Hydrogeological Feasibility Study, 1434 Gennings Street, Sudbury, Ontario

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Table of Contents

List of Tables

List of Appended Figures

List of Appendices

1.0 Introduction

Cambium Inc. (Cambium) was retained by Jean Charles (Client) in association with Tulloch Engineering to complete a hydrogeological feasibility study of the property located at 1434 Gennings Street, Sudbury, Ontario (Site). See attached Figure 1 for Site Location Plan.

It is understood that this hydrogeological feasibility study is being conducted as a matter of due diligence to support the severance of the Site into two residential lots. The Site is approximately 0.77 hectares (7,772 m^2) in size with the eastern half is developed with a single-family dwelling. The proposed severed lot will be the western portion of the Site and proposed to be approximately 3,038 m^2 in size; the intention is to develop the severed lot with a single-family dwelling. Site details are included on Figure 2, attached.

The Site is located approximately 130 m south of Ramsey Lake at its closest extent (Appendix A), which is a municipal drinking water source for City of Greater Sudbury (City). There are no municipal sewer and water services available for the Site, and as such the proposed severed lot would require a private sewage (septic) system and a private water supply well. This hydrogeological feasibility study will assess if the installation of a septic system on the proposed severed lands will adversely impact the nearby lake or down-gradient water supply well users.

This hydrogeological feasibility study includes a review of well records within 500 m of the Site, a test pit investigation, soil and groundwater quality analysis, a nitrate loading assessment, and a phosphorus loading assessment.

1.1 Site Description

The total area of the Site is approximately 7,772 m^2 and it is currently zoned as a Low Density Residential One (R1-3) Zone. The properties surrounding the Site are also all zoned as R1-3, as land use around the Site is all residential (Appendix A). The Site is bordered by Gennings Street to the south and Lake Point Court to the west.

The eastern portion of the Site is developed with a single-family dwelling that is serviced by private on-site water and sewage system. The proposed severance incudes the western portion of the Site, that is predominantly woodland. The western portion of the Site has locally variable topography, and it is understood that rocky fill material was imported approximately 20 years ago. There are some low-lying wet areas within the western portion of the Site, mainly in the north and northeastern areas of the proposed severed lands. There is a low-lying drainage ditch present at the Site currently that flows to the north and bisects the proposed severed and retained lands.

The proposed development plan, including a proposed single-family dwelling, private water supply well, sewage system, and reserved sewage system area for the severed lands, is included in Appendix A. The regional location of the Site is outlined on Figure 1, the property and surrounding areas outlined on Figure 2.

1.2 Official Plan Policy

This hydrogeological feasibility study was required as a matter of due diligence to assess if severing the Site into two residential lots and therefore adding an additional private sewage system to the Site will adversely impact Ramsey Lake's municipal water supply and or down-gradient water supply well users.

As per the per the City's Official Plan (OP) Appendix B. Policy 20.5.1.a) of the OP (stated below) applies to the Site:

> *In order to protect Ramsey Lake as a municipal water supply, no severances or subdivisions are permitted until municipal sewer and water services are available. In the interim, only single detached dwellings are permitted on legally existing lots fronting on public roads, subject to the approval of the appropriate regulatory authorities for a private sewage disposal system.*

Appendix B of the OP states that Ramsey Lake is categorized as Enhanced Management 2, which means that a) the lake has a potential phosphorus load that could cause it to exceed the

revised Provincial Water Quality Objective (PWQO) for total phosphorus concentration, and b) the lake has a high responsiveness to phosphorus load.

1.2.1 Source Protection Policy

As per the Source Protection Information Atlas (SPIA) mapping (Appendix A), provided by the Ministry of Environment, Conservation and Parks (MECP) and the Greater Sudbury Source Protection Plan (GS SPP) (Greater Sudbury Source Protection Committee, 2021), the Site is located an Intake Protection Zone 3 (IPZ-3) with a vulnerability score of 9 and an Issues Contributing Area (ICA) for sodium and total phosphorus (due to the presence of Microcystin LR, a toxin associated with cyanobacteria).

Intake Protection Areas (IPZ)

IPZ's are the areas of land and water that may influence the water quality of water sources upstream of the municipal drinking water intakes. This area accounts for the influence of runoff from heavy rains that may pick up pollutants and affect water quality in local watersheds and the near-shore waters of a municipal intake.

An IPZ-3 is a protective zone where early warning activities such as monitoring can be effective. Where an IPZ-3 abuts land, the area within a 120 m setback of the high-water mark of the related surface is included in the delineation. The IPZ-3 includes all rivers and tributaries where modeling demonstrates that contaminant spills may reach the intake during an extreme rainfall or windstorm events.

Any pollutants that are spilled in the IPZ-3 or contaminant introduced into the shallow groundwater / surface water system (i.e. contamination from wastewater systems) will eventually reach the intake and affect water quality in the vicinity of intake area.

Issues Contributing Area

ICA means the vulnerable areas that have been delineated as contributing to the "issues" identified for Ramsey Lake. In the Greater Sudbury Source Protection Area, the occurrence of Microcystin LR and the increasing amount of sodium resulted in these two issues being

identified for Ramsey Lake. The Ramsey Lake ICA is comprised of all of the IPZ areas (1, 2 and 3).

Microcystin LR is a toxin sometimes produced by cyanobacteria (also known as blue-green algae) and is listed as a parameter in the Ontario Drinking Water Quality Standards (ODWQS). Phosphorus contributes to cyanobacterial growth, therefore its presence is associated with this issue.

1.2.2 Wastewater Contaminants of Concern

It is understood that the City's OP policy and the GS SPP are in place to protect the overall health of Ramsey Lake and the drinking water source. Based on the policy and the GS SPP, phosphorus generated from the proposed sewage system is the considered the primary contaminant of concern for Ramsey Lake. Therefore, this feasibility study will include a phosphorus loading assessment to determine whether an additional septic system at the Site (to service the severed lands) will adversely impact Ramsey Lake.

This feasibility study was also conducted to assess any drinking water threats from a sewage system for the severed lands considering the neighboring lots are all serviced by individual private supply wells. As such, a nitrate loading assessment has been included in this study to evaluate if the nitrate concentration will be within the ODWQS 10 mg/L criteria at the down-gradient boundary.

2.0 Methodology

This section outlines the methodology followed to complete the hydrogeological feasibility study.

2.1 Document Review

A review of available relevant background information was completed, which included the following resources:

- Ministry Water Well Information System (WWIS) website provided by the Ministry of Environment, Conservation and Parks (MECP, 2024a);
- Source Protection Information Atlas (MECP, 2024b);
- Provincial (Stream) Water Quality Monitoring Network (MECP, 2024c);
- City of Greater Sudbury Official Plan (City of Greater Sudbury, 2023);
- Greater Sudbury Source Protection Plan (Greater Sudbury Source Protection Committee, 2021); and
- Clemchar, Jean Charles – Severance Application drawing, prepared by Canadian Shield Consultants Agency Inc. on January 4, 2024 (Appendix A).

2.2 Test Pit Investigation

A test pit investigation was completed by Cambium on April 5, 2024, to characterize the shallow subsurface conditions across the Site. A total of four test pits, designated as test pit TP101-24 through TP104-24, were excavated to a depth of 2 to 3 metres below ground surface (mbgs) using an excavator under the supervision of a Cambium representative. The test pit locations were selected based on the proposed and reserved sewage system locations shown on the severance application drawing (Appendix A). Test pit logs are provided in Appendix B. Test pit locations are identified in Figure 2.

Soil units encountered during test pit excavation were logged in the field using visual and tactile methods. Soil samples were collected from each geological unit encountered and

placed in labelled plastic bags for transport, future reference, possible laboratory testing, and storage. Open test pits were checked for groundwater and general stability prior to backfilling. All test pits were backfilled to as close as possible to pre-existing conditions.

2.3 Drive-Point Piezometer Installation

One drive-point piezometer was installed at the Site on April 5, 2024, to facilitate groundwater sampling of the shallow overburden aquifer at the Site (receiving aquifer for the sewage system(s)). The piezometer consists of a 19 mm diameter stainless steel pipe with 300 mm in length screen and was installed to a depth of 1.69 mbgs within the shallow unconfined aquifer. Static water level was not observed following installation due to the fine-grained clay soils. As such, groundwater sampling could not be completed on the same day as the installation.

2.4 Soil Sampling

Grain size analysis was completed on three samples collected during the test pit investigation; the soils were analysed at Cambium's soil lab. In addition, three soil samples were submitted to SGS Canada Inc. (SGS) for analysis of calcium carbonate, iron oxide, and aluminum oxide to determine if the soils are non-calcareous and rich in iron and aluminum. This analysis serves to determine the phosphorus attenuation of the on-site soils. The grain size analysis is included in Appendix C and soil analysis by SGS is included in Appendix D.

2.5 Groundwater Sampling

Cambium staff returned to the Site on April 12, 2024, to measure the static water level and collect a groundwater sample from the drive-point piezometer. The sample was sent to SGS for analysis of nitrate, nitrite, ammonia, total phosphorus, and dissolved phosphorus. Results are included in Appendix E.

3.0 MECP Well Records within 500 m

Cambium accessed the Ministry of the Environment Conservation and Parks (MECP) Water Well Information System (WWIS) to review water well records within 500 m of the Site. Well records within the area of the Site were reviewed to determine if there were any nearby water supply wells installed within the shallow unconfined aquifer that could be susceptible to potential wastewater contamination from the installation of a new septic system on the severed lands.

There were 54 water well records found within approximately 500 m of the Site (Appendix F; Figure 3). All of the well records were installed into bedrock with an average depth of 33.2 mbgs. The overburden – bedrock contact was encountered between ground surface to 16.8 mbgs, with an average overburden depth of 3.1 mbgs. The wells were installed between the years 1956 and 2022. A summary of the depths, static water levels, and pumping rates for the overburden wells are shown in Table 1.

Table 1 Summary of Surrounding Water Well Record Information

Well Type		Depth (mbgs)	Depth Water Found (mbgs)	Static Water Level (mbgs)	Recommended Pumping Rate (L/min)
Bedrock Supply Wells = 54	Minimum	13.7	5.2	1.0	5
	Maximum	76.2	56.7	12.0	136
	Average	37.2	29.0	3.8	23.2

A summary of the information outlined in the well records is provided below:

- Overburden was generally reported as clay-dominant soils with select units indicating gravel and sand components.
- Water yields from the water supply wells in the area are generally moderate, indicating the presence of a productive aquifer capable of supporting many groundwater users.

- Several well records encountered water at multiple depths within the bedrock, indicating that there are multiple fracture systems at varying depths which contribute water to the water supply wells.

As per the MECP WWIS mapping (and as shown on Figure 3), there is one well located in the eastern portion of the Site that was installed in 2022 (Well Record No. 7419795). It is assumed that this well record is for the private supply well that services the existing single-family dwelling on the retained portion of the Site.

4.0 Results

4.1 Subsurface Conditions

Subsurface conditions encountered during the test pit investigation at the Site generally consisted of a layer of a black topsoil that ranged in depth from 0.15 to 0.30 m, which was underlain by fill materials in most locations (except test pit TP104-24). The fill materials ranged in composition, from black large boulders and gravel to brown gravel and sand. Based on correspondence with the Client, it is understood that the previous owner of the land brought in the boulder and gravel fill approximately 20 years ago. Native overburden underlies the fill materials in each test pit location (and underlies topsoil at TP104-24). The native overburden is generally described as clayey silt to clay, with varying amounts of sand. The fine-grained native soils extended down to termination depth (maximum termination depth of 2.74 mbgs). The shallow native soils were described as brown, turning into grey soils prior to termination depth; brown and grey mottling was observed in the soils in each test pit location.

The soils were predominantly described as being moist in the shallow soils and transitioning to wet / saturated at depth in each test pit location. Groundwater seepage and caving (sloughing) were observed in each test pit, ranging in depths from 0.30 mbgs to 1.52 mbgs. In general, groundwater was encountered shallower towards the centre of the Site where the drainage ditch bisects the Site and flows north, and groundwater was encountered deeper where greater thickness of fill materials was observed.

The groundwater level observations in the test pits are not considered representative of the stabilized groundwater conditions and as such, the groundwater table elevation may vary. It was noted that groundwater levels at the Site may fluctuate seasonally and in response to climatic events. As the test pit investigation was conducted during the spring, it is assumed that the groundwater encountered was in its annual shallowest conditions.

Bedrock was not encountered within the depths of the test pit investigations.

