Gananoque Gas Station and Coffee Shop Geotechnical Report

2019-07-16

Prepared for:
Pavarani Holdings Inc.

CAMBIUM INC.
866.217.7900
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Peterborough | Barrie | Oshawa | Kingston

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1.0 Introduction

Cambium Inc. (Cambium) was retained by Pavarani Holdings Inc. (Client) to complete a geotechnical investigation in support of the construction of a gas station and coffee shop located at 575 King Street East, Gananoque, Ontario.

The existing site is bounded to the north by King Street, to the east by a residential property, to the south by Tote Road and to the west by the parking lot of the Imperial Inn – 1000 Islands Motel. The site is currently covered by a mixture of dense trees and grass. The foundation remains of a past residential house which is understood to have burnt down is also present on site; this report does not address the possibility of environmental contaminants as the scope of this exploration program is limited to geotechnical parameters only. The geotechnical investigation was required to confirm the existing subsurface soil conditions, groundwater conditions, soil bearing capacity, and bedrock depth as input into the design and construction of the proposed development. A Site Plan, including borehole locations, is included as Figure 1 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 reconstruction of the retaining wall.

2.0 Methodology

2.1 Borehole Investigation

A borehole investigation was conducted on June 6, 2019 to assess subsurface conditions at the Site. Seven boreholes, designated as boreholes BH101-19 through BH107-19, were advanced throughout the Site. The boreholes extended to termination in the overburden silty clay at depths ranging from 2 meters below ground surface (mbgs) to 5 mbgs without encountering bedrock. GPS coordinates of each borehole were obtained using a RTK GPS system. All borehole elevations were benchmarked against the fire hydrant on the north west side of the property. A site plan and borehole location map is shown in Figure 1.

Drilling and sampling was completed using a track-mounted drill rig operating under the supervision of a Cambium technician. The boreholes were advanced to the sampling depths by means of continuous flight solid stem augers and 50 mm O.D. split spoon sampling equipment. Standard Penetration Test (SPT) N values were recorded for the sampled intervals as the number of blows required to drive a split spoon sampler 305 mm in to the soil, using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. The SPT N values are used in this report to assess consistency of cohesive soils and relative density of non-cohesive soils.

Borehole samples were inspected and logged in the field using visual and tactile methods. Soil samples were placed in labelled plastic containers for transport, review, potential laboratory testing, and temporary storage. Open boreholes were checked for groundwater and stability prior to backfilling and were backfilled in accordance with O.Reg. 903, as amended.

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 four particle distribution analyses (LS-702,705), was completed on selected soil samples to confirm textural classification and to assess

geotechnical parameters. Moisture content testing was completed on all soil samples from the boreholes. The results are presented in Appendix B and are discussed in Section 3.0.

3.0 Subsurface Conditions

The subsurface conditions at the site predominantly consist of silty topsoil, overlaying an approximately 150 mm thick layer of black sandy gravel which is presumed to be the result of the residential house burning down on the property. These surficial units overly a silty clay unit which extended to termination depth in each borehole. These soils were encountered throughout the borehole locations and the boreholes were terminated in the silty clay unit. The borehole locations are shown in Figure 1 and the individual soil units are described in detail below.

3.1 Topsoil

The site area features topsoil throughout with 150 mm to 300 mm of topsoil encountered in each of the seven test locations. Topsoil quality analysis was outside the scope of this study.

3.2 Black Gravelly Sand

In all boreholes except BH102-19 and BH107-19, a layer of black sandy gravel to gravelly sand was observed with a general thickness of 150 mm to 300 mm. This layer was identified at depths immediately beneath the topsoil from 0.15 mbgs to 0.3 mbgs with SPT N values ranging from 3 to 11 indicating a very loose to compact relative density. These soils were observed to be moist to wet with laboratory moisture testing resulting in a range from 16.3% to 39.5%. Some samples from this soil unit were identified to contain small pieces of charcoal presumed to be associated with the burnt down structure on the property.

One sample of this black sandy gravel soil was submitted for laboratory particle size distribution analysis. The analytical results are shown on the borehole logs, included in Appendix A, and are summarized in Table 1 based on the Unified Soil Classification System (USCS) with original reports found in Appendix B.

Table 1 Particle Size Distribution Results – Gravelly Sand

Borehole	Depth (m)	Soil	% Gravel	% Sand	% Silt	% Clay
BH103-19-SS3	0.2 – 0.6	Gravelly Sand	22	58	15	6

3.3 Silty Clay to Silt and Clay

Below the surficial soils, a layer of silty clay was observed in all boreholes advanced across the site. Laboratory moisture testing results show the moisture content ranged from 19.0% to 40.1%. SPT N values in this unit ranged from 5 to 21 indicating a firm to very stiff relative density.

