FIGURE C2**

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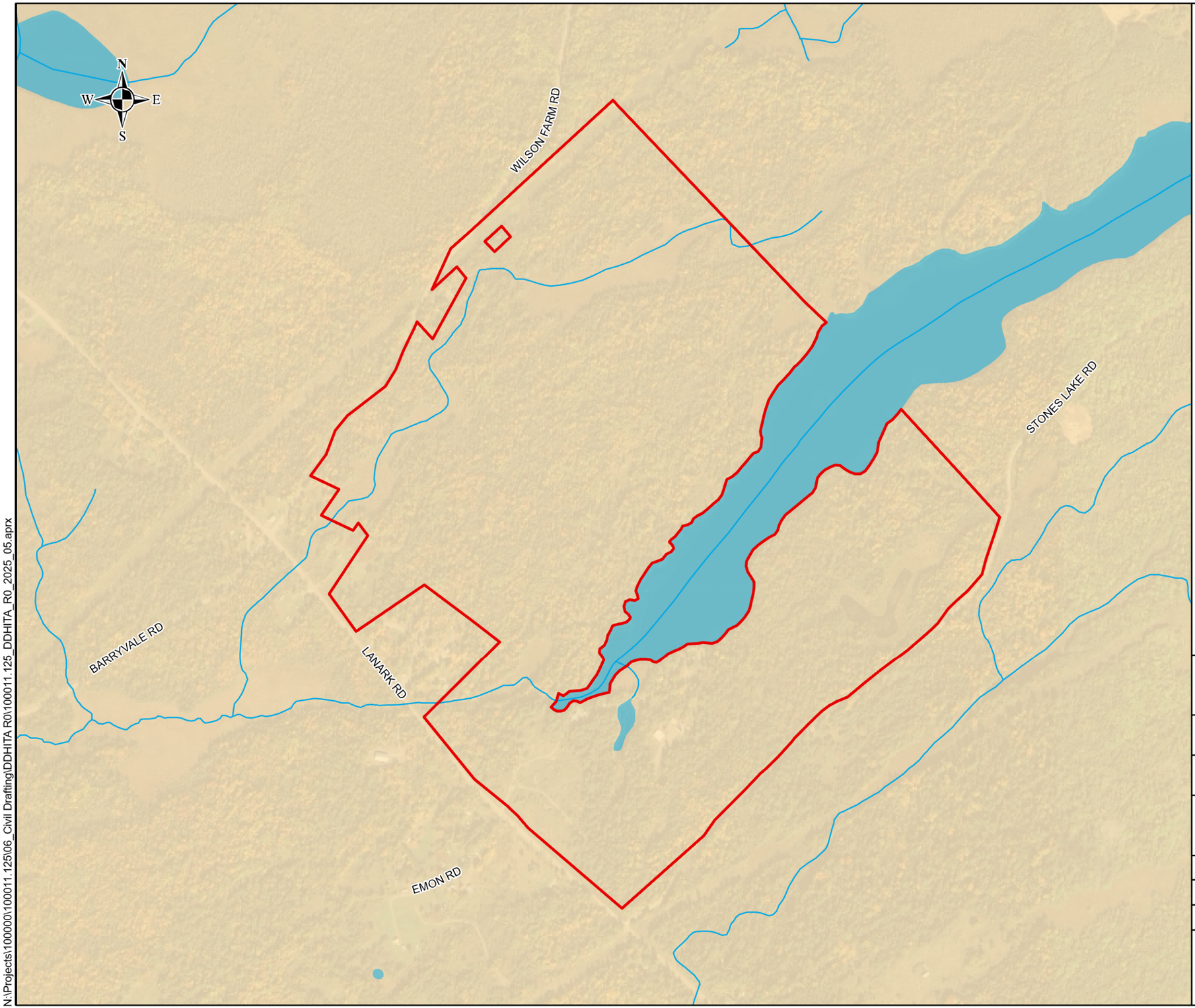

LEGEND

APPROXIMATE SITE BOUNDARY

PALEOZOIC GEOLOGY (FORMATION: ROCK TYPES)

PRECAMBRIAN: UNDIFFERENTIATED METAMORPHIC AND IGNEOUS ROCKS

GENERAL NOTES:

1. Coordinate system: NAD83 UTM zone 18N.
2. Geographic dataset source: Ontario GeoHub.
3. Contains information licensed under the Open Government Licence – Ontario.
4. Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219.
5. Service Layer Credits: @2024 Google Maps, CNES / Airbus, First Base Solutions, Maxar TechnologiesGoogle Earth: © OpenStreetMap (and) contributors, CC-BY-SA

Scale:

1:8,000 Meters

0 175 350 700

Drawing: PALEOZOIC BEDROCK GEOLOGY (CURRENT PROVINCIAL MAP)

Client: RICK RUMP C/O Q9

Project: DUE DILIGENCE HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS
11728 LANARK ROAD
TOWNSHIP OF GREATER MADAWASKA, ONTARIO

Drwn By:	S.L.	Chkd By:	J.KA.
Project No.	100011.125	Revision No.	0
Date	JULY 2025		**FIGURE C3**