4.2 Hydrogeology

As discussed above, each of the test pits encountered groundwater and caving (sloughing) prior to test pit termination, ranging between 0.30 mbgs to 1.52 mbgs. While these conditions are not considered representative of stabilized groundwater conditions, it can be concluded that there is an unconfined shallow overburden aquifer present within the native overburden at the Site.

Drive-point piezometer DP101-24 was installed adjacent to test pit TP104-24 (where the shallowest groundwater was encountered during the test pitting) on April 5, 2024. Cambium staff returned to the Site on April 12, 2024, to measure static water level conditions and collect the groundwater quality sample. The static groundwater level at DP101-24 on April 12, 2024, was measured at 1.16 mbgs.

Based on the drive-point piezometer and the test pit investigation, an unconfined aquifer exists within the shallow overburden at the Site. According to the MECP WWIS (Section 3.0), there are also several horizons of fractured bedrock aquifers that all of the supply wells within the area of the Site draw from. The connectivity of the shallow overburden aquifer and the bedrock aquifer systems was not investigated as part of this report; however, it is assumed there is limited connection between the shallow and deeper aquifers due to the distance between the aquifers and the fine-grained nature of the native soils in the area.

4.3 Soil Analysis

4.3.1 Grain Size Analysis

Physical laboratory testing was completed for a total of three soil samples to confirm textural classification and to estimate the percolation rates of the native soils. Results are included in Appendix C and details of the grain-size analysis are presented in Table 2, below.

Table 2 Particle Size Distribution

Test Pit	Depth (mbgs)	Soil Description	% Gravel	% Sand	% Silt	% Clay	Percolation Time (min/cm)
TP101-24 GS2	2.3 – 2.6	Silt trace Clay trace Sand	0	4	88	8	25
TP102-24 GS2	1.7 – 2.0	Clayey Silt trace Sand	0	4	72	24	40
TP104-24 GS3	1.2 – 1.5	Clay and Silt trace Sand	0	1	47	52	>50

Based on grain size analysis data, tested samples were a fine-grained soil reported as clay and silt, to clayey silt, to silt with trace amounts of sand. These results are consistent with lithological descriptions recorded in the field. Soil percolation rates ranged from 25 min/cm to >50 min/cm,. This indicates the presence of low transmissive soils at the Site.

4.4 Laboratory Soil Analysis

Three native soil samples collected from test pit TP102-24, TP103-24, and TP104-24 were sent to SGS for analysis of calcium carbonate, iron oxide, and aluminum oxide to determine if the soils are non-calcareous and rich in iron and aluminum. Aqua Regia analysis was conducted on each of the samples. The results of the soil analysis are included in Table 3 and Appendix D.

Table 3 Laboratory Soil Results

Soil Sample	Calcium Carbonate (wt%)	Iron Oxide (wt%)	Aluminum Oxide (wt%)
TP102-24	0.32	1.30	1.70
TP103-24	0.34	1.40	1.90
TP104-23	0.44	1.80	2.40

As the concentration of calcium carbonate within each soil sample was less than 1 wt%, each of the soil samples are considered to be non-calcareous. Additionally, all of the soils samples also reported a greater than 1 wt% concentration for both iron oxide and aluminum oxide. The results of the laboratory soil analysis will be discussed in Section 6.0.

4.5 Groundwater Analysis

On April 12, 2024, a groundwater sample was collected from DP101-24 and analysed for nitrate, nitrite, ammonia, total phosphorus, and dissolved phosphorus. The laboratory certificate of analysis is included in Appendix E and summarized in Table 4 below:

Table 4 Groundwater Quality Results

Parameter	Filtered vs Unfiltered	Concentration (mg/L)	ODWQS Criteria (mg/L)	PWQO Criteria (mg/L)
Ammonia + Ammonium (N)	Unfiltered	<0.1	-	-
Nitrite (as N)	Unfiltered	<0.03	1.0	-
Nitrate (as N)	Unfiltered	<0.06	10.0	-
Nitrate + Nitrite (as N)	Unfiltered	<0.06	-	-
Phosphorus (total)	Unfiltered	0.145	-	0.02[1]
Phosphorus (dissolved)	Filtered	0.041	-	-

1. *0.2 mg/L is the PWQO criteria to avoid nuisance concentrations of algae in lakes.*

The concentrations of ammonia + ammonia, nitrite, and nitrate are all less than the laboratory detectable limit meeting the corresponding ODWQS criteria (where applicable). Both the total and dissolved phosphorus concentrations were reported greater than the PWQO phosphorus criteria for algae impacts to lakes (i.e. the concern for Ramsey Lake).

The Provincial (Stream) Water Quality Monitoring Network includes a surface water sampling station on Paris Street in an outlet of Ramsey Lake, located approximately 3 km west of the Site. Monthly total phosphorus concentrations between May 2010 and March 2021 are publicly available. The total phosphorus concentrations at this location ranged from 0.002 mg/L to 0.098 mg/L, with an average concentration of 0.019 mg/L (i.e. just below the 0.02 mg/L PWQO criteria).

It is noted that the total phosphorus concentration reported from drive point DP101-24 is greater than the PWQO criteria, however this result is attributed to sediment within the sample causing interference during analysis. The dissolved phosphorus concentration reported from drive point DP101-24 is considered to be representative of the phosphorus conditions within

the shallow groundwater aquifer. The dissolved phosphorus concentration reported falls within the measured range at the Ramsey Lake monitoring station.

5.0 Nitrate Loading Assessment

As per Procedure D-5-4 Technical Guideline for Individual On-Site Sewage Systems: Water Quality Risk Assessment (Procedure D-5-4) (MOE, 1996), an assessment was completed to determine the feasibility of utilizing on-site sewage disposal for the development.

The proposed severance will increase the potential of wastewater effluent loading on the receiving aquifer system (i.e. water table) located within the overburden soils in the area. Within the effluent, nitrate is considered the limiting contaminant due to the human health concerns. Procedure D-5-4 requires that the effluent plume at the Site boundary to be less than the ODWQS limit of 10 mg/L for nitrate to prevent contamination of adjacent properties. It was determined through groundwater quality sampling (Section 4.5) at DP101-24 (which is located adjacent to the down-gradient boundary) that the current background nitrate concentration of the receiving aquifer at the Site is below 10 mg/L (<0.06 mg/L) at the down-gradient property boundary.

Although natural processes and soil interaction can result in nitrate being attenuated in the receiving aquifer system, Procedure D-5-4 states that only dilution can be used as the principal attenuation mechanism to predict future nitrate concentrations. As such, a mass balance calculation is presented below to assess the impact of developing a residential unit on the Site.

The wastewater assessment employed a detailed water balance and pre- and post-development infiltration calculations to determine the volume of available dilution water at the Site. The volume of available dilution water was then utilized to provide a predictive assessment of nitrate attenuation based on the number of units for the proposed development. Detailed mass balance calculations are provided in Appendix G. An overview of calculations and results are discussed in the following subsections.

5.1 Available Dilution

The total available dilution for the Site is estimated by the following equation:

$$Qi = A * S * I$$

Where: Qi – Volume of Available dilution water

A – Area of the Site

S – Water surplus

I – Infiltration factor

To calculate the water surplus, the climate normal data collected between 1981 and 2010 at the Sudbury A weather station was used (Climate ID: 6068150) located approximately 20 km from the Site. The data was accessed through the Environment Canada website (Environment Canada, 2024). The total yearly precipitation, on average, was 904 mm.

The Thornthwaite method was used to determine the amount of evapotranspiration that will occur at the Site (S. Lawrence Dingman, 2008). The calculated depth of evapotranspiration was 474 mm/year. The evapotranspiration calculations are attached in Appendix G. Therefore, the water surplus calculated to be 429 mm per year (1.18 mm/day).

To determine the fraction of surplus water that infiltrates into the soils on-site, the volume of surplus water is multiplied by an infiltration factor. The infiltration factor varies between 0 and 1 and is estimated based on topography, soils and cover (as per the Stormwater Management Planning and Design Manual (MOE, 2003)). As outlined in Table 5, an estimated infiltration factor of 0.5 was established for the Site.

In addition to calculating the infiltration factor, the developable area of the Site (7,772 m^2) was considered to determine the total volume of dilution water available. The proposed paved areas and roofed areas were included in the total dilution area as it is assumed that runoff for all surfaces will be directed to the ground surface and therefore will not contribute to a post-development recharge deficit. A summary of parameters and calculations used for available

dilution water calculations are outlined in Table 5. Detailed calculations are given in Appendix G.

Table 5 Available Dilution Calculation Parameters

Infiltration Factor (I)	
Topography	Rolling land = 0.20
Soil	Clayey silt, trace sand = 0.15
Cover	Woodland / cultivated land = 0.15
Infiltration Factor (I)	0.50
Volume of Dilution Water	
Dilution Area (A) (m^2)	7,772
Surplus (S) (m/day)	0.00118
Total Volume of Surplus Water Available Per Day (AxS) (m^3/day)	9.14
Volume of Infiltrated Surplus Water Per Day {(AxS)xI} (m^3/day)	5.94

5.2 Predictive Assessment

Based on Procedure D-5-4, the proposed dwelling is anticipated to generate an average discharge of 1,000 L/day of sewage effluent. Total nitrogen (all species) ultimately converts to nitrate through the wastewater treatment process. Nitrate is considered to be the critical contaminant in sewage effluent. A nitrate loading of 40 grams/unit/day is the effluent loading from conventional septic systems on the receiving groundwater system. As per the site plan provided (Appendix A), the existing single-family dwelling at the Site is serviced with a conventional filter bed septic system. If a tertiary (Class 4) septic system were to be installed within the severed lands instead of a conventional septic system, a nitrate loading of 20 grams/unit/day would be the effluent loading value due to the nitrate removal assigned to the treatment process.

To evaluate the impact of a septic system on a groundwater resource, a reference point or value is established to assist in determining the extent of the impact, if any. In this respect, the quality of the groundwater that is not impacted by septic system on the Site (i.e. background

water quality) should be used for comparison purposes. The concentration of nitrate is assumed to be 0.01 mg/L in the surplus water infiltrating into the ground once the development is created.

To determine the adequate unit density for the Site, a mass balance calculation is used to determine the sewage loading for nitrate on the property boundary. The mass balance calculations are outlined below as:

$$Q_tC_t = Q_eC_e + Q_iC_i$$

Where: Q_t = Total volume ($Q_e + Q_i$)

C_t = Total concentration of nitrate at the property boundary

Q_e = Volume of septic effluent

C_e = Concentration of nitrate in effluent (40 mg/L for conventional and 20 mg/L for tertiary)

Q_i = Volume of available dilution water

C_i = Concentration of nitrate in dilution water (0.01 mg/L)

To determine the concentration of nitrate at the property boundary (C_t), the above mass balance equation is arranged as follows:

$$C_t = \frac{QeCe + QiCi}{Qt}$$

This equation was used for the developable portion of the Site. The results of the calculations are outlined in the table below:

Table 6 Predictive Assessment of Nitrate Concentrations

Variable	Conventional Septic System	Tertiary Septic System
Number of Units	2	2
Volume of Sewage Effluent (Qe)	2,000	2,000
Concentration of nitrate in effluent Ce (mg/L)	40	30[1]
Volume of available dilution water Qi (L/day)	5,938	4,568
Concentration of nitrate in dilution water Ci (mg/L)	0.1	0.1
Total Volume Qt (L/day)	7,938	6,568
Target Nitrate Concentration at the Property Boundary Ct (mg/L)	**12.25**	**9.20**

1. *Average concentration of nitrate in effluent with conventional septic system (40 mg/L) installed for the retained lands and a tertiary septic system (20 mg/L) for the retained lands.*

Based on the predictive assessment prepared, a down-gradient nitrate concentration of 12.25 mg/L is expected with two conventional septic systems within the entire property area (i.e. one within the retained and one within the severed lands). This value is greater than the nitrate concentration limit of 10 mg/L at the property boundary and therefore is not recommended.

It is known that a conventional septic bed is currently installed for the single-family dwelling within the retained portion of the Site. Predictive assessment calculations were prepared assuming that a tertiary (Class 4) septic system was installed for the proposed severed lands, and a cumulative down-gradient nitrate concentration of 9.20 mg/L was calculated. This value is less than the nitrate concentration limit of 10 mg/L at the property boundary and is considered acceptable.

It is noted that the Procedure D-5-4 calculations are considered conservative as it does not account for attenuation from natural soil processes. For example, the nitrate loading assessment calculations predicts a down-gradient nitrate concentration of 7.27 mg/L for a conventional septic bed servicing just the single-family dwelling in the retained lands (i.e. not including a second septic bed for the severed lands and using the whole site area). However, based on the groundwater quality testing completed at drive point DP101-24, the actual down-gradient nitrate concentration is <0.06 mg/L.

