



Geotechnical Investigation Report - Potential Residential Developments - Area A, College Street, Quinte West, Ontario

June 15, 2023

Prepared for:
City of Quinte West

Cambium Reference: 13324-049

CAMBIUM INC.

866.217.7900

cambium-inc.com

Peterborough | Barrie | Oshawa | Kingston



Table of Contents

1.0	Introduction.....	1
2.0	Methodology	2
2.1	Borehole Investigation	2
2.2	Physical Laboratory Testing	3
3.0	Subsurface Conditions	4
3.1	Surface Soils	4
3.2	Fill Material	5
3.2.1	Silty Sand	5
3.2.2	Gravelly Sand to Gravel	5
3.3	Native Material	6
3.3.1	Gravel.....	6
3.3.2	Silty Sand	6
3.4	Bedrock	7
3.5	Groundwater.....	7
4.0	Site Recommendations.....	9
4.1	Site Preparation.....	9
4.2	Frost Penetration.....	10
4.3	Excavations and Shoring.....	10
4.4	Dewatering	10
4.5	Backfill and Compaction	11
4.5.1	Engineered Fill	11
4.6	Foundation Design	12
4.7	Lateral Earth Pressures.....	13
4.7.1	Earthquake Induced Pressures	15
4.8	Subdrainage	16
4.9	Floor Slabs	16
4.10	Buried Utilities	17



4.11	Seismic Site Classification.....	17
4.12	Pavement Design	18
4.13	Design Review and Inspections	19
5.0	Closing	20
6.0	Standard Limitations.....	21



List of Embedded Tables

Table 1	Existing Topsoil Thickness.....	4
Table 2	Particle Size Distribution Analysis – Gravel	6
Table 3	Particle Size Distribution Analysis – Silty Sand.....	7
Table 4	Bedrock Depth and Elevation	7
Table 5	Groundwater Depth, Water Level, and Caving	8
Table 6	Founding Elevations and Correlating Bearing Capacities.....	12
Table 7	Lateral Earth Pressure Coefficients	14
Table 8	Recommended Minimum Pavement Structure – Parking Areas	18

List of Appended Figures

Figure 1	Site Location Map
Figure 2	Borehole Location Plan

List of Appendices

Appendix A	Borehole Logs
Appendix B	Physical Laboratory Results
Appendix C	Seismic Hazard Table
Appendix D	Soil Characterization Report



1.0 Introduction

Cambium Inc. (Cambium) was retained by the City of Quinte West (Client) to complete a geotechnical investigation in support of potential developments located in the area of the previously demolished College Street Public School in Quinte West, Ontario (Site). Figure 1 one shows the approximate site location. The Site is to be split into four separate parcels, currently referred to as parcels A through D, the subject site of this report is Area A, and the parcel boundaries are shown on Figure 2. Proposed developments for Area A would consist of a 1000 square meter, 4-storey apartment building that would house 32 residential units in addition to a parking lot, entrance roadways, and greenspace.

The potential development property is currently a vacant lot in the place of the demolished College Street Public School. The Site is bound by South Street to the east and residential dwellings to the west, north, and south that front onto Francis, Princess, and Marmora Streets, respectively. The general topography includes slight elevation changes throughout the property.

The geotechnical investigation was required to confirm the existing subsurface conditions, groundwater conditions, and various other parameters as input into the design and construction of the potential future developments. Site Plans for Area A, including borehole locations, are included as Figure 2 of this report.

An environmental investigation was completed in addition to the geotechnical investigation with findings and results presented in Appendix D of this report.

This report presents the methodology and findings of the geotechnical investigation at the Site and addresses requirements and constraints for the design and construction of the development.



2.0 Methodology

2.1 Borehole Investigation

The geotechnical investigation was conducted at the Site on April 4 to April 6, 2022. A total of four boreholes, designated as boreholes BH105-22 through BH108-22, were strategically placed and advanced throughout the site to depths of 3.0 to 6.2 meters below ground surface (mbgs). All boreholes were advanced to target depths and auger refusal was encountered only in borehole BH108-22 during the investigation which was advanced past target exploration depths to determine depths to inferred bedrock. The borehole locations are shown in Figure 2. The location of each borehole was referenced to a local benchmark by a Cambium technician with UTM coordinates and relative elevations included on the borehole logs provided in Appendix A. The boreholes were surveyed using fire hydrant TE310 as a benchmark. All elevations are relative to the top nut of the fire hydrant which was assigned an elevation of '200.00' mREL. The benchmark is shown in the Figures.

Drilling and sampling operations were completed using a track-mounted drill rig operating under the supervision of a Cambium technician. All boreholes were advanced to the sampling depths by means of continuous flight solid stem augers. Soil samples were collected at intervals of approximately 0.75 mbgs or whenever a change in soil type occurred, starting directly from the surface material. The encountered soil units were logged in the field using visual and tactile methods, and samples were placed in labelled plastic bags for transport, future reference, possible laboratory testing, and storage. Open boreholes were checked for groundwater and general stability prior to backfilling. All boreholes were backfilled in accordance with O.Reg. 903, as amended, and the property was reinstated to pre-existing conditions.

Borehole logs are provided in Appendix A. Site soil and groundwater conditions are described, and geotechnical recommendations are discussed in the following sections of this report.



2.2 Physical Laboratory Testing

Physical laboratory testing, consisting of two sieve analyses (LS-702) was completed on selected soil samples to confirm textural classification and to assess geotechnical parameters. Moisture content testing was completed on all soil samples. Results are presented in Appendix B and are discussed in Section 3.0.



3.0 Subsurface Conditions

The subsurface conditions at the Site generally contained surficial soils consisting of topsoil, silty sands, or soils containing a mixture of sand and gravel. Soils underlying the near surface soils generally consisted of mixtures of sands, silts, and gravels. Boreholes were advanced to depths of between 3.0 and 6.2 mbgs and auger refusal was encountered only in borehole BH108-22. Based on publicly available historical imagery, boreholes BH105-22 to BH108-22 were advanced throughout the proposed parcel, largely within an area that appeared to consist of the entrance to the demolished school and within the footprint of the school's playground. Boreholes BH105-22 and BH106-22 were advanced into the existing silty sand to gravel surface (previously paved) of the entrance to the school. Borehole BH107-22 was advanced into a silty sand material at surface where the swings for the school playground were previously located. Borehole BH108-22 was located at the northwesterly corner of the proposed parcel, at the northern end of the demolished school. The boreholes were advanced to depths of approximately 3.0 to 6.2 mbgs. The various soil strata are described in detail below and are identified on the borehole logs included in Appendix A.

3.1 Surface Soils

All boreholes were advanced into the existing surficial material. Boreholes BH105-22 to BH107-22 did not encounter topsoil at the surface. The encountered topsoil thicknesses are summarized in Table 1 below:

Table 1 Existing Topsoil Thickness

Boreholes	Topsoil Thickness (mm)
BH105-22	-
BH106-22	-
BH107-22	-
BH108-22	250



The organic topsoil encountered at the site was generally described as dark brown silty sand with some organic material and gravel content at the time of investigation. The topsoil material in this area was moist at the time of the investigation with natural moisture content of 12.7% based on laboratory testing. Analysis of the content of the organic material within the topsoil was beyond of the scope of this investigation and report.

3.2 Fill Material

3.2.1 Silty Sand

The near surface soils encountered in boreholes BH106-22 and BH107-22 generally consisted of a silty sand material with some gravel content. Borehole BH108-22 encountered topsoil at surface which consists of silty sand with some organics content. The fill silty sand soil extended from the surface to depths between 0.25 to 1.1 mbgs. In borehole BH107-22, a seam of sandy gravel soil was encountered from approximately 0.2 to 0.4 mbgs. The soils were generally brown and moist at the time of the investigation with natural moisture content ranging between 4.2 to 15.4% based on laboratory testing. The soils have a loose to dense relative density based on SPT N values of 8 to 45 blows for 305 mm of penetration.

3.2.2 Gravelly Sand to Gravel

Gravelly sand to gravel soils with varying amounts of silt content were encountered in boreholes BH105-22 to BH108-22 underlying the silty sand in boreholes BH106-22 to BH108-22 and from the surface in borehole BH105-22. The predominately gravel fill material extended to a depth of approximately 2 mbgs in boreholes BH105-22 to BH107-22. In borehole BH108-22, the material extended to approximately 2.5 mbgs, likely due to the school partial basement excavations.

The mixtures of predominately gravel fill material were generally brown and moist at the time of the investigation with natural moisture contents ranging between 1.6 to 8.9% based on laboratory testing. The soils have a compact to very dense relative density based on SPT N values of 25 to over 50 blows for 305 mm of penetration.



Laboratory particle size distribution analyses was completed for one sample of the gravel fill soil within Area A. The analysis results, based on the Unified Soil Classification System (USCS) scale, are summarized in Table 2 with full results provided in Appendix B.

Table 2 Particle Size Distribution Analysis – Gravel

Sample	Depth (mbgs)	Soil	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Moisture (%)
BH106-22, SS2B	1.0 – 1.4	Gravel and Sand trace Silt	53	38		9	1.9

3.3 Native Material

3.3.1 Gravel

Underlying the fill materials, all boreholes advanced at site encountered native materials extending to borehole termination depths. The native material generally encountered directly underlying the fill material consisted of a Till matrix, predominantly consisting of gravel with varying amount of sand, silts, and clays. In boreholes BH106-22 to BH108-22, the native gravel material extends to terminations depths ranging between 3.0 to 6.2 mbgs. The soils can be described as brown to grey, mottled, and moist at the time of the investigation with natural moisture contents ranging between 4.1 to 8.9% based on laboratory testing. The soils have a compact to very dense relative density based on SPT N values of 22 to over 50 blows for 305 mm of penetration.

3.3.2 Silty Sand

In borehole BH105-22, a silty sand was encountered underlying the native gravel materials at a depth of approximately 3.5 mbgs, extending to termination depths. In borehole BH106-2, a seam of silty sand soil was encountered between the depths of approximately 2.3 to 2.5 mbgs. The native silty sand material can be described as grey to brown and moist at the time of the investigation with natural moisture contents ranging between 5.6 to 12.7% based on laboratory testing. The soils have a very dense relative density based on SPT N values of over 50 blows for 305 mm of penetration.



Laboratory particle size distribution analyses was completed for one sample of the native silty sand soils within Area A. The analysis results, based on the Unified Soil Classification System (USCS) scale, are summarized in Table 3 with full results provided in Appendix B.

Table 3 Particle Size Distribution Analysis – Silty Sand

Sample	Depth (mbgs)	Soil	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Moisture (%)
BH106-22, SS4A	2.3 – 2.5	Silty Sand some Gravel	13	55		32	5.6

3.4 Bedrock

Auger refusal was encountered in borehole BH108-22, which was intentionally advanced based target exploration depths of 5.0 mbgs to determine local bedrock elevation depths. Based on knowledge of local geology and the results on the investigation, bedrock is believed to be the cause of auger refusal in that borehole. Table 4 outlines the depth to bedrock and associated elevation.

Table 4 Bedrock Depth and Elevation

Borehole	Collar Elevation (mRel)	Depth to Bedrock (mbgs)	Bedrock Elevation (mRel)
BH105-22	198.45	NE*	-
BH106-22	198.31	NE	-
BH107-22	199.00	NE	-
BH108-22	198.91	6.2	192.71

*NE – bedrock not encountered within exploration depths

3.5 Groundwater

At the time of the investigation, groundwater seepage was encountered in all boreholes within Area A. All boreholes were checked for seepage, caving, and groundwater prior to backfilling, with the results summarized in Table 5 below.



Table 5 Groundwater Depth, Water Level, and Caving

Borehole ID	First Groundwater Encounter (mbgs)	Water Level in Open Borehole (mbgs)	Borehole Caving Depth (mbgs)	Borehole Collar Elevation (mRel)	Standing Groundwater Elevation (mRel)	Borehole Caving Elevation (mRel)
BH105-22	3.0	-	2.8	198.45	-	195.65
BH106-22	2.5	2.7	2.8	198.31	195.61	195.51
BH107-22	2.7	-	2.9	198.96	-	196.06
BH108-22	3.0	-	2.9	198.91	-	196.01

Groundwater was encountered in all boreholes advanced at the site; however, standing groundwater was only encountered in BH106-22 as caving depths of the boreholes was generally shallower than encountered groundwater depths. Caving depths found to be shallower than encountered groundwater depths can be indicative of standing groundwater depths. Therefore, it is possible that the groundwater table throughout the site is at a relative elevation of approximately 195.5 to 196.0 mREL. However, where grey soils are encountered within the subsurface, the soils are typically indicative of long-term ground water levels. The material encountered on site was never found to consist of completely grey soils, therefore, it is possible that groundwater elevations encountered on site may have been the results of seasonal fluctuations in response to climatic events.



4.0 Site Recommendations

The following recommendations are based on the borehole information and are intended to assist designers. Recommendations should not be construed as providing instructions to contractors, who should form their own opinions about site conditions. It is possible that subsurface conditions beyond the borehole locations may vary from those observed. If significant variations are found before or during construction, Cambium should be contacted so that we can reassess our findings, if necessary.

4.1 Site Preparation

Any topsoil, organic fill, and any other disturbed material encountered should be excavated and removed beneath the proposed development footprints; additionally, this material should be excavated and removed to a minimum distance of 1.0 meters around the proposed footprint. Any topsoil and materials with significant quantities of organics and deleterious materials (i.e., construction debris, asphalt etc.) are not appropriate for use as fill. Utility trench subgrades should be inspected by a qualified geotechnical engineer prior to construction of the proposed developments.

Any exposed subgrades should be proof-rolled and inspected by a qualified geotechnical engineer prior to placement of any granular fill. Any loose/soft soils identified at the time of proof-rolling that are unable to uniformly be compacted should be sub-excavated and removed. The excavations created through the removal of these materials should be backfilled with approved engineered fill consistent with the recommendations provided below.

The encountered overburden soil mixtures can be unstable if they are wet or saturated. Such conditions are common in the spring and late fall. Under these conditions, temporary use of granular fill, and possible reinforcing geotextiles, may be required to prevent severe rutting on construction access routes. Where possible, the existing roadways should be used for construction access routes.



4.2 Frost Penetration

Based on climate data and design charts, the maximum frost penetration depth below the surface at the site is estimated at 1.2 mbgs. Utilities should be founded at or below a depth of 1.2 mbgs, or upon free-draining granular fill extending to below 1.2 mbgs.

4.3 Excavations and Shoring

All excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). If the predominantly gravel overburden material is encountered during excavations, it may be classified as Type 2 soils above the groundwater table in accordance with OHSA. Type 2 soils may be excavated with unsupported vertical side slopes to a depth of 1.2 mbgs; deeper excavations must have side slopes no steeper than 1H:1V above the 1.2 mbgs. If the groundwater table is encountered during construction, below the groundwater table the soils may be classified as Type 4 soils and may be excavated with unsupported side slopes no steeper than 3H:1V. Excavations below any encountered groundwater should be continually monitored.

Excavation side slopes should be protected from exposure to precipitation and associated ground surface runoff and should be inspected regularly for signs of instability. If localized instability is noted during excavation or if wet conditions are encountered, the side slopes should be flattened as required to maintain safe working conditions or the excavation sidewalls must be fully supported (shored).

4.4 Dewatering

Based on where groundwater was encountered and the borehole casing depths, it is likely that groundwater may reside at an approximately relative elevation of 196 mREL. Based on the groundwater conditions observed upon completing the borehole drilling, groundwater may be encountered during excavations for the proposed facility, depending on the proposed building design and how deep the footings are founded. A Permit to Take Water (PTTW) or registration on the Environmental Activity and Sector Registry (EASR) through the Ministry of the Environment Conservation and Parks (MOECP) would be required if pumping rates are to



exceed 50,000 L/day. If the proposed building is to be constructed on shallow foundations, it is unlikely that groundwater will be encountered. If the proposed development is to include a basement or be constructed on deep foundations, groundwater within excavations will likely be controllable using filtered sumps and pumps.

It is noted that the elevation of the groundwater table will vary due to seasonal conditions and in response to heavy precipitation events.