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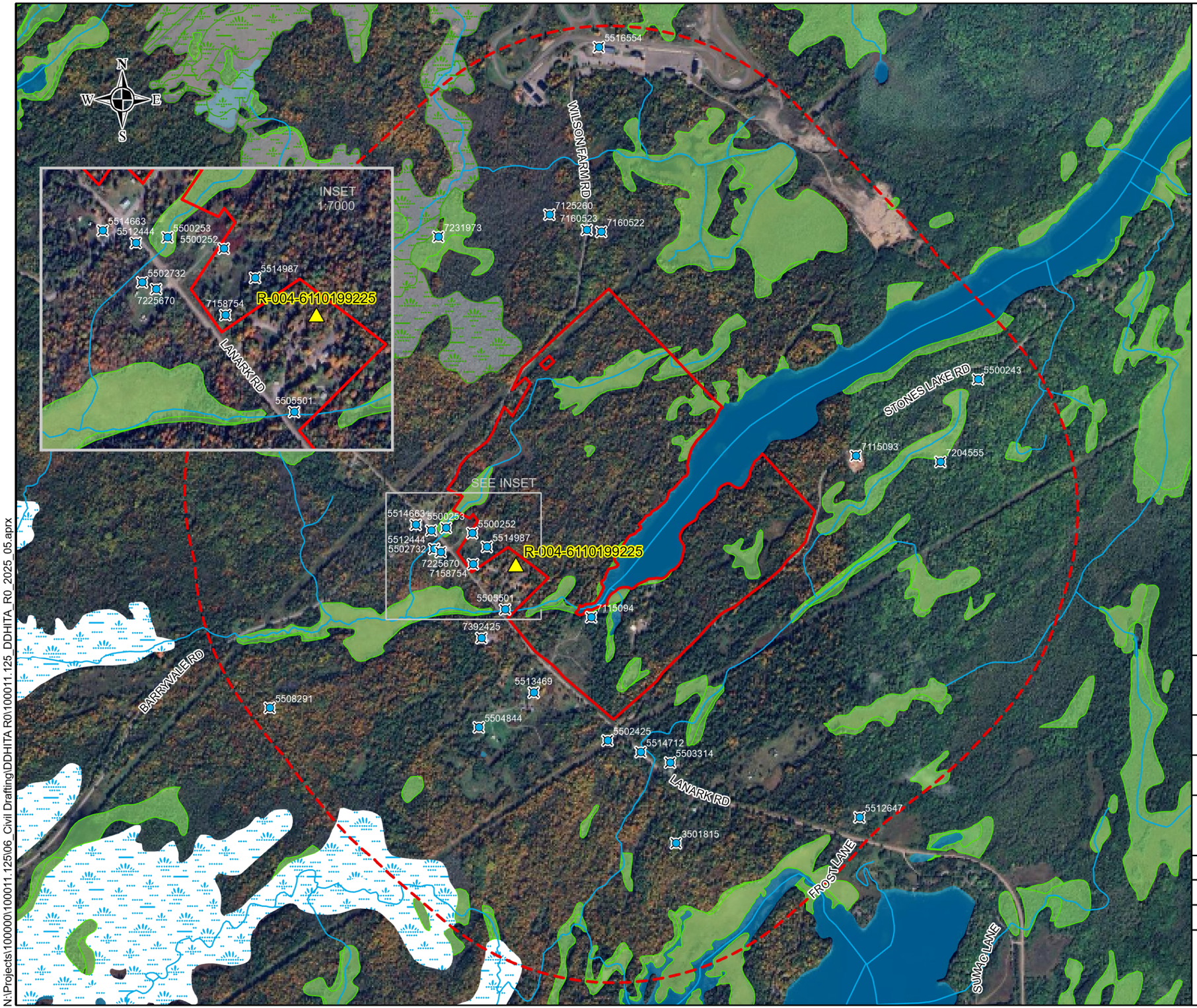

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LEGEND

- MECP WELL PUBLIC RECORD WITHIN 1000M BUFFER
- ENVIRONMENTAL ACTIVITY AND SECTOR REGISTRATIONS
- APPROXIMATE SITE BOUNDARY
- WATERBODY
- WATERCOURSE

WETLANDS

- UNEVALUATED (PROVINCIAL MAPPING)
- EVALUATED-OTHER WETLAND
- EVALUATED-PROVINCIAL (PROVINCIAL MAPPING)

GENERAL NOTES:

1. Coordinate system: NAD83 UTM zone 18N.
2. Geographic dataset sources: MECP, 2024a, 2024b; MNRF, 2019; RVCA 2019a, 2019b, 2018.
3. Contains information licensed under the Open Government Licence – Ontario.
4. Service Layer Credits: @2024 Google Maps, CNES / Airbus, First Base Solutions, Maxar TechnologiesGoogle Earth: © OpenStreetMap (and) contributors, CC-BY-SA

Scale:

1:15,000

0 300 600 1,200 Meters

Drawing: DESIGNATED AREAS, APPROVALS, PUBLIC WELL RECORDS, AND NATURAL FEATURES

Client: RICK RUMP C/O Q9

Project: DUE DILIGENCE HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS
11728 LANARK ROAD
TOWNSHIP OF GREATER MADAWASKA, ONTARIO