5.3 Assessment of Effluent on Private Water Supply Wells

Due to the fine-grained nature of the native soils at the Site and the vertical distance between the shallow overburden aquifer and the deeper bedrock aquifers that supply wells draw from, it is not anticipated that any effluent-impacted groundwater will percolate into the water supply bedrock aquifers. Therefore, the supply wells down-gradient of the Site are not interpreted to be impacted by the proposed severance. In addition, the predictive assessment concludes that the nitrate concentrations at the down-gradient boundary will be underneath the 10 mg/L ODWQS criteria if single-family dwelling within the severed lands is serviced with a tertiary (Class 4) septic bed. Therefore, the additional wastewater requirements for the proposed severance does not pose a risk to nearby water well users.

As per the severance application drawing provided Appendix A, the proposed septic system for the severed lands would meet the Ontario Building Code minimum horizontal clearances required to the proposed water supply well (and the existing water supply well for the retained lands). This minimum horizontal clearance is intended to protect the future supply source from contamination. Additionally, it is assumed that the proposed supply well for the severed lands will also be installed within the deeper fractured bedrock aquifer(s).

6.0 Phosphorus Loading Assessment

Based on contours and proximity, Ramsey Lake (approximately 130 m north of the Site) is considered the final receiver of effluent from the septic system at the Site. As such total phosphorus is considered the contaminant of concern.

6.1 Surface Water Assessment Criteria

The Lakeshore Capacity Assessment Handbook (Handbook) was used to assess if phosphorous could be attenuated through adsorption in the soil prior to reaching the surface water bodies (Ministry of the Environment, 2010). Specifically, the method based on Robertson, W.D. (2005) and (2019) and Appendix B of the Handbook was used which includes a site-specific subsurface investigation to determine if the site conditions meet the criteria for phosphorus attenuation. The criteria are as follows:

1. Overburden must be at least 3 m deep native and undisturbed;
2. Unsaturated zone of at least 1.5 m during the shallowest extent of the water table (assessed during spring following snow melt or late fall);
3. Soils must be non-calcareous (<1% $CaCO_3$ by weight); and
4. Soils must have acid extractable concentrations of iron and aluminum (>1% equivalent by weight).

It is understood that, based on the Robertson studies (2005) (2019), 97% of phosphorus attenuation can be achieved within 10 m (proximal zone) of the leaching bed area if the above subsurface criteria are achieved.

6.2 Soils Assessment for Phosphorus Attenuation

From the test pit investigation, it was concluded that the overburden is at least 2.74 m in thickness. Percolation rates (i.e. T-Times) from the grain size analysis (Section 4.3.1) reported limited percolation potential of the soils due to their fine-grained nature. Accordingly, a fully raised septic bed design will be required. To install the fully raised septic bed, topsoil will be stripped back (ranging from 0.15 m to 0.30 m), and imported sand fill will be utilized. With the

additional thickness of the imported sand for the raised septic bed, a minimum overburden thickness of 3.0 m is achievable.

The static groundwater level reported at DP101-24 on April 12, 2024 (i.e. peak spring groundwater conditions) was 1.16 mbgs. This groundwater value is considered conservative, as DP101-24 is located immediately adjacent to the drainage watercourse at the Site where groundwater levels are assumed to be shallowest. Therefore, with the imported materials required for the raised septic bed, an unsaturated zone of 1.5 m is achievable.

Based on the laboratory soil results (Section 4.4), the soils at the Site are considered non-calcareous, with less than 1 wt% for calcium carbonate and both iron oxide and aluminum oxide concentrations exceeding 1 wt%.

Therefore, all of the criteria noted above are met for the proposed severance at the Site, and phosphorous within the effluent of the proposed septic bed within the severed lands is expected to be attenuated through adsorption in the soil on-site.

It is recommended that a wastewater engineer is retained to design the proposed septic system for the severed lands. The severed lands septic system leaching bed should be raised above existing grade and constructed with imported non-calcareous sand fill rich in aluminum and iron. This optimal sand fill and additional vertical separation will achieve additional total phosphorus attenuation within the leaching bed footprint.

7.0 Conclusions and Recommendations

The following are our conclusions based on the assessment completed:

- Phosphorus is the primary contaminant of concern to the municipal drinking water supply source in Ramsey Lake for a private septic system installed within the proposed severed lands. Nitrate is the primary contaminant of concern for the private water well supply users down-gradient of the Site.
- Subsurface conditions were generally described as a thin layer of topsoil, underlain by boulders, gravel, and sand fill materials, underlain by fine-grained soils. Shallow groundwater seepage and caving (sloughing) were observed in each test pit, ranging in depths.
- Drive-point piezometer DP101-24 was installed adjacent to TP104-24 with a static water level measurement of 1.16 mbgs.
- Based on grain size analysis data, tested samples were a fine-grained soil with percolation rates ranging from 25 min/cm to >50 min/cm indicating low transmissive soils at the Site.
- From the soil laboratory analysis, the soils are considered non-calcareous and rich in iron and aluminum.
- The nitrate loading calculations support the site severance given the severed portion sewage system incorporate Level IV tertiary treatment with a nitrate effluent of 20 mg/L (typical). The calculations indicate that the cumulative existing conventional and proposed tertiary sewage system will be 9.20 mg/L, less than the Guideline D-5-4 limit of 10 mg/L.
- Based on the review of local well records, the sewage system for the proposed severance does not pose a risk to nearby water well users, as the bedrock water supply aquifers are not determined to be the final receiver of the wastewater effluent at the Site and Ontario Building Code horizontal clearances must be met.
- Based on the soils analysis and subsurface investigation, the Lakeshore Handbook criteria for phosphorus attenuation within 10 m of the sewage system is achievable if suitable

imported sand is utilized to construct the severed lands sewage system. Therefore, there is no expected risk of additional phosphorus levels adversely impacting Ramsey Lake.

- It is recommended that a wastewater engineer is retained to design the proposed septic system for the severed lands.

8.0 Closing

We trust that the information in this submission meets your current requirements. If you have any questions regarding the contents of this report, please contact the undersigned.

Respectfully submitted,

Cambium Inc.

DocuSigned by:
6AAA0661AAA8459...

Nicole Latimer, M.Sc., GIT
Project Coordinator

DocuSigned by:
5230F648B0C64BD...

Stew Dolstra, Honours, B. Sc., Dipl. BCIN
Senior Project Manager

\\cambiumincstorage.file.core.windows.net\projects\19600 to 19699\19614-001 Jean Charles - Landowner - HydroG - 1431 Gennings St Sudbury\Deliverables\REPORT - HydroG\Final\2024-06-12 RPT, HydroG, 1434 Gennings St, Sudbury.docx

9.0 References

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10.0 Standard Limitations

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Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

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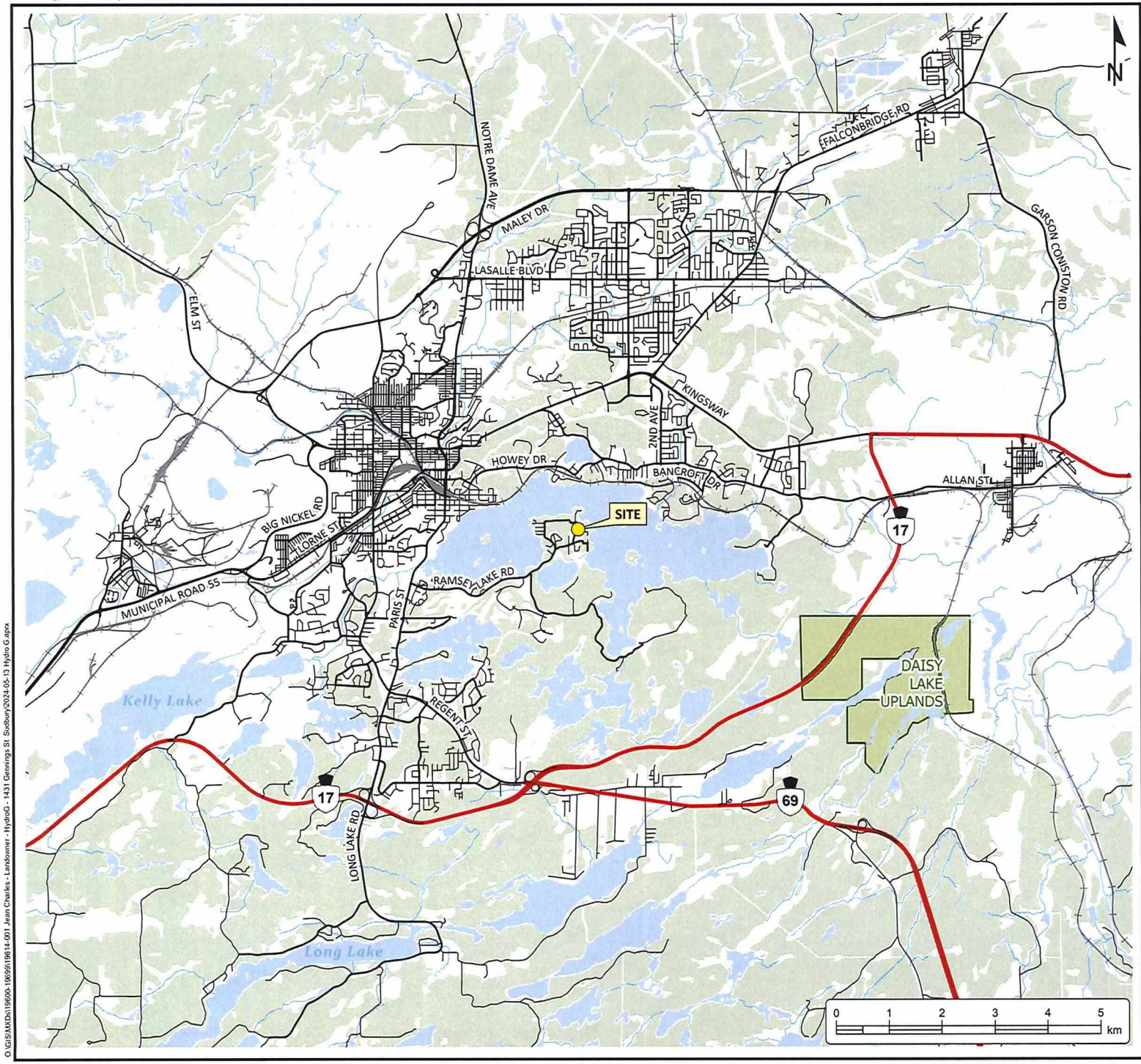
Appended Figures



HYDROGEOLOGICAL FEASIBILITY STUDY

JEAN CHARLES
1434 Gennings Street
Sudbury, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Railway
- Watercourse
- Water Area
- First Nations Reserve
- Provincial Park
- Wooded Area
- Built Up Area

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SITE LOCATION PLAN

Project No.: 19614-001		Date: May 2024	Rev.:
Scale: 1:100,000		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: NL	Figure: 1	

O:\GIS\MXD\19600-19699\19614-001 Jean Charles - Landowner - HydroG - 1431 Gennings St Sudbury\2024-05-13 Hydro G.aprx

HYDROGEOLOGICAL FEASIBILITY STUDY

JEAN CHARLES
1434 Gennings Street
Sudbury, Ontario

LEGEND

- Test Pit
- Drive Point
- Site (approximate)