4.5 Backfill and Compaction

Excavated predominantly gravel and sand mixtures from the Site are appropriate for use as fill below grading areas, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities. Further testing of the near surface soils would be required to determine if the material can be used as an engineered fill. The silty sand material encountered on site may not be suitable for re-use at the site as engineered fill materials but may be used for landscaping as approved by a landscape architect. Some moisture content adjustments may be required depending upon seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Backfill for basement, retaining, or foundation walls should consist of imported, free-draining granular material as described in Section 4.5.1. Any engineered fill for foundations should be placed in maximum 200 mm thick lifts, consist of materials described in the following section and be compacted to a minimum of 100% of standard Proctor maximum dry density (SPMDD). If engineered fill is being placed for general site backfill and grading, then compaction to 98% of SPMDD is applicable.

4.5.1 Engineered Fill

When the fill is treated as an engineered fill to support structural elements such as non-floating utilities, the following is recommended for the construction of engineered fill:

- I. Remove any and all existing vegetation, surficial topsoil/ organics, organic fills or fills and any loose soils to a competent subgrade for a suitable envelope;



- II. As a minimum, the area of the engineered fill should extend horizontally 1 meter beyond the outside edge of the foundations then extend downward at a 1:1 slope to the competent native soil;
- III. The subgrade or base of the engineered fill area must be approved by Cambium prior to placement of any new fill, to ensure that suitability of subgrade condition;
- IV. Place approved OPSS 1010 SSM or Granular 'B' Type I material at a moisture content at or near optimum moisture in suitable maximum 200 mm thick lifts, compacted to 100% of SPMDD. Any frost penetration into the fill material must be removed prior to placement of subsequent lifts of fill and reviewed by Cambium;
- V. Full time testing and inspection of the engineered fill will be required for it to be used as a founding material, as outlined in Section 4.2.2.2 of the Ontario Building Code.

4.6 Foundation Design

Whether the proposed design is to include a basement or deeper foundations is currently unknown. Therefore, Cambium recommends continuous perimeter strip and isolated spread foundations can be founded on the following materials / elevations shown in Table 6.

Table 6 Founding Elevations and Correlating Bearing Capacities

Approximate Founding Elevation (mREL)	Subgrade Material	Relative Density	Bearing Capacity (SLS)	Bearing Capacity (ULS)
197.00 – 198.00	Gravel to Sandy Gravel	Compact to Dense	175 kPa	200 kPa
Below 197.00	Silty Sand to Gravel	Dense to Very Dense	200 kPa	250 kPa

All foundations should bear on undisturbed native soils. Where weak, deleterious material, or fill material is encountered at footing elevations, it should be scarified to a depth of 200 mm below the proposed founding elevation and recompacted to SPMDD 100% or replaced with engineered fill prepared as outline in Section 4.5.1. Subgrades should be approved by a geotechnical engineer prior to placement of footings to confirm adequate founding material and



bearing capacities. Settlement potential at the above-noted SLS loadings is less than 25 mm and differential settlement should be less than 10 mm.

Under no circumstances will the foundations be placed directly on organic materials, loose, frozen subgrade, construction debris, or within ponded water. Footings and walls exposed to frost action shall be backfilled with OPSS 1010 Granular B Type I.

The quality of the subgrade should be inspected by Cambium during construction, prior to constructing the footings, to confirm bearing capacity estimates.

4.7 Lateral Earth Pressures

The design of the retaining walls, foundation walls, and basement walls should consider the horizontal soil loads, as well as surcharge loads that may occur during or after construction. The backfill materials should consist of imported free-draining granular soils (e.g. OPSS Granular B, Type I or Granular A and Granular B Type II) as approved by a Geotechnical Engineer.

The backfill materials should be placed in lifts not exceeding 200 mm thick. The layers should be compacted to at least 95% of SPMDD. Lateral earth pressure coefficients (K) are shown in Table 7. It is assumed that potential lateral loads will result from cohesion less, frictional materials.



Table 7 Lateral Earth Pressure Coefficients

Soil	Bulk Unit Weight γ (kN/m ³)	Internal Friction Angle Φ' (°)	Active earth pressure coefficient K_a (Rankine)	Passive earth pressure coefficient K_p (Rankine)	At-rest earth pressure coefficient K_0 (Rankine)
Compacted Granular A and Granular B Type II	22	34	0.28	3.54	0.44
Compacted Granular B Type I	21	32	0.31	3.25	0.47
Onsite Sand and Gravels*	19	30	0.33	3.00	0.5

**Values derived from empirical relationships based on soil types and SPT N-values*

The earth pressure coefficient adopted will depend on whether the retaining structure is restrained, or some movement can occur such that the active state of earth pressure can develop. The use of vibratory compaction equipment immediately behind the retaining walls should be restricted in size.

The coefficients provided in Table 7 assume that the surface of the granular backfill or native material is horizontal against any proposed retaining wall, and the wall is vertical and smooth. Cambium should be contacted to provide updated lateral earth pressure coefficients should the assumptions differ to those noted.

The following formula may be used to calculate active lateral thrust (Pa) on yielding retaining structures;

$$P_a = (H/2)(K_a)(\gamma H + 2q)$$

where,

- H = Height of retaining structure (m)
- γ = unit weight of retained soil (kN/m³)
- q = surcharge (kPa)



Unit weights found in Table 7 should be used for compacted loadings of the appropriate material.

Where traffic loads are expected within 3 meters of the retaining walls, foundation walls, or temporary shoring, a vehicle surcharge pressure of at least 3 and up to 6 kPa should be applied to the upper 3 meters of the wall; the actual surcharge pressure should depend on the type of traffic. Where construction equipment will be working behind the walls within a horizontal distance equal to the wall height (1H:1V), the design should include a surcharge pressure of 15 kPa. The above pressures should be assumed to act over the entire width of the retaining wall.

4.7.1 Earthquake Induced Pressures

Earthquakes will induce additional pressures on retaining structures. For active earth pressure loads:

$$P_{ae} = \frac{1}{2} \gamma H^2 (1 - k_v) K_{ae}$$

Where,

P_{ae} = resultant active lateral earth load inducing static and dynamic loads;

γ = unit weight of the soil behind the wall;

k_v = vertical component of the earthquake acceleration (as a decimal fraction of the acceleration due to gravity);

k_h = horizontal component of the earthquake acceleration (as a decimal fraction of the acceleration due to gravity); and

K_{ae} = horizontal component of active earth pressure coefficient including effects of earthquake loading;

And

$$K_{ae} = \frac{\cos(\delta + a \cos^2(\phi' - \varphi - i))}{\cos^2 i \cos \delta \cos(\delta + i + \varphi) (1 + X_a^{1/2})^2}$$

$$X_a = \frac{\sin(\delta + \varphi') \sin(\phi' - \varphi - \beta)}{\cos(\delta + i + \varphi) \cos(\beta - i)}$$

$$\varphi = \tan^{-1}[k_h/(1 - k_v)]$$

$$i = 90 - \alpha$$

For the site, γ is as provided in Table 7, $\alpha=90^\circ$ and $i=0$. Using Coulomb's theory, the angle of wall friction (δ) is related to both the internal angle of friction of the soil (ϕ') as provided in Table 7 and the roughness of the wall. For smooth vertical walls $\delta=0$, and the recommended maximum value for rough concrete walls $\delta = 14$. If the walls are not smooth, Cambium would recommend reviewing the design δ values.

4.8 Subdrainage

The guidelines below are based on the assumptions that a "drained" foundation system will be provided. These guidelines should be revisited if it is decided that the construction of any basements should be water-tight. Provisions should be made for draining any permanent or long-standing retaining or basement wall backfill to prevent buildup of hydrostatic pressures; this could consist of geotextile-wrapped perforated plastic sub-drain appropriately sloped and drained to the stormwater management system or other suitable frost-free outlet, or geotextile-wrapped perforated plastic sub-drains draining through the wall itself would be considered suitable provided they could be kept frost-free. Perimeter and under floor slab drainage systems would be also required for the proposed building if it is to include a basement. The perforated pipes should discharge to a positive outlet such as a storm water sewer or a sump from which the water is pumped. Basement floor slabs, elevator pits, and foundation walls should also be waterproofed.

4.9 Floor Slabs

Where floor slabs are to be constructed it is recommended that existing soils be stripped to compact, inorganic soils. To create a stable working surface with adequate drainage and to distribute loadings, all slabs-on-grade should be constructed on a minimum of 200 mm of



OPSS 1010 Granular A compacted to 98% SPMDD with additional engineered fill placed and compacted to 98% SPMDD to raise grades as required.

4.10 Buried Utilities

Trench excavations above the groundwater table should generally consider Type 2 soil conditions, which allow unsupported vertical side slopes to a depth of 1.2 mbgs. Deeper excavations require side slopes above the 1.2 meter vertical cuts to be no steeper than 1H:1V, otherwise shoring would be required. Any excavations below the water table should generally consider Type 4 soil conditions which require side slopes of 3H:1V or flatter.

Bedding and cover material for any services should consist of OPSS 1010 Granular A or B Type II, placed in accordance with pertinent Ontario Provincial Standard Drawings (OPSD 802.013). The bedding and cover material shall be placed in maximum 200 mm thick lifts and should be compacted to at least 98% of SPMDD. The cover material shall be a minimum of 300 mm over the top of the pipe and compacted to 98% of SPMDD, taking care not to damage the utility pipes during compaction. If bedding is being placed in wet conditions consideration should be given to using 19 mm crushed clear stone underlain by a geotextile (Terrafix 270R or similar).

4.11 Seismic Site Classification

The Ontario Building Code (OBC) specifies that the structures should be designed to withstand forces due to earthquakes. For the purpose of earthquake design, geotechnical information shall be used to determine the "Site Class". The parameters for determination of Site Classification for Seismic Site Response are set out in Table 4.1.8.4A of the OBC (2012). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken. Alternatively, the classification is estimated on the basis of rational analysis of undrained shear strength (s_u) or penetration resistances (N_{60} values). Based on the explored soil properties and in accordance with Table 4.1.8.4.A, it is recommended that Site Class "D" (stiff soil) be applied for utilities at the Site.



Peak ground acceleration and spectral acceleration (period of 0.2 seconds) for the site are calculated to be 0.102g and 0.165g respectively using the 2015 National Building Code Seismic Hazard Calculation. Calculation results are shown in Appendix C.

Consideration could be given to carrying out shear wave velocity testing (“MASW”) to evaluate whether an improved seismic site class can be obtained.

4.12 Pavement Design

The performance of the pavement is dependent upon proper subgrade preparation. All topsoil and organic materials should be removed down to native material and backfilled with approved engineered fill or native material, compacted to 98% SPMDD. The subgrade should be proof rolled and inspected by a Geotechnical Engineer. Any areas where rutting or appreciable deflection is noted should be subexcavated and replaced with suitable fill. The fill should be compacted to at least 98% SPMDD. The recommended pavement structure should meet the municipal standards for parking and driving areas and should, as a minimum, consist of the pavement layers identified in Table 8.

The light duty pavement structure is intended for car and light-truck parking areas.

Table 8 Recommended Minimum Pavement Structure – Parking Areas

Pavement Layer	Light Duty
Surface Course Asphalt	40 mm HL3
Binder Course Asphalt	50 mm HL8
Granular Base	150 mm OPSS 1010 Granular A
Granular Subbase	300 mm OPSS 1010 Granular B

Material and thickness substitutions must be approved by the Design Engineer.

The thickness of the subbase layer could be increased at the discretion of the Engineer, to accommodate site conditions at the time of construction, including soft or weak subgrade soil replacement. Compaction of the subgrade should be verified by the Engineer prior to placing the granular fill. Granular layers should be placed in 150 mm thick lifts and compacted to at



least 98% of SPMDD (ASTM D698) standard. The granular materials specified should conform to OPSS standards, as confirmed by appropriate materials testing. The final asphalt surface should be sloped at a minimum of 2% to shed runoff. Abutting pavements should be sawcut to provide clean vertical joints with new pavement areas. Compaction of the subgrade should be verified by the Engineer prior to placing the granular fill. Granular layers should be placed in 150 mm thick lifts and compacted to at least 98% of SPMDD (ASTM D698) standard. The granular materials specified should conform to OPSS standards, as confirmed by appropriate materials testing.

The final asphalt surface should be sloped at a minimum of 2% to shed runoff. Abutting pavements should be sawcut to provide clean vertical joints with new pavement areas.

4.13 Design Review and Inspections

Testing and inspections should be carried out during construction operations to examine and approve subgrade conditions, fill material, compaction of pipe bedding, trench backfill, granular base courses, and asphaltic concrete. Compressive strength testing of concrete placed for curbs is also recommended.

We should be contacted to review and approve design drawings, prior to tendering or commencing construction, to ensure that all pertinent geotechnical-related factors have been addressed. It is important that onsite geotechnical supervision be provided at this site for excavation and backfill procedures, deleterious soil removal, subgrade inspections and compaction testing.



5.0 Closing

Please note that this work program and report are governed by the attached Qualifications and Limitations. If you have questions or comments regarding this document, please do not hesitate to contact the undersigned at (613) 389-2323.

Respectfully submitted,

Cambium Inc.

Mackenzie Garrison, M.Eng., P.Eng.
Geotechnical Engineer, Project Manager

Stuart Baird, M.Eng., P.Eng.
Director – Geotechnical, Building Sciences,
and Construction Quality & Verification

MG/sb

P:\13300 to 13399\13324-049 CoQW - GEO & ENV - College Street Development A, B, and C\Deliverables\REPORT - GEO\Parcel A\Final\2023-06-15 RPT GEO College Street Residential Development (A).docx



6.0 Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

Reliance on Materials and Information

The findings and results presented in reports prepared by Cambium are based on the materials and information provided by the client to Cambium and on the facts, conditions and circumstances encountered by Cambium during the performance of the work requested by the client. In formulating its findings and results into a report, Cambium assumes that the information and materials provided by the client or obtained by Cambium from the client or otherwise are factual, accurate and represent a true depiction of the circumstances that exist. Cambium relies on its client to inform Cambium if there are changes to any such information and materials. Cambium does not review, analyze or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Cambium will not be responsible for matters arising from incomplete, incorrect or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Cambium during the provision of services, work or reports.

Facts, conditions, information and circumstances may vary with time and locations and Cambium's work is based on a review of such matters as they existed at the particular time and location indicated in its reports. No assurance is made by Cambium that the facts, conditions, information, circumstances or any underlying assumptions made by Cambium in connection with the work performed will not change after the work is completed and a report is submitted. If any such changes occur or additional information is obtained, Cambium should be advised and requested to consider if the changes or additional information affect its findings or results.

When preparing reports, Cambium considers applicable legislation, regulations, governmental guidelines and policies to the extent they are within its knowledge, but Cambium is not qualified to advise with respect to legal matters. The presentation of information regarding applicable legislation, regulations, governmental guidelines and policies is for information only and is not intended to and should not be interpreted as constituting a legal opinion concerning the work completed or conditions outlined in a report. All legal matters should be reviewed and considered by an appropriately qualified legal practitioner.

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.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

Reliance

Cambium's services, work and reports may be relied on by the client and its corporate directors and officers, employees, and professional advisors. Cambium is not responsible for the use of its work or reports by any other party, or for the reliance on, or for any decision which is made by any party using the services or work performed by or a report prepared by Cambium without Cambium's express written consent. Any party that relies on services or work performed by Cambium or a report prepared by Cambium without Cambium's express written consent, does so at its own risk. No report of Cambium may be disclosed or referred to in any public document without Cambium's express prior written consent. Cambium specifically disclaims any liability or responsibility to any such party for any loss, damage, expense, fine, penalty or other such thing which may arise or result from the use of any information, recommendation or other matter arising from the services, work or reports provided by Cambium.

Limitation of Liability

Potential liability to the client arising out of the report is limited to the amount of Cambium's professional liability insurance coverage. Cambium shall only be liable for direct damages to the extent caused by Cambium's negligence and/or breach of contract. Cambium shall not be liable for consequential damages.