Drwn By:	S.L.	Chkd By:	J.KA.
Project No.	100011.125	Revision No.	0
Date	JULY 2025		**FIGURE C4**

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APPENDIX D

Public Well Records Summary Table

MECP Online Well Database Summary (1000-m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
3501815	PAKENHAM TOWNSHIP CON 06 007	1951-09-14	ST	26.8	4.3	4.3	2.7	FR 0032 FR 0063 FR 0087	MSND STNS 0014 GREY LMSN 0040 WHIT LMSN 0088
5500252	BAGOT & BLITHFIELD T CON 09 012	1961-12-09	DO	21.6	1.2	4.6	2.1	FR 0068	LOAM 0004 GREY GRNT 0071
5500253	BAGOT & BLITHFIELD T CON 09 012	1967-08-05	DO	13.7	0.0	1.2	3.0	FR 0043	GREY GRNT 0045
5502425	BAGOT & BLITHFIELD T CON 09 010	1970-05-02	DO	29.9	0.6	3.0	1.2	FR 0059 FR 0084	BRWN LOAM 0002 BLCK GRNT 0098
5502732	BAGOT & BLITHFIELD T CON 10 012	1971-11-22	DO	26.2	0.6	6.1	3.7	FR 0029 FR 0084	BRWN MSND BLDR 0002 BLCK GRNT 0069 GREN GRNT 0086
5503314	BAGOT & BLITHFIELD T CON 09 010	1973-08-01	DO	32.0	0.0	6.1	2.7	FR 0100	GREY GRNT 0105
5504844	BAGOT & BLITHFIELD T CON 10 011	1976-05-05	DO	22.6	1.2	7.6	6.1	FR 0070	GREY SAND STNS LOOS 0004 WHIT LMSN SOFT 0074
5505501	BAGOT & BLITHFIELD T CON 09 011	1978-09-04	DO	41.1	1.5	6.7	5.5	FR 0130	BRWN SAND LOOS 0005 BLCK GRNT HARD 0135
5512444	BAGOT & BLITHFIELD T CON 09 012	1995-09-01	DO	48.8	1.2	6.1	3.7	FR 0075 FR 0150	BRWN FILL 0004 RED GRNT 0160
5513469	BAGOT & BLITHFIELD T CON 09 011	1998-10-05	DO	36.6	1.2	6.1	5.8	FR 0045 FR 0115	BRWN SAND 0004 GREY GRNT 0020 GREY LMSN GRNT 0120
5514663	BAGOT & BLITHFIELD T CON 09 012	2001-10-04	DO	42.7	1.8	6.7	3.0	FR 0130	BRWN SAND LOAM PCKD 0006 GREY GRNT SOFT 0140
5514712	BAGOT & BLITHFIELD T CON 10 011	2002-04-24	DO	79.2	1.5	6.7	3.0	FR 0250	BRWN SAND 0005 BLCK GRNT 0260
5514987	BAGOT & BLITHFIELD T CON 09 012	2002-10-02	DO	97.5	2.1	6.7	9.8		BRWN SAND BLDR 0007 WHIT LMSN GRNT 0320

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

MECP Online Well Database Summary (1000-m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7115093	BAGOT & BLITHFIELD T CON 08 011	2008-10-01	DO	37.2	0.9	6.8	4.2	0112	BRWN GRVL 0003 GREY GRNT 0122
7115094	BAGOT & BLITHFIELD T CON 09 012	2008-10-01	DO	43.4	1.6	6.8	6.8	0131	BRWN GRVL 0005 BLCK GRNT LMSN 0142
7125260	BAGOT & BLITHFIELD T CON 09 012	2009-06-25	CO	49.6	2.2	6.8	4.3	0151	BRWN GRVL 0007 BLCK GRNT 0102 BLCK GRNT 0163
7158754	BAGOT & BLITHFIELD T CON 09 013	2010-11-11	DO	49.6	0.9	6.8	1.5	UT 0112 UT 0153	BRWN SAND BLDR 0003 GREY LMSN 0066 GREY GRNT 0142 RED GRNT 0163
7160522	BAGOT & BLITHFIELD T CON 09 012	2010-05-14	NU						
7160523	BAGOT & BLITHFIELD T CON 09 012	2010-05-17	DO	58.9	3.7	6.2	4.6	UT 0183	BRWN GRVL 0012 BLCK GRNT 0193
7204555	BAGOT & BLITHFIELD T CON 08 011	2013-05-27	DO	79.7	1.9	6.8	13.6	UT 0259	BRWN GRVL 0006 BLCK GRNT 0261
7225670	BAGOT & BLITHFIELD T CON 09 012	2014-07-26	OT				3.7	UT 0067 UT 0115	
7231973	BAGOT & BLITHFIELD T CON 09 012	2014-10-27	CO	77.5	3.1	6.8	4.4	UT 0244	BRWN SAND GRVL 0010 GREY GRNT 0254
7392425	BAGOT & BLITHFIELD T CON 09 011	2021-06-18	CO	82.3	1.8	6.1	11.6	UT 0260	BRWN SAND GRVL 0006 GREY GRNT 0270

