

McClintock Septage Site Expansion Preliminary Investigation Report

Cambium Reference No.: 5565-001

January 31, 2017

Prepared for: The Corporation of the Township of Algonquin Highlands



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1.0 INTRODUCTION

The Corporation of the Township of Algonquin Highlands (Township) retained Cambium Inc. (Cambium) to complete an assessment in support of a proposed expansion of the Municipality's Hauled Sewage Disposal Site (Site), which is known as the McClintock Septage Lagoon.

The Site operates under the amended Ontario Ministry of the Environment and Climate Change (MOECC) Environmental Compliance Approval (ECA) No. 3746-8RRM8C (Appendix A), which came into effect on March 14, 2012. As per the ECA, the maximum allowable volume of septage to be received in a given year is 2,470 cubic metres (m³).

The objective of this assessment was to determine the viability of constructing and operating septage dewatering trenches at the Site based on a review of existing documentation, an intrusive soil investigation, and subsequent sewage loading calculations. Furthermore, as the existing Site is currently not large enough to support an expansion and all adjacent lands are owned by the Crown (Ministry of the Natural Resources and Forestry (MNRF)), this assessment was completed to prepare a conceptual septage trench design for the Site to determine the size of property required to allow for the construction of the trenches.

1.1 SITE LOCATION

The McClintock Septage Lagoon is located on Part 1, Plan 19R-4134 and Parts 1 & 2, Plan 19R-7214 (known as Part of Lots 14 & 15, Concession 2, in the geographic township of McClintock), Township of Algonquin Highlands, County of Haliburton, approximately eight (8) kilometres (km) northeast of the Hamlet of Dorset (Figure 1). Access is gained to the Site from 1068 Wes Clarke Trail, which is located approximately 400 metres (m) east of McClintock Road. The existing Site is approximately 3.33 hectares in area and is secured by a solar powered card-lock system on the gate (installed in 2014). The geospatial coordinates for the access point to the Site are: Zone 17T 669178E 5018619N.

1.2 SCOPE OF WORK

The Municipality is proposing an expansion of the Site to accommodate additional hauled sewage (septage) capacity by installing dewatering trenches. In order to increase the capacity of the Site an application to amend the ECA is required. As per the MOECC documents entitled *Introductory Guide to Applying for an Environmental Compliance Approval* (Ministry of the Environmental, 2012) and *Guide to Disposal of Septage in Dewatering Trenches* (Ministry of the Environment, 2008), the following supporting documentation is required to accompany all ECA applications for sewage works, at a minimum:



- Operational Plan including Water Monitoring Program
- Hydrogeological Assessment
- Closure Plan
- Contingency Plan

The objective of this assessment is to complete a conceptual septage trench design for the Site based on existing documentation, soil investigation, and sewage loading calculations. Pending the results of this assessment, the Township will be required to complete a full Hydrogeological Assessment.



2.0 METHODOLOGY

A thorough review of the available background information was undertaken. The background review included MOECC water well records, geological and physiographic mapping for the Site, and a review of any hydrogeological/environmental studies previously conducted at the Site.

On November 15 and 17, 2016 a test pitting investigation was completed by Cambium to determine the subsurface conditions across the property. The test pits were excavated using a Township contracted rubber tracked excavator under the supervision of a Cambium technician. A total of fourteen (14) test pits, designated as TP101-16 through TP114-16, were advanced throughout the property surrounding the Site in accessible areas. Soil samples were logged for soil type, moisture content, and odour. Open test pits were backfilled with the excavated soils and compacted with the excavator bucket. Test pit logs are provided in Appendix B.



3.0 GEOLOGICAL AND HYDROGEOLOGICAL CONTEXT

3.1 TOPOGRAPHY AND DRAINAGE

The Site is located in a rolling upland area characteristic of this region of Ontario. The Site is known to be situated within a glacio-fluvial deposit consisting primarily of sand with some silty and gravely layers, as determined through interpretation of the Test Pit logs for the Site (see Appendix B).

The Site is located in a low-lying area, relative to the hilly landscape of the surrounding topography which is characteristic of the Haliburton Highlands. The topography of the Site is illustrated on Figure 2. Surface drainage is primarily to the north, toward the tributary to Harvey Lake Creek. Harvey Lake Creek is located approximately 500 m east of the existing Site property boundary. A tributary stream to Harvey Lake Creek, located approximately 250 m north of the existing Site boundary, is the closest permanent watercourse to the north of the Site. Harvey Lake is located approximately 380 m to the South of the current property boundary. Refer to Figure 2 for the surface water distances to the existing Site.

An assessment of the Site's surroundings and the topographic controls on the overburden groundwater flow, as outlined in previous *Performance Report* for the Site (Cambium Inc., 2015), indicated that shallow groundwater emanating from the Site will discharge to the surface water area located north of the lagoon. The groundwater flow direction in the area being considered for the dewatering trenches is also inferred to be to the north as shown on Figure 3.