Three samples of the silty clay unit were submitted for laboratory particle size distribution analysis. The analytical results are shown on the borehole logs, included in Appendix A, and are summarized in Table 2 based on the Unified Soil Classification System (USCS) with original reports found in Appendix B.

Table 2 Particle Size Distribution Results – Silty Clay to Silt and Clay

Borehole	Depth (m)	Soil	% Gravel	% Sand	% Silt	% Clay
BH101-19 SS5	3.0 – 3.5	Silt and Clay	0	1	49	40
BH104-19-SS2	0.8 – 1.2	Silty Clay	0	2	30	68
BH106-19 SS4	2.3 – 2.7	Silty Clay	0	1	25	74

The boreholes were advanced to termination depths ranging from 2 mbgs to 5 mbgs without encountering bedrock. The surveyed borehole elevations are summarized below in Table 3.

Table 3 Summary of Elevations

Borehole	Borehole Elevation (m rel)	Depth to Borehole Termination (mbgs)	Borehole Termination Elevation (m rel)
BH101-19	83.970	5.0	78.970
BH102-19	83.655	3.5	80.155
BH103-19	83.969	3.5	80.469
BH104-19	83.650	3.5	80.150
BH105-19	83.542	3.5	80.042
BH106-19	83.068	3.5	79.568
BH107-19	83.580	2.0	81.580

3.4 Groundwater

Groundwater seepage was observed in boreholes BH101-19, BH102-19 and BH107-19, generally at shallow, approx. 300 mm to 600 mm depths. Based on these site observations, it is presumed that the groundwater present during drilling is perched on top of the less permeable silty clay soil unit. Rains during the night prior to drilling likely influenced the presence and amount of perched ground water encountered at the site. It should be noted that soil moisture and groundwater levels at the Site may fluctuate seasonally and in response to climatic events.

4.0 Geotechnical Recommendations

The following recommendations are based on 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

The existing topsoil and any soils identified with significant organic content at the Site should be excavated and removed from beneath any areas of the Site to be developed. A qualified geotechnical engineer should inspect the exposed subgrade prior to placement of granular fill. Any loose/soft fill or soils identified at the time of inspection 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.

4.2 Excavations

Temporary excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA). Overburden soils at the site can be considered to be Type 3 soils, as such, excavation side slopes in the overburden should be no steeper than 1H:1V.

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).

4.3 Dewatering

Some groundwater was encountered onsite in the form of perched groundwater atop the silty clay soil unit. Any perched groundwater or minor infiltration of groundwater will be controllable as per the following recommendations. Based on excavation depth, minimal groundwater seepage is anticipated and, if encountered (either perched or seasonal groundwater), should be controllable with filtered sumps and pumps within the excavations. A Permit to Take Water (PTTW) or registration in the Environmental Activity and Sector Registry (EASR) through the Ministry of the Environment, Conservation and Parks (MOECP) will not be required as pumping rates should not exceed 50,000 L/day.

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

4.4 Backfill and Compaction

Excavated overburden soils below the asphalt surface, excluding the clay rich material, from the site may be appropriate for use as fill below grading and parking areas, provided that the actual or adjusted moisture content at the time of construction is within a range that permits compaction to required densities. Some moisture content adjustments may be required depending upon seasonal conditions. Geotechnical inspections and testing of engineered fill are required to confirm acceptable quality.

Foundation or retaining wall backfill should consist of imported, free-draining granular fill. Any engineered fill for foundations should be placed in maximum 300 mm thick lifts and should 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% is applicable. If conditions are wet at the time of construction, compaction of granular fill may not be possible and 19 mm diameter crushed clear stone wrapped in a geotextile filter fabric (Terrafix 270R or equivalent) should be used in place of engineered fill when placed atop native fine grained soils.

Placement of engineered fill should be verified by onsite compaction testing during construction.

4.5 Foundation Design

Assuming that the Site is prepared as outlined above, all conventional strip and spread footings should be set on competent overburden soils or on engineered fill extending to competent soils. All foundations shall be excavated to below the topsoil and black sandy gravel layer identified in each of the boreholes, and backfilled with engineered fill if necessary. The overburden silty clay material can be designed for an allowable bearing capacity of 150 kPa at serviceability limit state (SLS) and 225 kPa at ultimate limit state (ULS).

Foundations may also be founded on OPSS 1010 Granular B Type 2 extending to competent native soils and compacted in lifts maximum 300 mm thick to 100% SPMDD. Granular B material placed beneath the footing must have an overbuild beyond the footing equal to the depth of the excavation to ensure a 1H:1V ratio. The compacted Granular B may be designed for an allowable bearing capacity of 120 kPa at SLS and 180 kPa at ULS.

The quality of the subgrade should be inspected by Cambium during construction, prior to constructing the footings, to confirm bearing capacity estimates. Settlement potential at the above-noted SLS loadings on native soil is less than 25 mm and differential settlement should be less than 10 mm.