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

APPENDIX E

Private Well Water Quality Sampling Results

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Certificate of Analysis

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Kanata, ON K2K 2A9
Attn: Jason Karis-Allen

Client PO:
Project: 100011.125
Custody: 20225

Report Date: 27-May-2025
Order Date: 21-May-2025

Order #: 2521214

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

Paracel ID	Client ID
2521214-01	PW-11728

Approved By:

Mark Foto, M.Sc.
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-May-25	22-May-25
Ammonia, as N	EPA 351.2 - Auto Colour	26-May-25	26-May-25
Anions	EPA 300.1 - IC	22-May-25	22-May-25
Colour	SM2120 - Spectrophotometric	22-May-25	22-May-25
Colour, apparent	SM2120 - Spectrophotometric	22-May-25	22-May-25
Conductivity	EPA 9050A- probe @25 °C	22-May-25	22-May-25
Dissolved Organic Carbon	MOE 3247B - Combustion IR	21-May-25	21-May-25
E. coli	MOE E3407	21-May-25	21-May-25
Fecal Coliform	SM 9222D	21-May-25	21-May-25
Heterotrophic Plate Count	SM 9215C	21-May-25	23-May-25
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	22-May-25	22-May-25
Metals, ICP-MS	EPA 200.8 - ICP-MS	21-May-25	22-May-25
pH	EPA 150.1 - pH probe @25 °C	22-May-25	22-May-25
Phenolics	EPA 420.2 - Auto Colour, 4AAP	22-May-25	22-May-25
Hardness	Hardness as CaCO3	21-May-25	22-May-25
Sulphide	SM 4500SE - Colourimetric	26-May-25	26-May-25
Tannin/Lignin	SM 5550B - Colourimetric	23-May-25	23-May-25
Total Coliform	MOE E3407	21-May-25	21-May-25
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-May-25	23-May-25
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	22-May-25	22-May-25
Turbidity	SM 2130B - Turbidity meter	22-May-25	22-May-25

Certificate of Analysis

Report Date: 27-May-2025

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

Order Date: 21-May-2025

Client PO:

Project Description: 100011.125

	Client ID:	PW-11728	-	-	-		
	Sample Date:	21-May-25 12:15	-	-	-	-	-
	Sample ID:	2521214-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	100	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	279	-	-	-	-	-
Ammonia as N	0.01 mg/L	<0.01	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.4	-	-	-	-	-
Colour, apparent	2 ACU	9	-	-	-	-	-
Colour	2 TCU	<2	-	-	-	-	-
Conductivity	5 uS/cm	574	-	-	-	-	-
Hardness	1 mg/L	292	-	-	-	-	-
pH	0.1 pH Units	7.4	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	334	-	-	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-	-	-
Turbidity	0.1 NTU	1.2	-	-	-	-	-
Anions							
Chloride	1 mg/L	5	-	-	-	-	-
Fluoride	0.1 mg/L	<0.1	-	-	-	-	-
Nitrate as N	0.1 mg/L	1.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	17	-	-	-	-	-

	Client ID:	PW-11728	-	-	-	-	-
	Sample Date:	21-May-25 12:15	-	-	-		
	Sample ID:	2521214-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	<0.0001	-	-	-	-	-
Aluminum	0.001 mg/L	0.003	-	-	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-	-	-
Arsenic	0.001 mg/L	<0.001	-	-	-	-	-
Barium	0.001 mg/L	0.040	-	-	-	-	-
Beryllium	0.0005 mg/L	<0.0005	-	-	-	-	-
Boron	0.01 mg/L	0.01	-	-	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-	-	-
Calcium	0.1 mg/L	78.9	-	-	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-	-	-
Cobalt	0.0005 mg/L	<0.0005	-	-	-	-	-
Copper	0.0005 mg/L	0.0027	-	-	-	-	-
Iron	0.1 mg/L	0.2	-	-	-	-	-
Lead	0.0001 mg/L	<0.0001	-	-	-	-	-
Magnesium	0.2 mg/L	22.9	-	-	-	-	-
Manganese	0.005 mg/L	<0.005	-	-	-	-	-
Molybdenum	0.0005 mg/L	<0.0005	-	-	-	-	-
Nickel	0.001 mg/L	<0.001	-	-	-	-	-
Potassium	0.1 mg/L	2.8	-	-	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-	-	-
Silver	0.0001 mg/L	<0.0001	-	-	-	-	-
Sodium	0.2 mg/L	3.1	-	-	-	-	-
Strontium	0.01 mg/L	0.40	-	-	-	-	-
Thallium	0.001 mg/L	<0.001	-	-	-	-	-
Uranium	0.0001 mg/L	0.0002	-	-	-	-	-

	Client ID:	PW-11728	-	-	-		
	Sample Date:	21-May-25 12:15	-	-	-	-	-
	Sample ID:	2521214-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	<0.0005	-	-	-	-	-
Zinc	0.005 mg/L	<0.005	-	-	-	-	-