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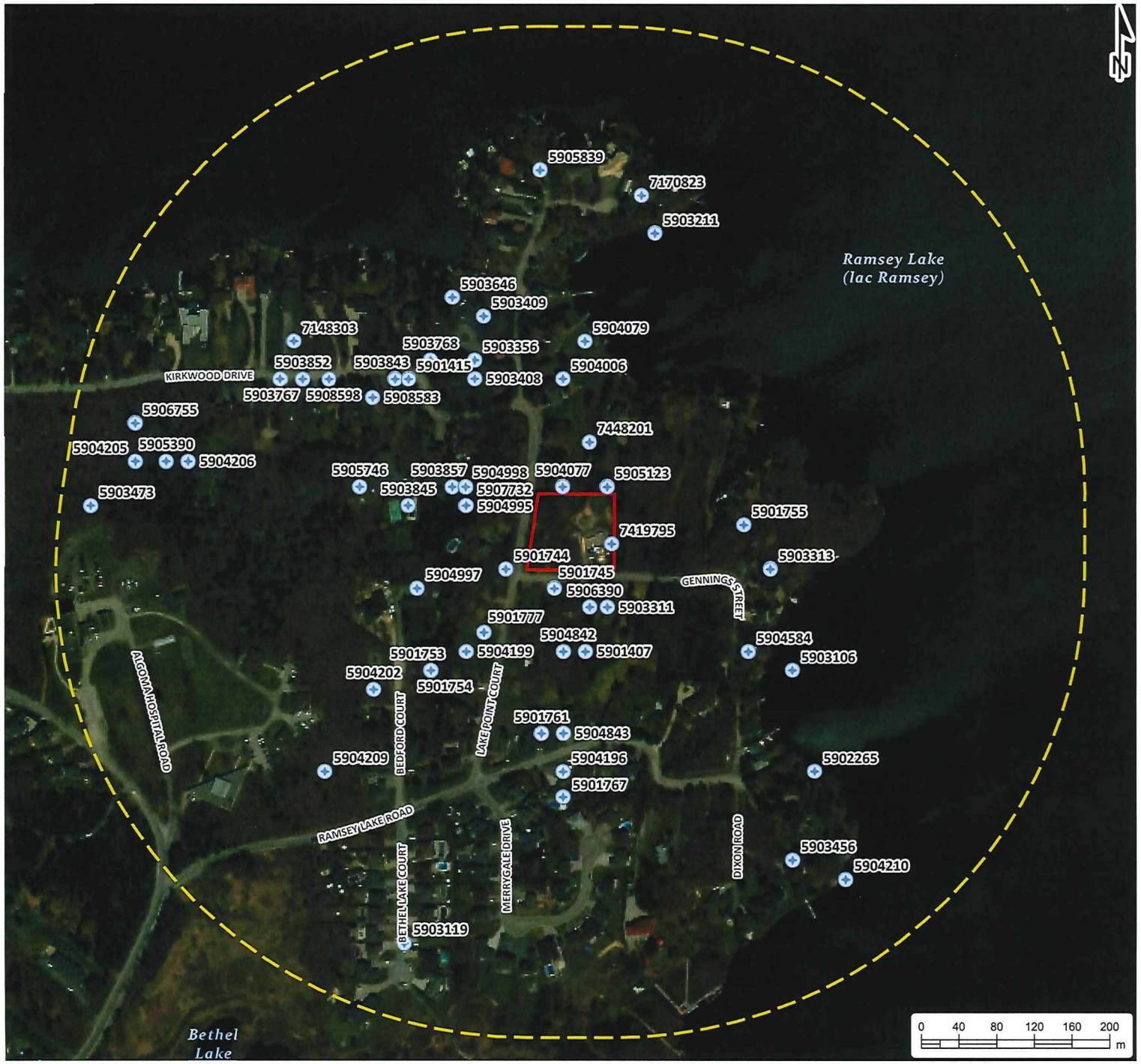
TEST PIT LOCATION PLAN

Project No.: 19614-001		Date: May 2024	
		Rev.:	
Scale: 1:750		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: NL	Figure:	2

O:\GIS\MXDs\19600-19699\19614-001 Jean Charles - Landowner - HydroG - 1431 Gennings St Sudbury\2024-05-13 Hydro G.aprx



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HYDROGEOLOGICAL FEASIBILITY STUDY

JEAN CHARLES
1434 Gennings Street
Sudbury, Ontario

LEGEND

- Water Well Record
- Study Area (500m)
- Site (approximate)

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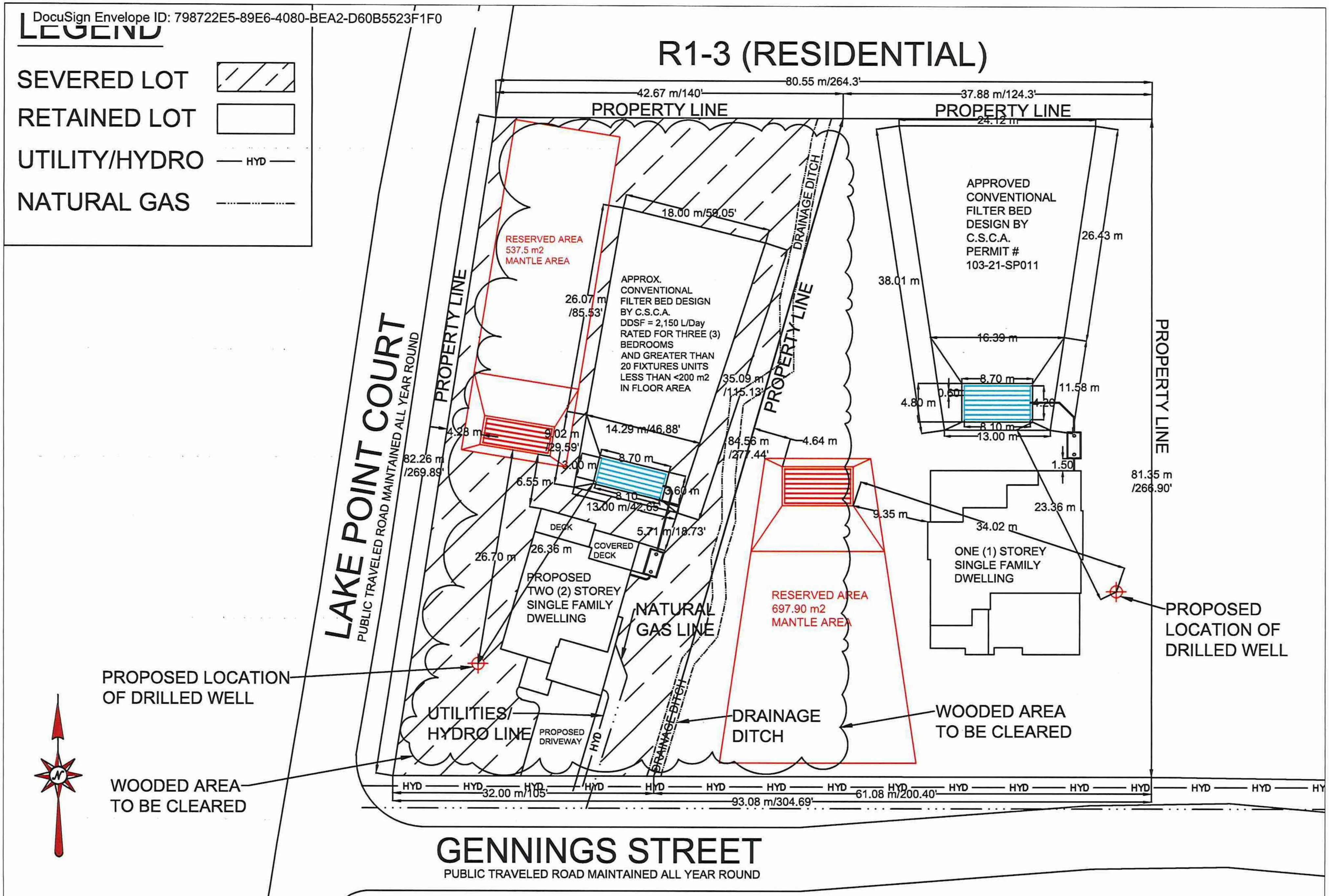
MECP WELL RECORDS WITHIN 500m

Project No.: 19614-001		Date: May 2024 Rev.:	
Scale: 1:5,750		Projection: NAD 1983 UTM Zone 17N	
Created by: DBB	Checked by: NL	Figure:	3

Appendix A

Proposed Development Plan and Land Information



Canadian Shield Consultants Agency Inc.
21 King Street W., St. Charles, ON P0M 2W0
T: (705) 867-5242 F: (705) 867-9988
Email: office@canadianshieldconsultants.com
Your turn key water & wastewater professionals

Title : Clemchar, Jean Charles - Severance Application		Address: 1434 Gennings Street, Sudbury, ON P3E 6J2
Drawn by: J.L.	Scale: Scale to fit	
Designed by: G.D.	Date: January 4, 2024	
Verified by: G.D.	Drawing: 1 of 1	

Ontario

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Make a Topographic Map

Notes:

Existing Site Conditions

Legend

- Building as Symbol
- Building to Scale
- Airport
- Heliport \ Hospital Heliport
- Seaplane Base
- Ferry Route
- Trail
- Bruce Trail
- Greenbelt Route
- Rideau Trail
- Trans Canada Trail
- Voyageur Trail
- Waterfront Trail
- Railway \ Train Station
- Railway with Bridge
- Railway with Tunnel
- Road (Major — Minor)
- Winter Road
- Road with Bridge
- Road with Tunnel
- Primary, Kings or 400 Series Highway
- Secondary Highway
- Tertiary Highway
- District, County, Regional or Municipal Road
- Toll Highway
- One Way Road
- Road with Permanent Blocked Passage
- Road with Address Ranges
- Hydro Line, Communication Line or Unknown Transmission Line
- Natural Gas Pipeline, Water Pipeline or Unknown Pipeline
- Spot Height
- Index Contour
- Contour
- Wooded Area
- Wetland
- Waterbody
- Waterbody Elevation
- Watercourse
- Falls
- Rapids
- Rapids \ Falls
- Rapids
- Rocks
- Lock Gate
- Dam \ Hydro Wall
- Dam \ Hydro Wall
- Provincial \ State Boundary
- International Boundary
- Upper Tier \ District Municipal Boundary
- Lower Tier \ Single Tier Municipal Boundary
- Lot Line
- Indian Reserve
- Provincial Park
- National Park
- Conservation Reserve
- Military Lands

0 0.2 km

Projection: Web Mercator

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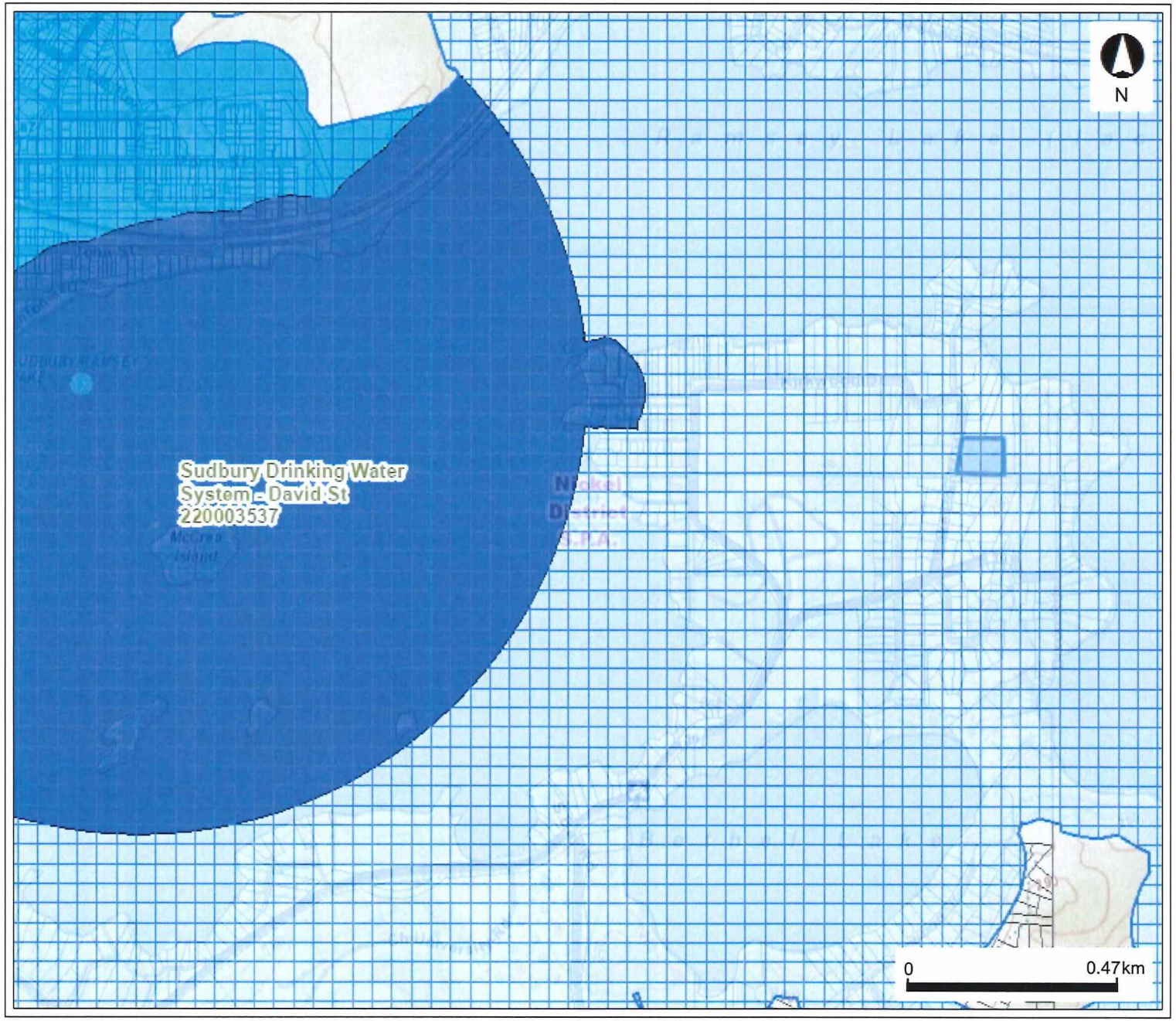
SPIA Map