3.2 GEOLOGICAL AND HYDROGEOLOGICAL CONDITIONS

According to available mapping, the Site and surrounding area is characterized by one bedrock region composed of felsic igneous granodiorite, tonalite, monzonite, derived gneisses, granite and syenite (Ontario Geological Survey, 2011). Bedrock was not encountered in any of the fourteen (14) test pits excavated as part of this investigation which varied in depths ranging from 2.90 to 3.66 metres below ground surface (mbgs).

During the November 2016 test pitting program, the overburden characteristics were recorded. Similar stratigraphic conditions were observed throughout most of the fourteen (14) test pits completed at the property surrounding the Site; however, some of the stratigraphic conditions varied at different locations. The following table summarizes the findings of the test pitting program:



Test Pit ID	Test Pit Depth	Soil Composition	Comments
TP101-16 to TP102-16	Ranges from 2.90 to 3.65 mbgs	Sandy silt topsoil layer overlying a layer of fine sand with some silt	TP105-16 had a third coarse sand with gravel layer below the topsoil and sand with some silt layer.
TP103-16 to TP111-16	Ranges from 1.68 to 3.05 mbgs	Loose medium sand	These test pits were completed in what was determined to be an old sand pit.
TP112-16 to TP114-16	Ranges from 3.05 to 3.20 mbgs	Fine sandy silt topsoil layer overlying a medium to coarse sand with some pebbles and trace gravel	

All of the test pits were backfilled upon completion and neither the water table nor bedrock were encountered in any of the test pits.

In total, four (4) soil samples were submitted for grain size analysis from the test pitting program to assess the soils of the area being considered for the dewatering trenches. A summary of the results of the analysis follows; refer to Appendix C for the laboratory results of the grain size analysis:

TP102-16 (0.05 to 2.90 mbgs)

 Classified the soil as S.P. with a percolation rate of 2 – 8 min/cm with 88% sand, 11% gravel and 1% silt and clay. As such, a percolation rate of 5 min/cm was selected for design purposes.

TP107-65 (1.37 to 3.35 mbgs)

Classified the soil as S.P. with a percolation rate of 2 – 8 min/cm with 82% sand and 18% silt and clay.
 As such, a percolation rate of 9 min/cm was selected for design purposes.

TP109-16 (surface to 0.60 mbgs)

Classified the soil as M.L. with a percolation rate of 20 – 50 min/cm with 21% sand and 79% silt and clay.
 As such, a percolation rate of 20 min/cm was selected for design purposes.

TP113-16 (0.90 to 1.52 mbgs)

 Classified the soil as S.P. with a percolation rate of 8 – 20 min/cm with 80% sand, 19% gravel and 1% silt and clay. As such, a percolation rate of 4 min/cm was selected for design purposes.

According to the *Draft Guide to Disposal of Septage In Dewatering Trenches* (Ministry of the Environment, 2008), soils which have a soil percolation time of 1 to 50 min/cm are suitable for dewatering trenches; therefore, soils surrounding the Site are suitable for a dewatering trench operation. In addition, no water seepage was noted in any of the test pits completed during the November 2016 test pitting program, confirming that there is an adequate separation distance of 1.5 m between the bottom of the trench and the water table, as required by the Guide.



4.0 PROPOSED SITE OPERATIONS

The following two (2) suitable options are proposed to manage the increasing capacity of septage generated within the Township's boundaries over the long-term by using dewatering trenches. The following provides operational and construction standards related to the proposed operation of the Site adheres to the standards outlined in the *Draft Guide to Disposal of Septage In Dewatering Trenches* (Ministry of the Environment, 2008)

4.1 OPTION 1 – 20 TRENCHES

The installation of a 20 - trench system at the Site would be used as a separate treatment system from the existing lagoon. If in future the capacity of the trench system needed to be increased, the option to expand the number of trenches will be an acceptable solution, provided the acquired property area will allow for a larger trench footprint. The following provides operational and construction standards related to the proposed operation of the 20-trench system based on the Guide.

Trench Length (L): 75m Trench Width (W): 1m Trench Depth (D): 1m Loading Rate (S): 25L/m² - *based on percolation time of 20 min/cm*

Trench Surface Area

A (m²) = 0.85*L(m)*W(m) A=0.85*75m*1m A=63.75m²

Maximum 7-Day Trench Loading Per Week

$$\label{eq:Qmax} \begin{split} Q_{max} &= A(m)^* S(L/m^2) \\ Q_{max} &= 63.75 m^{2*} 25 L/m^2 \\ Q_{max} &= 1,593 L/week \end{split}$$

Trench Volume

V = 0.36*L*W*D V = 0.36*75m*1m*1m $V = 27m^3$

Total Maximum Septage Volume Deposited Per Trench Per Year

P_{max} = Q_{max}*26 P_{max} = 1,593L/week*26 P_{max} = 41,418L (41.4m³)



Total Maximum Septage Volume Deposited Per Year in Trench System

With incorporating 20 trenches, the total maximum septage volume per year is calculated by multiplying the P_{max} by the number of proposed trenches.

$$V_{max} = 20^* P_{max}$$
$$V_{max} = 20^* 41.4 m^3$$
$$V_{max} = 828 m^3$$

The Guide prescribes a minimum separation distance of five (5) metres between individual trenches, provided that the buffer between the trenches is vegetated.

Given the required spacing and the dimensions of the trenches, a total area of 8,625 m² (75 m x 115 m; 0.86 ha.) would be required for the trench area, with an additional minimum separation distance of 100 m from the nearest property lot line. Refer to Figure 3 for a proposed trench layout.

4.2 OPTION 2 – 30 TRENCHES

The installation of a 30- trench system at the Site would be used as a separate treatment system from the existing lagoon. If in future the capacity of the trench system needed to be increased, the option to expand the number of trenches will be an acceptable solution, provided the acquired property area will allow for a larger trench footprint. The following provides operational and construction standards related to the proposed operation of the 30-trench system based on the Guide.

Trench Length (L): 75m Trench Width (W): 1m Trench Depth (D): 1m Loading Rate (S): 25L/m² - *based on percolation time of 20 min/cm*

Trench Surface Area

A (m²) = 0.85*L(m)*W(m) A=0.85*75m*1m A=63.75m²

Maximum 7-Day Trench Loading Per Week

 $Q_{max} = A(m)^*S(L/m^2)$ $Q_{max} = 63.75m^{2*}25L/m^2$ $Q_{max} = 1,593L/week$



Trench Volume

V = 0.36*L*W*D V = 0.36*75m*1m*1m $V = 27m^3$

Total Maximum Septage Volume Deposited Per Trench Per Year

P_{max} = Q_{max}*26 P_{max} = 1,593L/week*26 P_{max} = 41,418L (41.4m³)

Total Maximum Septage Volume Deposited Per Year in Trench System

With incorporating 30 trenches, the total maximum septage volume per year is calculated by multiplying the P_{max} by the number of proposed trenches.

 $V_{max} = 30^* P_{max}$ $V_{max} = 30^* 41.4 m^3$ $V_{max} = 1,242 m^3$

The Guide prescribes a minimum separation distance of five (5) metres between individual trenches, provided that the buffer between the trenches is vegetated.

Given the required spacing and the dimensions of the trenches, a total area of 13,125 m² (75 m x 175 m; 1.13 ha) would be required for the trench area, with an additional minimum separation distance of 100 m from the nearest property lot line. Refer to Figure 3 for a proposed trench layout.



5.0 REASONABLE USE CONCEPT POLICY ASSESSMENT

The MOECC Reasonable Use Policy states that, in accordance with the appropriate criteria for particular uses, a change in quality of the groundwater on an adjacent property will be accepted only as follows:

The quality cannot be degraded by an amount in excess of 50% of the difference between background and the Ontario Drinking Water Quality Standard (ODWQS) for non-health related parameters and in excess of 25% of the difference between background and the ODWQS for health related parameters. Background is considered to be the quality of the groundwater prior to any man made contamination.

MOE Procedure B-7-1. (Ministry of the Environment, 1994)

With respect to dewatering trenches, as outlined in the Guide, the primary contaminants of concern that are assessed as they could lead to adverse impact to the surrounding groundwater and/or surface water are nitrate and phosphorus. Nitrate is a health related drinking water parameter; therefore, should be assessed at the property and/or proposed property boundary to ensure the groundwater will not adversely impact neighbouring properties. With respect to phosphorus, as it can be harmful to surface water bodies in elevated concentrations due to the creation of algae and the resultant oxygen depletion, where groundwater may discharge to surface, phosphorus must be considered. That being said, where the potential discharge site is greater than 300 metres down-gradient from the proposed source (i.e. the dewatering trenches), it is understood that phosphorus will be naturally attenuated prior to discharge to surface water.

As discussed in Section 3.1, the groundwater flow direction in the area being considered for the dewatering trenches is inferred to be to the north based on existing groundwater elevation data surrounding the lagoon location. Although the flow direction will need to be confirmed by the installation of additional monitoring wells and subsequent water level measurements prior to the construction of the trenches, it was determined that the nearest surface water receiver is approximately 450 metres down-gradient of the proposed location. Since there is greater than 300 metres between the proposed dewatering trench boundary and this surface water receiver, an assessment of phosphorus is not required at this time; an assessment on nitrate follows.

5.1 NITRATE ASSESSMENT

Considering that the shallow groundwater at the Site is interpreted to discharge to the shallow overburden and ultimately Harvey Lake Creek to the north and northeast of the Site, an assessment of nitrate dilution using the ODWQS at the edge of the proposed property boundary indicated on Figure 3 is provided as follows:



The maximum concentration at the property boundary C_w is calculated as follows:

 C_b = Nitrate background assumed 0.01mg/L C_r = ODWQS limit 10 mg/L x = RUC health related parameter factor 0.25 C_m = maximum concentration under adjacent property (C_b +($x^*(C_r$ - C_b))) C_m = 2.51mg/L C_w = Cm-Cb C_w = 2.50mg/L

5.2 OPTION 1 – 20 TRENCHES

The concentration of nitrate at the property boundary, utilizing the data indicated below:

Average annual precipitation (P)	1.074 m (Environment Canada – Barrie)
Regional evapotranspiration (ET)	0.550 m/year (MNR – Ontario 500-600 mm/year)
Available recharge dilution (k)	0.524 m/year (k = P - ET)
Area available for dilution (A_D)	110,000 m² (contributing property dilution area)
Annual Dilution Volume (V _A)	57,640 m³ (A _D * k)
Annual Sewage Volume (Vs)	828 m³ + 2,470 m³ (Trench + Lagoon annual sewage volume)
	$= 3,298 m^3$
Total volume of water (V_T)	$60,938 m^3 (V_A + V_S)$
Nitrate Concentration (Cs)	40 mg/L (MOECC data)
Projected Concentration at border (C_P)	2.17 mg/L (C _S *V _S)/V _T

Given that the projected nitrate concentration at the proposed property boundary of 2.17 mg/L is less than the maximum allowable concentration at the property boundary of 2.50mg/L, the proposed property boundary will meet the intent of the RUC policy.

5.3 OPTION 2 – 30 TRENCHES

The concentration of nitrate at the property boundary, utilizing the data indicated below:

Average annual precipitation (P)	1.074 m (Environment Canada – Barrie)
Regional evapotranspiration (ET)	0.550 m/year (MNR – Ontario 500-600 mm/year)
Available recharge dilution (k)	0.524 m/year (k = P - ET)
Area available for dilution (A_D)	110,000 m² (contributing property dilution area)
Annual Dilution Volume (V _A)	57,640 m³ (A _D * k)
Annual Sewage Volume (Vs)	1,242 m³ + 2,470 m³ (Trench + Lagoon annual sewage volume)
	$= 3,712 m^3$



Total volume of water (V_T) $61,352 m^3 (V_A + V_S)$ Nitrate Concentration (C_S)40 mg/L (MOECC data)Projected Concentration at border (C_P) $2.42 mg/L (C_S * V_S)/V_T$

Given that the projected nitrate concentration at the proposed property boundary of 2.42 mg/L is less than the maximum allowable concentration at the property boundary of 2.50mg/L, the proposed property boundary will meet the intent of the RUC policy.



6.0 ASSESSMENT SUMMARY

- This assessment included a preliminary hydrogeological investigation and terrain analysis / impact assessment to support the expansion of the existing septage site by constructing dewatering trenches. Currently, the existing Site has a total allowable capacity of 2,470 m³ of septage per year.
- An assessment of the Site's surroundings and the topographic controls indicated that shallow groundwater emanating from the proposed septage dewatering trench area is towards the north.
- A test pit investigation was completed by Cambium in November 2016 to determine the subsurface conditions across the property. Similar stratigraphic conditions were observed through most of the fourteen (14) test pits completed at the Site's surrounding property. The soil composition generally consisted of sandy silt topsoil layer overlying a layer of fine sand with some silt; however, areas of loose medium sand and medium to coarse sand with some pebbles and trace gravel were also encountered.
- The most common soil composition observed during the test pit investigation was a layer of sand with some silt. This soil layer was observed at a depth in which the dewatering trenches would be installed. Grain size analysis classified the soil as M.L with a percolation rate of approximately 20 min/cm. Three (3) additional grain size analyses were completed on the other soil types observed; all three (3) were classified as S.P with percolation rates ranging from 4 to 9 min/cm. Grain size analyses confirmed that on-site soils are suitable for dewatering trench operation.
- The number of trenches installed on the Site relates to the maximum allowable septage volume to be dewatered on the Site per year. Calculations herein determined that 0.86 ha will be required to allow for an increased septage volume of 828m³ per year; a trench area of 1.31 ha. will allow for an increased septage volume of 1,242m³ per year.
- Based on a mass balance calculation, construction of 20 dewatering trenches would result in a nitrate concentration of 2.17 mg/L at the property boundary while 30 trenches would result in a nitrate concentration of 2.42 mg/L. Both options are less than the maximum allowable concentration of nitrate calculated to be 2.50 mg/L for the Site. A theoretical assessment utilizing the MOECC RUC procedure indicated that the Site would meet the intent of the RUC for nitrate concentration at the property boundary.
- A septage disposal facility with up to 30 dewatering trenches is feasible for the Site. The new facility would have an annual capacity of 1,242 m³, which is an additional increase of approximately 50% of the existing septage lagoon.



• Based on separation distances of 100 m from the trenches to the nearest property line and calculations utilizing the MOECC RUC procedure, a minimum total property size of 14.55 ha. will be required; refer to Figure 3.



7.0 CLOSING

If you have any questions or comments concerning the above, or require further assistance, please do not hesitate to contact the undersigned at (705) 742-7900 ext. 203.

Respectfully submitted,

Cambium Inc.

Jeremy Tracey, B.Eng., E.I.T. Senior Technician

Kevin Warner, M.Sc., P.Geo (Ltd.), BCIN Senior Project Manager

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Appended Figures









Appendix A ECA No. 3746-8RRM8C



AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 3746-8RRM8C Issue Date: March 14, 2012

The Corporation of the Township of Algonquin Highlands 1123 North Shore Rd Algonquin Highlands, Ontario K0M 1J1

Site Location: McClintock Septage Lagoon Lot Part Lots 14, 15, Concession 2 Township of Algonquin Highlands, County of Haliburton

You have applied under section 20.2 of Part II.1 of the <u>Environmental Protection Act</u>, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

an attenuation zone on the north east side of the lagoon cell composed of Part 1 and Part 2, Plan 19R-7214, approved on December 14, 2001, in accordance with a Plan of Survey, dated July 3, 2001, as prepared by John E. Jackson Surveying Limited, and, existing septage treatment lagoon system capable of handling a maximum volume of 2,470 m³/year, consisting of the following:

• a concrete screening box measuring 3.86 m x 2.13 m with a depth of 0.65 m and a design capacity of 3.4 m^3 , comprised of a gravity drained concrete tank with two compartments divided by a steel bar screen to prevent non-sewage waste from entering the lagoon.

• a 36.5 x 30.5 x 2.4 m depth sewage lagoon having an existing operating depth of 1.0 m (0.3 m freeboard), surface area of 1,113 m² with an exfiltration rate of 3000 m³/year.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document and any schedules attached to it, and the application;

"Average Daily Flow" means the cumulative total sewage flow to the sewage works during a calendar year divided by the number of days during which sewage was flowing to the sewage works that year;

"BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demand;

"By-pass" means any discharge from the Works that does not undergo any treatment or only receives partial treatment before it is discharged to the environment;

"CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"Director" means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA*;

"District Manager" means the District Manager of the Peterborough District Office;

"EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;

"E. Coli" refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

"Geometric Mean Density" is the nth root of the product of multiplication of the results of n number of samples over the period specified;

"*Ministry*" means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;

"Owner" means The Corporation of the Township of Algonquin Highlands and its successors and assignees;

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended

"Proposed Works" means the sewage works described in the Owner's application, this Approval, to the extent approved by this Approval;

"Rated Capacity" means the Average Daily Flow for which the Works are approved to handle;

"Works" means the sewage works described in the Owner's application, and this Approval, and includes both Proposed Works and Previous Works.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Approval*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Approval*.

(3) The requirements of this *Approval* are severable. If any requirement of this *Approval*, or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this Approval shall not be affected thereby.

2. CHANGE OF OWNER

(1) The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within 30 days of the change occurring:

- (a) change of Owner;
- (b) change of address of the Owner;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the <u>Business Names Act</u>, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*;

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the <u>Corporations Informations Act</u>, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*;

(2) In the event of any change in ownership of the *Works*, other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Approval*, and a copy of such notice shall be forwarded to

the District Manager and the Director.

3. <u>BY-PASSES</u>

(1) Any *By-pass* of sewage from any portion of the *Works* is prohibited, except where:

(a) it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage;
(b) the *District Manager* agrees that it is necessary for the purpose of carrying out essential maintenance and the *District Manager* has given prior written acknowledgment of the *by-pass*; or
(c) the *Regional Director* has given prior written acknowledgment of the *By-pass*.

(2) The *Owner* shall collect at least one (1) grab sample of the *By-pass* and have it analyzed for the parameters outlined in Table 1 using the protocols in Condition 6.

(3) The *Owner* shall maintain a logbook of all *By-pass* events which shall include, at a minimum, the time, location, duration, quantity of *By-pass*, the authority for *By-pass* pursuant to subsection (1), and the reasons for the occurrence.

4. PERFORMANCE OBJECTIVES

(1) The *Owner* shall use best efforts to operate the *Works* with the objective that the daily concentrations of the materials named in Table 2-Ground Water Monitoring Parameters at the designated sampling locations meet the MOE Reasonable Use Concept-Guideline B-7 and the Ontario Drinking Water Standards.

5. OPERATION AND MAINTENANCE

(1) The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Approval* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Approval* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the *Works*.

(2) The *Owner* shall prepare an operations manual within six months of the issuance date of this Approval, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the Works;

(b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;

(c) procedures for the inspection and calibration of monitoring equipment;

(d) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager*, and

(e) procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

(3) The *Owner* shall maintain the operations manual current and retain a copy at the Township Office for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

(4) The *Works* shall remain locked at all times except while in use and access to the *Works* shall be provided only to those authorized by the *Owner*.

(5) A minimum of 0.3m freeboard, measured from the top of the berm at the lowest elevation of the lagoon shall be maintained at all times.

(6) The screen within the screening box shall be cleaned after each load discharged to the lagoon, or at any time during the transfer of septage to the lagoon that the screen becomes clogged.

(7) The waste material removed from the screen shall be transferred to a waste receiving bin located on the site for such purpose.

(8) The waste bin shall be routinely maintained by the *Owner*. All waste shall be transported to an approved facility.

6. MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the Works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this *Approval* are to be taken at a time and in a location characteristic of the quality and quantity over the time period being monitored.

(2) Grab samples for raw septage shall be collected during unloading of hauled septage into the lagoon at a bimonthly frequency and analyzed for the parameters listed in Table 1.

Table 1 - Septage Quality Monitoring - (Receiving Point)						
Parameters	Parameters	Parameters				
Alkalinity	Nitrate Nitrogen	Total Kjeldahl Nitrogen (TKN)				
BOD5	Nitrite Nitrogen	Total Suspended Solids				
COD	Sulphate	Total Volatile Solids				
Chlorides Total Ammonia Nitrogen		Total Phosphorus				
Organics: Acetone, Benzene, Ethylbenzene, Isopropyl Alcohol, Methyl Alcohol, Methylene Chloride, Methyl Ethyl Ketone, Toluene, Xylene.						
Metals: Aluminum, Arsenic, Magnesium, Manganese, Mer	Barium, Cadmium, Chromium, C curv, Nickel, Potassium, Seleniur	obalt, Copper, Iron, Lead, n. Silver, Sodium, Tin, Zinc,				

(3) Grab samples of ground water and static level measurements shall be collected from sampling locations MW1, MW2, MW3, MW4 and MW5 at a semi-annual, in the Spring and Fall, sampling frequency and analyzed for the parameters listed in Table 2.

Table 2 - Ground Water Monitoring - (Designated Locations)					
Parameters	Parameters	Parameters			
Alkalinity	Nitrate Nitrogen	Total Kjeldahl Nitrogen (TKN)			
BOD5	Nitrite Nitrogen	Total Suspended Solids			
COD	Sulphate	Total Phosphorus			
Chlorides	Total Ammonia Nitrogen	Total Dissolved Solids			
Dissolved Organic Carbon	Hardness	Potassium			
pH	Conductivity	Arsenic			
Calcium	Magnesium	Iron			
Barium	Cadmium	Copper			
Boron	Chromium	Lead			
Manganese	Zinc	Temperature			

(4) Grab samples of surface water monitoring shall be taken at monitoring wells, MCSW3 and MCSW4, in a semi-annual frequency, in the Spring and Fall, and, analyzed for the parameters listed in Table 2. It is recommended that unionized ammonia be calculated using temperature and pH measurements.

MCSW3 Harvey Lake Creek north (downstream) of its confluence with the tributary stream, approximately 150m north of Wes Lake Trail..

MCSW4 Tributary stream approximately 100m west (upstream) of its confluence of Harvey Lake Creek.

(5) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (20th edition), as amended from time to time by more recently published editions.

(6) The *Owner* shall install maintain a receiving septage system to record the date, volume of septage received, the name the septage hauler and the source of the hauled septage (geographic location of the source, commercial, residential, etc.) for all instances the septage is deposited into the *Works*.

(7) The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Approval*.

7. <u>REPORTING</u>

(1) In addition to the obligations under Part X of the Environmental Protection Act, the Owner shall, within 10 working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by-product, intermediate product, oil, solvent, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

(2) The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.

(3) The *Owner* shall prepare, and upon request submit to the District Manager, a performance report, on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the issuance date of this *Approval* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all ground water monitoring data and an overview of the success and adequacy of the *Works* to meet the *Ministry* Reasonable Use Concept-Guideline B-7 and the Ontario Drinking Water Standards; (b) a description of any operating problems encountered and corrective actions taken;

(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works*;

(g) a tabulation of the volume of sludge generated in the reporting period, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;

(h) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(i) a summary of all *By-pass*, spill or abnormal discharge events; and

(j) any other information the *District Manager* requires from time to time.

1. Application for Approval of Municipal and Private Sewage Works dated December 20, 2012 signed by Brain Whetstone, Manager of Operations, The Corporation of the Township of Algonquin Highlands.

2. Report entitled "2011 Performance Report, McClintock Septage Lagoon, Provisional Approval of Approval No. 6473-72LRJ5" prepared for The Corporation of the Township of Algonquin Highlands by Cambium Environmental Inc.

3. Application for Approval of Municipal and Private Sewage Works, Summary Report for the McClintock Septage Lagoon, dated October 26, 2001, and 2002 Water Quality Monitoring Report, dated December 13, 2002 prepared and submitted for approval by Trow Consulting Engineers Ltd.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Approval* and the practice that the *Approval* is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the *Owners* their responsibility to notify any person they authorized to carry out work pursuant to this *Approval* the existence of this *Approval*.

2. Condition 2 is included to ensure that the *Ministry* records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the *Works* are made aware of the *Approval* and continue to operate the *Works* in compliance with it.

3. Condition 3 is included to indicate that by-pass of untreated sewage or spill is prohibited, save in certain circumstances where the failure could result in grater injury to the public interest.

4. Condition 4 is imposed to establish non-enforceable effluent quality objectives which the *Owner* is obligated to use best efforts to strive towards on an ongoing basis. These objectives are to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

5. Condition 5 is included to require that the *Works* be properly operated, maintained, and equipped such that the environment is protected. As well, the inclusion of an operations manual, maintenance agreement with the manufacturer for the treatment process/technology and a complete set of "as constructed" drawings governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the *Ministry*. Such a information is an integral part of the operation of the *Works*. Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*'s operation of the work.

6. Condition 6 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works*, on a continual basis, so that the Works are properly operated and does not cause any impairment to the environment.

7. Condition 7 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Approval*, so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 6473-72LRJ5 issued on April 26, 2007.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;

2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

- 3. The name of the appellant;
- 4. The address of the appellant;
- 5. The environmental compliance approval number;
- 6. The date of the environmental compliance approval;
- 7. The name of the Director, and;
- 8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 655 Bay Street, Suite 1500 Toronto, Ontario M5G 1E5	AND	The Director appointed for the purposes of Part II.1 of the Environmental Protection Act Ministry of the Environment 2 St. Clair Avenue West, Floor 12A Toronto, Ontario M4V 11.5
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* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 14th day of March, 2012

Mansoor Mahmood, P.Eng. Director appointed for the purposes of Part II.1 of the *Environmental Protection Act*

HV/

c: District Manager, MOE Peterborough District Office Kelly Murphy, P.Eng., Cambium Environmental Inc.



Appendix B Test Pit Logs



Project Name: McClintock Sewage Logoon Test Pitting Cambium Reference No. 5565-001

Date: November 15, 2016 Staff: J.Tracey

Test Pit ID	Depth (mbgs ¹)	Material Description	Sample
TP101-16	0 - 0.05 0.05 - 2.90 2.9	Moss/turf Brown Medium sand, loose, moist Test Pit terminated at 2.90 mbgs Some caving at bottom of Test Pit No bedrock or water table encountered Backfilled on completion	SS1
TP102-16	0 - 3.50 3.50 - 3.65 3.65	Brown medium sand, loose, moist Brown medium sand, loose, moist, trace gravel Test pit terminated at 3.65 mbgs on assumed bedrock contact or large boulder Some caving in test pit while digging No water table encountered Backfilled on completion	551
TP103-16	0 - 0.60 0.60 - 3.35 3.35	Brown fine to medium sand, some silt, trace gravel, soft, moist Grey/Brown fine silt, compact, moist, trace clay Test pit terminated at 3.35 mbgs Some caving in test pit while digging No bedrock or water table encountered Backfilled on completion	551 552
TP104-16	0 - 0.60 0.60 - 3.05 3.05	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Test pit terminated at 3.05 mbgs No bedrock or water table encountered Backfilled on completion	SS1 SS2
TP105-16	0 - 0.45 0.45 - 1.68 1.68 - 3.20 3.2	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Brown coarse sand with gravel, moist, firm, Test pit terminated at 3.20 mbgs No bedrock or water table encountered Backfilled on completion	SS1 SS2 SS3
TP106-16	0 - 0.45 0.45 - 3.20 3.2	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Test pit terminated at 3.20 mbgs No bedrock or water table encountered Backfilled on completion	SS1
TP107-16	0 - 1.37 1.37 - 3.35 3.35	Brown fine silty-sand, trace organics, soft, moist Grey/Brown sand, some silt, compact, moist Test pit terminated at 3.35 mbgs Some caving in test pit while digging No bedrock or water table encountered Backfilled on completion	SS1 SS2



TEST PIT LOGS

Project Name: McClintock Sewage Logoon Test Pitting Cambium Reference No. 5565-001

TP108-16	0 - 0.60 0.60 - 3.20 3.2	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Test pit terminated at 3.20 mbgs Some caving in test pit while digging No bedrock or water table encountered Backfilled on completion	551
TP109-16	0 - 0.60 0.60 - 3.20 3.2 3.2	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Boulder encountered at 3.20 mbgs Test pit terminated at 3.20 mbgs No bedrock or water table encountered Backfilled on completion	551
TP110-16	0 - 0.60 0.60 - 3.35 3.35	Brown fine silty-sand, trace organics, soft, moist Grey/Brown fine silt, compact, moist, trace clay Test pit terminated at 3.35 mbgs No bedrock or water table encountered Backfilled on completion	551 552
TP111-16	0 - 0.46 0.46 - 3.66 3.66	Brown fine silty-sand, trace organics, soft, moist Grey/Brown sandy-silt, compact, moist Test pit terminated at 3.66 mbgs No bedrock or water table encountered Backfilled on completion	SS1
TP112-16	0 - 0.46 0.46 - 3.20 3.2	Brown fine silty-sand, trace organics, soft, moist Brown medium sand, trace silt, firm, moist Test pit terminated at 3.20 mbgs No bedrock or water table encountered Backfilled on completion	SS2
TP113-16	0 - 0.90 0.90 - 1.52 1.52 - 3.05 3.05	Brown fine silty-sand, trace organics, soft, moist Brown coarse sand and pebbles, some gravel (looks like pea stone), firm, moist Brown coarse sand, trace pebbles, trace gravel, trace silt, firm, moist Test pit terminated at 3.05 mbgs Some caving in test pit while digging No bedrock or water table encountered Backfilled on completion	551 552
TP114-16	0 - 0.90 0.90 - 1.52 1.52 - 3.20 3.2	Brown fine silty-sand, trace organics, soft, moist Brown coarse sand, some pebbles, some gravel, firm, moist Brown medium to coarse sand, some silt, trace pebbles, trace gravel, firm, moist Test pit terminated at 3.20 mbgs Some caving in test pit while digging No bedrock or water table encountered Backfilled on completion	551 552

Notes: 1. mbgs = metres below ground surface



Appendix C Grain Size Distribution Results





Project Number:	5565-001	Client:	Township of Algonquin Highlands	
Project Name:	McClintock Lagoon Expansion			
Sample Date:	November 17, 2016	Sampled By:	Jeremy Tracey - Cambium Inc.	
Hole No.:	TP 102-16 SS 1	Depth:	Lab Sample No:	S-16-781

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	0.11 T	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	00111 0500
	SILI		SAND			GRAVEL		BOULDERS

Borehole No.	Sample No.	Depth		Gravel	Sand		Silt	Clay	Moisture
TP 102-16	SS 1			11	88		1		3.6
	Description		Classification	D ₆₀	D ₃₀		D ₁₀	C _u	C _c
S	and some Gravel		SP	1.00	0.43		0.21	4.8	0.9

Issued By:

Date Issued:

December 1, 2016

(Senior Project Manager)

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Project Number:	5565-001	Client:	Township of Algonquin Highlands	
Project Name:	McClintock Lagoon Expansion			
Sample Date:	November 17, 2016	Sampled By:	Jeremy Tracey - Cambium Inc.	
Hole No.:	TP 107-16 SS 2	Depth:	Lab Sample No:	S-16-782

UNIFIED SOIL CLASSIFICATION SYSTEM									
	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		BOULDERS		

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt	Clay	Moisture
TP 107-16	SS 2		0	82	18		9.6
	Description	Classification	D ₆₀	D ₃₀	D ₁₀	Cu	Cc
	Sand some Silt	SP	0.25	0.12	-	#VALUE!	#VALUE!

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Date Issued:

December 1, 2016

(Senior Project Manager)

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Project Number:	5565-001	Client:	Township of Algonquin Highlands	
Project Name:	McClintock Lagoon Expansion			
Sample Date:	November 17, 2016	Sampled By:	Jeremy Tracey - Cambium Inc.	
Hole No.:	TP 109-16 SS 1	Depth:	Lab Sample No:	S-16-779

UNIFIED SOIL CLASSIFICATION SYSTEM								
	SAND (<4.	75 mm to 0.075 mm)	GRAVEL (>4.75 mm)					
	FINE	MEDIUM	COARSE	FINE	COARSE			



	MIT SOIL CLASSIFICATION SYSTEM										
CLAY		FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	00111 0500			
	SILT		SAND			GRAVEL		BOULDERS			

Borehole No.	Sample No.	Depth	Gravel	Sand	Silt		Clay	Moisture
TP 109-16	SS 1		0	21	79	'9		12.7
	Description	Classification	D ₆₀	D ₃₀	D ₁₀		Cu	Cc
	Sandy Silt	ML	0.06	0.03	0.01		5.9	1.4

Issued By:

A

Date Issued:

December 1, 2016

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Project Number:	5565-001	Client:	Township of Algonquin Highlands	
Project Name:	McClintock Lagoon Expansion			
Sample Date:	November 17, 2016	Sampled By:	Jeremy Tracey - Cambium Inc.	
Hole No.:	TP 113-16 SS 1	Depth:	Lab Sample No:	S-16-780

UNIFIED SOIL CLASSIFICATION SYSTEM								
	SAND (<4.	75 mm to 0.075 mm)	GRAVEL (>4.75 mm)					
	FINE	MEDIUM	COARSE	FINE	COARSE			



MIT SOIL CLASSIFICATION SYSTEM									
	011 F	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	00111 0500	
CLAY	CLAY SILI		SAND			GRAVEL		BOULDERS	

Borehole No.	Sample No.	Depth			Gravel		Sand		Silt	Clay	Moisture
TP 113-16	SS 1				19	80		1		2.4	
Description			Classification		D ₆₀		D ₃₀		D ₁₀	Cu	C _c
Sand some Gravel		SP		2.80		1.40		0.58	4.8	1.2	

Issued By:

Date Issued:

December 1, 2016

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