Method Quality Control: Blank

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

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	40.1	1	mg/L	40.2			0.1	20	
Fluoride	0.15	0.1	mg/L	0.15			0.5	20	
Nitrate as N	0.61	0.1	mg/L	0.61			0.2	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	58.7	1	mg/L	58.8			0.1	20	
General Inorganics									
Alkalinity, total	244	5	mg/L	244			0.3	10	
Ammonia as N	ND	0.01	mg/L	ND			NC	18	
Dissolved Organic Carbon	ND	0.5	mg/L	ND			NC	38	
Colour	ND	2	TCU	ND			NC	20	
Colour, apparent	9	2	ACU	9			0.0	20	
Conductivity	481	5	uS/cm	498			3.4	5	
pH	7.9	0.1	pH Units	7.9			0.1	3.3	
Phenolics	0.002	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	312	10	mg/L	334			6.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	15	
Total Kjeldahl Nitrogen	0.16	0.1	mg/L	0.15			3.7	20	
Turbidity	1.1	0.1	NTU	1.2			4.4	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.003	0.001	mg/L	0.003			3.4	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.039	0.001	mg/L	0.040			1.8	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.01	0.01	mg/L	0.01			7.7	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	78.0	0.1	mg/L	78.9			1.2	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0026	0.0005	mg/L	0.0027			3.7	20	
Iron	0.2	0.1	mg/L	0.2			2.1	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	23.0	0.2	mg/L	22.9			0.1	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	2.8	0.1	mg/L	2.8			1.5	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	3.1	0.2	mg/L	3.1			1.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0001	0.0001	mg/L	0.0002			2.7	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	70	10	CFU/mL	100			35.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	49.1	1	mg/L	40.2	89.5	70-124			
Fluoride	1.03	0.1	mg/L	0.15	87.3	70-130			
Nitrate as N	1.65	0.1	mg/L	0.61	104	77-126			
Nitrite as N	0.944	0.05	mg/L	ND	94.4	82-115			
Sulphate	67.6	1	mg/L	58.8	88.2	70-130			
General Inorganics									
Ammonia as N	1.03	0.01	mg/L	ND	103	85-115			
Dissolved Organic Carbon	11.0	0.5	mg/L	ND	110	73-127			
Phenolics	0.026	0.001	mg/L	ND	103	67-133			
Total Dissolved Solids	98.0	10	mg/L	ND	98.0	75-125			
Sulphide	0.49	0.02	mg/L	ND	98.6	82-118			
Tannin & Lignin	0.9	0.1	mg/L	ND	88.5	75-125			
Total Kjeldahl Nitrogen	1.16	0.1	mg/L	0.15	101	75-125			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	94.0	70-130			
Aluminum	45.1	0.001	mg/L	2.59	85.0	80-120			
Antimony	43.6	0.0005	mg/L	0.0386	87.1	80-120			
Arsenic	50.3	0.001	mg/L	0.075	100	80-120			
Barium	83.7	0.001	mg/L	39.6	88.2	80-120			
Beryllium	47.1	0.0005	mg/L	0.0110	94.1	80-120			
Boron	55.9	0.01	mg/L	11.3	89.3	80-120			
Cadmium	44.7	0.0001	mg/L	0.0053	89.4	80-120			
Calcium	9840	0.1	mg/L	ND	98.4	80-120			
Chromium	52.5	0.001	mg/L	0.222	104	80-120			
Cobalt	48.3	0.0005	mg/L	0.0490	96.5	80-120			
Copper	48.4	0.0005	mg/L	2.68	91.5	80-120			
Iron	2380	0.1	mg/L	157	89.0	80-120			
Lead	36.7	0.0001	mg/L	0.0240	73.4	80-120			QM-07
Magnesium	30900	0.2	mg/L	22900	79.5	80-120			QM-07
Manganese	55.7	0.005	mg/L	4.68	102	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Molybdenum	47.9	0.0005	mg/L	0.130	95.6	80-120			
Nickel	46.8	0.001	mg/L	0.207	93.2	80-120			
Potassium	12500	0.1	mg/L	2760	97.7	80-120			
Selenium	51.7	0.001	mg/L	0.098	103	80-120			
Silver	43.1	0.0001	mg/L	ND	86.2	80-120			
Sodium	12800	0.2	mg/L	3080	97.3	80-120			
Thallium	44.6	0.001	mg/L	0.007	89.2	80-120			
Uranium	32.8	0.0001	mg/L	0.153	65.2	80-120			QM-07
Vanadium	52.7	0.0005	mg/L	0.273	105	80-120			
Zinc	48.5	0.005	mg/L	3.36	90.4	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

BAC04	Duplicate QC data falls within method prescribed 95% confidence limits.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

PARACEL

Paracel ID: 2521214

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Paracel Order Number	Chain of Custody
2521216 = PW-11765 2521214 = PW-11728	Ontario Drinking Water Supplies № 20225

Client Name:	Gemtec	Project Ref:	100011.125	Waterworks Name:		Samples Taken By: ML
Contact Name:	Jason Karis Allen	Quote #:		Waterworks Number:		Name: Mich
Address:	32 Steacie Drive	PO #:		Address:		Signature: M. [illegible]
After Hours Contact:		E-mail:	jason.karisallen@gemtec.ca			Page 1 of 1
Telephone:	902-579-1154	Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

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

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

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

All information must be completed before samples will be processed.