4.5.1 Tank and Floor Slab Bedding

Bedding for the tank and floor slabs shall consist of OPSS 1010-3 Granular A material. Any granular engineered fill for foundations should be placed in maximum 200 mm thick lifts and should be compacted to a minimum of 100% of SPMDD. If conditions are wet at the time of construction, compaction of granular fill may not be possible and 19 mm diameter crushed clear stone wrapped in a geotextile filter fabric (Terrafix 270R or equivalent) should be used in place of engineered fill when placed atop native fine grained soils.

4.6 Frost Penetration

Based on climate data and design charts, the maximum frost penetration at the Site is estimated at 1.2 m.

Footings for the proposed structures should be situated at or below this depth for frost protection or should be protected. It is assumed that the pavement structure thickness will be less than 1.2 m, so grading and drainage are important for good pavement performance and life expectancy. The construction of any underground services should be located below this depth or be appropriately insulated.

4.7 Design Review and Inspections

Cambium should be retained to complete testing and inspections during construction operations to examine and approve subgrade conditions, placement and compaction of fill materials, granular base courses, and asphaltic concrete.

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

We trust that the information contained in this report meets your current requirements. If you have questions or comments regarding this document, please do not hesitate to contact the undersigned reviewer at (613) 389-2323.

Respectfully submitted,

CAMBIUM INC.

Prepared By:

Michael Smit, EIT.
Project Coordinator

Reviewed By:

Stuart Baird, M.Eng., P.Eng.
General Manager - Geotechnical

SEB/mav/ms

Appended Figures

GANANOQUE GAS STATION GEOTECHNICAL INVESTIGATION

PAVARANI HOLDINGS INC.
575 King Street East,
Gananoque, Ontario

LEGEND

- Borehole
- Benchmark
- Site boundary (approximate)

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.

Benchmarks:
BM - Benchmark was shot on the top nut of a fire hydrant located at the western corner of the property, adjacent to King Street East.

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BOREHOLE LOCATIONS

Project No.:	9299-001	Date:	June 2019
		Rev.:	
Scale:	1:1,000	Projection:	NAD 1983 UTM Zone 17N
Created by:	MAT	Checked by:	MS
Figure:	1		

O:\GIS\project_MXDs\3200-9299\9299-001 Pavarani Holdings Inc. - 575 King Street East Gananoque - GEO\2019-06-11 FIG 1 Borehole Locations.mxd

Appendix A
Borehole Logs

Peterborough
Barrie
Oshawa
Kingston
T: 866-217-7900
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Log of Borehole: BH101-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909779.849, 408073.726
Elevation: 83.970 m rel

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N)	Well Installation	Remarks
83	0	TOPSOIL: 150 mm thick brown silty sand topsoil, organic rich, loose, moist	1	SS	25	11		Pieces of charcoal observed in split spoon sample.
		SANDY GRAVEL: Black sandy gravel, compact, wet						
	1	SANDY SILT: Dark brown silt, some sand, some clay, trace gravel, loose, wet	2	SS	80	9		
82	2	SILTY CLAY: Dark brown silty clay, some sand, stiff to very stiff, MWTPL	3	SS	100	20		
			4	SS	100	19		
81	3	SILT AND CLAY: Dark brown silt and clay, trace sand, stiff to very stiff, MWTPL	5	SS	100	10		
80	4							
			6	SS	100	8		
79	5	Borehole terminated at 5.0 m in silty clay						Borehole open with groundwater at 1.8 m upon completion.

% Moisture: 25 50 75
SPT (N): 10 20 30 40

Logged By: M. Vaselenak
Input By: M. Vaselenak

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Log of Borehole: BH102-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909786.689, 408094.068
Elevation: 83.655 m rel

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)	% Moisture (25 50 75)	SPT (N) (10 20 30 40)	Well Installation	Remarks
83 / 0		TOPSOIL: 300 mm thick brown silty sand topsoil, organic rich, loose, moist	1	SS	100	3				
		SILT: Dark brown silt, some sand, trace clay, very loose, moist								
82 / 1		SILTY CLAY: Dark brown silty clay, trace sand, firm to stiff, APL	2	SS	100	5				
			3	SS	100	11				
81 / 2			4	SS	100	21				
			5	SS	100	9				
80 / 3		Borehole terminated at 3.5 m in silty clay								Borehole open and dry upon completion.
79 / 4										
5										

Logged By: M. Vaselenak
Input By: M. Vaselenak

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Log of Borehole: BH103-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909771.081, 408080.827
Elevation: 83.969 m rel