Legend

- Issue Contributing Areas
- Intake Protection Zone 1
- Event Based Areas
- Intake Protection Zone 2
- Intake Protection Zone 3
- Source Protection Areas
- Assessment Parcel

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Ontario

Map Created: 5/15/2024
Map Center: 46.47812 N, -80.96803 W

Appendix B
Test Pit Logs

TEST PIT LOGS

Hydrogeological Assessment: 1434 Gennings Street, Sudbury, Ontario

Technician: NL

Cambium Reference: 19614-001

Completed: April 5, 2024

Test Pit ID	Depth (mbgs[1])	Field Soil Sample ID	Moisture Content (%)	Material Description	Lab Soil Sample ID	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	T-Time (min/cm)
TP101-24	0.00 - 0.15			TOPSOIL - with roots; black (~ 150mm thick)						
	0.15 - 0.46			FILL (SM) - SAND and SILT, with gravel and cobbles; brown; moist						
	0.46 - 0.76			(ML) - CLAYEY SILT, with sand and gravel; grey; moist						
	0.76 - 2.29	GS1	12.0	FILL (SM) - SAND and SILT, with gravel, cobbles, and boulders; brown; wet to saturated						
	2.29 - 2.74	GS2	21.4	(ML) - SILT, trace clay and sand, some organics; brown and grey mottling; wet to saturated	S-24-0778	0	4	88	8	25
17T				Groundwater seepage and caving observed at 0.76 mbgs						
503297.02 m E										
5147300.77 m N				Test pit terminated at 2.74 mbgs						
TP102-24	0.00 - 0.30			TOPSOIL - with organics and roots; black (~ 300mm thick)						
	0.30 - 1.52	GS1		FILL (GP) - GRAVEL and SAND, trace cobbles and boulders; brown; moist						
	1.52 - 1.98	GS2	18.7	(ML) - CLAYEY SILT, trace sand; brown and grey mottling; wet to saturated	S-24-0779	0	4	72	24	40
				Soil turns grey at 1.83 mbgs						
17T				Groundwater seepage and caving observed at 1.52 mbgs						
503304.90 m E										
5147328.28 m N				Test pit terminated at 1.98 mbgs						
TP103-24	0.00 - 0.91			FILL (GP) - GRAVEL, large cobble and boulders; black; moist to wet						
	0.91 - 1.52	GS1	17.1	FILL (GP) - GRAVEL, trace silt and sand; black to brown; wet to saturated						
	1.52 - 1.98	GS2	20.7	(ML) - CLAY, some silt, trace sand; brown and grey mottling; wet to saturated						
17T				Groundwater seepage observed at 0.61 mbgs						
503313.93 m E										
5147295.65 m N				Test pit terminated at 1.98 mbgs						
TP104-24	0.00 - 0.30			TOPSOIL - with organics and roots; black (~ 300mm thick)						
	0.30 - 0.61	GS1 / GS2	42.9 / 25.5	(ML) - CLAY, some silt, trace sand, some organics; brown and grey mottling; wet to saturated						
	0.61 - 1.98	GS3	35.2	(CL) - CLAY and SILT, trace sand; brown and grey mottling; wet to saturated	S-24-0780	0	1	47	52	>50
17T				Groundwater seepage observed at 0.30 mbgs						
503321.98 m E										
5147317.07 m N				Test pit terminated at 1.98 mbgs						

[1]: metres below ground surface

Appendix C
Grain Size Analysis Results

Grain Size Distribution Chart

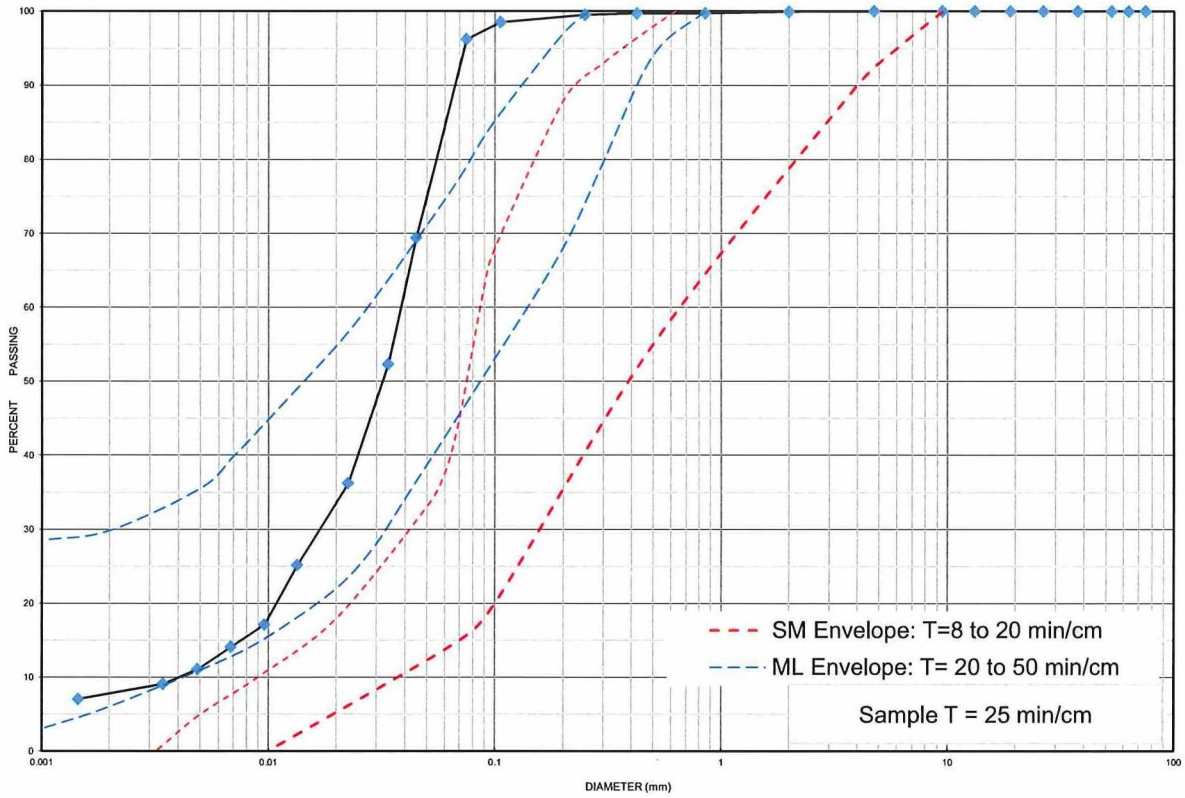
Project Number: *19614-001* **Client:** *Jean Charles*

Project Name: *1431 Gennings Street, Sudbury*

Sample Date: *April 5, 2024* **Sampled By:** *Nicole Latimer - Cambium Inc.*

Location: *TP 101-24 GS 2* **Depth:** *2.3 m to 2.6 m* **Lab Sample No:** *S-24-0778*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM									
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 101-24	GS 2	2.3 m to 2.6 m	0	4	88	8	21.4

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silt trace Clay trace Sand	ML	0.038	0.017	0.004	9.50	1.90

Additional information availabe upon request

Issued By: _____ *Date Issued:* *May 2, 2024*

(Senior Project Manager)

Cambium Inc. (Laboratory)
866.217.7900 | cambium-inc.com
194 Sophia St. | Peterborough | ON | K9H 1E5

CAMBIUM

Grain Size Distribution Chart

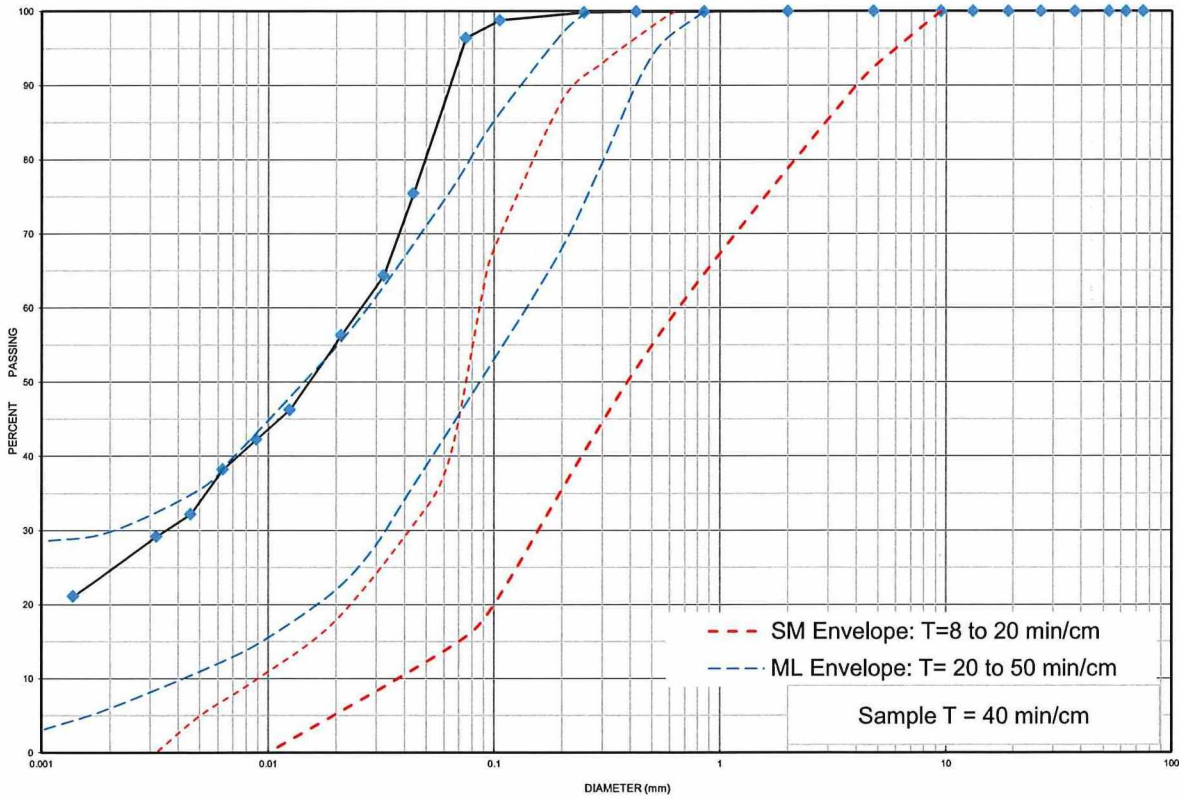
Project Number: *19614-001* **Client:** *Jean Charles*

Project Name: *1431 Gennings Street, Sudbury*

Sample Date: *April 5, 2024* **Sampled By:** *Nicole Latimer - Cambium Inc.*

Location: *TP 102-24 GS 2* **Depth:** *1.7 m to 2 m* **Lab Sample No:** *S-24-0779*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 102-24	GS 2	1.7 m to 2 m	0	4	72	24	18.7

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clayey Silt trace Sand	ML	0.0260	0.0035	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *May 2, 2024*

(Senior Project Manager)

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194 Sophia St. | Peterborough | ON | K9H 1E5

Grain Size Distribution Chart

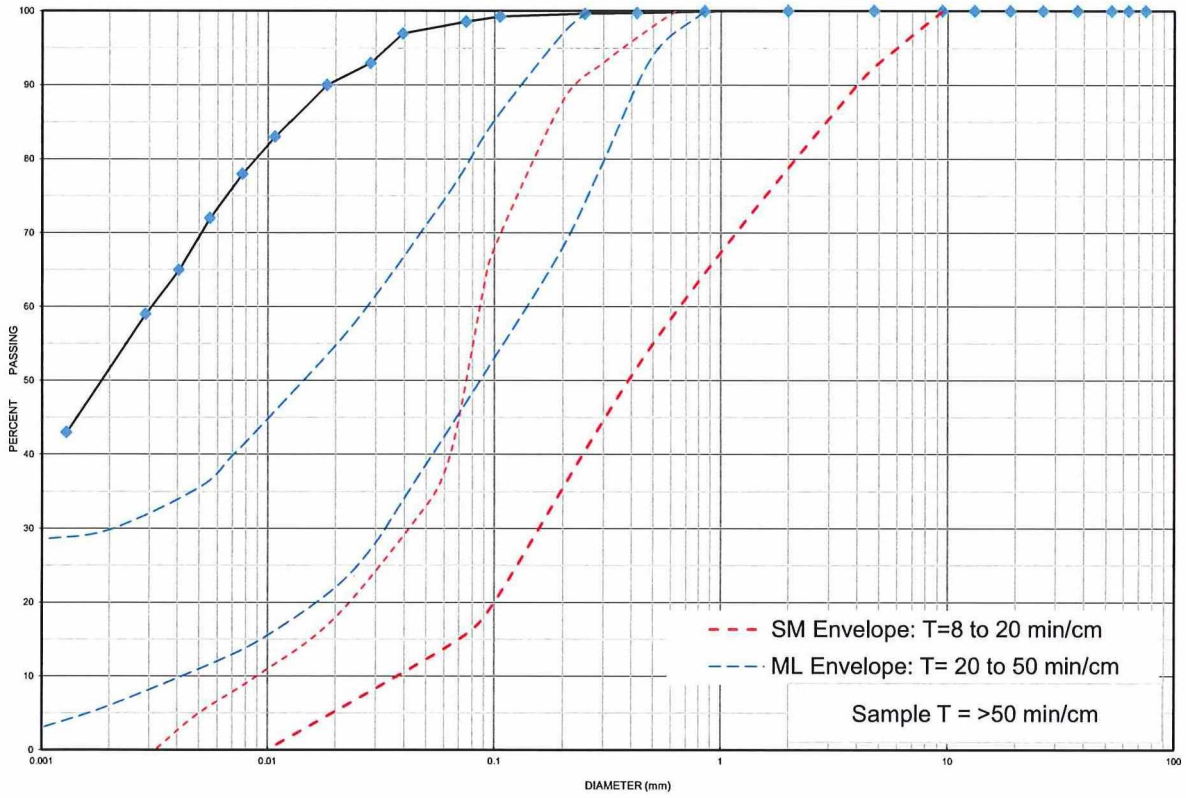
Project Number: *19614-001* **Client:** *Jean Charles*

Project Name: *1431 Gennings Street, Sudbury*

Sample Date: *April 5, 2024* **Sampled By:** *Nicole Latimer - Cambium Inc.*

Location: *TP104-24 GS 3* **Depth:** *1.2 m to 1.5 m* **Lab Sample No:** *S-24-0780*

UNIFIED SOIL CLASSIFICATION SYSTEM					
CLAY & SILT (<0.075 mm)	SAND (<4.75 mm to 0.075 mm)			GRAVEL (>4.75 mm)	
	FINE	MEDIUM	COARSE	FINE	COARSE



MIT SOIL CLASSIFICATION SYSTEM								
CLAY	SILT	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	BOULDERS
		SAND			GRAVEL			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 104-24	GS 3	1.2 m to 1.5 m	0	1	47	52	35.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Clay and Silt trace Sand	CL	0.0031	-	-	-	-

Additional information availabe upon request

Issued By: _____ *Date Issued:* *May 2, 2024*

(Senior Project Manager)

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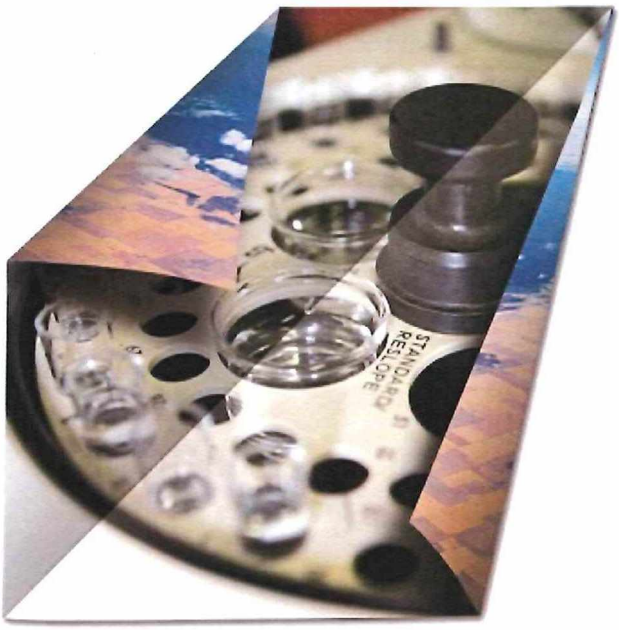
Appendix D
Soil Laboratory Results



FINAL REPORT

CA40046-APR24 R1

19614-001, 1434 Gennings St. Sudbury

Prepared for

Cambium Inc.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Cambium Inc.	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	74 Cedar Pointe Drive Barrie, ON . Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Nicole Latimer	Telephone	705-652-2143
Telephone	705-742-7900	Facsimile	705-652-6365
Facsimile	705-742-7907	Email	brad.moore@sgs.com
Email	Natalie.Wright@cambium-inc.com; file@cambium-inc.com; ESI	SGS Reference	CA40046-APR24
Project	19614-001, 1434 Gennings St. Sudbury	Received	04/06/2024
Order Number		Approved	04/11/2024
Samples	Soil (3)	Report Number	CA40046-APR24 R1
		Date Reported	04/11/2024

COMMENTS

Temperature of Sample upon Receipt: 6 degrees C
Cooling Agent Present:yes
Custody Seal Present:yes

Chain of Custody Number:035602

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: Cambium Inc.
Project: 19614-001, 1434 Gennings St. Sudbury
Project Manager: Nicole Latimer
Samplers: Nicole Latimer

MATRIX: SOIL

			Sample Number	29	30	31	
			Sample Name	TP102-24	TP103-24	TP104-24	
			Sample Matrix	Soil	Soil	Soil	
			Sample Date	05/04/2024	05/04/2024	05/04/2024	
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	
Metals and Inorganics							
Calcium	µg/g	3		3200	3400	4400	
Aluminum	µg/g	1		13000	14000	18000	
Iron	µg/g	1		17000	19000	24000	

FINAL REPORT

QC SUMMARY

Metals in Soil - Aqua-regia/ICP-MS

Method: EPA 3050/EPA 200.8 I Internal ref.: ME-CA-[ENVISPE-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Aluminum	EMS0107-APR24	ug/g	1	<1	2	20	90	70	130	127	70	130
Calcium	EMS0107-APR24	ug/g	3	<3	0	20	103	70	130	100	70	130
Iron	EMS0107-APR24	ug/g	1	<1	2	20	99	70	130	107	70	130

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

FINAL REPORT

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm.
The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Reproduction of this analytical report in full or in part is prohibited.

This report supersedes all previous versions.

-- End of Analytical Report --

DocuSign Envelope ID: 798722E5-89E6-4080-BEA2-D60B5523F1F0

SGS Request for Laboratory Services and CHAIN OF CUSTODY

No: 035602

Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Northstream
Received By (signature):
Received Date: 04/06/24 (mm/dd/yy)
Received Time: 12:00 (hr:min)
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 5.6 6
LAB LIMS #: CA400046-apr24

REPORT INFORMATION

Company: Cambium Inc.
Contact: Nicole Latimer
Address: 135 Bayfield St Suite 102 Barrie
Phone: 705-279-6374
Fax:
Email: nicole.latimer@cambium-inc.com

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #: Email titled "Bottle Order 19614-001" P.O. #:
Project #: 19614-001 Site Location/ID: 1434 Gemmy St. Sudbury

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19

☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ____ Appx. ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX
1	TP102-24	Apr 5/24	9:30	1	Soil
2	TP103-24	↓	10:30	1	↓
3	TP104-24		10:45	1	
4					
5					
6					
7					
8					
9					
10					
11					
12					

M & I: Field Filtered (Y/N); Metals & Inorganics (incl CrVI, CN, Hg, pH, EC, SAR, ion balance); Full Metals Suite (ICP metals plus B(HWS), Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, U, V, Zn, Hg, CrVI); ICP Metals only (Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Mo, Ni, Se, Ag, Tl, U, V, Zn)
SVOC: PAHs only; SVOCs (all incl PAHs, ABNs, CPs)
PCB: PCBs; Aroclor ☐; Total ☐
PHC: F1-F4 + BTEX; F1-F4 only (no BTEX)
VOC: VOCs (all incl BTEX); BTEX only
Pest: Pesticides (Organochlorine or specify other)
Other (please specify): As per email
Sewer Use: (Specify pkg:)
Water Characterization Pkg: ☐ General ☐ Extended
SPLP: Specify tests — ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN
TCLP: Specify tests — ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit

COMMENTS:

Observations/Comments/Special Instructions

Sampled By (NAME): Nicole Latimer
Signature:
Date: ____/____/____ (mm/dd/yy)

Relinquished by (NAME): Nicole Latimer
Signature:
Date: ____/____/____ (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.7
Date of Issue: 07 JUNE 2023

Lawrence, Ryan (Lakefield)

From: Nicole Latimer <Nicole.Latimer@cambium-inc.com>
Sent: March 25, 2024 11:49 AM
To: Lakefield.EHS.Courier.Request
Subject: [EXTERNAL] Bottle Order - 19614-001

Hi,

I would like to submit a bottle order for the following:

- Groundwater sampling (One Set)
  - Nitrate
  - Nitrite
  - Ammonia
  - Total phosphorus
  - Dissolved phosphorus
    - Should DP be field filtered or lab filtered?
- Soil sampling (Three sets)
  - Calcium
  - Aluminum
  - Iron

Can these bottles please be shipped to our Cambium Barrie office (135 Bayfield St, Suite 102, Barrie, ON) and have them arrive by noon on April 2nd at the latest, please?

Analysis will be charged to 19614-001.

Thanks,
Nicole

Nicole Latimer, GIT
Project Coordinator/GIT
Cambium - Barrie
705.279.6374
866.217.7900
cambium-inc.com

Environmental | Building Sciences | Geotechnical | Construction Testing & Inspection

Appendix E

Groundwater Quality Results

FINAL REPORT

CA14590-APR24 R1

19614-001, 1434 Gennings St. Sudbury

Prepared for

Cambium Inc.

FINAL REPORT

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Cambium Inc.	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	135 Bayfield St. Suite 102 Barrie, ON . Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Nicole Latimer	Telephone	705-652-2143
Telephone	705-279-6374	Facsimile	705-652-6365
Facsimile		Email	brad.moore@sgs.com
Email	nicole.latimer@cambium-inc.com; file@cambium-inc.com; esd:	SGS Reference	CA14590-APR24
Project	19614-001, 1434 Gennings St. Sudbury	Received	04/13/2024
Order Number		Approved	04/22/2024
Samples	Ground Water (1)	Report Number	CA14590-APR24 R1
		Date Reported	04/22/2024

COMMENTS

Note: Unionized ammonia calculated using lab results for pH and temperature.

Temperature of Sample upon Receipt: 2 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes
Chain of Custody Number: 035603

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

FINAL REPORT

Client: Cambium Inc.
Project: 19614-001, 1434 Gennings St. Sudbury
Project Manager: Nicole Latimer
Samplers: Nicole Latimer

MATRIX: WATER

Sample Number	6
Sample Name	DP101-24
Sample Matrix	Ground Water
Sample Date	12/04/2024

Parameter	Units	RL	Result
General Chemistry			
Ammonia+Ammonium (N)	as N mg/L	0.1	< 0.1
Metals and Inorganics			
Nitrite (as N)	as N mg/L	0.03	< 0.03
Nitrate (as N)	as N mg/L	0.06	< 0.06
Nitrate + Nitrite (as N)	as N mg/L	0.06	< 0.06
Phosphorus (dissolved)	mg/L	0.003	0.041
Phosphorus (total)	mg/L	0.003	0.145

FINAL REPORT

QC SUMMARY

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0206-APR24	as N mg/L	0.1	<0.1	ND	10	104	90	110	101	75	125

Anions by IC

Method: EPA300/MA300-Ions1.3 I Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nitrate + Nitrite (as N)	DIO0330-APR24	mg/L	0.06	<0.06	NA		NA			NA		
Nitrite (as N)	DIO0330-APR24	mg/L	0.03	<0.03	ND	20	98	90	110	94	75	125
Nitrate (as N)	DIO0330-APR24	mg/L	0.06	<0.06	ND	20	98	90	110	101	75	125

FINAL REPORT

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	EMS0156-APR24	mg/L	0.003	<0.003	2	20	97	90	110	NV	70	130

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

DocuSign Envelope ID: 798722E5-89E6-4080-BEA2-D60B5523F1F0

SGS Request for Laboratory Services and CHAIN OF CUSTODY

No: 035603

Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Siri Romard
Received Date: 04/13/24 (mm/dd/yy)
Received Time: 12:00 (hr : min)
Received By (signature): ____
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ICE PACK
Temperature Upon Receipt (°C): 1.2.2
LAB LIMS #: CA-14590-APR24 SR.

REPORT INFORMATION	INVOICE INFORMATION
Company: Cambium Inc.	☒ (same as Report Information)
Contact: Nicole Latimer	Company:
Address: 135 Bayfield St Suite 102 Barrie	Contact:
Phone: 705-279-6379	Address:
Fax:	Phone:
Email: Nicole.latimer@queensu.ca	Email:

Quotation #: email titled "Bottle Order - 19614-001" #:
Project #: 19614-001
Site Location/ID: 1434 Gennings St, Sudbury

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date: ____

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ____ Appx ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA ____
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality: ____

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	M&I: Field Filtered (Y/N)	M&I: Metals & Inorganics	M&I: Full Metals Suite	M&I: ICP Metals only	SVOC: PAHs only	SVOC: SVOCs	PCB: PCBs	PHC: F1-F4 + BTEX	PHC: F1-F4 only	VOC: VOCs	VOC: BTEX only	Pest: Pesticides	Other: Nitrate + Nitrite	Other: Ammonia	Other: Total + Dissolved phosphorus	Other: Sewer Use	Other: Water Characterization Pkg	SPLP: Specify tests	TCLP: Specify tests	COMMENTS:
1	DP101-24	24/04/12	1:30	4	GW	N												X	X	X					lab filter dissolved phosphorus
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									

Observations/Comments/Special Instructions

Sampled By (NAME): Nicole Latimer	Signature:	Date: 04/12/24 (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): Nicole Latimer	Signature:	Date: 04/12/24 (mm/dd/yy)	Yellow & White Copy - SGS

Revision #: 1.7
Date of Issue: 27 JUNE 2020

Appendix F

MECP Well Records

Water Well Records Summary Report

Produced by Cambium Inc. using MOECP Water Well Information System (WWIS)

All units in meters unless otherwise specified

Well ID: 5901407
Construction Date: 1959-08-04

Easting: 503335
Northing: 5147155

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	42.7	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	39.6	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	3 : 0
Static Level:	4				

Layer:	Driller's Description:	Top:	Bottom:
1	QUICKSAND	0	4.57
2	QUARTZITE	4.57	42.7

Well ID: 5901415
Construction Date: 1956-12-12

Easting: 503154
Northing: 5147455

UTM Zone 17
Positional Accuracy: unknown UTM

Well Depth:	54.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	
Water First Found:	53.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	MEDIUM SAND	0	3.05
2	ROCK	3.05	54.9

Well ID: 5901744
Construction Date: 1961-11-07

Easting: 503250
Northing: 5147260

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	18.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	18	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	4 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	1.83
2	ROCK	1.83	18.9

Well ID: 5901745
Construction Date: 1961-11-07

Easting: 503305
Northing: 5147235

UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	16.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	15.5	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	8 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	GRAVEL	4.57	5.18
3	ROCK	5.18	16.1

Well ID: 5901753
Construction Date: 1962-05-28
Easting: 503175
Northing: 5147150
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	22.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	27
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	27
Water First Found:	5.18	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	5 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	GRANITE	0	22.9
1	GRANITE	0	22.9
1	GRANITE	0	22.9

Well ID: 5901754
Construction Date: 1962-11-19
Easting: 503175
Northing: 5147135
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	22.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	23
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	5.18	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	6 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	MEDIUM SAND	0	0.61
1	MEDIUM SAND	0	0.61
1	MEDIUM SAND	0	0.61
2	GRANITE	0.61	22.9
2	GRANITE	0.61	22.9
2	GRANITE	0.61	22.9

Well ID: 5901755
Construction Date: 1962-10-04
Easting: 503510
Northing: 5147295
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	17.1	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	14.6	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 0
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	GRANITE	0	17.1

Well ID: 5901761
Construction Date: 1962-11-19
Easting: 503290
Northing: 5147075
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	15.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	14.6	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.05
2	GRAVEL	3.05	4.57
3	ROCK	4.57	15.9

Well ID: 5901767
Construction Date: 1964-11-02
Easting: 503315
Northing: 5147010
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	43.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	43.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	10 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.96
2	GRANITE	3.96	43.9

Well ID: 5901777
Construction Date: 1966-08-22
Easting: 503235
Northing: 5147185
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	50.3	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	18
Water First Found:	48.8	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	1				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	ROCK	4.57	50.3

Well ID: 5902265
Construction Date: 1969-12-05
Easting: 503585
Northing: 5147025
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	17.4	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):		**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	14.6	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	3 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	SILT	0	1.52
1	SILT	0	1.52
2	GRANITE	1.52	17.4
2	GRANITE	1.52	17.4

Well ID: 5903106
Construction Date: 1973-11-30
Easting: 503563
Northing: 5147133
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	45.7	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	38.1	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	8 : 0
Static Level:	8				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
2	ROCK	1.22	45.7

Well ID: 5903119
Construction Date: 1973-11-30
Easting: 503150
Northing: 5146859
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	25.9	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	18
Water First Found:	16.8	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:

1	CLAY	0	2.44
2	ROCK	2.44	25.9

Well ID: 5903211
Construction Date: 1974-04-02

Easting: 503408
Northing: 5147613

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 13.7
Well Diameter (cm): 15.2
Water First Found: 12.2
Static Level: 3

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 9
Recommended Pump Rate: 9
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	CLAY	4.27	4.57
3	GRANITE	4.57	13.7

Well ID: 5903311
Construction Date: 1975-03-11

Easting: 503364
Northing: 5147218

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 22.9
Well Diameter (cm): 15.2
Water First Found: 19.8
Static Level: 3

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 5
Recommended Pump Rate: 5
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	GRANITE	4.27	22.9

Well ID: 5903313
Construction Date: 1975-03-11

Easting: 503538
Northing: 5147266

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 29
Well Diameter (cm): 15.2
Water First Found: 18.3
Static Level: 11

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 0
Recommended Pump Rate: 0
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	GRAVEL	0	0.61
2	GRANITE	0.61	29

Well ID: 5903356
Construction Date: 1975-06-23

Easting: 503224
Northing: 5147465

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 52.1
Well Diameter (cm): 5.08
Water First Found: 50.6
Static Level: 2

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 55
Recommended Pump Rate: 45
Pumping Duration (h:m): 3 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.83
2	GRANITE	1.83	50
3	GRANITE	50	52.1

Well ID: 5903408
Construction Date: 1975-09-29
Easting: 503218
Northing: 5147464
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	61	**Water Kind**	FRESH	**Pump Rate (LPM):**	14
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	52.1	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 30
Static Level:	4				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.57
2	GRANITE	4.57	44.2
3	GRANITE	44.2	61

Well ID: 5903409
Construction Date: 1975-09-29
Easting: 503228
Northing: 5147513
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	51.5	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	18
Water First Found:	50.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 30
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.35
2	GRANITE	3.35	43.3
3	GRANITE	43.3	51.5

Well ID: 5903456
Construction Date: 1975-12-09
Easting: 503551
Northing: 5146929
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	39.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	45
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	45
Water First Found:	38.1	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	4				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.74
2	GRANITE	2.74	39.6

Well ID: 5903473
Construction Date: 1975-12-11
Easting: 502814
Northing: 5147325
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	39.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	
Well Diameter (cm):	10.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	
Water First Found:		**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	
Static Level:					

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.83
1	SAND	0	1.83
2	GRANITE	1.83	39.6
2	GRANITE	1.83	39.6

Well ID: 5903646
Construction Date: 1976-11-25

Easting: 503194
Northing: 5147545

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	26.8	**Water Kind**	FRESH	**Pump Rate (LPM):**	36
Well Diameter (cm):	5.08	**Final Status**	Water Supply	**Recommended Pump Rate:**	32
Water First Found:	25.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 30
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.22
2	GRANITE	1.22	26.8

Well ID: 5903767
Construction Date: 1977-08-08

Easting: 503014
Northing: 5147445

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	22.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	45
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	45
Water First Found:	20.4	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	2.13
2	CLAY	2.13	3.35
3	GRAVEL	3.35	3.66
4	GRANITE	3.66	22.6

Well ID: 5903768
Construction Date: 1977-08-08

Easting: 503174
Northing: 5147465

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	19.8	**Water Kind**	FRESH	**Pump Rate (LPM):**	23
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	16.8	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	2.13
2	CLAY	2.13	3.66
3	GRANITE	3.66	19.8

Well ID: 5903843
Construction Date: 1978-01-10

Easting: 503134
Northing: 5147445

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	20.4	**Water Kind**	FRESH	**Pump Rate (LPM):**	36
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	18.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.74
2	GRANITE	2.74	20.4

Well ID: 5903845
Construction Date: 1978-01-10
Easting: 503154
Northing: 5147325
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	22.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	18
Water First Found:	20.1	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 30
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	3.35
2	GRANITE	3.35	22.6

Well ID: 5903852
Construction Date: 1978-01-10
Easting: 503034
Northing: 5147445
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	16.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	23
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	14.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	0.91
2	CLAY	0.91	2.74
3	GRANITE	2.74	16.1

Well ID: 5903857
Construction Date: 1977-10-15
Easting: 503194
Northing: 5147345
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	29	**Water Kind**	FRESH	**Pump Rate (LPM):**	14
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	14
Water First Found:	21.0	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 15
Static Level:	4				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	0.30
2	CLAY	0.30	4.27
3	GRAVEL	4.27	4.57
4	GRANITE	4.57	29

Well ID: 5904006
Construction Date: 1978-11-22
Easting: 503315
Northing: 5147445
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	59.4	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	51.8	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 0
Static Level:	8				

Layer:	Driller's Description:	Top:	Bottom:
1	GRANITE	0	59.4
1	GRANITE	0	59.4

Well ID: 5904077
Construction Date: 1979-02-28
Easting: 503315
Northing: 5147345
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	29	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	12.7	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	28.0	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	16.8
1	CLAY	0	16.8
2	QUARTZ	16.8	29
2	QUARTZ	16.8	29

Well ID: 5904079
Construction Date: 1979-02-28
Easting: 503335
Northing: 5147485
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	24.4	**Water Kind**	FRESH	**Pump Rate (LPM):**	23
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	10.7	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.88
1	CLAY	0	4.88
2	QUARTZ	4.88	24.4
2	QUARTZ	4.88	24.4

Well ID: 5904196
Construction Date: 1980-01-11
Easting: 503315
Northing: 5147025
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	29	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	14
Water First Found:	25.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.74
2	GRANITE	2.74	29

Well ID: 5904199
Construction Date: 1980-01-11
Easting: 503215
Northing: 5147175
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	21.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	18.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	2.13
2	GRANITE	2.13	21.6

Well ID: 5904202
Construction Date: 1980-01-11
Easting: 503114
Northing: 5147125
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	35.1	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	26.5	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	2.13
2	GRANITE	2.13	35.0

Well ID: 5904205
Construction Date: 1980-01-14
Easting: 502864
Northing: 5147375
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	22.6	**Water Kind**	FRESH	**Pump Rate (LPM):**	23
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	14
Water First Found:	21.0	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.66
2	GRANITE	3.66	22.6

Well ID: 5904206
Construction Date: 1980-01-14
Easting: 502914
Northing: 5147375
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	16.5	**Water Kind**	FRESH	**Pump Rate (LPM):**	18
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	18
Water First Found:	14.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.44
2	GRANITE	2.44	16.5

Well ID: 5904209
Construction Date: 1980-01-11
Easting: 503064
Northing: 5147025
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	35.1	**Water Kind**	Not stated	**Pump Rate (LPM):**	36
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	32
Water First Found:	32	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	4				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	2.13
1	SAND	0	2.13
1	SAND	0	2.13
1	SAND	0	2.13
2	GRANITE	2.13	35.0
2	GRANITE	2.13	35.0
2	GRANITE	2.13	35.0
2	GRANITE	2.13	35.0

Well ID: 5904210
Construction Date: 1980-01-11
Easting: 503615
Northing: 5146925
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 29
Well Diameter (cm): 15.2
Water First Found: 27.4
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 32
Recommended Pump Rate: 32
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.83
2	GRANITE	1.83	29

Well ID: 5904584
Construction Date: 1982-04-23
Easting: 503515
Northing: 5147175
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 41.2
Well Diameter (cm):
Water First Found: 27.4
Static Level: 12
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 36
Recommended Pump Rate: 36
Pumping Duration (h:m): :

Layer:	Driller's Description:	Top:	Bottom:
1	FILL	0	1.52
1	FILL	0	1.52
1	FILL	0	1.52
1	FILL	0	1.52
2	GRANITE	1.52	41.2
2	GRANITE	1.52	41.2
2	GRANITE	1.52	41.2
2	GRANITE	1.52	41.2

Well ID: 5904842
Construction Date: 1984-01-17
Easting: 503315
Northing: 5147175
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 38.1
Well Diameter (cm): 15.2
Water First Found: 22.9
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	1.83
2	GRANITE	1.83	38.1

Well ID: 5904843
Construction Date: 1984-01-17
Easting: 503315
Northing: 5147075
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth: 44.2
Well Diameter (cm): 15.2
Water First Found: 41.2
Static Level: 3
Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic
Pump Rate (LPM): 9
Recommended Pump Rate: 9
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	GRAVEL	4.27	4.57
3	GRANITE	4.57	44.2

Well ID: 5904995
Construction Date: 1985-04-03
Easting: 503215
Northing: 5147325
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	50.3	**Water Kind**	FRESH	**Pump Rate (LPM):**	114
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	114
Water First Found:	44.2	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	8				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
2	GRANITE	1.22	50.3

Well ID: 5904997
Construction Date: 1985-04-03
Easting: 503164
Northing: 5147225
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	47.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	136
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	136
Water First Found:	18.3	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	2 : 0
Static Level:	3				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
1	SAND	0	1.22
1	SAND	0	1.22
1	SAND	0	1.22
2	GRANITE	1.22	47.2
2	GRANITE	1.22	47.2
2	GRANITE	1.22	47.2
2	GRANITE	1.22	47.2

Well ID: 5904998
Construction Date: 1985-04-03
Easting: 503215
Northing: 5147355
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	56.4	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	51.8	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.66
2	GRAVEL	3.66	5.18
3	GRANITE	5.18	56.4

Well ID: 5905123
Construction Date: 1986-02-03
Easting: 503359
Northing: 5147340
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	44.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	30.5	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	GRANITE	0	44.2

Well ID: 5905390
Construction Date: 1987-06-15
Easting: 502895
Northing: 5147374
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	44.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	5
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	5
Water First Found:	25.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	2				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.22
2	GRANITE	1.22	44.2

Well ID: 5905746
Construction Date: 1988-10-04
Easting: 503098
Northing: 5147349
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	38.1	**Water Kind**	FRESH	**Pump Rate (LPM):**	73
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	36
Water First Found:	25.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:					

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	6.1
2	GRANITE	6.1	38.1

Well ID: 5905839
Construction Date: 1989-05-16
Easting: 503291
Northing: 5147686
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	44.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	45
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	45
Water First Found:	7.62	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	0.61
1	SAND	0	0.61
2	GRANITE	0.61	44.2
2	GRANITE	0.61	44.2

Well ID: 5906390
Construction Date: 1991-08-15
Easting: 503346
Northing: 5147202
UTM Zone 17
Positional Accuracy: margin of error : 100 m - 300 m

Well Depth:	44.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	68
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	68
Water First Found:	38.4	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	4.27
2	GRANITE	4.27	44.2

Well ID: 5906755
Construction Date: 1993-06-07
Easting: 502863
Northing: 5147421
UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	50.3	**Water Kind**	FRESH	**Pump Rate (LPM):**	9
Well Diameter (cm):	15.2	**Final Status**	Water Supply	**Recommended Pump Rate:**	9
Water First Found:	42.7	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	1				

Layer:	Driller's Description:	Top:	Bottom:

1	SAND	0	5.79
2	GRANITE	5.79	50.3

Well ID: 5907732
Construction Date: 1999-09-01

Easting: 503216
Northing: 5147347

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 44.2
Well Diameter (cm): 15.2
Water First Found: 30.5
Static Level: 4

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 14
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 :

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	3.66
1	CLAY	0	3.66
2	GRANITE	3.66	44.2
2	GRANITE	3.66	44.2

Well ID: 5908583
Construction Date: 2005-09-08

Easting: 503108
Northing: 5147440

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 55.5
Well Diameter (cm): 15.9
Water First Found: 17.4
Static Level: 4

Water Kind FRESH
Final Status Water Supply
Primary Water Use: Domestic

Pump Rate (LPM): 23
Recommended Pump Rate: 23
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	CLAY	0	2.44
1	CLAY	0	2.44
2	SAND	2.44	3.66
2	SAND	2.44	3.66
3	GRANITE	3.66	55.5
3	GRANITE	3.66	55.5

Well ID: 5908598
Construction Date: 2005-10-05

Easting: 503067
Northing: 5147459

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth: 73.8
Well Diameter (cm): 15.9
Water First Found: 48.8
Static Level: 10

Water Kind FRESH
Final Status
Primary Water Use:

Pump Rate (LPM): 45
Recommended Pump Rate: 14
Pumping Duration (h:m): 1 : 0

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	5.49
1	SAND	0	5.49
2	GRAVEL	5.49	6.1
2	GRAVEL	5.49	6.1
3	GRANITE	6.1	73.8
3	GRANITE	6.1	73.8

Well ID: 7148303
Construction Date: 2010-07-15

Easting: 503028
Northing: 5147498

UTM Zone 17
Positional Accuracy: margin of error : 30 m - 100 m

Well Depth:	76.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	14
Well Diameter (cm):	15.9	**Final Status**	Water Supply	**Recommended Pump Rate:**	14
Water First Found:	56.7	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	5				

Layer:	Driller's Description:	Top:	Bottom:
1	SAND	0	1.83
2	GRANITE	1.83	76.2

Well ID: 7170823
Construction Date: 2011-11-01

Easting: 503401
Northing: 5147643

UTM Zone 17
Positional Accuracy: margin of error : 10 - 30 m

Well Depth:	76.2	**Water Kind**	FRESH	**Pump Rate (LPM):**	14
Well Diameter (cm):	15.9	**Final Status**	Water Supply	**Recommended Pump Rate:**	23
Water First Found:	54.9	**Primary Water Use:**	Domestic	**Pumping Duration (h:m):**	1 : 0
Static Level:	7				

Layer:	Driller's Description:	Top:	Bottom:
1	TOPSOIL	0	3.35
2		3.35	76.2

Appendix G
Nitrate Loading Calculations

CAMBIUM

Water Balance Calculations

THORNTHWAITE-TYPE MONTHLY WATER-BALANCE MODEL

modified from Dingman 2015: Box 6-8 (pg 299) using ET model of Hamon (1963)

	Input Data				Computed Values						Surplus	429	mm/yr
Weather Station Location: Sudbury, ON					**Latitude:**	**46.4 degree**							
Solar Declination (degree)	-20.6	-12.6	-1.5	10.0	19.0	23.1	21.0	13.4	2.6	-9.0	-18.5	-23.0	
DayLength (hr)*	8.9	10.2	11.8	13.4	14.8	15.5	15.2	13.9	12.4	10.7	9.3	8.5	
Available Water Storage Capacity	0.20 m/m				**Root Depth**	1500 mm			**SOILmax**	300.0 mm			

MONTHLY WATER BALANCE DATA

Temperatures in C, water-balance terms in mm.

Month:	J	F	M	A	M	J	J	A	S	O	N	D	Year
TEMPERATURE (T)	-13.0	-10.8	-4.9	3.8	11.1	16.5	19.1	18.0	13.0	6.0	-1.0	-8.6	
PRECIPITATION (P)	62.2	51.1	60.5	65.7	83.4	80.3	76.9	85.4	101.1	90.9	78.5	67.5	904
RAIN	11.9	7.2	27.9	49.7	81.4	80.3	76.9	85.5	101.0	84.9	52.3	16.6	676
SNOW	50	44	33	16	2	0	0	0	0	6	26	51	228
MELT FACTOR (F)	0.00	0.00	0.00	0.63	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	
PACK	127	171	204	81	0	0	0	0	0	0	26	77	
MELT	0	0	0	139	83	0	0	0	0	6	0	0	228
INPUT (W)	12	7	28	189	164	80	77	85	101	91	52	17	904
POTENTIAL ET (PET)	0	0	0	35	64	90	106	91	58	33	0	0	478
NET INPUT (ΔW)	12	7	28	154	100	-10	-29	-6	43	58	52	17	
SOIL MOISTURE (SOIL)	300	300	300	300	300	290	263	258	300	300	300	300	
ΔSOIL	0	0	0	0	0	-10	-27	-5	42	0	0	0	
ET	0	0	0	35	64	90	104	91	58	33	0	0	474
SURPLUS=W-ET-DSOIL	12	7	28	154	100	0	0	0	1	58	52	17	429

Notes:

Precipitation, Rain, Temperature, and Latitude are inputted parameters

SOILmax = available water storage capacity * root depth

m = month

D = Day length (hrs) $=2*\cos^{-1}(-\tan(\text{Latitude})*\tan(\text{Declination}))/0.2618$ [calculation is in radians]

$SNOW_m = P_m - RAIN_m$

$F_m = 0$ if $T_m <= 0^oC$; $F_m = 0.167*T_m$ if $0^oC<T_m<6^oC$; $F_m = 1$ if $T_m>=6^oC$

$PACK_m = (1-F_m)*(SNOW_m+PACK_{m-1})$

$MELT = F_m*(SNOW_m+PACK_{m-1})$

$W_m = RAIN_m+MELT_m$.

PET = 0 if $T_m<0$; otherwise $PET = 2.98*0.611*\exp(17.3*T_m/(T_m+237))/(T_m+237.2)$*Number of days in month [Hamon ET model (1963)]

$\Delta W_m = W_m - PET_m$

$SOIL = \min\{[\Delta W_m+SOIL_{m-1}], SOILmax\}$, if $\Delta Wm>0$; otherwise $SOIL = SOIL_{m-1}* \exp(\Delta W/SOILmax)$

$\Delta SOIL = SOIL_{m-1}-SOIL_m$

ET = PET if W_m > PET; otherwise, $ET=W_m-\Delta SOIL$

CAMBIUM

Nitrate Attenuation

Calculations for Rural Developments - Conventional Septic

Input Data

Computed Values

Areas	Retained Lot	Severed Lot	Total
LOT AREA (m^2)	4734	3038	7772

Surplus water

0.429 m/yr
0.00118 m/day
9.136136 m^3/day

Infiltration Factor

Rolling	0.2
Clayey silt, trace sand	0.15
Cultivated land/ Woodland	0.15
Total	0.5

Infiltrated water

0.000588 m/day
4.568068 m^3/day

Runoff 4.568068176 m^3/day

PREDICTED NITRATE CONCENTRATIONS

Concentrations at Individual Lot Boundaries

	Retained	Severed	Existing
Qe	1000	1000	1000
Ce	40	40	40
Qi	2782.45	1785.61	4568.07
Ci	0.1	0.1	0.1
Qt	3782.45	2785.61	5568.07
mg/L	**10.65**	**14.42**	**7.27**

Combined Concentrations at Property Boundaries

	Both
	2000
	40
	4568.068
	0.1
	6568.068
	12.25

CAMBIUM

Nitrate Attenuation

Calculations for Rural Developments - Tertiary (Level IV) Septic

Input Data | Computed Values

Areas	Retained Lot	Severed Lot	Total
LOT AREA (m^2)	4734	3038	7772

Surplus water

0.429	m/yr
1.18E-03	m/day
9.136136	m^3/day

Infiltration Factor

Rolling	0.2
Clayey Silt	0.15
Cultivated land/ Woodland	0.15
Total	0.5

Infiltrated water

0.000588	m/day
4.568068	m^3/day

Runoff 4.568068176 m^3/day

PREDICTED NITRATE CONCENTRATIONS

Concentrations at Individual Lot Boundaries

	Retained	Severed
Qe	1000	1000
Ce	40	20
Qi	2782.45	1785.61
Ci	0.1	0.1
Qt	3782.45	2785.61
mg/L	**10.65**	**7.24**

Combined Concentrations at Property Boundaries

	Both
Qe	2000
Ce	30
Qi	4568.068
Ci	0.1
Qt	6568.068
	9.2