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

Required Analysis

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	SAMPLE TAKEN DATE	SAMPLE TAKEN TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S/F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Subdivision Package	Trace metals (unfiltered only)	
1		PW-11728	R	G	N		May 21 2025	12:15 pm	10							✓	✓	
2																		
3		PW-11765	R	G	N		" "	11:00 am	10							✓	✓	
4																		
5																		
6																		
7																		
8																		
9																		
10																		

Comments: - DOC field filtered
- Separate lab reports for each sample

Method of Delivery: WALK-IN

Relinquished By (Sign): M. [illegible]	Received at Depot:	Received at Lab: LTJ	Verified By: SO
Relinquished By (Print): Mich Yalonde	Date/Time:	Date/Time: 21/05/25; 14:51	Date/Time: May 21 2025 3:20pm
Date/Time: May 21, 2025 / 2:50 pm	Temperature: °C	Temperature: 9.1 °C	pH Verified: ☑ By: LTJ

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Jason Karis-Allen

Client PO:
Project: 100011.125
Custody: 20225

Report Date: 27-May-2025
Order Date: 21-May-2025

Order #: 2521216

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

Paracel ID	Client ID
2521216-01	PW-11765

Approved By:

Mark Foto

Mark Foto, M.Sc.
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	22-May-25	22-May-25
Ammonia, as N	EPA 351.2 - Auto Colour	26-May-25	26-May-25
Anions	EPA 300.1 - IC	22-May-25	22-May-25
Colour	SM2120 - Spectrophotometric	22-May-25	22-May-25
Colour, apparent	SM2120 - Spectrophotometric	22-May-25	22-May-25
Conductivity	EPA 9050A- probe @25 °C	22-May-25	22-May-25
Dissolved Organic Carbon	MOE 3247B - Combustion IR	21-May-25	21-May-25
E. coli	MOE E3407	21-May-25	21-May-25
Fecal Coliform	SM 9222D	21-May-25	21-May-25
Heterotrophic Plate Count	SM 9215C	21-May-25	23-May-25
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	22-May-25	22-May-25
Metals, ICP-MS	EPA 200.8 - ICP-MS	21-May-25	22-May-25
pH	EPA 150.1 - pH probe @25 °C	22-May-25	22-May-25
Phenolics	EPA 420.2 - Auto Colour, 4AAP	22-May-25	22-May-25
Hardness	Hardness as CaCO3	21-May-25	22-May-25
Sulphide	SM 4500SE - Colourimetric	26-May-25	26-May-25
Tannin/Lignin	SM 5550B - Colourimetric	23-May-25	23-May-25
Total Coliform	MOE E3407	21-May-25	21-May-25
Total Dissolved Solids	SM 2540C - gravimetric, filtration	22-May-25	23-May-25
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	22-May-25	22-May-25
Turbidity	SM 2130B - Turbidity meter	22-May-25	22-May-25

	Client ID:	PW-11765	-	-	-	-	-
	Sample Date:	21-May-25 11:00	-	-	-		
	Sample ID:	2521216-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	>2000	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	244	-	-	-	-	-
Ammonia as N	0.01 mg/L	<0.01	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.6	-	-	-	-	-
Colour, apparent	2 ACU	2	-	-	-	-	-
Colour	2 TCU	<2	-	-	-	-	-
Conductivity	5 uS/cm	498	-	-	-	-	-
Hardness	1 mg/L	288	-	-	-	-	-
pH	0.1 pH Units	7.9	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	278	-	-	-	-	-
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	0.2	-	-	-	-	-
Anions							
Chloride	1 mg/L	2	-	-	-	-	-
Fluoride	0.1 mg/L	0.2	-	-	-	-	-
Nitrate as N	0.1 mg/L	0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	24	-	-	-	-	-

	Client ID:	PW-11765	-	-	-	-	-
	Sample Date:	21-May-25 11:00	-	-	-		
	Sample ID:	2521216-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	<0.0001	-	-	-	-	-
Aluminum	0.001 mg/L	0.004	-	-	-	-	-
Antimony	0.0005 mg/L	<0.0005	-	-	-	-	-
Arsenic	0.001 mg/L	<0.001	-	-	-	-	-
Barium	0.001 mg/L	0.061	-	-	-	-	-
Beryllium	0.0005 mg/L	<0.0005	-	-	-	-	-
Boron	0.01 mg/L	0.11	-	-	-	-	-
Cadmium	0.0001 mg/L	<0.0001	-	-	-	-	-
Calcium	0.1 mg/L	82.2	-	-	-	-	-
Chromium	0.001 mg/L	<0.001	-	-	-	-	-
Cobalt	0.0005 mg/L	<0.0005	-	-	-	-	-
Copper	0.0005 mg/L	0.0081	-	-	-	-	-
Iron	0.1 mg/L	<0.1	-	-	-	-	-
Lead	0.0001 mg/L	<0.0001	-	-	-	-	-
Magnesium	0.2 mg/L	20.1	-	-	-	-	-
Manganese	0.005 mg/L	0.009	-	-	-	-	-
Molybdenum	0.0005 mg/L	<0.0005	-	-	-	-	-
Nickel	0.001 mg/L	<0.001	-	-	-	-	-
Potassium	0.1 mg/L	4.3	-	-	-	-	-
Selenium	0.001 mg/L	<0.001	-	-	-	-	-
Silver	0.0001 mg/L	<0.0001	-	-	-	-	-
Sodium	0.2 mg/L	18.2	-	-	-	-	-
Strontium	0.01 mg/L	4.39	-	-	-	-	-
Thallium	0.001 mg/L	<0.001	-	-	-	-	-
Uranium	0.0001 mg/L	0.0001	-	-	-	-	-