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)	% Moisture (25 50 75)	SPT (N) (10 20 30 40)	Well Installation	Remarks
83 / 0		TOPSOIL: 150 mm thick brown silty sand topsoil, organic rich, loose, moist	1	SS	100	7				Pieces of charcoal observed in split spoon sample.
		GRAVELLY SAND: Black gravelly sand, some silt, trace clay, loose, moist								
83 / 1		SILTY CLAY: Dark brown silty clay, trace sand, firm to stiff, APL	2	SS	100	10				
82 / 2			3	SS	100	18				
			4	SS	100	18				
81 / 3										
			5	SS	100	15				
80 / 4		Borehole terminated at 3.5 m in silty clay								Borehole open and dry upon completion.
79 / 5										

Logged By: M. Vaselenak
Input By: M. Vaselenak

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Log of Borehole: BH104-19

Client: Pavarani Holdings | **Project Name:** Gananoque Gas Station | **Project No.:** 9299-001

Contractor: Canadian Environmental Drilling Company | **Method:** Solid Stem Auger | **Date Completed:** June 6, 2019

Location: 575 King St E, Gananoque | **UTM:** 18T 4909758.405, 408084.886 | **Elevation:** 83.650 m rel

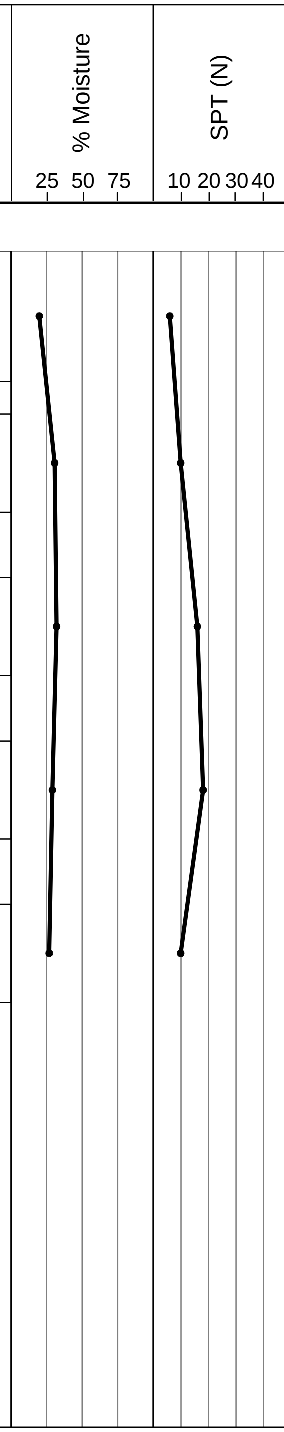
SUBSURFACE PROFILE

Elevation (m)	Depth (m)	Description	Remarks
	0	TOPSOIL: 150 mm thick brown silty sand topsoil, organic rich, loose, moist	Pieces of charcoal observed in split spoon sample.
83		SANDY GRAVEL: Black sandy gravel, compact, wet	Reddish brown colour.
82	1	SILTY CLAY: Brown silty clay, trace sand, stiff to very stiff, APL	Becomes brown in colour.
80	3.5	Borehole terminated at 3.5 m in silty clay	Borehole open and dry upon completion.

Depth scale: 0, 1, 2, 3, 4, 5. Elevation scale: 83, 82, 81, 80, 79.

SAMPLE

Number	Type	% Recovery	SPT (N)
1A	SS	80	6
1B			
2	SS	100	10
3	SS	100	16
4	SS	10	18
5	SS	100	10



Well Installation

Logged By: M. Vaselenak **Input By:** M. Vaselenak

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Log of Borehole: BH105-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909766.220, 408096.305
Elevation: 83.542 m rel

Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)	% Moisture (25 50 75)	SPT (N) (10 20 30 40)	Well Installation	Remarks
83 / 0		TOPSOIL: 300 mm thick brown sandy silt topsoil, organic rich, loose, moist	1A	SS	75	13				
			1B							
		SANDY GRAVEL: Black sandy gravel, compact, moist								Pieces of charcoal observed in split spoon sample.
82 / 1		SILTY CLAY: Brown silty clay, trace sand, stiff, APL	2	SS	100	11				
81 / 2			3	SS	100	11				
			4	SS	100	11				
80 / 3										
			5	SS	100	10				
		Borehole terminated at 3.5 m in silty clay								Borehole open and dry upon completion.
79 / 4										
5										

Logged By: M. Vaselenak
Input By: M. Vaselenak

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Log of Borehole: BH106-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909757.453, 408094.259
Elevation: 83.068 m rel

Elevation (m)	Depth	Description	Number	Type	% Recovery	SPT (N)	Well Installation	Remarks
83	0	TOPSOIL: 150 mm thick brown sandy silt topsoil, oraganic rich, loose, moist	1	SS	80	4		Pieces of charcoal observed in split spoon sample.
		GRAVELLY SAND: Black gravelly sand, loose, moist						
82	1	SILTY CLAY: Brown silty clay, trace sand, firm to stiff, APL	2	SS	100	5		
			3	SS	100	16		
81	2		4	SS	100	10		
80	3		5	SS	100	9		
79	4	Borehole terminated at 3.5 m in silty clay						Borehole open and dry upon completion.
78	5							

% Moisture: 25 50 75
SPT (N): 10 20 30 40

Logged By: M. Vaselenak
Input By: M. Vaselenak

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Log of Borehole: BH107-19

Client: Pavarani Holdings
Project Name: Gananoque Gas Station
Project No.: 9299-001
Contractor: Canadian Environmental Drilling Company
Method: Solid Stem Auger
Date Completed: June 6, 2019
Location: 575 King St E, Gananoque
UTM: 18T 4909743.803, 408096.861
Elevation: 83.580 m rel

SUBSURFACE PROFILE			SAMPLE							
Elevation (m) / Depth	Lithology	Description	Number	Type	% Recovery	SPT (N)	% Moisture (25 50 75)	SPT (N) (10 20 30 40)	Well Installation	Remarks
83 / 0		TOPSOIL: 300 mm thick brown sandy silt topsoil, oraganic rich, loose, moist	1	SS	25	4				
		SILTY SAND: Dark brown sand and silt, some gravel, moist								
82 / 1		SILTY CLAY: Brown silty clay, trace sand, stiff to very stiff, WTPL	2	SS	100	15				
			3	SS	100	19				
81 / 2		Borehole terminated at 2.0 m in silty clay								Borehole open with groundwater at 1.5 m upon completion.
80 / 3										
79 / 4										
		5								

Logged By: M. Vaselenak
Input By: M. Vaselenak

Appendix B

Physical Laboratory Data

Grain Size Distribution Chart

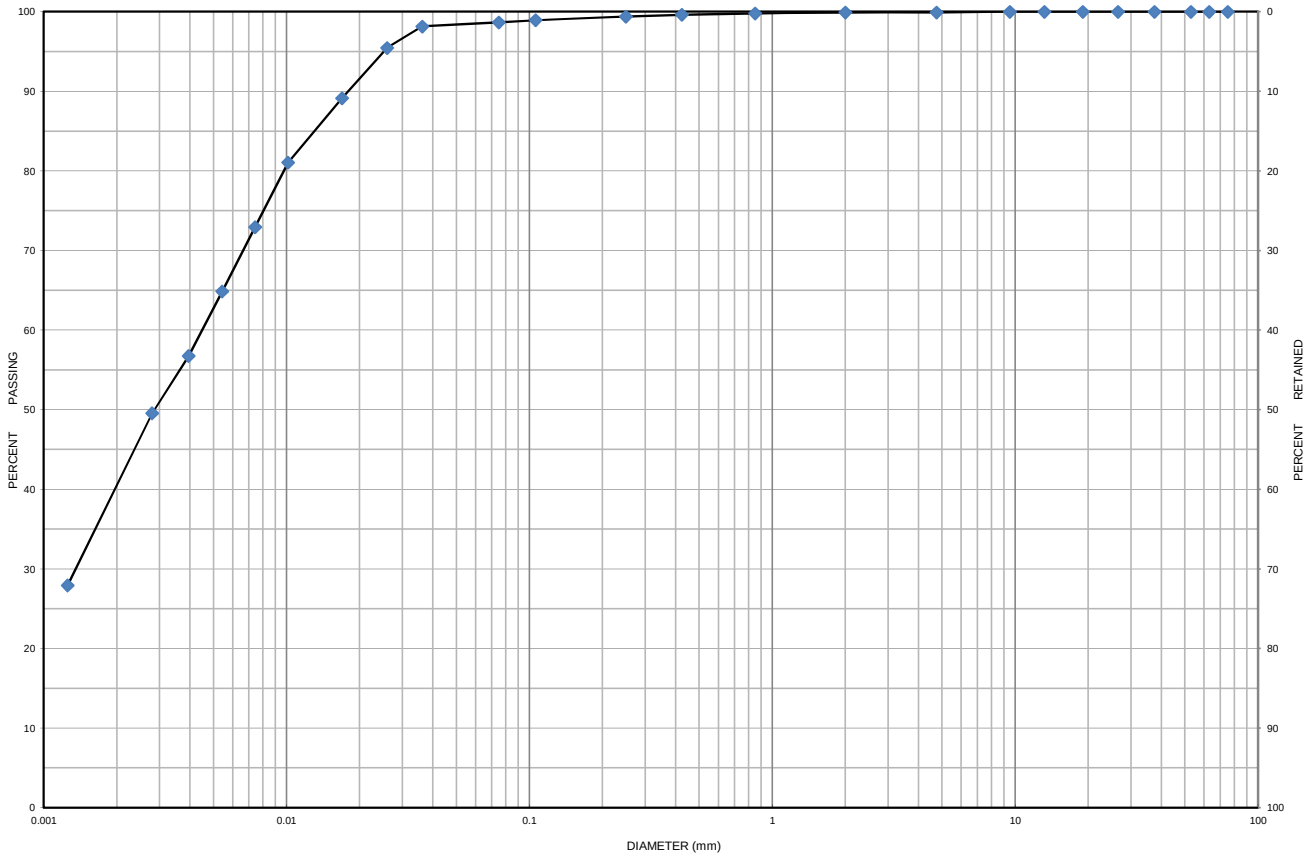
Project Number: *9299-001* **Client:** *Pavarani Holdings Inc.*

Project Name: *575 King St E Gananoque - Geotechnical Investigation*

Sample Date: *June 6, 2019* **Sampled By:** *Mike Vaselenak - Cambium Inc.*

Location: *BH 101-19 SS 5* **Depth:** *3 m to 3.5 m* **Lab Sample No:** *S-19-0394*

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 101-19	SS 5	3 m to 3.5 m	0	1	99		27.7

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silt and Clay trace Sand	ML-CL	0.0045	0.0014	-	-	-

Issued By: _____ *Date Issued:* *June 19, 2019*

(Senior Project Manager)

Cambium Inc. (Laboratory)

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701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

Grain Size Distribution Chart

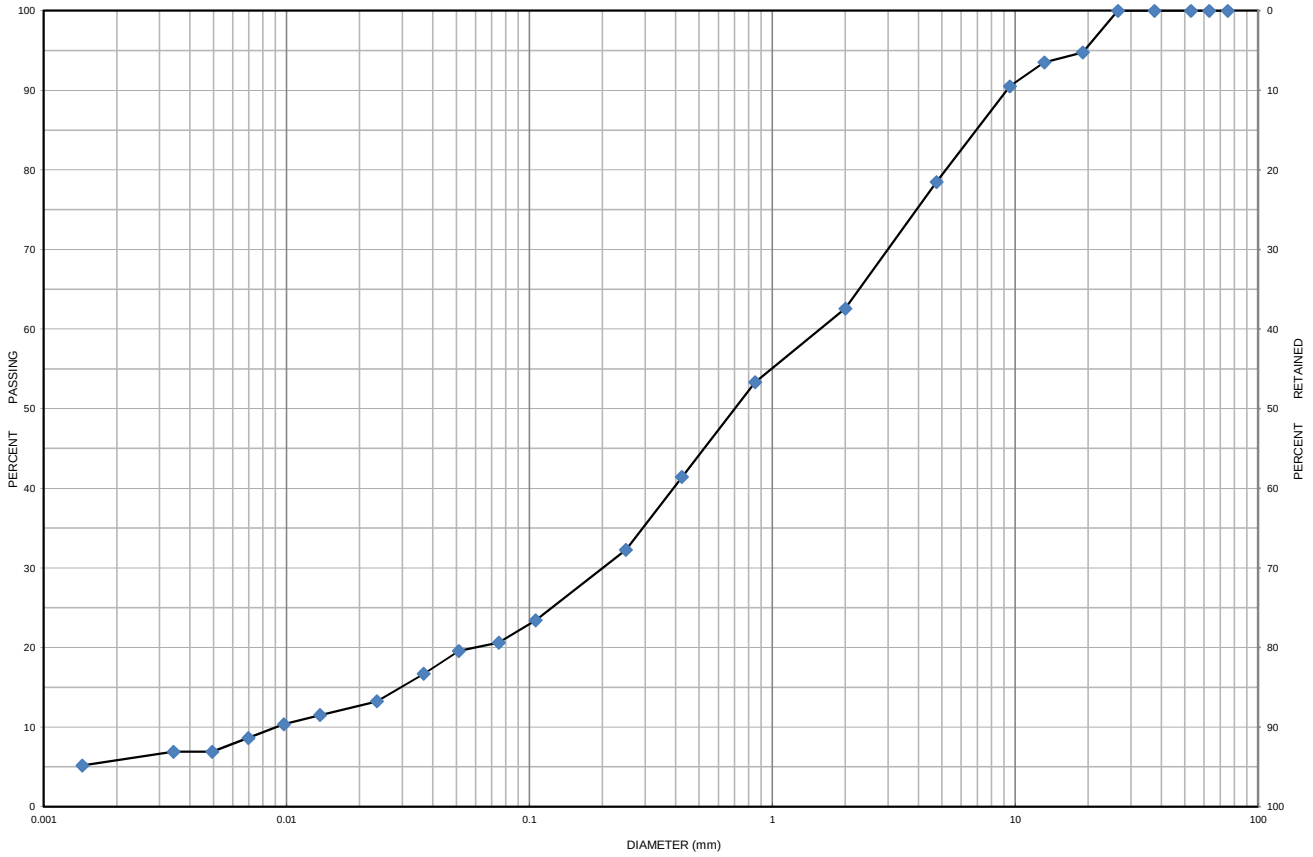
Project Number: *9299-001* **Client:** *Pavarani Holdings Inc.*

Project Name: *575 King St E Gananoque - Geotechnical Investigation*

Sample Date: *June 6, 2019* **Sampled By:** *Mike Vaselenak - Cambium Inc.*

Location: *BH 103-19 SS 1* **Depth:** *0.2 m to 0.6 m* **Lab Sample No:** *S-19-0397*

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 103-19	SS 1	0.2 m to 0.6 m	22	58	21		16.2

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Gravelly Sand some Silt trace Clay	SW	1.600	0.200	0.009	177.78	2.78

Issued By: _____ *Date Issued:* *June 19, 2019*

(Senior Project Manager)

Cambium Inc. (Laboratory)

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701 The Queensway | Units 5-6 | Peterborough | ON | K9J 7J6

Grain Size Distribution Chart

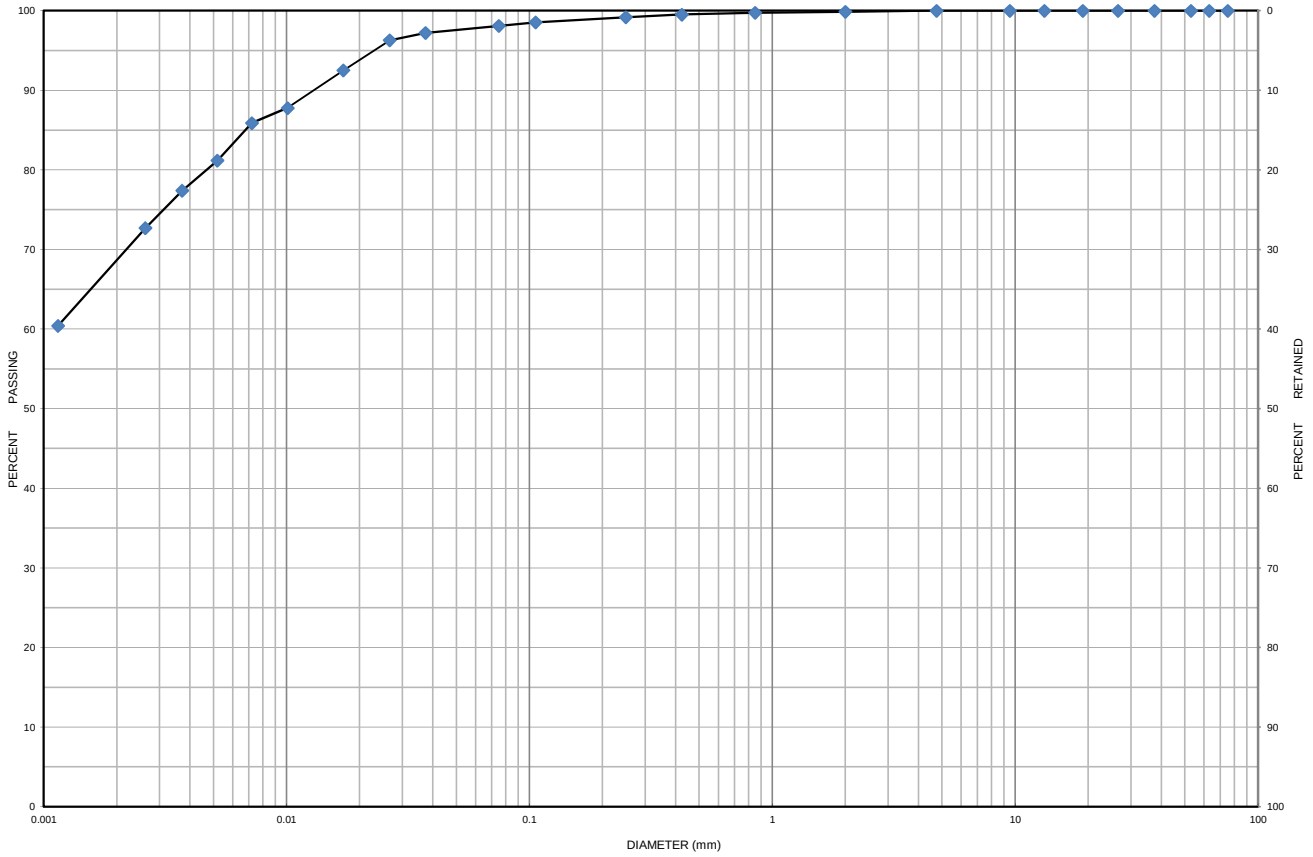
Project Number: *9299-001* **Client:** *Pavarani Holdings Inc.*

Project Name: *575 King St E Gananoque - Geotechnical Investigation*

Sample Date: *June 6, 2019* **Sampled By:** *Mike Vaselenak - Cambium Inc.*

Location: *BH 104-19 SS 2* **Depth:** *0.8 m to 1.2 m* **Lab Sample No:** *S-19-0395*

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 104-19	SS 2	0.8 m to 1.2 m	0	2	98		30.5

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Clay trace Sand	CL	-	-	-	-	-

Issued By: _____ *Date Issued:* *June 19, 2019*

(Senior Project Manager)

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Grain Size Distribution Chart

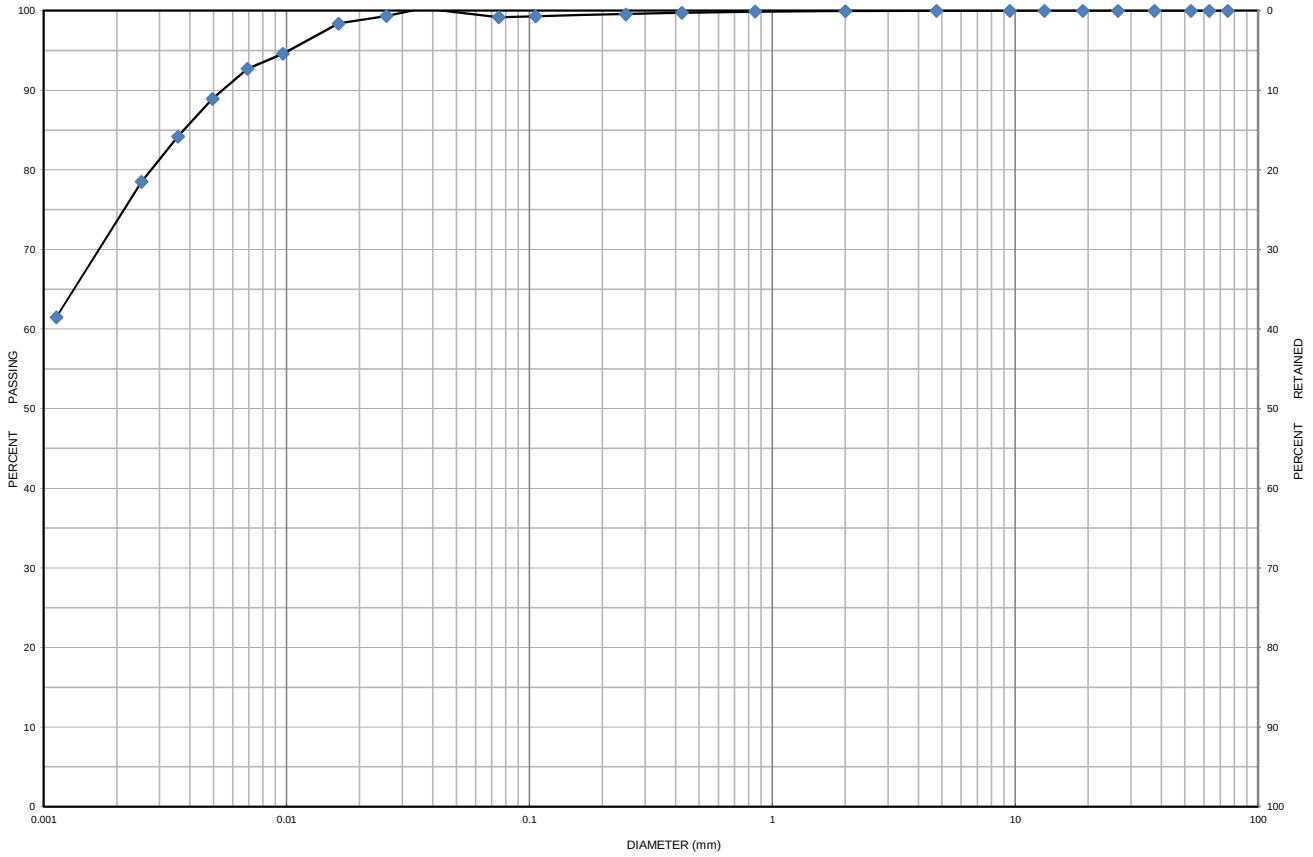
Project Number: *9299-001* **Client:** *Pavarani Holdings Inc.*

Project Name: *575 King St E Gananoque - Geotechnical Investigation*

Sample Date: *June 6, 2019* **Sampled By:** *Mike Vaselenak - Cambium Inc.*

Location: *BH 106-19 SS 4* **Depth:** *2.3 m to 2.7 m* **Lab Sample No:** *S-19-0396*

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 106-19	SS 4	2.3 m to 2.7 m	0	1	99		32.6

Description	Classification	D_{60}	D_{30}	D_{10}	C_u	C_c
Silty Clay trace Sand	CL	-	-	-	-	-

Issued By: _____ *Date Issued:* *June 19, 2019*

(Senior Project Manager)

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