Personal Liability

The client expressly agrees that Cambium employees shall have no personal liability to the client with respect to a claim, whether in contract, tort and/or other cause of action in law. Furthermore, the client agrees that it will bring no proceedings nor take any action in any court of law against Cambium employees in their personal capacity.



Figures

O:\GIS\MD\13000-1399\13324-049 CoOW - GEO & ENV - College Street Development A, B, and C\2022-04-27 FIG 1 - Site Location Map.mxd



GEOTECHNICAL INVESTIGATION
 CITY OF QUINTE WEST
 College street
 Trenton, Ontario

LEGEND

- Highway
- Major Road
- Minor Road
- Railroad
- Watercourse
- Water Area
- Wooded Area
- Built Up Area

Notes:
 - Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
 - Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
 - Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

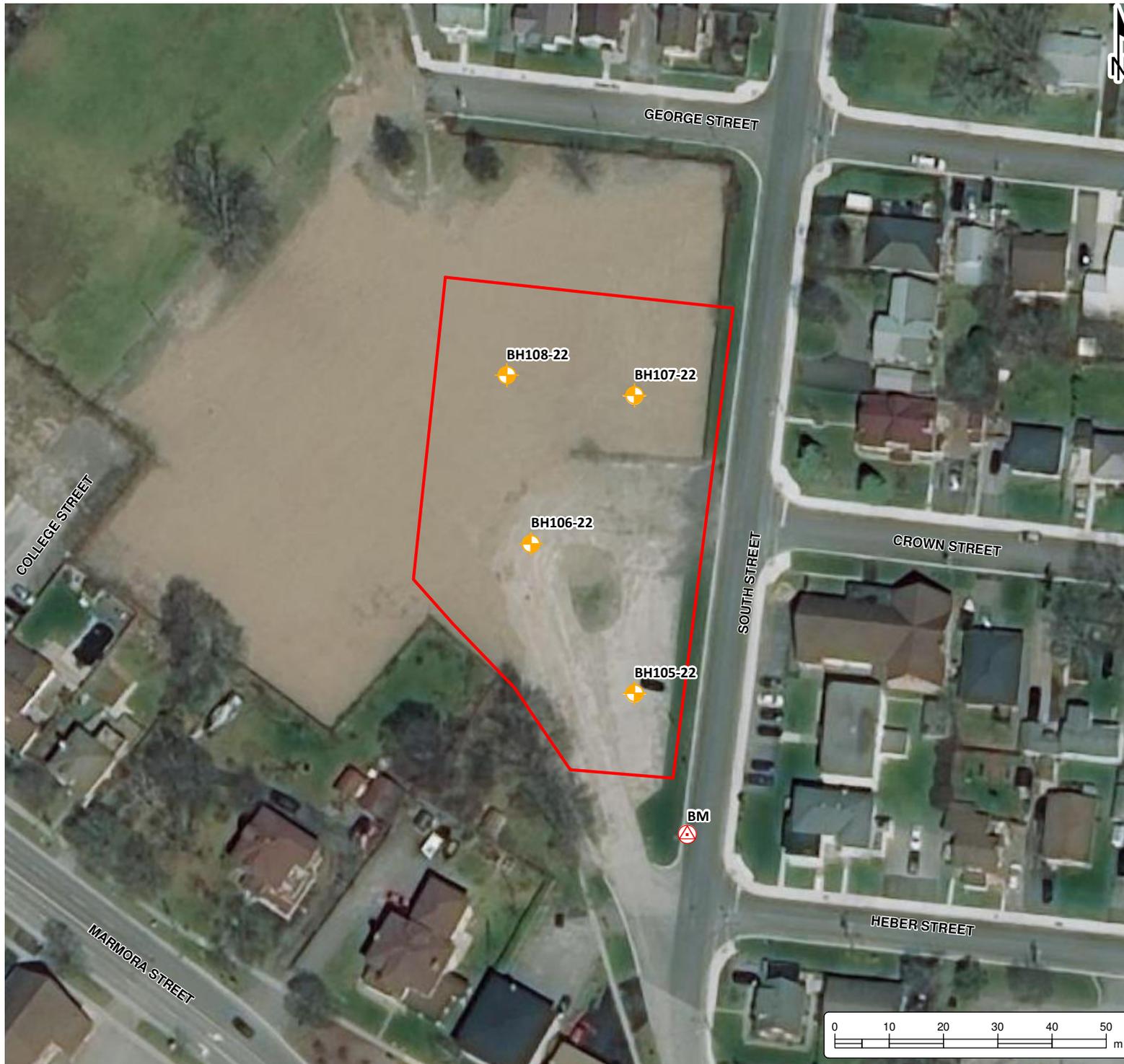


194 Sophia Street
 Peterborough, Ontario, K9H 1E5
 Tel: (705) 742.7900 Fax: (705) 742.7907
 www.cambium-inc.com

SITE LOCATION MAP

Project No.:	13324-049	Date:	April 2022
Scale:	1:100,000	Projection:	NAD 1983 UTM Zone 18N
Created by:	ACS	Checked by:	MDG
			1





GEOTECHNICAL INVESTIGATION
 CITY OF QUINTE WEST
 College street
 Trenton, Ontario

LEGEND

-  Benchmark
-  Borehole
-  Area A

Notes:

- Benchmark is the top nut of a fire hydrant.
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.



194 Sophia Street
 Peterborough, Ontario, K9H 1E5
 Tel: (705) 742.7900 Fax: (705) 742.7907
 www.cambium-inc.com

BOREHOLE LOCATION PLAN

Project No.:	13324-049	Date:	April 2022
Scale:	1:1,000	Rev.:	
Created by:	ACS	Checked by:	MDG
		Figure:	2A



Appendix A

Borehole Logs



Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

Log of Borehole: BH105-22
Page 1 of 1

Client: City of Quinte West Project Name: GEO & ENV - College Street Developments Project No.: 13324-049
Contractor: Canadian Environmental Drilling Method: Track Mounted Solid Stem Auger Date Completed: April 4 - 6, 2022
Location: College Street, Quinte West, ON UTM: 18 T N: 4889362.316 E: 774489.698 Elevation: 198.5 m Rel.

SUBSURFACE PROFILE				SAMPLE						Well Installation	Log Notes				
Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)/DCPT	% Moisture				SPT (N) / DCPT			
								25	50	75	20	40	60	80	
198.5	0		(GW) sandy GRAVEL: [FILL], grey to brown, moist, compact Becomes Brown with trace Silt	1A	SS										
				1B	SS	83	25	1.6%				25			
198.12				1C	SS										
198	0.5		(SP-SM) gravelly SAND with SILT: [FILL], dark brown, moist, compact												
197.74															
197.5	1		(GP-GM) sandy GRAVEL with SILT: [FILL], brown to grey, moist, dense Becomes Very Dense, increase in Fine Gravel content	2	SS	67	48	3.6%					48		
197	1.5														
196.5	2			3	SS	100	67	3.3%						67	
196	2.5		(GP-GM) sandy GRAVEL with SILT: brown to grey, moist, very dense												
195.5	3														
195	3.5			4	SS	79	57	7.4%						57	
194.5	4		(SM) SILTY SAND: grey to brown, moist, very dense, some gravel												
194	4.5														
193.5	5			5A	SS	100	64	9%						64	
193	5.5			5B	SS			7.8%							
192.5	6			6	SS	67	50	12.7%					50		
192	6.5		Borehole Terminated @ 5.2m Due to Target Depth Reached.												

Depth = 1.1m
5" seam of crushed limestone observed.

Depth = 1.3m
SPT refusal encountered.

Depth = 3.6m
SPT refusal encountered.

Depth = 4m
SPT refusal encountered.

Depth = 5.2m
Borehole terminated. Caving observed at 2.8 mbgs. Groundwater encountered at 3.0 mbgs. Standing water not observed upon completion.

GRAINSIZE | DEPTH | GRAVEL | SAND | SILT | CLAY
DISTRIBUTION



Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

Log of Borehole: BH106-22
Page 1 of 1

Client: City of Quinte West Project Name: GEO & ENV - College Street Developments Project No.: 13324-049
Contractor: Canadian Environmental Drilling Method: Track Mounted Solid Stem Auger Date Completed: April 4 - 6, 2022
Location: College Street, Quinte West, ON UTM: 18 N: 4889388.461 E: 774468.708 Elevation: 198.3 m Rel.

SUBSURFACE PROFILE				SAMPLE						Well Installation	Log Notes			
Elevation (m)	Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)/DCPT	% Moisture				SPT (N) / DCPT		
								25	50	75	20	40	60	80
198.3	0		(SM) SILTY SAND: [FILL], brown to grey, moist, compact, some gravel	1	SS	71	16	8.1%				16		
			Becomes Dense, increase in Gravel content	2A	SS			4.2%						
197.8	0.5													
197.3	1		(GP-GM) sandy GRAVEL with SILT: [FILL], grey to brown, moist, dense	2B	SS	100	45	1.9%				45		
			Becomes Very Dense	3	SS	100	73	1.6%					73	
196.8	1.5													
196.3	2		(SM) SILTY SAND: brown, moist, very dense, some gravel	4A	SS			5.6%						
195.8	2.5		(GP) sandy GRAVEL: brown, moist, very dense, trace silt	4B	SS	92	60	6.6%				60		
195.3	3		Borehole Terminated @ 3m Due to Target Depth Reached.											
194.8	3.5													

Depth = 0.3m Environmental sample obtained.

Depth = 1.2m Environmental sample obtained.

Depth = 1.8m Asphalt and debris observed in sampled.

Depth = 2.4m Environmental sample obtained.

Depth = 3m Borehole terminated. Caving observed at 2.8 mbgs. Groundwater encountered at 2.5 mbgs. Standing water observed at 2.7 mbgs upon completion.

GRAINSIZE DISTRIBUTION	DEPTH	GRAVEL	SAND	SILT	CLAY
	1.2	53	38	9	
	2.4	13	55	32	

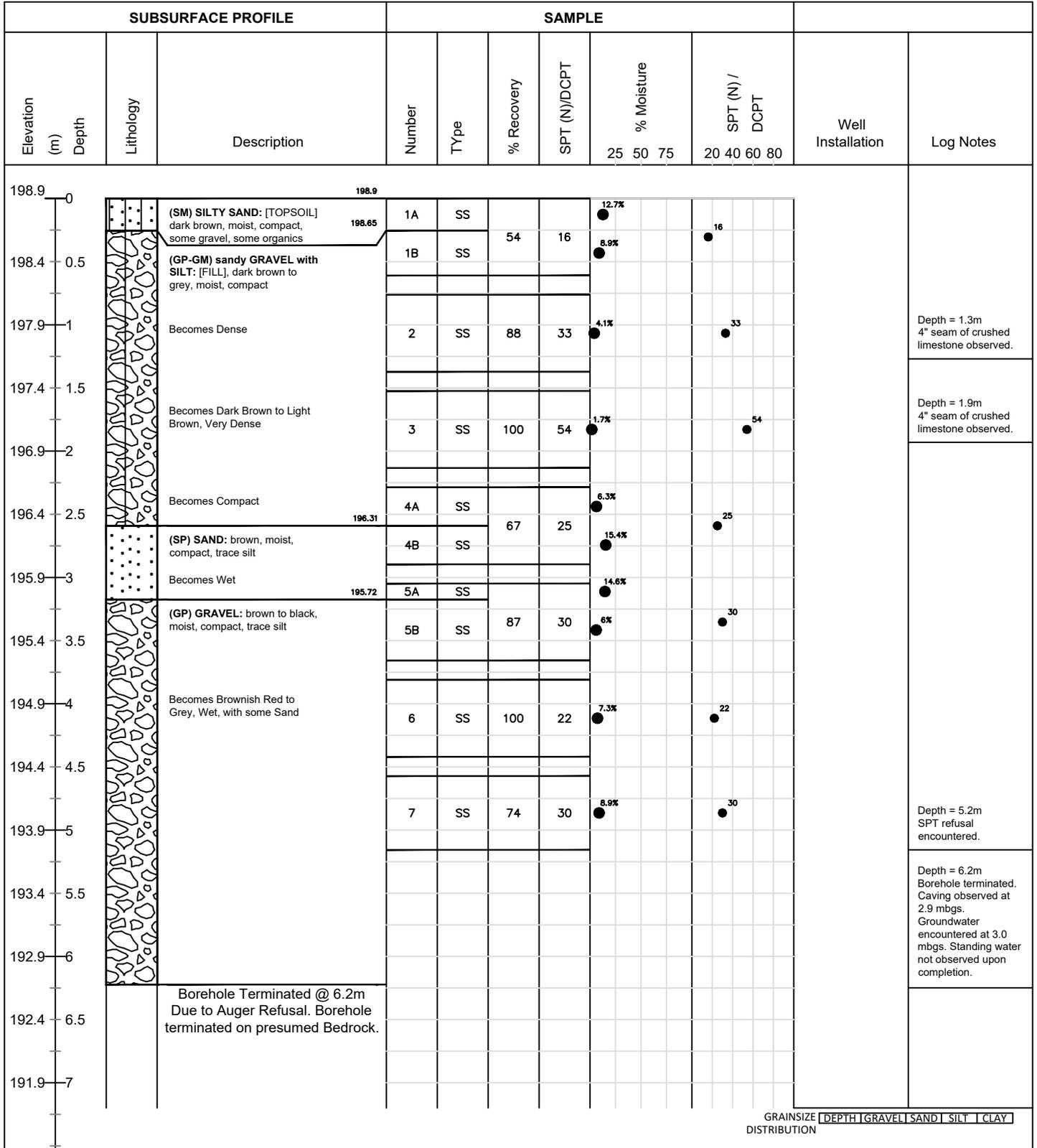
1m = 50 units
Logged By: Nik Valliant Input By: Farhan Imtiaz



Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
www.cambium-inc.com

Log of Borehole: BH108-22
Page 1 of 1

Client: City of Quinte West Project Name: GEO & ENV - College Street Developments Project No.: 13324-049
Contractor: Canadian Environmental Drilling Method: Track Mounted Solid Stem Auger Date Completed: April 4 - 6, 2022
Location: College Street, Quinte West, ON UTM: 18 T N: 4889419.127 E: 774461.956 Elevation: 198.9 m Rel.



Depth = 1.3m
4" seam of crushed limestone observed.

Depth = 1.9m
4" seam of crushed limestone observed.

Depth = 5.2m
SPT refusal encountered.

Depth = 6.2m
Borehole terminated. Caving observed at 2.9 mbgs. Groundwater encountered at 3.0 mbgs. Standing water not observed upon completion.



Appendix B

Physical Laboratory Results

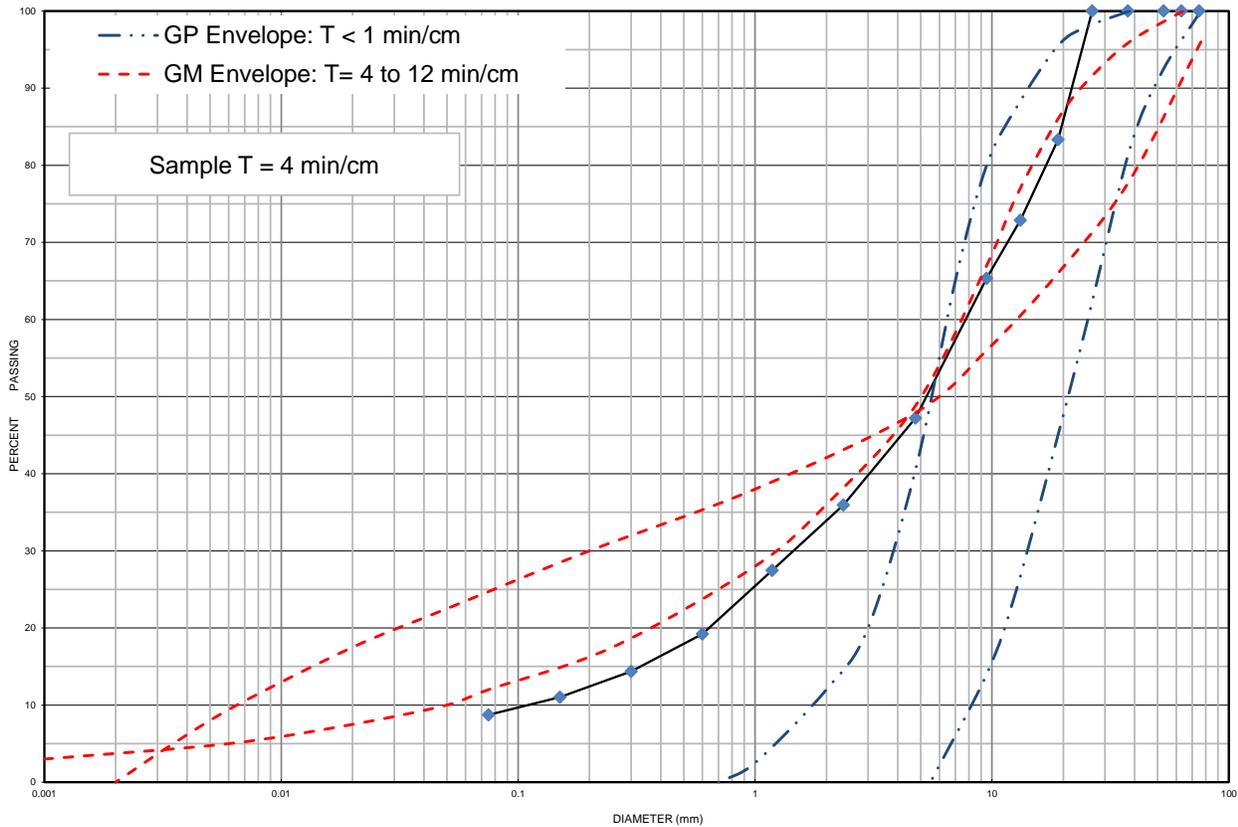


Grain Size Distribution Chart



Project Number: 13324-049 **Client:** City of Quinte West
Project Name: GEO & ENV - College Street Development A, B, and C
Sample Date: April 4 - 6, 2022 **Sampled By:** Nik Valiant - Cambium Inc.
Location: BH 106-22 SS 2B **Depth:** 1 m to 1.4 m **Lab Sample No:** S-22-0589

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
BH 106-22	SS 2B	1 m to 1.4 m	53	38	9		1.9
Description		Classification	D ₆₀	D ₃₀	D ₁₀	C _u	C _c
Gravel and Sand trace Silt		GW	7.950	1.550	0.115	69.13	2.63

Additional information available upon request

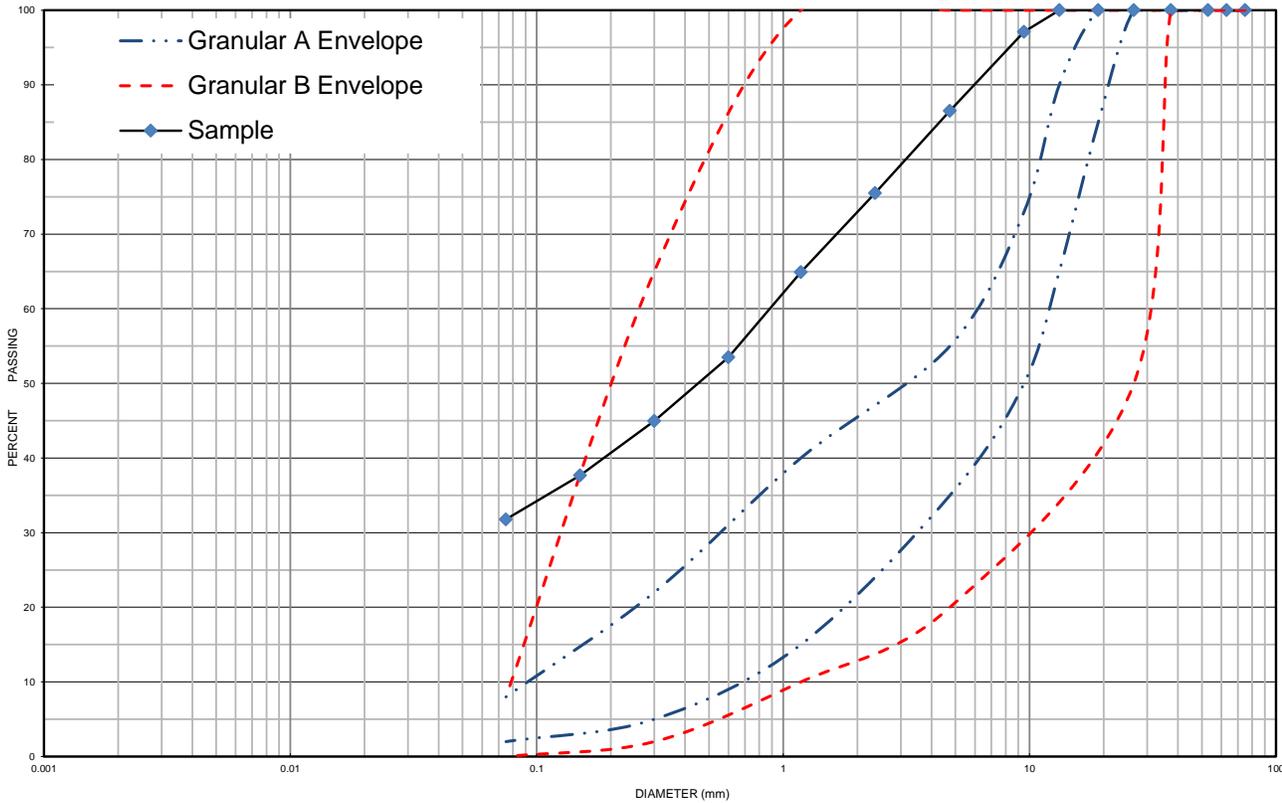
Issued By: *[Signature]* **Date Issued:** May 9, 2023
 (Senior Project Manager)



Grain Size Distribution Chart

Project Number: 13324-049 **Client:** City of Quinte West
Project Name: GEO & ENV - College Street Development A, B, and C
Sample Date: April 4 - 6, 2022 **Sampled By:** Nik Valiant - Cambium Inc.
Location: BH 106-22 SS 4A **Depth:** 2.3 m to 2.5 m **Lab Sample No:** S-22-0590

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
BH 106-22	SS 4A	2.3 m to 2.5 m	13	55	32		5.6
Description		Classification	D ₆₀	D ₃₀	D ₁₀	C _u	C _c
Silty Sand some Gravel		SM	0.089	-	-	-	-

Additional information available upon request

Issued By:  **Date Issued:** April 27, 2022
 (Senior Project Manager)



Moisture Content

Project Number:	13324-049	Lab Number:	S-22-0586
Project Name:	GEO & ENV - College Street Development, Area A	Date Tested:	2022-04-21
Client:	City of Quinte West	Tested By:	K. Dickson and A. Heffernan
Date Taken:	2022-04-04		

Borehole Number	Sample Number	Sample Depth (m)	Water Weight (g)	Water Content (%)	Additional Observations
105	1A	0.00-0.18	1.2	1.6	NR
105	1B	0.18-0.38	1.8	2.4	NR
105	1C	0.38-0.61	4.1	4.0	NR
105	2	0.76-1.37	4.3	3.6	NR
105	3	1.52-2.13	5.0	3.3	NR
105	4	2.29-2.90	11.7	7.4	NR
105	5A	3.05-3.45	29.4	9.0	
105	5B	3.45-3.66	21.1	7.8	
105	6	3.81-3.96	14.5	12.7	NR
106	1	0.00-0.61	14.8	8.1	NR
106	2A	0.15-1.04	5.6	4.2	NR
106	2B	1.07-1.37	7.7	1.9	NR
106	3	1.52-2.13	3.6	1.6	NR
106	4A	2.29-2.51	5.4	5.6	NR
106	4B	2.51-2.87	25.3	6.8	NR
107	1A	0.00-0.20	7.8	8.9	NR
107	1B	0.20-0.38	8.8	5.6	NR
107	1C	0.38-0.61	12.9	15.4	NR
107	2A	0.76-0.96	6.9	7.0	NR
107	2B	0.96-1.22	2.5	3.3	NR
107	3A	1.52-1.93	7.5	3.8	NR
107	3B	1.93-2.13	8.7	4.1	NR

- | | |
|------------------------------------|--|
| 1 – Contains organics | 6 – Very moist – near optimum moisture content |
| 2 – Contains rubble | 7 – Moist – below optimum moisture |
| 3 – Hydrocarbon Odour | 8 – Dry – dry texture – powdery |
| 4 – Unknown Chemical Odour | 9 – Very small – caution may not be representative |
| 5 – Saturated – free water visible | 10 – Hold sample for gradation analysis |



Moisture Content

Project Number:	13324-049	Lab Number:	S-22-0586
Project Name:	GEO & ENV - College Street Development, Area A	Date Tested:	2022-04-21
Client:	City of Quinte West	Tested By:	K. Dickson and A. Heffernan
Date Taken:	2022-04-04		

Borehole Number	Sample Number	Sample Depth (m)	Water Weight (g)	Water Content (%)	Additional Observations
107	4	2.29-2.90	18.8	7.7	NR
108	1A	0.00-0.23	8.0	12.7	NR
108	1B	0.23-0.61	2.4	8.9	NR
108	2	0.76-1.37	7.9	4.1	NR
108	3	1.52-2.13	3.9	1.7	NR
108	4A	2.29-2.59	16.9	6.3	NR
108	4B	2.59-2.90	7.2	15.4	NR
108	5A	3.05-3.18	7.1	14.6	NR
108	5B	3.18-3.66	21.6	6.0	NR
108	6	3.81-4.42	22.5	7.3	
108	7	4.57-5.16	26.7	8.9	NR

- | | |
|------------------------------------|--|
| 1 – Contains organics | 6 – Very moist – near optimum moisture content |
| 2 – Contains rubble | 7 – Moist – below optimum moisture |
| 3 – Hydrocarbon Odour | 8 – Dry – dry texture – powdery |
| 4 – Unknown Chemical Odour | 9 – Very small – caution may not be representative |
| 5 – Saturated – free water visible | 10 – Hold sample for gradation analysis |



Appendix C
Seismic Hazard Table

2015 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Site: 44.107N 77.571W

User File Reference: College Street, Quinte West, ON

2022-05-16 19:38 UT

Requested by: Farhan Imtiaz, Cambium Inc.

Probability of exceedance per annum	0.000404	0.001	0.0021	0.01
Probability of exceedance in 50 years	2 %	5 %	10 %	40 %
Sa (0.05)	0.143	0.076	0.046	0.015
Sa (0.1)	0.184	0.105	0.066	0.023
Sa (0.2)	0.165	0.100	0.066	0.025
Sa (0.3)	0.134	0.085	0.057	0.022
Sa (0.5)	0.105	0.068	0.046	0.017
Sa (1.0)	0.060	0.039	0.026	0.008
Sa (2.0)	0.031	0.019	0.013	0.004
Sa (5.0)	0.008	0.005	0.003	0.001
Sa (10.0)	0.003	0.002	0.001	0.001
PGA (g)	0.102	0.059	0.038	0.013
PGV (m/s)	0.088	0.054	0.034	0.011

Notes: Spectral ($S_a(T)$, where T is the period in seconds) and peak ground acceleration (PGA) values are given in units of g (9.81 m/s^2). Peak ground velocity is given in m/s . Values are for "firm ground" (NBCC2015 Site Class C, average shear wave velocity 450 m/s). NBCC2015 and CSAS6-14 values are highlighted in yellow. Three additional periods are provided - their use is discussed in the NBCC2015 Commentary. Only 2 significant figures are to be used. **These values have been interpolated from a 10-km-spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the directly calculated values.**

References

National Building Code of Canada 2015 NRCC no. 56190; Appendix C: Table C-3, Seismic Design Data for Selected Locations in Canada

Structural Commentaries (User's Guide - NBC 2015: Part 4 of Division B)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File 7893 Fifth Generation Seismic Hazard Model for Canada: Grid values of mean hazard to be used with the 2015 National Building Code of Canada

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information



Appendix D
Soil Characterization Report



Environmental

Geotechnical

Building Sciences

Construction Quality
Verification

Telephone

(866) 217.7900
(705) 742.7900

Website

cambium-inc.com

Mailing Address

P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations

Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory

Peterborough



June 3, 2022

The City of Quinte West
7 Creswell Drive
Trenton, ON K8V 5R6

Attn: Chris Angelo, Director of Public Works & Environmental Services

**Re: Excess Soil Characterization – Potential Residential Development
(Area A) College Street, City of Quinte West
Cambium Reference: 13324-049**

Dear Chris Angelo,

Cambium Inc. (Cambium) was retained by the City of Quinte West to characterize excess in-situ soil at the potential development on College Street in Quinte West, Ontario (the Site). It is understood that the Site will be divided into four areas during the development, referred to as Areas A, B, C, and D. The scope of work includes excess soil characterization for Area A only.

It is understood that the Site was previously developed for institutional use as a public school, which was demolished in 2020. Area A will be developed with a residential building with a footprint of about 1,000 m². Assuming a foundation depth of 2 m, it is estimated that 2,000 m³ of excess soil is expected to be generated from Area A during construction.

The excess soil characterization involved soil sampling and analysis to assess environmental quality, including the presence of contaminants and their respective concentration relative to regulatory standards.

The methodology for the excess soil characterization was based on the requirements of Ontario Regulation (O.Reg.) 406/19 and the associated document “Rules for Soil Management and Excess Soil Quality Standards”. Note that for work being conducted and concluded prior to January 1, 2023, amendments to O.Reg. 406/19 allows some deviation from the regulatory requirements. Any deviations from the regulation in 2022 should be approved by the intended receiving site if one is identified prior to commencement of work.



Environmental

Geotechnical

Building Sciences

Construction Quality
Verification

Telephone

(866) 217.7900
(705) 742.7900

Website

cambium-inc.com

Mailing Address

P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations

Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory

Peterborough



June 3, 2022

Based on a cursory review of the Site and surrounding properties, the contaminants of potential concern (COPCs) for the Site were metals, hydride-forming metals, electrical conductivity (EC), sodium adsorption ratio (SAR), petroleum hydrocarbon fractions 1 to 4 (PHC F1-F4), and benzene, toluene, ethylbenzene, xylenes (BTEX).

Methodology

The methodology for the excess soil characterization was developed by a qualified person (QP) based on the requirements of O.Reg. 406/19.

Cambium personnel conducted the soil sampling on April 4 to 6, 2022. Cambium oversaw the advancement of four boreholes by Canadian Environmental Drilling & Contractors Inc. throughout the subject soil volume source. Each borehole was advanced to varying depths during the geotechnical investigation completed by Cambium¹.

Soil samples were logged for soil type, moisture content, presence of odour, and visual evidence of impacts such as staining. The borehole logs are provided in the geotechnical investigation report¹. Soil samples from each borehole, for a total of 10 samples in Area A, were selected for analysis of the COPCs, at the following depths in meters below ground surface (mbgs):

- 0.5, 1.45, and 2.5 mbgs in BH105
- 0.5, 1.45, and 2.5 mbgs in BH106
- 0.5 and 2.45 mbgs in BH107
- 0.5 and 2.55 mbgs in BH108

Four samples were submitted for modified Synthetic Precipitation Leaching Procedure (mSPLP) analysis. The mSPLP samples were submitted from the sampling locations where 90% (or higher) of the highest contaminant concentrations were identified.

¹ Geotechnical Investigation – Potential Residential Development (A, B, C) College Street, City of Quinte West. Cambium Inc. May 25, 2022.



Environmental

Geotechnical

Building Sciences

Construction Quality
Verification

Telephone

(866) 217.7900
(705) 742.7900

Website

cambium-inc.com

Mailing Address

P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations

Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory

Peterborough



June 3, 2022

The soil samples were submitted to Paracel Laboratories Ltd. (Paracel).

Quality Assurance and Control Analysis

In addition, quality control duplicate samples were analyzed as part of a Quality Assurance/Quality Control (QA/QC) program. The following blind duplicate soil samples were submitted for analysis of the COPCs:

- QAQC1 is a duplicate of BH105 at 2.5 mbgs

Where analytical parameters were detected in both the parent and the duplicate samples at concentrations greater than five times the laboratory reported detection limit (RDL), relative percent difference (RPD) was calculated to assess the precision of the results. RPD between was calculated as follows:

$$RPD(\%) = \frac{|x_1 - x_2|}{x_m} \times 100\%$$

Where: x_1 = parent sample result

x_2 = duplicate sample result

x_m = arithmetic mean of parent and duplicate sample results

RPD are generally more sensitive at low parameter concentrations; as such, RPD is not calculated when the parameter concentration if the parent and/or duplicate sample is less than five times the laboratory RDL.

The calculated RPD results were compared to data quality objectives (DQOs) of 50% for soil. These DQOs are accepted by the Ministry.

All calculated RPDs met the DQOs, as such, the sample results were considered acceptable and suitable for use in evaluating soil quality at the Site.

Results

No odours, staining, deleterious material, or elevated vapours were noted in the soil samples. Soil analysis results were compared to the volume independent generic excess soil quality standards (ESQS) and Generic Leachate Screening Levels For Excess Soil Reuse in Appendix 1 of the *Rules for Soil Management and Excess Soil Quality Standards*.



Environmental

Geotechnical

Building Sciences

Construction Quality
Verification

Telephone

(866) 217.7900
(705) 742.7900

Website

cambium-inc.com

Mailing Address

P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations

Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory

Peterborough



June 3, 2022

As a receiving site has not yet been determined, analysis results were compared to the Table 1 standards for residential, parkland, institutional, industrial, commercial, community (RPIICC) property use, as well as the Table 2.1 and 3.1 ESQS for residential, parkland, institutional (RPI) property use and industrial, commercial, community (ICC) property use. The original laboratory Certificates of Analysis are attached, and soil analysis results are presented in Table D1, attached.

The following is a summary of the excess soil quality standards that are met based on the analysis.

Table 1 Excess Soil Quality Standards Met

Sample ID	Sample Depth (mbgs)	Table 1 (RPIICC)	Table 2.1 (RPI)	Table 2.1 (ICC)	Table 3.1 (RPI)	Table 3.1 (ICC)
Area A						
BH105	0.5	✘	✔	✔	✔	✔
	1.45	✔	✔	✔	✔	✔
	2.5	✔	✔	✔	✔	✔
BH106	0.5	✘	✔	✔	✔	✔
	1.45	✔	✔	✔	✔	✔
	2.5	✔	✔	✔	✔	✔
BH107	0.5	✔	✔	✔	✔	✔
	2.45	✘	✔	✔	✔	✔
BH108	0.5	✔	✔	✔	✔	✔
	2.55	✘	✔	✔	✔	✔

Additionally, the leachate results met the O.Reg. 406/19 Appendix 2 *Generic Leachate Screening Levels for Excess Soil* for Table 1, Table 2.1, and Table 3.1. The leachate results are provided in the laboratory Certificates of Analysis and are tabulated in Table D2, attached.

Recommendations

Recommendations for reuse/disposal are summarized below. Additional delineation and soil sampling may be required if the volume of excess soil exceeds the soil sample frequency collected as part of this soil characterization.



Environmental

Geotechnical

Building Sciences

Construction Quality
Verification

Telephone

(866) 217.7900
(705) 742.7900

Website

cambium-inc.com

Mailing Address

P.O. Box 325,
Peterborough, Ontario
Canada, K9J 6Z3

Locations

Peterborough
Kingston
Barrie
Oshawa
Calgary

Laboratory

Peterborough



June 3, 2022

The following options are available for the soil tested in Area A:

- Reuse on-site as backfill or for re-grading, under the guidance of a QP and as approved by a geotechnical engineer
- Reuse off-site at a Table 2.1 or 3.1 (RPI or ICC) receiving site, under the guidance of the receiving site's QP, and subject to applicable municipal fill bylaws

Recommendations provided herein are based solely on the analysis of samples obtained and do not represent acceptance or suitability of this material on behalf of an intended receiving site. Should conditions encountered during excavation vary from those described in this report, Cambium should be notified to evaluate the need for further work.

Closing

We trust that this report meets your requirements. Should you have any questions or concerns regarding any aspect of this report, or should you require any further assistance, please do not hesitate to contact our office

Best regards,

Cambium Inc.

Patrick Garrett, M.Sc., C.Chem.
Environmental Specialist/Jr. Risk
Assessor

Brad Sawdon, P.Geo. QP_{ESA}
Senior Project Manager

pjg/BATS

Attached: Tables D1 and D2

Laboratory Certificates of Analysis

P:\13300 to 13399\13324-049 CoQW - GEO & ENV - College Street Development A, B, and C\Deliverables\REPORT - SCR\Area A\2022-06-03 13324-049 SCR College Street Area A.docx



Table D1 - Summary of Soil Quality

Sample Location	Units	RDL	Table 1 RPICC	Table 2.1 RPI	Table 2.1 ICC	Table 3.1 RPI	Table 3.1 ICC	BH105				BH106			BH107		BH108	
								SS105_0.1_0.9	SS105_1.0_1.9	SS105_2.0_3.0	QAQC#1	SS106_0.1_0.9	SS106_1.0_1.9	SS106_2.0_3.0	SS107_0.1_0.9	SS107_2.1_2.9	SS108_0.1_0.9	SS108_2.2_2.9
								04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22	04-Apr-22
Sample ID																		
Sample Date (dd-mm-yy)																		
Sample Depth (mbgs)																		
Volatile Organic Compounds																		
Benzene	µg/g	0.02	0.02	0.02	0.02	0.02	0.034	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	µg/g	0.05	0.05	0.05	0.05	1.9	1.9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	µg/g	0.05	0.2	0.2	0.2	0.99	7.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
m/p-Xylene	µg/g	0.05	NV	NV	NV	NV	NV	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g	0.05	NV	NV	NV	NV	NV	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylenes (total)	µg/g	0.05	0.05	0.091	0.091	0.9	3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Petroleum Hydrocarbons																		
F1 (C5-C10)	µg/g	7	25	25	25	25	25	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
F2 (C10-C16)	µg/g	4	10	10	26	10	26	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
F3 (C16-C34)	µg/g	8	240	240	240	300	1700	54	14	<8	<8	23	<8	<8	<8	<8	<8	<8
F4 (C34-C50)	µg/g	6	120	2800	3300	2800	3300	149	29	<6	<6	136	<6	<6	<6	<6	<6	<6
F4G	µg/g	50	120	2800	3300	2800	3300	154	-	-	-	340	-	-	-	-	-	-
Metals and Inorganics																		
Antimony	µg/g	1	1.3	7.5	40	7.5	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	<1.0	1.4
Arsenic	µg/g	1	18	18	18	18	18	1.8	1.9	1.9	1.7	5.4	2.2	2.5	2.9	2.4	2.1	2
Barium	µg/g	1	220	390	670	390	670	77.1	16.5	26.7	22.6	78.6	23.5	25.1	58.8	32.5	40.2	26.4
Beryllium	µg/g	0.5	2.5	4	8	4	8	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	0.6	<0.5	<0.5	<0.5
Boron (HWS)	µg/g	0.5	NV	1.5	2	1.5	2	-	-	-	-	-	-	-	-	<0.5	-	<0.5
Boron	µg/g	5	36	120	120	120	120	<5.0	<5.0	5.8	5.5	6.8	6.9	6.8	<5.0	9.5	<5.0	6.3
Cadmium	µg/g	0.5	1.2	1.2	1.9	1.2	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium (VI)	µg/g	0.2	0.66	8	8	8	8	-	-	-	-	-	-	-	-	<0.2	-	<0.2
Chromium	µg/g	5	70	160	160	160	160	9.3	9.7	17.2	11.3	21.5	9.3	10.5	20.5	14.3	11.8	9.2
Cobalt	µg/g	1	21	22	80	22	80	3.4	3.3	4.5	4.2	6.7	3.5	3.8	5.1	3.9	3.7	3.5
Copper	µg/g	5	92	140	230	140	230	<5.0	<5.0	5.9	5.2	14.1	5.1	7.2	7.7	7.6	6.5	14.6
Lead	µg/g	1	120	120	120	120	120	5.2	2.9	3.5	3.3	22.6	3.9	4.3	51.3	3.5	7.1	3.4
Mercury	µg/g	0.1	0.27	0.27	0.27	0.27	0.27	-	-	-	-	-	-	-	-	<0.1	-	<0.1
Molybdenum	µg/g	1	2	6.9	40	6.9	40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	µg/g	5	82	100	270	100	270	5.4	6.1	10.5	7	13	6.4	6.9	9.9	8.2	7.2	5.1
Selenium	µg/g	1	1.5	2.4	5.5	2.4	5.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	µg/g	0.3	0.5	20	40	20	40	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Thallium	µg/g	1	1	1	3.3	1	3.3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Uranium	µg/g	1	2.5	23	33	23	33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	µg/g	10	86	86	86	86	86	17.6	18.7	15.6	17.7	29	11.9	12.5	24.5	17	19.2	14.8
Zinc	µg/g	20	290	340	340	340	340	<20.0	<20.0	22	<20.0	42	<20.0	<20.0	43.6	<20.0	29.9	<20.0
Sodium Adsorption Ratio	N/A	0.01	2.4	5	12	5	12	0.27	0.22	1.18	0.93	0.39	0.47	1.25	0.34	0.11	0.15	0.28
Conductivity	mS/cm	5	0.57	0.7	1.4	0.7	1.4	0.113	0.11	0.169	0.136	0.178	0.135	0.146	0.192	0.118	0.161	0.118

Notes:
 Table 1 Standards - Full Depth Background Site Condition Standards - Residential/Parkland/Industrial/Commercial/Community Property Use
 Table 2.1 Standards - Full Depth Background Site Condition Standards - Residential/Parkland/Industrial Property Use
 Table 2.2 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition Industrial/Commercial/Community Property Use
 Table 3.1 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition Residential/Parkland/Industrial Property Use
 Table 3.2 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition Industrial/Commercial/Community Property Use
 Bold and shaded grey - value exceeds Table 1 RPICC
 Bold and shaded yellow - value exceeds Table 2.1 RPI
 Bold and shaded orange - value exceeds Table 2.1 ICC
 Bold and shaded red - value exceeds Table 3.1 RPI
 Bold and shaded purple - value exceeds Table 3.1 ICC
 Bold and underlined - RDL exceeds standard
 N/A - not applicable
 NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
 NV - no value
 -/- not analyzed



Table D2 - Summary of Soil Leachate Quality

Sample Location	Units	RDL	Table 1 RPIICC	Table 2.1 RPI	Table 2.1 ICC	Table 3.1 RPI	Table 3.1 ICC	BH106	BH107		BH108
Sample ID								SS106_0.1_0.9	SS107_0.1_0.9	SS107_2.1_2.9	SS108_2.2_2.9
Sample Date (dd-mmm-yy)								05-Apr-22	05-Apr-22	05-Apr-22	05-Apr-22
Sample Depth (mbgs)								0.1-0.9	0.1-0.9	2.1-2.9	2.2-2.9
mSPLP Leachate Metals											
Antimony	ug/L	0.5	NV	6	6	NV	NV	0.6	<0.5	<0.5	<0.5
Arsenic	ug/L	1	NV	NV	NV	NV	NV	3.4	2.2	<1.0	<1.0
Barium	ug/L	1	NV	1000	1000	4600	4600	53.5	56.5	3.5	1.6
Beryllium	ug/L	0.5	NV	4	4	11	11	<0.5	<0.5	<0.5	<0.5
Boron	ug/L	10	NV	5000	5000	NV	NV	19.9	18.8	<10.0	20.2
Cadmium	ug/L	0.2	NV	NV	0.5	NV	0.5	<0.2	<0.2	<0.2	<0.2
Chromium	ug/L	1	NV	50	50	130	130	12.4	11.9	<1.0	1.3
Cobalt	ug/L	0.5	NV	3.8	3.8	10	10	1.4	1.3	<0.5	<0.5
Copper	ug/L	0.5	NV	14	14	14	14	4.6	4	0.8	<0.5
Lead	ug/L	0.2	NV	NV	NV	NV	NV	5.8	39.1	<0.2	0.4
Molybdenum	ug/L	0.5	23	23	23	NV	1500	4	0.7	0.5	0.7
Nickel	ug/L	1	NV	78	78	78	78	5.5	5	<1.0	<1.0
Selenium	ug/L	1	NV	10	10	10	10	<1.0	<1.0	<1.0	<1.0
Silver	ug/L	0.2	0.3	0.3	0.3	0.3	0.3	<0.2	<0.2	<0.2	<0.2
Thallium	ug/L	0.5	2	2	2	NV	80	<0.5	<0.5	<0.5	<0.5
Uranium	ug/L	0.2	NV	20	20	66	66	0.3	<0.2	<0.2	<0.2
Vanadium	ug/L	0.5	NV	NV	NV	NV	NV	14	12.5	1.2	1.3
Zinc	ug/L	5	NV	180	180	180	180	21.1	27.6	<5.0	<5.0

Notes:
 Table 1 Standards - Full Depth Background Site Condition Standards - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
 Table 2.1 Standards - Full Depth Background Site Condition Standards - Residential/Parkland/Institutional Property Use
 Table 2.1 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition-Industrial/Commercial/Community Property Use
 Table 3.1 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition- Residential/Parkland/Institutional Property Use
 Table 3.1 Standards - Full Depth Excess Soil Quality Standards in a Potable Ground Water Condition- Industrial/Commercial/Community Property Use
 Bold and shaded grey - value exceeds Table 1 RPIICC
 Bold and shaded yellow - value exceeds Table 2.1 RPI
 Bold and shaded orange - value exceeds Table 2.1 ICC
 Bold and shaded red - value exceeds Table 3.1 RPI
 Bold and shaded purple - value exceeds Table 3.1 ICC
 Bold and underline - RDL exceeds standard
 N/A - not applicable
 NC - The duplicate RPD was not calculated. One or both samples < 5x RDL.
 NV - no value
 "-" not analyzed

Certificate of Analysis

Cambium Inc. (Kingston)

625 Fortune Crescent Unit 1
Kingston, ON K7P0L5
Attn: Christine Wilson

Client PO:
Project: 13324-049
Custody: 135905, 904, 906, 134074

Report Date: 5-May-2022
Order Date: 7-Apr-2022

Revised Report

Order #: 2215420

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

Paracel ID	Client ID
2215420-01	SS106_0.1_0.9
2215420-02	SS106_1.0_1.9
2215420-03	SS106_2.0_3.0
2215420-04	SS107_0.1_0.9
2215420-05	SS107_2.1_2.9
2215420-06	SS108_0.1_0.9
2215420-07	SS108_2.2_2.9
2215420-08	SS105_0.1_0.9
2215420-09	SS105_1.0_1.9
2215420-10	QA/QC #1
2215420-11	SS105_2.0_3.0
2215420-12	BH101_0.1_0.9
2215420-13	BH101_1.0_1.9
2215420-14	BH101_2.0_3.0
2215420-15	QAQC2
2215420-16	BH102_0.1_0.9
2215420-17	BH102_2.0_2.9
2215420-18	BH103_0.1_0.9
2215420-19	BH103_2.3_2.8
2215420-20	BH104_0.1_0.9
2215420-21	BH104_1.0_1.9
2215420-22	BH104_2.0_3.0
2215420-23	BH111_0.1_0.9
2215420-24	BH111_2.2_2.9
2215420-25	BH109_0.1_0.9
2215420-26	BH109_1.0_1.9
2215420-27	BH109_4.0_5.0
2215420-28	QAQC3
2215420-29	BH110_0.1_0.9
2215420-30	BH110_2.0_3.0

Approved By:



Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

2215420-31	BH112_0.1_0.9
2215420-32	BH112_1.0_1.9
2215420-33	BH112_4.0_5.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Boron, available	MOE (HWE), EPA 200.8 - ICP-MS	20-Apr-22	20-Apr-22
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	8-Apr-22	10-Apr-22
Chromium, hexavalent - soil	MOE E3056 - Extraction, colourimetric	19-Apr-22	20-Apr-22
Conductivity	MOE E3138 - probe @25 °C, water ext	12-Apr-22	12-Apr-22
Mercury by CVAA	EPA 7471B - CVAA, digestion	20-Apr-22	20-Apr-22
PHC F1	CWS Tier 1 - P&T GC-FID	8-Apr-22	10-Apr-22
PHC F4G (gravimetric)	CWS Tier 1 - Extraction Gravimetric	11-Apr-22	13-Apr-22
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	9-Apr-22	11-Apr-22
REG 153: Metals by ICP/MS, soil	EPA 6020 - Digestion - ICP-MS	12-Apr-22	12-Apr-22
REG 406: Metals, leachate	mSPLP EPA 6020 - Digestion - ICP-MS	4-May-22	5-May-22
SAR	Calculated	12-Apr-22	12-Apr-22
Solids, %	Gravimetric, calculation	11-Apr-22	11-Apr-22

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	SS106_0.1_0.9	SS106_1.0_1.9	SS106_2.0_3.0	SS107_0.1_0.9
Sample Date:	04-Apr-22 09:00	04-Apr-22 09:30	04-Apr-22 09:45	04-Apr-22 10:30
Sample ID:	2215420-01	2215420-02	2215420-03	2215420-04
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	91.1	96.1	92.0	88.9
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	0.6	-	-	<0.5
Arsenic	1.0 ug/L	3.4	-	-	2.2
Barium	1.0 ug/L	53.5	-	-	56.5
Beryllium	0.5 ug/L	<0.5	-	-	<0.5
Boron	10.0 ug/L	19.9	-	-	18.8
Cadmium	0.2 ug/L	<0.2	-	-	<0.2
Chromium	1.0 ug/L	12.4	-	-	11.9
Cobalt	0.5 ug/L	1.4	-	-	1.3
Copper	0.5 ug/L	4.6	-	-	4.0
Lead	0.2 ug/L	5.8	-	-	39.1
Molybdenum	0.5 ug/L	4.0	-	-	0.7
Nickel	1.0 ug/L	5.5	-	-	5.0
Selenium	1.0 ug/L	<1.0	-	-	<1.0
Silver	0.2 ug/L	<0.2	-	-	<0.2
Thallium	0.5 ug/L	<0.5	-	-	<0.5
Uranium	0.2 ug/L	0.3	-	-	<0.2
Vanadium	0.5 ug/L	14.0	-	-	12.5
Zinc	5.0 ug/L	21.1	-	-	27.6

General Inorganics

SAR	0.01 N/A	0.39	0.47	1.25	0.34
Conductivity	5 uS/cm	178	135	146	192

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	5.4	2.2	2.5	2.9
Barium	1.0 ug/g dry	78.6	23.5	25.1	58.8
Beryllium	0.5 ug/g dry	0.6	<0.5	<0.5	0.6
Boron	5.0 ug/g dry	6.8	6.9	6.8	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	21.5	9.3	10.5	20.5
Cobalt	1.0 ug/g dry	6.7	3.5	3.8	5.1
Copper	5.0 ug/g dry	14.1	5.1	7.2	7.7
Lead	1.0 ug/g dry	22.6	3.9	4.3	51.3
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	SS106_0.1_0.9	SS106_1.0_1.9	SS106_2.0_3.0	SS107_0.1_0.9
	Sample Date:	04-Apr-22 09:00	04-Apr-22 09:30	04-Apr-22 09:45	04-Apr-22 10:30
	Sample ID:	2215420-01	2215420-02	2215420-03	2215420-04
	MDL/Units	Soil	Soil	Soil	Soil
Nickel	5.0 ug/g dry	13.0	6.4	6.9	9.9
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	29.0	11.9	12.5	24.5
Zinc	20.0 ug/g dry	42.0	<20.0	<20.0	43.6

Volatiles

Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	56.5%	54.8%	56.4%	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	-
F3 PHCs (C16-C34)	8 ug/g dry	23	<8	<8	-
F4 PHCs (C34-C50)	6 ug/g dry	136 [3]	<6	<6	-
F4G PHCs (gravimetric)	50 ug/g dry	340	-	-	-

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	SS107_2.1_2.9	SS108_0.1_0.9	SS108_2.2_2.9	SS105_0.1_0.9
Sample Date:	04-Apr-22 10:45	04-Apr-22 12:30	04-Apr-22 12:45	04-Apr-22 14:45
Sample ID:	2215420-05	2215420-06	2215420-07	2215420-08
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	91.6	92.9	90.7	97.7
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	<0.5	-	<0.5	-
Arsenic	1.0 ug/L	<1.0	-	<1.0	-
Barium	1.0 ug/L	3.5	-	1.6	-
Beryllium	0.5 ug/L	<0.5	-	<0.5	-
Boron	10.0 ug/L	<10.0	-	20.2	-
Cadmium	0.2 ug/L	<0.2	-	<0.2	-
Chromium	1.0 ug/L	<1.0	-	1.3	-
Cobalt	0.5 ug/L	<0.5	-	<0.5	-
Copper	0.5 ug/L	0.8	-	<0.5	-
Lead	0.2 ug/L	<0.2	-	0.4	-
Molybdenum	0.5 ug/L	0.5	-	0.7	-
Nickel	1.0 ug/L	<1.0	-	<1.0	-
Selenium	1.0 ug/L	<1.0	-	<1.0	-
Silver	0.2 ug/L	<0.2	-	<0.2	-
Thallium	0.5 ug/L	<0.5	-	<0.5	-
Uranium	0.2 ug/L	<0.2	-	<0.2	-
Vanadium	0.5 ug/L	1.2	-	1.3	-
Zinc	5.0 ug/L	<5.0	-	<5.0	-

General Inorganics

SAR	0.01 N/A	0.11	0.15	0.28	0.27
Conductivity	5 uS/cm	118	161	118	113

Metals

Antimony	1.0 ug/g dry	1.7	<1.0	1.4	<1.0
Arsenic	1.0 ug/g dry	2.4	2.1	2.0	1.8
Barium	1.0 ug/g dry	32.5	40.2	26.4	77.1
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	9.5	<5.0	6.3	<5.0
Boron, available	0.5 ug/g dry	<0.5	-	<0.5	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	14.3	11.8	9.2	9.3
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	3.9	3.7	3.5	3.4
Copper	5.0 ug/g dry	7.6	6.5	14.6	<5.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	SS107_2.1_2.9	SS108_0.1_0.9	SS108_2.2_2.9	SS105_0.1_0.9
	Sample Date:	04-Apr-22 10:45	04-Apr-22 12:30	04-Apr-22 12:45	04-Apr-22 14:45
	Sample ID:	2215420-05	2215420-06	2215420-07	2215420-08
	MDL/Units	Soil	Soil	Soil	Soil
Lead	1.0 ug/g dry	3.5	7.1	3.4	5.2
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	8.2	7.2	5.1	5.4
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	17.0	19.2	14.8	17.6
Zinc	20.0 ug/g dry	<20.0	29.9	<20.0	<20.0

Volatiles

Benzene	0.02 ug/g dry	<0.02	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene-d8	Surrogate	56.7%	-	57.6%	53.5%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	54
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	149 [3]
F4G PHCs (gravimetric)	50 ug/g dry	-	-	-	154

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	SS105_1.0_1.9	QA/QC #1	SS105_2.0_3.0	BH101_0.1_0.9
Sample Date:	04-Apr-22 14:50	04-Apr-22 09:00	04-Apr-22 15:00	05-Apr-22 10:00
Sample ID:	2215420-09	2215420-10	2215420-11	2215420-12
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	95.6	92.9	92.6	92.1
----------	--------------	------	------	------	------

General Inorganics

SAR	0.01 N/A	0.22	0.93	1.18	0.08
Conductivity	5 uS/cm	110	136	169	120

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	1.9	1.7	1.9	3.3
Barium	1.0 ug/g dry	16.5	22.6	26.7	57.9
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	<5.0	5.5	5.8	5.6
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	9.7	11.3	17.2	20.3
Cobalt	1.0 ug/g dry	3.3	4.2	4.5	6.9
Copper	5.0 ug/g dry	<5.0	5.2	5.9	19.5
Lead	1.0 ug/g dry	2.9	3.3	3.5	16.6
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	6.1	7.0	10.5	10.6
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	18.7	17.7	15.6	25.6
Zinc	20.0 ug/g dry	<20.0	<20.0	22.0	43.9

Volatiles

Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	54.4%	56.3%	55.1%	56.2%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	14	<8	<8	<8

Certificate of Analysis
Client: Cambium Inc. (Kingston)
Client PO:

Report Date: 05-May-2022
 Order Date: 7-Apr-2022
Project Description: 13324-049

	Client ID:	SS105_1.0_1.9	QA/QC #1	SS105_2.0_3.0	BH101_0.1_0.9
	Sample Date:	04-Apr-22 14:50	04-Apr-22 09:00	04-Apr-22 15:00	05-Apr-22 10:00
	Sample ID:	2215420-09	2215420-10	2215420-11	2215420-12
	MDL/Units	Soil	Soil	Soil	Soil
F4 PHCs (C34-C50)	6 ug/g dry	29	<6	<6	<6

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	BH101_1.0_1.9	BH101_2.0_3.0	QAQC2	BH102_0.1_0.9
Sample Date:	05-Apr-22 10:00	05-Apr-22 10:00	05-Apr-22 09:00	05-Apr-22 11:30
Sample ID:	2215420-13	2215420-14	2215420-15	2215420-16
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	88.9	95.5	94.7	91.1
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	-	<0.5	-	<0.5
Arsenic	1.0 ug/L	-	<1.0	-	1.2
Barium	1.0 ug/L	-	2.8	-	43.0
Beryllium	0.5 ug/L	-	<0.5	-	<0.5
Boron	10.0 ug/L	-	<10.0	-	27.5
Cadmium	0.2 ug/L	-	<0.2	-	<0.2
Chromium	1.0 ug/L	-	<1.0	-	5.4
Cobalt	0.5 ug/L	-	<0.5	-	0.5
Copper	0.5 ug/L	-	0.5	-	2.5
Lead	0.2 ug/L	-	<0.2	-	10.1
Molybdenum	0.5 ug/L	-	0.9	-	0.8
Nickel	1.0 ug/L	-	<1.0	-	2.0
Selenium	1.0 ug/L	-	<1.0	-	<1.0
Silver	0.2 ug/L	-	<0.2	-	<0.2
Thallium	0.5 ug/L	-	<0.5	-	<0.5
Uranium	0.2 ug/L	-	<0.2	-	<0.2
Vanadium	0.5 ug/L	-	1.5	-	5.9
Zinc	5.0 ug/L	-	<5.0	-	15.1

General Inorganics

SAR	0.01 N/A	0.11	0.08	0.10	0.07
Conductivity	5 uS/cm	156	94	100	136

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	2.6	2.0	2.0	3.1
Barium	1.0 ug/g dry	53.7	29.0	31.8	131
Beryllium	0.5 ug/g dry	0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	<5.0	5.2	5.3	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	21.6	15.9	15.2	15.2
Cobalt	1.0 ug/g dry	6.9	6.0	5.5	4.0
Copper	5.0 ug/g dry	8.5	9.0	8.2	14.8
Lead	1.0 ug/g dry	6.6	3.5	3.3	94.5
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	BH101_1.0_1.9	BH101_2.0_3.0	QAQC2	BH102_0.1_0.9
	Sample Date:	05-Apr-22 10:00	05-Apr-22 10:00	05-Apr-22 09:00	05-Apr-22 11:30
	Sample ID:	2215420-13	2215420-14	2215420-15	2215420-16
	MDL/Units	Soil	Soil	Soil	Soil
Nickel	5.0 ug/g dry	12.1	11.4	10.7	7.4
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	31.1	24.2	22.6	18.9
Zinc	20.0 ug/g dry	47.2	27.2	24.7	78.7

Volatiles

Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	-
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	-
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	-
Toluene-d8	Surrogate	56.1%	54.9%	54.0%	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	20	12	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	21	15	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	-

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	BH102_2.0_2.9	BH103_0.1_0.9	BH103_2.3_2.8	BH104_0.1_0.9
Sample Date:	05-Apr-22 11:30	05-Apr-22 13:00	05-Apr-22 13:00	05-Apr-22 14:30
Sample ID:	2215420-17	2215420-18	2215420-19	2215420-20
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	92.2	92.3	96.6	86.5
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Element	MDL	92.2	92.3	96.6	86.5
Antimony	0.5 ug/L	-	-	<0.5	-
Arsenic	1.0 ug/L	-	-	<1.0	-
Barium	1.0 ug/L	-	-	2.1	-
Beryllium	0.5 ug/L	-	-	<0.5	-
Boron	10.0 ug/L	-	-	14.0	-
Cadmium	0.2 ug/L	-	-	<0.2	-
Chromium	1.0 ug/L	-	-	<1.0	-
Cobalt	0.5 ug/L	-	-	<0.5	-
Copper	0.5 ug/L	-	-	<0.5	-
Lead	0.2 ug/L	-	-	<0.2	-
Molybdenum	0.5 ug/L	-	-	0.7	-
Nickel	1.0 ug/L	-	-	<1.0	-
Selenium	1.0 ug/L	-	-	<1.0	-
Silver	0.2 ug/L	-	-	<0.2	-
Thallium	0.5 ug/L	-	-	<0.5	-
Uranium	0.2 ug/L	-	-	<0.2	-
Vanadium	0.5 ug/L	-	-	1.1	-
Zinc	5.0 ug/L	-	-	<5.0	-

General Inorganics

Parameter	MDL	92.2	92.3	96.6	86.5
SAR	0.01 N/A	0.10	0.08	0.12	0.10
Conductivity	5 uS/cm	97	314	118	135

Metals

Element	MDL	92.2	92.3	96.6	86.5
Antimony	1.0 ug/g dry	1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	2.0	2.1	3.4	2.7
Barium	1.0 ug/g dry	43.9	45.0	52.7	46.4
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	0.5
Boron	5.0 ug/g dry	7.7	<5.0	5.6	<5.0
Boron, available	0.5 ug/g dry	<0.5	-	<0.5	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	11.8	14.0	16.4	15.8
Chromium (VI)	0.2 ug/g dry	<0.2	-	<0.2	-
Cobalt	1.0 ug/g dry	3.9	9.3	8.7	4.5
Copper	5.0 ug/g dry	5.9	37.4	11.6	6.2

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	BH102_2.0_2.9	BH103_0.1_0.9	BH103_2.3_2.8	BH104_0.1_0.9
	Sample Date:	05-Apr-22 11:30	05-Apr-22 13:00	05-Apr-22 13:00	05-Apr-22 14:30
	Sample ID:	2215420-17	2215420-18	2215420-19	2215420-20
	MDL/Units	Soil	Soil	Soil	Soil
Lead	1.0 ug/g dry	3.8	9.8	4.1	16.2
Mercury	0.1 ug/g dry	<0.1	-	<0.1	-
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	7.0	13.7	8.7	7.9
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	17.2	24.8	28.8	22.9
Zinc	20.0 ug/g dry	<20.0	32.7	56.7	64.8

Volatiles

Benzene	0.02 ug/g dry	<0.02	-	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	-	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	-	<0.05	<0.05
Toluene-d8	Surrogate	56.3%	-	53.9%	55.5%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	-	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	<6	<6

Certificate of Analysis
 Client: Cambium Inc. (Kingston)
 Client PO:

Report Date: 05-May-2022

Order Date: 7-Apr-2022

Project Description: 13324-049

Client ID:	BH104_1.0_1.9	BH104_2.0_3.0	BH111_0.1_0.9	BH111_2.2_2.9
Sample Date:	05-Apr-22 14:30	05-Apr-22 14:30	05-Apr-22 15:30	05-Apr-22 15:30
Sample ID:	2215420-21	2215420-22	2215420-23	2215420-24
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	84.5	90.4	93.2	94.5
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	<0.5	-	<0.5	-
Arsenic	1.0 ug/L	<1.0	-	1.3	-
Barium	1.0 ug/L	7.5	-	23.5	-
Beryllium	0.5 ug/L	<0.5	-	<0.5	-
Boron	10.0 ug/L	17.5	-	29.1	-
Cadmium	0.2 ug/L	<0.2	-	<0.2	-
Chromium	1.0 ug/L	2.1	-	6.3	-
Cobalt	0.5 ug/L	<0.5	-	0.6	-
Copper	0.5 ug/L	1.1	-	2.6	-
Lead	0.2 ug/L	0.4	-	1.6	-
Molybdenum	0.5 ug/L	0.9	-	1.3	-
Nickel	1.0 ug/L	<1.0	-	2.6	-
Selenium	1.0 ug/L	<1.0	-	<1.0	-
Silver	0.2 ug/L	<0.2	-	<0.2	-
Thallium	0.5 ug/L	<0.5	-	<0.5	-
Uranium	0.2 ug/L	<0.2	-	0.9	-
Vanadium	0.5 ug/L	3.0	-	6.6	-
Zinc	5.0 ug/L	<5.0	-	11.9	-

General Inorganics

SAR	0.01 N/A	0.11	0.12	0.09	0.11
Conductivity	5 uS/cm	140	154	150	112

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.3	3.3	3.7	2.2
Barium	1.0 ug/g dry	51.3	48.5	46.3	27.0
Beryllium	0.5 ug/g dry	0.8	0.6	<0.5	<0.5
Boron	5.0 ug/g dry	5.7	6.8	5.9	5.9
Boron, available	0.5 ug/g dry	-	-	-	<0.5
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	25.2	22.7	18.5	10.6
Chromium (VI)	0.2 ug/g dry	-	-	-	<0.2
Cobalt	1.0 ug/g dry	7.9	7.4	5.6	3.6
Copper	5.0 ug/g dry	7.3	9.6	11.0	6.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	BH104_1.0_1.9	BH104_2.0_3.0	BH111_0.1_0.9	BH111_2.2_2.9
	Sample Date:	05-Apr-22 14:30	05-Apr-22 14:30	05-Apr-22 15:30	05-Apr-22 15:30
	Sample ID:	2215420-21	2215420-22	2215420-23	2215420-24
	MDL/Units	Soil	Soil	Soil	Soil
Lead	1.0 ug/g dry	10.8	9.4	15.6	3.5
Mercury	0.1 ug/g dry	-	-	-	<0.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	13.9	13.1	11.8	6.4
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	19.6	<1.0
Vanadium	10.0 ug/g dry	33.7	31.4	24.8	12.2
Zinc	20.0 ug/g dry	65.0	54.3	44.2	24.0

Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	-	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	-	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	-	<0.05
Toluene-d8	Surrogate	56.9%	54.4%	-	54.4%

Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	-	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	-	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	-	10
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	-	18

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	BH109_0.1_0.9	BH109_1.0_1.9	BH109_4.0_5.0	QAQC3
Sample Date:	06-Apr-22 11:30	06-Apr-22 11:30	06-Apr-22 11:30	06-Apr-22 09:00
Sample ID:	2215420-25	2215420-26	2215420-27	2215420-28
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	93.2	95.6	90.1	91.8
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	-	-	<0.5	-
Arsenic	1.0 ug/L	-	-	<1.0	-
Barium	1.0 ug/L	-	-	6.0	-
Beryllium	0.5 ug/L	-	-	<0.5	-
Boron	10.0 ug/L	-	-	<10.0	-
Cadmium	0.2 ug/L	-	-	<0.2	-
Chromium	1.0 ug/L	-	-	<1.0	-
Cobalt	0.5 ug/L	-	-	<0.5	-
Copper	0.5 ug/L	-	-	<0.5	-
Lead	0.2 ug/L	-	-	<0.2	-
Molybdenum	0.5 ug/L	-	-	0.9	-
Nickel	1.0 ug/L	-	-	<1.0	-
Selenium	1.0 ug/L	-	-	<1.0	-
Silver	0.2 ug/L	-	-	<0.2	-
Thallium	0.5 ug/L	-	-	<0.5	-
Uranium	0.2 ug/L	-	-	<0.2	-
Vanadium	0.5 ug/L	-	-	1.3	-
Zinc	5.0 ug/L	-	-	<5.0	-

General Inorganics

SAR	0.01 N/A	0.09	0.18	2.26	1.96
Conductivity	5 uS/cm	138	118	230	223

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.3	3.2	2.5	2.0
Barium	1.0 ug/g dry	52.6	35.8	27.3	33.0
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	5.8	6.0	<5.0	<5.0
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	15.7	18.3	7.0	7.2
Cobalt	1.0 ug/g dry	4.7	4.4	2.2	2.2
Copper	5.0 ug/g dry	22.2	7.6	<5.0	5.8
Lead	1.0 ug/g dry	10.5	6.2	2.0	2.1
Molybdenum	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	9.8	9.0	<5.0	<5.0

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	BH109_0.1_0.9	BH109_1.0_1.9	BH109_4.0_5.0	QAQC3
	Sample Date:	06-Apr-22 11:30	06-Apr-22 11:30	06-Apr-22 11:30	06-Apr-22 09:00
	Sample ID:	2215420-25	2215420-26	2215420-27	2215420-28
	MDL/Units	Soil	Soil	Soil	Soil
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	22.7	17.9	12.2	12.3
Zinc	20.0 ug/g dry	31.5	25.9	<20.0	<20.0
Volatiles					
Benzene	0.02 ug/g dry	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	<0.05	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	54.7%	54.0%	54.5%	56.0%
Hydrocarbons					
F1 PHCs (C6-C10)	7 ug/g dry	<7	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	<4	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	<8	<8	<8	<8
F4 PHCs (C34-C50)	6 ug/g dry	<6	<6	<6	<6

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	BH110_0.1_0.9	BH110_2.0_3.0	BH112_0.1_0.9	BH112_1.0_1.9
Sample Date:	06-Apr-22 13:00	06-Apr-22 13:00	06-Apr-22 09:45	06-Apr-22 09:45
Sample ID:	2215420-29	2215420-30	2215420-31	2215420-32
MDL/Units	Soil	Soil	Soil	Soil

Physical Characteristics

% Solids	0.1 % by Wt.	93.4	96.3	93.3	96.8
----------	--------------	------	------	------	------

mSPLP Leachate Metals

Antimony	0.5 ug/L	<0.5	-	<0.5	-
Arsenic	1.0 ug/L	2.4	-	2.0	-
Barium	1.0 ug/L	30.1	-	37.3	-
Beryllium	0.5 ug/L	<0.5	-	<0.5	-
Boron	10.0 ug/L	13.6	-	14.8	-
Cadmium	0.2 ug/L	<0.2	-	<0.2	-
Chromium	1.0 ug/L	9.0	-	8.3	-
Cobalt	0.5 ug/L	0.7	-	0.9	-
Copper	0.5 ug/L	10.8	-	3.3	-
Lead	0.2 ug/L	4.1	-	3.0	-
Molybdenum	0.5 ug/L	1.0	-	1.1	-
Nickel	1.0 ug/L	3.4	-	3.6	-
Selenium	1.0 ug/L	<1.0	-	<1.0	-
Silver	0.2 ug/L	<0.2	-	<0.2	-
Thallium	0.5 ug/L	<0.5	-	<0.5	-
Uranium	0.2 ug/L	<0.2	-	<0.2	-
Vanadium	0.5 ug/L	9.4	-	9.1	-
Zinc	5.0 ug/L	17.1	-	14.9	-

General Inorganics

SAR	0.01 N/A	0.19	0.16	0.11	0.22
Conductivity	5 uS/cm	150	116	148	124

Metals

Antimony	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Arsenic	1.0 ug/g dry	3.6	2.8	3.5	2.3
Barium	1.0 ug/g dry	48.5	24.5	44.2	24.5
Beryllium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Boron	5.0 ug/g dry	5.6	7.0	6.1	5.3
Boron, available	0.5 ug/g dry	-	<0.5	-	-
Cadmium	0.5 ug/g dry	<0.5	<0.5	<0.5	<0.5
Chromium	5.0 ug/g dry	14.8	11.0	16.5	12.0
Chromium (VI)	0.2 ug/g dry	-	<0.2	-	-
Cobalt	1.0 ug/g dry	4.2	3.2	4.6	3.2
Copper	5.0 ug/g dry	220	7.0	9.3	6.2

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

	Client ID:	BH110_0.1_0.9	BH110_2.0_3.0	BH112_0.1_0.9	BH112_1.0_1.9
	Sample Date:	06-Apr-22 13:00	06-Apr-22 13:00	06-Apr-22 09:45	06-Apr-22 09:45
	Sample ID:	2215420-29	2215420-30	2215420-31	2215420-32
	MDL/Units	Soil	Soil	Soil	Soil
Lead	1.0 ug/g dry	33.6	4.1	13.9	3.8
Mercury	0.1 ug/g dry	-	<0.1	-	-
Molybdenum	1.0 ug/g dry	1.2	<1.0	<1.0	<1.0
Nickel	5.0 ug/g dry	8.2	5.8	9.2	6.1
Selenium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Silver	0.3 ug/g dry	<0.3	<0.3	<0.3	<0.3
Thallium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Uranium	1.0 ug/g dry	<1.0	<1.0	<1.0	<1.0
Vanadium	10.0 ug/g dry	19.1	13.6	22.8	13.4
Zinc	20.0 ug/g dry	39.8	20.5	34.9	<20.0

Volatiles

Benzene	0.02 ug/g dry	-	<0.02	<0.02	<0.02
Ethylbenzene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
m,p-Xylenes	0.05 ug/g dry	-	<0.05	<0.05	<0.05
o-Xylene	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Xylenes, total	0.05 ug/g dry	-	<0.05	<0.05	<0.05
Toluene-d8	Surrogate	-	51.9%	51.5%	52.0%

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	-	<7	<7	<7
F2 PHCs (C10-C16)	4 ug/g dry	-	<4	<4	<4
F3 PHCs (C16-C34)	8 ug/g dry	-	<8	32	<8
F4 PHCs (C34-C50)	6 ug/g dry	-	<6	110 [3]	<6
F4G PHCs (gravimetric)	50 ug/g dry	-	-	118	-

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Client ID:	BH112_4.0_5.0	-	-	-
Sample Date:	06-Apr-22 09:45	-	-	-
Sample ID:	2215420-33	-	-	-
MDL/Units	Soil	-	-	-

Physical Characteristics

% Solids	0.1 % by Wt.	90.0	-	-	-
----------	--------------	------	---	---	---

General Inorganics

SAR	0.01 N/A	0.45	-	-	-
Conductivity	5 uS/cm	106	-	-	-

Metals

Antimony	1.0 ug/g dry	<1.0	-	-	-
Arsenic	1.0 ug/g dry	2.0	-	-	-
Barium	1.0 ug/g dry	17.5	-	-	-
Beryllium	0.5 ug/g dry	<0.5	-	-	-
Boron	5.0 ug/g dry	5.1	-	-	-
Cadmium	0.5 ug/g dry	<0.5	-	-	-
Chromium	5.0 ug/g dry	9.1	-	-	-
Cobalt	1.0 ug/g dry	2.7	-	-	-
Copper	5.0 ug/g dry	<5.0	-	-	-
Lead	1.0 ug/g dry	2.8	-	-	-
Molybdenum	1.0 ug/g dry	<1.0	-	-	-
Nickel	5.0 ug/g dry	5.3	-	-	-
Selenium	1.0 ug/g dry	<1.0	-	-	-
Silver	0.3 ug/g dry	<0.3	-	-	-
Thallium	1.0 ug/g dry	<1.0	-	-	-
Uranium	1.0 ug/g dry	<1.0	-	-	-
Vanadium	10.0 ug/g dry	12.6	-	-	-
Zinc	20.0 ug/g dry	<20.0	-	-	-

Volatiles

Benzene	0.02 ug/g dry	<0.02	-	-	-
Ethylbenzene	0.05 ug/g dry	<0.05	-	-	-
Toluene	0.05 ug/g dry	<0.05	-	-	-
m,p-Xylenes	0.05 ug/g dry	<0.05	-	-	-
o-Xylene	0.05 ug/g dry	<0.05	-	-	-
Xylenes, total	0.05 ug/g dry	<0.05	-	-	-
Toluene-d8	Surrogate	54.5%	-	-	-

Hydrocarbons

F1 PHCs (C6-C10)	7 ug/g dry	<7	-	-	-
F2 PHCs (C10-C16)	4 ug/g dry	<4	-	-	-
F3 PHCs (C16-C34)	8 ug/g dry	<8	-	-	-
F4 PHCs (C34-C50)	6 ug/g dry	<6	-	-	-

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Conductivity	ND	5	uS/cm						
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g						
F2 PHCs (C10-C16)	ND	4	ug/g						
F3 PHCs (C16-C34)	ND	8	ug/g						
F4 PHCs (C34-C50)	ND	6	ug/g						
F4G PHCs (gravimetric)	ND	50	ug/g						
Metals									
Antimony	ND	1.0	ug/g						
Arsenic	ND	1.0	ug/g						
Barium	ND	1.0	ug/g						
Beryllium	ND	0.5	ug/g						
Boron, available	ND	0.5	ug/g						
Boron	ND	5.0	ug/g						
Cadmium	ND	0.5	ug/g						
Chromium (VI)	ND	0.2	ug/g						
Chromium	ND	5.0	ug/g						
Cobalt	ND	1.0	ug/g						
Copper	ND	5.0	ug/g						
Lead	ND	1.0	ug/g						
Mercury	ND	0.1	ug/g						
Molybdenum	ND	1.0	ug/g						
Nickel	ND	5.0	ug/g						
Selenium	ND	1.0	ug/g						
Silver	ND	0.3	ug/g						
Thallium	ND	1.0	ug/g						
Uranium	ND	1.0	ug/g						
Vanadium	ND	10.0	ug/g						
Zinc	ND	20.0	ug/g						
mSPLP Leachate Metals									
Antimony	ND	0.5	ug/L						
Arsenic	ND	1.0	ug/L						
Barium	ND	1.0	ug/L						
Beryllium	ND	0.5	ug/L						
Boron	ND	10.0	ug/L						
Cadmium	ND	0.2	ug/L						
Chromium	ND	1.0	ug/L						
Cobalt	ND	0.5	ug/L						
Copper	ND	0.5	ug/L						
Lead	ND	0.2	ug/L						
Molybdenum	ND	0.5	ug/L						
Nickel	ND	1.0	ug/L						
Selenium	ND	1.0	ug/L						
Silver	ND	0.2	ug/L						
Thallium	ND	0.5	ug/L						
Uranium	ND	0.2	ug/L						
Vanadium	ND	0.5	ug/L						
Zinc	ND	5.0	ug/L						
Volatiles									
Benzene	ND	0.02	ug/g						
Ethylbenzene	ND	0.05	ug/g						
Toluene	ND	0.05	ug/g						
m,p-Xylenes	ND	0.05	ug/g						
o-Xylene	ND	0.05	ug/g						
Xylenes, total	ND	0.05	ug/g						
Surrogate: Toluene-d8	2.58		ug/g		80.6	50-140			

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
SAR	0.39	0.01	N/A	0.39			0.0	30	
Conductivity	183	5	uS/cm	178			2.8	5	
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	ug/g	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	ug/g	ND			NC	30	
F3 PHCs (C16-C34)	42	8	ug/g	23			NC	30	
F4 PHCs (C34-C50)	178	6	ug/g	136			26.5	30	
F4G PHCs (gravimetric)	285	50	ug/g	340			17.5	30	
Metals									
Antimony	2.2	1.0	ug/g	2.2			0.0	30	
Arsenic	5.0	1.0	ug/g	5.4			8.2	30	
Barium	79.7	1.0	ug/g	88.8			10.8	30	
Beryllium	0.9	0.5	ug/g	1.0			6.4	30	
Boron, available	ND	0.5	ug/g	ND			NC	35	
Boron	6.6	5.0	ug/g	6.6			0.0	30	
Cadmium	ND	0.5	ug/g	ND			NC	30	
Chromium (VI)	ND	0.2	ug/g	ND			NC	35	
Chromium	24.4	5.0	ug/g	26.2			7.1	30	
Cobalt	11.2	1.0	ug/g	12.2			8.9	30	
Copper	26.5	5.0	ug/g	28.4			6.7	30	
Lead	12.9	1.0	ug/g	13.7			5.9	30	
Mercury	ND	0.1	ug/g	ND			NC	30	
Molybdenum	ND	1.0	ug/g	ND			NC	30	
Nickel	21.6	5.0	ug/g	23.3			7.6	30	
Selenium	ND	1.0	ug/g	ND			NC	30	
Silver	ND	0.3	ug/g	ND			NC	30	
Thallium	ND	1.0	ug/g	ND			NC	30	
Uranium	ND	1.0	ug/g	ND			NC	30	
Vanadium	33.7	10.0	ug/g	36.3			7.5	30	
Zinc	61.2	20.0	ug/g	66.9			9.0	30	
mSPLP Leachate Metals									
Antimony	0.67	0.5	ug/L	0.68			0.9	50	
Arsenic	1.45	1.0	ug/L	1.50			3.1	50	
Barium	171	2.6	ug/L	200			16.1	50	
Beryllium	ND	0.5	ug/L	ND			NC	50	
Boron	25.9	10.0	ug/L	18.5			33.2	50	
Cadmium	ND	0.2	ug/L	ND			NC	50	
Chromium	20.1	1.0	ug/L	21.2			5.4	50	
Cobalt	3.34	0.5	ug/L	3.64			8.7	50	
Copper	5.17	0.5	ug/L	5.67			9.3	50	
Lead	3.49	0.2	ug/L	3.87			10.2	50	
Molybdenum	0.55	0.5	ug/L	0.53			3.9	50	
Nickel	8.43	1.0	ug/L	9.38			10.6	50	
Selenium	ND	1.0	ug/L	ND			NC	50	
Silver	ND	0.2	ug/L	ND			NC	50	
Thallium	ND	0.5	ug/L	ND			NC	50	
Uranium	0.26	0.2	ug/L	0.30			14.3	50	
Vanadium	19.1	0.5	ug/L	20.2			5.6	50	
Zinc	30.5	5.0	ug/L	33.5			9.5	50	
Physical Characteristics									
% Solids	89.5	0.1	% by Wt.	91.1			1.8	25	
Volatiles									
Benzene	ND	0.02	ug/g	ND			NC	50	
Ethylbenzene	ND	0.05	ug/g	ND			NC	50	
Toluene	ND	0.05	ug/g	ND			NC	50	

Certificate of Analysis
Client: Cambium Inc. (Kingston)
Client PO:

Report Date: 05-May-2022
 Order Date: 7-Apr-2022
Project Description: 13324-049

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
m,p-Xylenes	ND	0.05	ug/g	ND			NC	50	
o-Xylene	ND	0.05	ug/g	ND			NC	50	
<i>Surrogate: Toluene-d8</i>	3.03		ug/g		67.9	50-140			

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	172	7	ug/g	ND	86.2	80-120			
F2 PHCs (C10-C16)	79	4	ug/g	ND	90.0	60-140			
F3 PHCs (C16-C34)	236	8	ug/g	23	99.0	60-140			
F4 PHCs (C34-C50)	286	6	ug/g	136	110	60-140			
F4G PHCs (gravimetric)	980	50	ug/g	ND	98.0	80-120			
Metals									
Antimony	43.0	1.0	ug/g	ND	84.2	70-130			
Arsenic	53.3	1.0	ug/g	2.2	102	70-130			
Barium	91.7	1.0	ug/g	35.5	112	70-130			
Beryllium	55.3	0.5	ug/g	ND	110	70-130			
Boron, available	4.29	0.5	ug/g	ND	85.9	70-122			
Boron	49.6	5.0	ug/g	ND	93.8	70-130			
Cadmium	55.4	0.5	ug/g	ND	111	70-130			
Chromium (VI)	2.0	0.2	ug/g	ND	30.0	70-130			QM-05
Chromium	64.3	5.0	ug/g	10.5	108	70-130			
Cobalt	54.7	1.0	ug/g	4.9	99.7	70-130			
Copper	60.3	5.0	ug/g	11.3	97.9	70-130			
Lead	50.5	1.0	ug/g	5.5	90.1	70-130			
Mercury	1.55	0.1	ug/g	ND	103	70-130			
Molybdenum	50.2	1.0	ug/g	ND	99.8	70-130			
Nickel	60.1	5.0	ug/g	9.3	101	70-130			
Selenium	48.2	1.0	ug/g	ND	95.9	70-130			
Silver	50.0	0.3	ug/g	ND	99.9	70-130			
Thallium	50.6	1.0	ug/g	ND	101	70-130			
Uranium	41.3	1.0	ug/g	ND	82.1	70-130			
Vanadium	68.9	10.0	ug/g	14.5	109	70-130			
Zinc	75.6	20.0	ug/g	26.8	97.7	70-130			
mSPLP Leachate Metals									
Antimony	46.1	0.5	ug/L	ND	92.0	70-130			
Arsenic	49.3	1.0	ug/L	ND	98.2	70-130			
Barium	50.6	1.0	ug/L	2.82	95.5	70-130			
Beryllium	47.5	0.5	ug/L	ND	95.0	70-130			
Boron	55.1	10.0	ug/L	ND	90.9	70-130			
Cadmium	47.3	0.2	ug/L	ND	94.5	70-130			
Chromium	47.6	1.0	ug/L	ND	93.4	70-130			
Cobalt	46.0	0.5	ug/L	ND	91.9	70-130			
Copper	43.9	0.5	ug/L	0.52	86.8	70-130			
Lead	35.7	0.2	ug/L	ND	71.4	70-130			
Molybdenum	48.1	0.5	ug/L	0.88	94.4	70-130			
Nickel	44.7	1.0	ug/L	ND	88.8	70-130			
Selenium	45.3	1.0	ug/L	ND	90.4	70-130			
Silver	44.3	0.2	ug/L	ND	88.6	70-130			
Thallium	46.6	0.5	ug/L	ND	93.1	70-130			
Uranium	38.6	0.2	ug/L	ND	77.2	70-130			
Vanadium	50.0	0.5	ug/L	1.48	97.1	70-130			
Zinc	45.5	5.0	ug/L	ND	86.2	70-130			
Volatiles									
Benzene	4.76	0.02	ug/g	ND	119	60-130			

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Ethylbenzene	2.51	0.05	ug/g	ND	62.8	60-130			
Toluene	2.93	0.05	ug/g	ND	73.3	60-130			
m,p-Xylenes	6.91	0.05	ug/g	ND	86.4	60-130			
o-Xylene	2.74	0.05	ug/g	ND	68.6	60-130			
Surrogate: Toluene-d8	2.11		ug/g		65.8	50-140			

Certificate of Analysis

Report Date: 05-May-2022

Client: Cambium Inc. (Kingston)

Order Date: 7-Apr-2022

Client PO:

Project Description: 13324-049

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - CoC reads SS108_0.1_1.9. Containers read SS108_0.1_0.9

Applies to samples: SS108_0.1_0.9

Suspected methanol loss for preserved VOC soil vial resulting in increased uncertainty of the reported result.

Applies to samples: SS105_0.1_0.9, SS105_1.0_1.9, BH101_2.0_3.0, BH109_4.0_5.0

Sample Qualifiers :

3 : GC-FID signal did not return to baseline by C50

QC Qualifiers :

QM-05 : The spike recovery was outside acceptance limits for the matrix spike due to matrix interference.

Sample Data Revisions

None

Work Order Revisions / Comments:

REVISION-1: This report includes additional analysis data.

REVISION-2: This report includes additional mSPLP metals data.

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

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

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescribed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.



Parcel Order Number (Lab Use Only) 2215420	Chain Of Custody (Lab Use Only) No 135905
---	---

Client Name: Cambium Inc	Project Ref: 13324-049	Page 1 of 4
Contact Name: Christine Wilson	Quote #: 21-404	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address: 625 Portview cres unit 7 Kingston ON	PO #:	
Telephone:	E-mail: Christine.wilson@cambium-inc.com	
		Date Required: _____

<input type="checkbox"/> REG 153/04 <input checked="" type="checkbox"/> REG 406/19	Other Regulation	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)		Required Analysis											
<input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> Table _____ For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> REG 558 <input type="checkbox"/> PWQO <input type="checkbox"/> CCME <input type="checkbox"/> MISA <input type="checkbox"/> SU - Sani <input type="checkbox"/> SU - Storm Mun: _____ <input type="checkbox"/> Other: _____	Matrix	Air Volume	# of Containers	Sample Taken Date Time		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	STAR	LC
Sample ID/Location Name															
1	SS106-0.1-0.9	5		3	02-04-04	9:00	X		X					X	X
2	SS106-1.0-1.9			3		9:30	X		X					X	X
3	SS106-2.0-3.0			3		9:45	X		X					X	X
4	SS107-01-0.9			2		10:30			X					X	X
5	SS107-2.1-2.9			3		10:45	X								
6	SS108-01-1.9			2		12:30			X					X	X
7	SS108-2.2-2.9			3		12:45	X								
8	SS105-0.1-0.9			3		14:45	X		X					X	X
9	SS105-1.0-1.9			3		14:50	X		X					X	X
10	QA/QC #1			3			X		X					X	X

Comments:			Method of Delivery: drop-box		
Relinquished By (Sign): <i>Nik Vallat</i>	Received By Driver/Depot: <i>[Signature]</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>Racyn Cooper</i>		
Relinquished By (Print): Nik Vallat	Date/Time: Apr 07 08:30	Date/Time: Apr 8, 22 10:00	Date/Time: Apr 07 14:17		
Date/Time: April 6 / 2022 6:30pm	Temperature: 8.8 °C	Temperature: 4.8 °C	pH Verified: <input type="checkbox"/> By: _____		



Parcel Order Number (Lab Use Only) 2215420	Chain Of Custody (Lab Use Only) No 135904
---	---

Client Name: Cambium Inc	Project Ref: 13324-049	Page 2 of 4
Contact Name: Christine Wilson	Quote #: 21-404	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address: 685 Potomac cres. unit 1 Kingston ON	PO #:	
Telephone:	E-mail: Christine.wilson@cambium-inc.com	
		Date Required: _____

<input type="checkbox"/> REG 153/04 <input checked="" type="checkbox"/> REG 406/19	Other Regulation	Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)		Required Analysis											
<input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine	<input type="checkbox"/> REG 558 <input type="checkbox"/> PWQO	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHS	Metals by ICP	Hg	CrVI	B (HWS)	SAR	EC
<input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse	<input type="checkbox"/> CCME <input type="checkbox"/> MISA														
<input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other	<input type="checkbox"/> SU - Sani <input type="checkbox"/> SU - Storm	Mun: _____		Date		Time									
<input type="checkbox"/> Table _____	<input type="checkbox"/> Other: _____	Sample ID/Location Name													
For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No															
1	SS105-8.0-3.0	S		3	08-04-04	15:00	X			X				X	X
2	BH101-0.1-0.9	S		3	April 5/22	10:00	X			X				X	X
3	BH101-1.0-1.9	S		3			X		X					X	X
4	BH101-2.0-3.0	S		3			X		X					X	X
5	QAQC2	S		3			X		X					X	X
6	BH102-0.1-0.9	S		2		11:30			X					X	X
7	BH102-2.0-2.9	S		3			X								
8	BH103-0.1-0.9	S		2		13:00			X					X	X
9	BH103-2.3-2.8	S		3			X								
10	BH104-0.1-0.9	S		3		14:30	X		X					X	X

Comments:			Method of Delivery: drop-box		
Relinquished By (Sign): <i>[Signature]</i>	Received By Driver/Depot: <i>[Signature]</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>Kacey Cooper</i>		
Relinquished By (Print): Max Vallant	Date/Time: Apr 07 08:30	Date/Time: April 8, 22 10:00	Date/Time: Apr 07 14:17		
Date/Time: April 6/2022 6:30pm	Temperature: 8.8 °C	Temperature: 4.8 °C	pH Verified: <input type="checkbox"/> By: _____		



Client Name: Cambium Inc	Project Ref: 13324-049	Page 3 of 4
Contact Name: Christine Wilson	Quote #: 21-404	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address: 625 Fortune Cres. Kingston ON	PO #:	
Telephone:	E-mail: christine.wilson@cambium-inc.com	
Date Required: _____		

<input type="checkbox"/> REG 153/04 <input checked="" type="checkbox"/> REG 406/19 Other Regulation		Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)			Required Analysis										
<input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> REG 558 <input type="checkbox"/> PWQO <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> CCME <input type="checkbox"/> MISA <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> SU - Sani <input type="checkbox"/> SU - Storm <input type="checkbox"/> Table _____ For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Other: _____		Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	SAR	EC
Sample ID/Location Name					Date	Time									
1 BH104-1.0-1.9		S		3	April 5/22	14:30	X			X			X	X	
2 BH104-2.0-3.0		S		3	↓	↓	X			X			X	X	
3 BH111-0.1-0.9		S		2	↓	15:30				X			X	X	
4 BH111-2.2-2.9		S		3	↓	↓	X								
5 BH109-0.1-0.9		S		3	April 6/22	11:30	X			X			X	X	
6 BH109-1.0-1.9		S		3	↓	↓	X			X			X	X	
7 BH109-4.0-5.0		S		3	↓	↓	X			X			X	X	
8 QAQC 3		S		3	-	-	X			X			X	X	
9 BH110-0.1-0.9		S		2	↓	13:00				X			X	X	
10 BH110-2.0-3.0		S		3	↓	↓	X								

Comments:			Method of Delivery: drop-box		
Relinquished By (Sign): <i>[Signature]</i>	Received By Driver/Depot: <i>[Signature]</i>	Received at Lab: <i>[Signature]</i>	Verified By: <i>[Signature]</i>		
Relinquished By (Print): Nick Vallant	Date/Time: Apr 07 08:30	Date/Time: April 8/22 10:00	Date/Time: Apr 07 14:17		
Date/Time: April 6/2022 6:30pm	Temperature: 8.8 °C	Temperature: 4.8 °C	pH Verified: <input type="checkbox"/> By: _____		



Parcel Order Number (Lab Use Only) 2215420	Chain Of Custody (Lab Use Only) No 134074
---	--

Client Name: Cambium Inc	Project Ref: 13324-049	Page Hof 4
Contact Name: Christine Wilson	Quote #: 21-404	Turnaround Time <input type="checkbox"/> 1 day <input type="checkbox"/> 3 day <input type="checkbox"/> 2 day <input checked="" type="checkbox"/> Regular
Address: 625 Fairline Cres. Kingston ON	PO #:	
Telephone:	E-mail: Christine.Wilson@cambium-inc.com	
Date Required: _____		

<input type="checkbox"/> REG 153/04 <input checked="" type="checkbox"/> REG 406/19 Other Regulation <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/Fine <input type="checkbox"/> REG 558 <input type="checkbox"/> PWQO <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> CCME <input type="checkbox"/> MISA <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> SU - Sani <input type="checkbox"/> SU - Storm <input type="checkbox"/> Table _____ For RSC: <input type="checkbox"/> Yes <input type="checkbox"/> No		Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)		Required Analysis										
Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken		PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	SAR	EC
				Date	Time									
1 BH112-0.1-0.9	S		3	April 6, 22	9:45	X			X				X	X
2 BH112-1.0-1.9	S		3	↓	↓	X			X				X	X
3 BH112-4.0-5.0	S		3	↓	↓	X			X				X	X
4														
5														
6														
7														
8														
9														
10														

Comments:			Method of Delivery: drop-box		
Relinquished By (Sign): W. Van't Hof	Received By Driver/Depot: [Signature]	Received at Lab: [Signature]	Verified By: Karen Cooper		
Relinquished By (Print): W. Van't Hof	Date/Time: Apr 07 08:30	Date/Time: April 7, 22 10:00	Date/Time: Apr 07 14:17		
Date/Time: April 6 / 2022 6:58pm	Temperature: 8.8 °C	Temperature: 4.8 °C	pH Verified: <input type="checkbox"/> By: _____		