Certificate of Analysis

Report Date: 27-May-2025

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

Order Date: 21-May-2025

Client PO:

Project Description: 100011.125

	Client ID:	PW-11765	-	-	-		
	Sample Date:	21-May-25 11:00	-	-	-	-	-
	Sample ID:	2521216-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	<0.0005	-	-	-	-	-
Zinc	0.005 mg/L	0.009	-	-	-	-	-

Method Quality Control: Blank

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

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	40.1	1	mg/L	40.2			0.1	20	
Fluoride	0.15	0.1	mg/L	0.15			0.5	20	
Nitrate as N	0.61	0.1	mg/L	0.61			0.2	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	58.7	1	mg/L	58.8			0.1	20	
General Inorganics									
Alkalinity, total	244	5	mg/L	244			0.3	10	
Ammonia as N	ND	0.01	mg/L	ND			NC	18	
Dissolved Organic Carbon	ND	0.5	mg/L	ND			NC	38	
Colour	ND	2	TCU	ND			NC	20	
Colour, apparent	9	2	ACU	9			0.0	20	
Conductivity	481	5	uS/cm	498			3.4	5	
pH	7.9	0.1	pH Units	7.9			0.1	3.3	
Phenolics	0.002	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	312	10	mg/L	334			6.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	15	
Total Kjeldahl Nitrogen	0.16	0.1	mg/L	0.15			3.7	20	
Turbidity	1.1	0.1	NTU	1.2			4.4	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.003	0.001	mg/L	0.003			3.4	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.039	0.001	mg/L	0.040			1.8	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.01	0.01	mg/L	0.01			7.7	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	78.0	0.1	mg/L	78.9			1.2	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0026	0.0005	mg/L	0.0027			3.7	20	
Iron	0.2	0.1	mg/L	0.2			2.1	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	23.0	0.2	mg/L	22.9			0.1	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	2.8	0.1	mg/L	2.8			1.5	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	3.1	0.2	mg/L	3.1			1.0	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0001	0.0001	mg/L	0.0002			2.7	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	70	10	CFU/mL	100			35.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	49.1	1	mg/L	40.2	89.5	70-124			
Fluoride	1.03	0.1	mg/L	0.15	87.3	70-130			
Nitrate as N	1.65	0.1	mg/L	0.61	104	77-126			
Nitrite as N	0.944	0.05	mg/L	ND	94.4	82-115			
Sulphate	67.6	1	mg/L	58.8	88.2	70-130			
General Inorganics									
Ammonia as N	1.03	0.01	mg/L	ND	103	85-115			
Dissolved Organic Carbon	11.0	0.5	mg/L	ND	110	73-127			
Phenolics	0.026	0.001	mg/L	ND	103	67-133			
Total Dissolved Solids	98.0	10	mg/L	ND	98.0	75-125			
Sulphide	0.49	0.02	mg/L	ND	98.6	82-118			
Tannin & Lignin	0.9	0.1	mg/L	ND	88.5	75-125			
Total Kjeldahl Nitrogen	1.16	0.1	mg/L	0.15	101	75-125			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	94.0	70-130			
Aluminum	45.1	0.001	mg/L	2.59	85.0	80-120			
Antimony	43.6	0.0005	mg/L	0.0386	87.1	80-120			
Arsenic	50.3	0.001	mg/L	0.075	100	80-120			
Barium	83.7	0.001	mg/L	39.6	88.2	80-120			
Beryllium	47.1	0.0005	mg/L	0.0110	94.1	80-120			
Boron	55.9	0.01	mg/L	11.3	89.3	80-120			
Cadmium	44.7	0.0001	mg/L	0.0053	89.4	80-120			
Calcium	9840	0.1	mg/L	ND	98.4	80-120			
Chromium	52.5	0.001	mg/L	0.222	104	80-120			
Cobalt	48.3	0.0005	mg/L	0.0490	96.5	80-120			
Copper	48.4	0.0005	mg/L	2.68	91.5	80-120			
Iron	2380	0.1	mg/L	157	89.0	80-120			
Lead	36.7	0.0001	mg/L	0.0240	73.4	80-120			QM-07
Magnesium	30900	0.2	mg/L	22900	79.5	80-120			QM-07
Manganese	55.7	0.005	mg/L	4.68	102	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Molybdenum	47.9	0.0005	mg/L	0.130	95.6	80-120			
Nickel	46.8	0.001	mg/L	0.207	93.2	80-120			
Potassium	12500	0.1	mg/L	2760	97.7	80-120			
Selenium	51.7	0.001	mg/L	0.098	103	80-120			
Silver	43.1	0.0001	mg/L	ND	86.2	80-120			
Sodium	12800	0.2	mg/L	3080	97.3	80-120			
Thallium	44.6	0.001	mg/L	0.007	89.2	80-120			
Uranium	32.8	0.0001	mg/L	0.153	65.2	80-120			QM-07
Vanadium	52.7	0.0005	mg/L	0.273	105	80-120			
Zinc	48.5	0.005	mg/L	3.36	90.4	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

BAC04	Duplicate QC data falls within method prescribed 95% confidence limits.
QM-07	The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

PARACEL

Paracel ID: 2521216

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Paracel Order Number	Chain of Custody
2521216 = PW-11765 2521214 = PW-1172[illegible]	Ontario Drinking Water Supplies № 20225

Client Name:	GEMTEC	Project Ref:	100011.125	Waterworks Name:	
Contact Name:	Jason Karis Allen	Quote #:		Waterworks Number:	
Address:	32 Steacie Drive	PO #:		Address:	
After Hours Contact:		E-mail:	jason.karisallen@gemtec.ca		
Telephone:	902-579-1154	Fax:		Public Health Unit:	

Samples Taken By: MC

Name: Mich

Signature: M. [signature]

Page 1 of 1

Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☑ 4 day

Samples Submitted Under: (Indicate ONLY one)

☐ ON REG 170/03 ☐ ON REG 319/08 ☐ Private Well

☐ ON REG 243/07 ☑ Other O. Reg. 169/03

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

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

All information must be completed before samples will be processed.

Sample Type: R = Raw; T = Treated; D = Distridution; P = Plumbing

Source Type: G = Ground Water; S = Surface Water

Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

Required Analysis

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE TAKEN DATE	SAMPLE TAKEN TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Sodium Package	Trace metals (Cal/Hardness only)	
1																		
2		PW-11728	R	G	N		May 21 2025	12:15 pm	10							✓	✓	
3																		
4		PW-11765	R	G	N		" "	11:00 am	10							✓	✓	
5																		
6																		
7																		
8																		
9																		
10																		

Comments: - QC Field Report
- Separate lab reports for each sample

Relinquished By (Sign): M. [signature]	Received at Depot:	Received at Lab: LTJ	Method of Delivery: WALK-IN
Relinquished By (Print): Mich Lalonde	Date/Time:	Date/Time: 21/05/25; 14:51	Verified By: SD
Date/Time: May 21, 2025 / 2:50 pm	Temperature: °C	Temperature: 9.1 °C	Date/Time: May 21, 2025 3:20pm
			pH Verified: ☑ By: LTJ

APPENDIX F

Preliminary Nitrate Dilution Calculations

Allowable Flows - Commercial Septic System at 11728 Lanark Road (Preliminary)

Site	Area m^2	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m^3/year)	Infiltration Volume (m^3/year)
1500 Thomas Argue Road	63,000	0.15	0.20	0.15	0.50	0.311	19593

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Septic Flow-Advanced[2] (litres per day)
5%	25498	8499	<9,999
10%	24156	8052	<9,999
15%	22814	7605	<9,999

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Calculations assume no baseline nitrate concentration in the recieving groundwater system (overburden), based on field sampling.

Renfrew WATER BUDGET MEANS FOR THE PERIOD 1968-1996 DC20492

LAT.... 45.48 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 32.69
LONG... 76.70 LOWER ZONE..... 45 MM A..... 1.019

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-12.2	60	13	15	0	0	0	27	80	74	261
28- 2	-10.4	50	9	18	1	1	0	26	102	75	310
31- 3	-3.6	61	32	79	6	6	0	104	53	75	370
30- 4	5.0	67	60	60	31	31	0	90	0	74	438
31- 5	12.1	71	71	0	77	77	0	13	0	56	510
30- 6	16.9	75	75	0	110	102	-8	0	0	28	584
31- 7	19.8	77	77	0	130	96	-34	0	0	9	663
31- 8	18.6	75	75	0	113	78	-35	0	0	7	740
30- 9	13.6	70	70	0	71	62	-9	1	0	14	808
31-10	7.3	69	69	0	34	34	-1	5	0	45	70
30-11	.3	65	46	9	9	9	0	22	10	68	134
31-12	-8.4	68	14	16	1	1	0	23	48	74	202
AVE	5.0 TTL	808	611	197	583	497	-87	311			

Renfrew STANDARD DEVIATIONS FOR THE PERIOD 1968-1996 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	3.5	28	19	19	1	1	0	32	46	6	50
28- 2	2.9	29	14	24	1	1	0	34	61	2	52
31- 3	2.5	28	21	52	4	4	0	61	77	0	59
30- 4	2.1	29	30	80	10	10	0	79	0	4	67
31- 5	1.8	33	33	0	12	12	0	22	0	22	67
30- 6	1.1	29	29	0	7	14	14	2	0	28	70
31- 7	1.1	34	34	0	7	31	34	0	0	17	77
31- 8	1.1	32	32	0	7	29	31	0	0	14	91
30- 9	1.3	29	29	0	7	11	11	3	0	20	89
31-10	1.7	27	27	1	8	7	2	11	1	27	27
30-11	1.8	22	20	6	4	4	0	22	17	11	36
31-12	3.4	29	13	14	1	1	0	25	38	2	47

experience • knowledge • integrity

civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité