



**St. Lawrence Testing
& Inspection Co. Ltd.**

P.O. Box 997, Cornwall, ON, Canada K6H 5V1
814 Second Street W., Phone (613) 938-2521
E-mail: slt@ontarioeast.net Fax (613) 938-7395

January 7, 2022

Mr. Laura Leeder
c/o Mr. Richard Van Veldhuisen, P.Eng.
Marguerita Residence Corporation
48 Church St.
Brockville, ON
K6V 6L3

**RE: Bobby Leeder Property, Cardinal, ON
Additional Geotechnical Data
Report No. 22C004**

Dear Mr. Van Veldhuisen:

Further to your email of December 24, 2021, our email geotechnical report of December 31, 2021, and Ms. Wendy Van Keulen's email of January 5, 2022, following is our updated report for the Bobbie Leeder property in Cardinal, ON.

We read the 134 page document "Understanding Natural Hazards" put out by the Province of Ontario. This was taken into account when preparing out initial Report No. 21C067 and our email of December 31, 2021.

The soil conditions at this site are not suitable to build a building with standard foundations. The recommendation we provided was to use auger piles to support the house. The weight of the house gets transferred to the piles which go down vertically to the glacial till. We did not go into detail on the number and direction of the piles since this would be part of the structural design of the house. Typically, we should get a call during the final design stage. We would expect that some battered piles would be required on the South side of the house to deal with potential downward pressure of the soil towards the

Report No. 22C004
Continued

Page 2

former canal. There was no evidence of soil movement at this site during the approximate 100 years of fill placement at this site, which would have included some minor earthquakes over the years.

We calculated that the septic bed could have a mantle thickness of 0.75 m based on the Standard Penetration data at Borehole 3. This was noted in our December 31, 2021 email.

As noted in Ms. Wendy Van Keulen's email of January 5, 2022, we would be pleased to discuss any geotechnical concerns with Mr. James Holland of the SNC. Mr. Holland can call us at any time for a discussion.

Respectfully submitted

ST. LAWRENCE TESTING & INSPECTION CO. LTD.



G.G. McIntee, P. Eng.

GGM:mm

c.c. Wendy Van Keulen, Richard Van Veldhuisen, Bobbie Leeder, James Holland

Attachments





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January 31, 2021

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c/o Mr. Richard Van Veldhuisen, P. Eng.
Marguerita Residence Corporation
48 Church Street
Brockville, ON
K6V 6L3

**RE: Bobbie Leeder Property, Cardinal, ON
Geotechnical Subsurface Investigation
Report No. 21C067**

Dear Mr. Van Veldhuisen:

In accordance with e-mail and verbal instructions received from you, this report is submitted, outlining the results of a geotechnical subsurface investigation carried out at the site slightly West of Cardinal on the South side of County Rd. 2 on Lot 8, Concession 1 in the Township of Edwardsburgh Cardinal.

A) DESCRIPTION OF FIELD WORK

Prior to starting the field work, we drove to the site to note the access and the location. We then called for service locates.

Drilling and sampling were carried out on January 14, 2021 using a CME 55 track mounted drill from Eastern Ontario Diamond Drilling of Hawkesbury, ON. Supervision was by the undersigned geotechnical engineer.

The site had been layed out as far as the proposed house and septic bed. We started the boreholes at the house location. The boreholes were advanced by split spoon sampling. Standard Penetration tests were conducted along with the split spoon sampling. The recovered samples were placed in glass jars for later detailed lab classification washed gradation analyses, and moisture contents. The results are found in the borehole logs, gradation data sheets and moisture content data sheet attached at the end of the report.

A sketch showing the proposed house and septic bed location is attached to this report.

B) STRATIGRAPHY

The site has a significant thickness of fill going South from the entrance off of County Rd. 2.

The fill was thin at Borehole 1 at the North West corner of the proposed house but was thick at the South East corner of the proposed house.

The fill at Borehole 1 was a grey, moist, loose sand and gravel with silt that extended to 0.61 m. Below the fill was a brown, moist, stiff silty clay that become firm below 2.3 m. and grey, very moist and soft below 4.5 m.

The fill at Borehole 2 was the same sand and gravel with silt fill as noted at Borehole 1. However, it extended to 2.28 m. Below 2.28 m. was a brown, very moist loose silt with sand and clay fill that extended to 3.60 m. Below 3.60 m. was a grey, moist, firm silty clay that became wet and soft below 7.5 m. We advanced the borehole by driving down a penetration cone to the top

of the silty sand till. We then took Standard Penetration tests in order to note the depth where the silty sand till becomes dense to very dense.

We then put down another borehole South of Borehole 2 to note the amount of fill and the depths of the fill and silty clay. This was Borehole 3 and was 11.3 m. South of Borehole 2. This was 4.6 m. North of the rounded slope leading down to the canal.

The upper fill is the same loose sand and gravel with silt as at Borehole 2 and extended to 3.0 m. below the surface. Below the sand and gravel with silt fill is a grey, very moist, loose sandy silt fill to 4.34 m. Below the sandy silt fill was the grey, moist, firm silty clay.

For the specific stratigraphy at each borehole, the borehole logs should be referred to.

C) SITE ELEVATIONS

We did not bring any survey equipment with us but made notes on the approximate differences in elevation at the boreholes. We can return to take elevations if requested.

From a visual assessment, Borehole 3 is approximately 1.0 m. lower than Borehole 2 and is approximately 3.0 m. above the water surface in the canal.

There was major snow cover over the property. We didn't want to risk walking down the canal bank slope to obtain measurements. If need be, we can return to do this in the Spring.

D) GEOTECHNICAL DISCUSSION

1) General

It is our understanding that it is planned to sell this property to build a house, such as shown on the sketch.

2) Foundations

Because of the amount of fill and underlying soft to firm silty clay, it is not possible to support a house on normal spread footings. Assuming it is permissible to build a house at the location shown, the house will need to be supported on piles.

The best piling system to use is auger piles. Auger piles are pushed down vertically. When the top of the silty sand till stratum is reached, the piles are then augered to refusal. Typically refusal is reached within 1.0 m. of the top of the glacial till. The data at Borehole 2 would indicate a depth of 9.5 to 10.0 m. It would likely be close this at Borehole 1.

The auger pile companies have different size piles with varying capacities. The design would need to incorporate the number of piles with the structural design of the foundation walls supporting the house.

3) Slab

Given the height above the canal and river, it would appear that the house could incorporate a basement.

Because of the silty clay at Borehole 1 at 0.61 m., the depth should not exceed 2.3 m. This is a reasonable depth for a basement.

The gravel below the slab can be the typical clear stone used for basement slabs. The thickness should be 150 mm.

4) Driveway

Any surface topsoil should be removed.

The existing sand and gravel fill has a high silt content. As such, new gravel should be used to construct the driveway. This should consist of 300 mm. of Granular "B" Type 2 subbase and 150 mm. of Granular "A" base, each compacted to 100% Standard Proctor Density.

The asphalt should consist of 50 mm of HL3 compacted to 96% Marshall Density.

E) CONSTRUCTION CONTROL

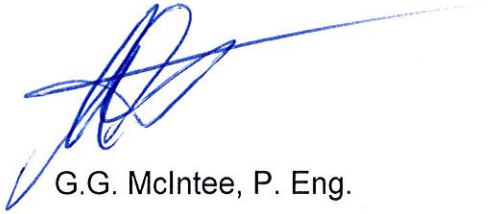
If permission is granted to build a house at this location, there is a requirement that our firm be engaged to inspect the installation of the piling on a full time basis. This is to approve the final driving depths of the piles and to record the length of each driven pile. Piling firms have a fixed price for the number and length of piles and have a credit and debit based on the differences from the stated amount in the tender.

Report No. 21C067
Continued

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Respectfully submitted

ST. LAWRENCE TESTING & INSPECTION CO. LTD.



G.G. McIntee, P. Eng.

GGM:njw



Attachments



**St. Lawrence Testing
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OFFICE BOREHOLE RECORD

REPORT NO. 21C067

CLIENT Richard Van Veldhuisen

BOREHOLE NO. 1

LOCATION Bobbie Leeder, Lot 8, Concession 1, CR2, Cardinal, ON

CASING HF Auger

DATE OF BORING January 14, 2021

DATE OF WL READING _____

DATUM _____

SOIL PROFILE				SAMPLES				LABORATORY TESTS PERFORMED	LAB TEST RESULTS			
DEPTH ELEVATION DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	CONDITION	TYPE	NUMBER	RECOVERY		N - VALUE	WATER CONTENT & ATTERBERG LIMITS.		
										WP	W	WL
0	Sand & Gravel Fill Grey, moist, loose, with silt									DYNAMIC PENETRATION TEST BLOWS PER FOOT. . K ...		
.61	Silty Clay Brown, moist, stiff, becoming firm below 2.3 m. and grey, very moist and soft below 4.5 m.											
1					SS	1	60	5				
					SS	2	70	5				
2					SS	3	85	3				
3					SS	4	100	2				
4					SS	5	100	1				
5												
5.18	Termination of borehole											
APPENDIX												

REPORT NO. 21C067

CLIENT Richard Van Veldhuisen

BOREHOLE NO. 2

LOCATION Bobbie Leeder, Lot 8, Concession 1, CR2, Cardinal, ON

CASING HF Auger

DATE OF BORING January 14, 2021 DATE OF WL READING

DATUM

SOIL PROFILE				SAMPLES						LABORATORY TESTS PERFORMED	LAB	TEST	RESULTS				
DEPTH	ELEVATION	DEPTH	SOIL DESCRIPTION	STRAT. PLOT	WATER CONDITIONS	CONDITION	TYPE	NUMBER	RECOVERY		N - VALUE	WATER CONTENT & ATTERBERG LIMITS.					
												WP	W	WL			
												DYNAMIC PENETRATION TEST BLOWS PER FOOT. . K . . .					
0			<u>Sand & Gravel Fill</u> Brown, moist, loose with silt									0	20	40	60	80	
-1																	
-2																	

REPORT NO. 21C067

BOREHOLE NO. 3

CLIENT Richard Van Veldhuisen

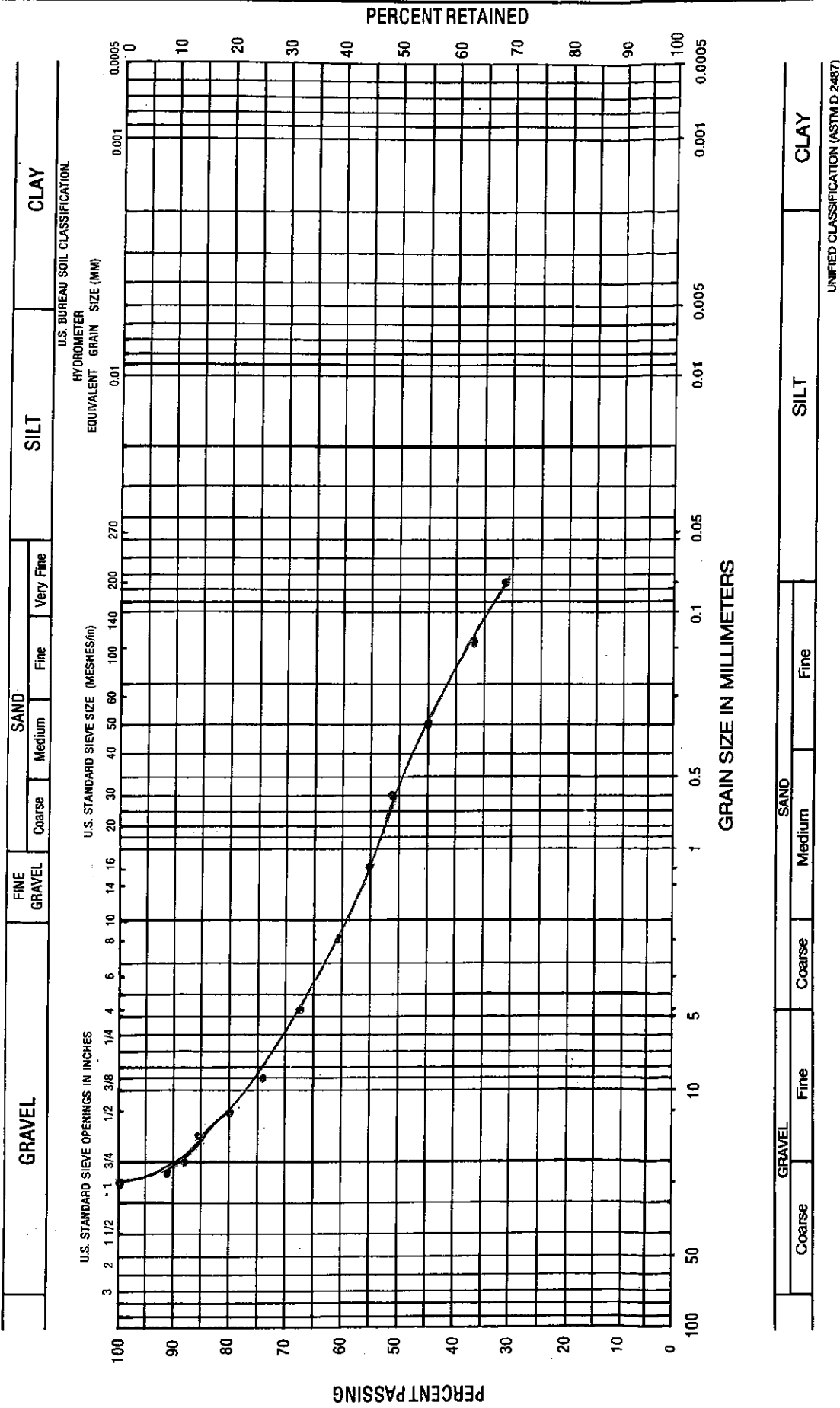
LOCATION Bobbie Leeder, Lot 8, Concession 1, CR2, Cardinal, ON

CASING HF Auger

DATE OF BORING January 14, 2021 DATE OF WL READING

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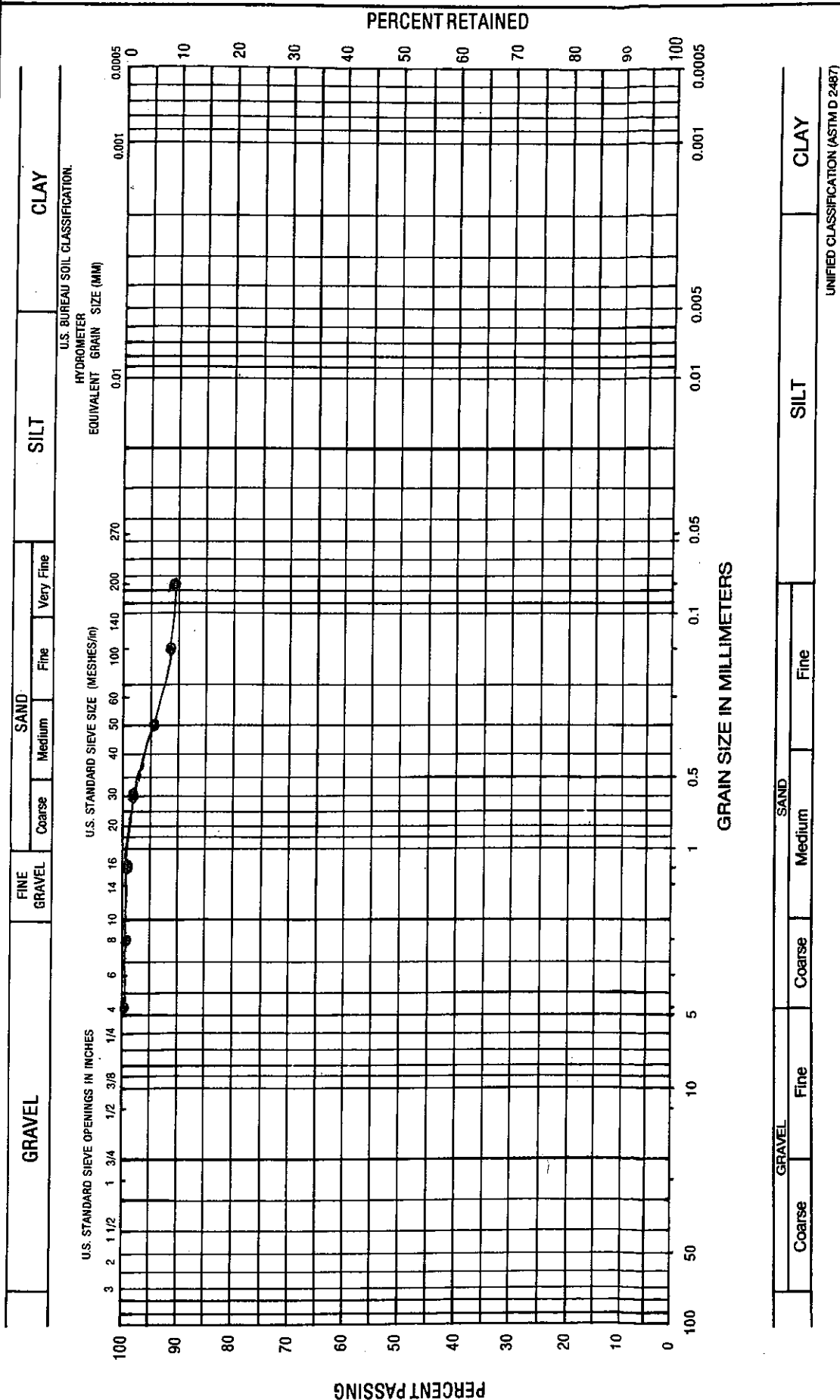


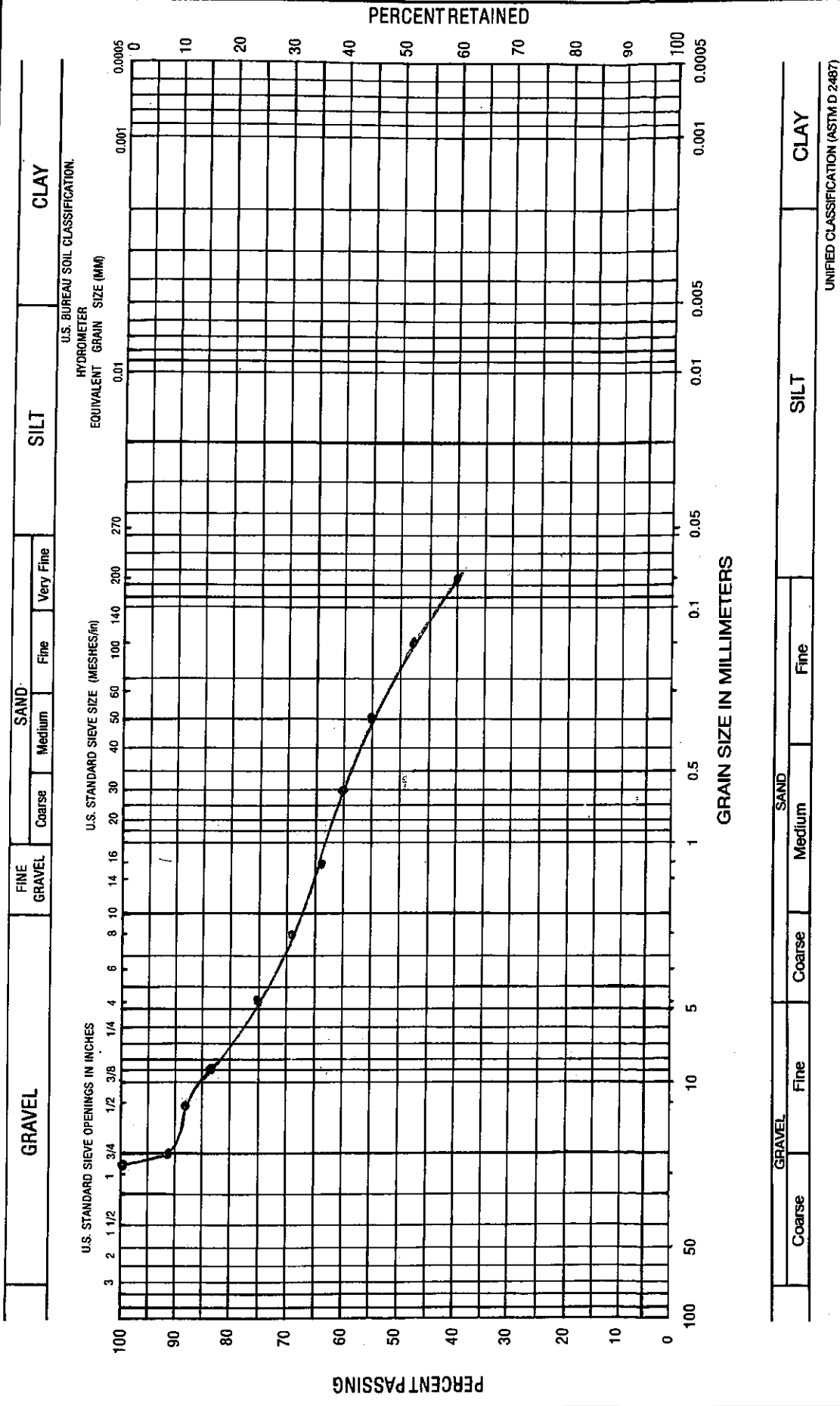
BOREHOLE No. 2

SAMPLE No. 2

DEPTH 5 - 7 ft.

DESCRIPTION Sand and gravel with silt





DESCRIPTION

Sand and gravel with silt

DEPTH

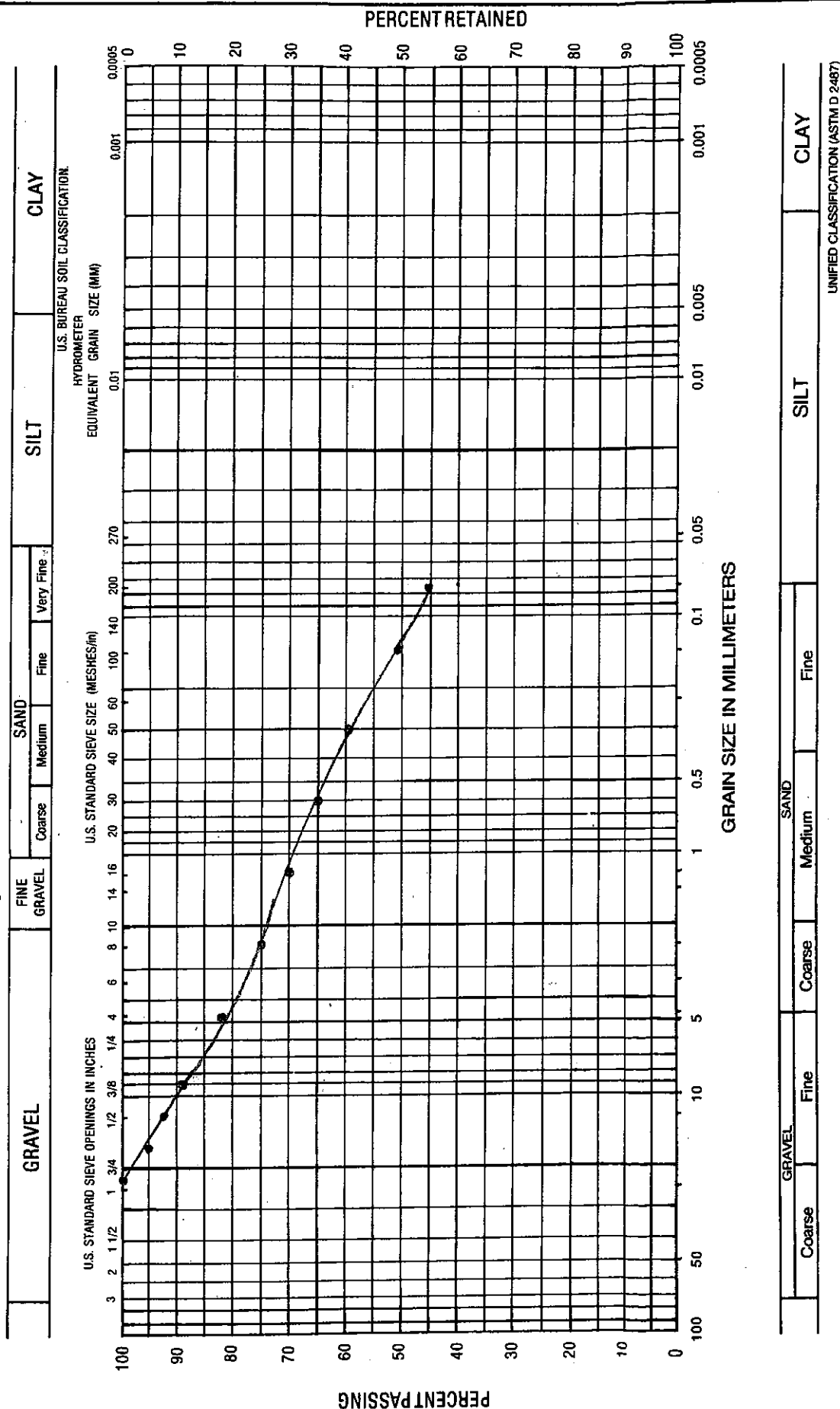
5 - 7 ft.

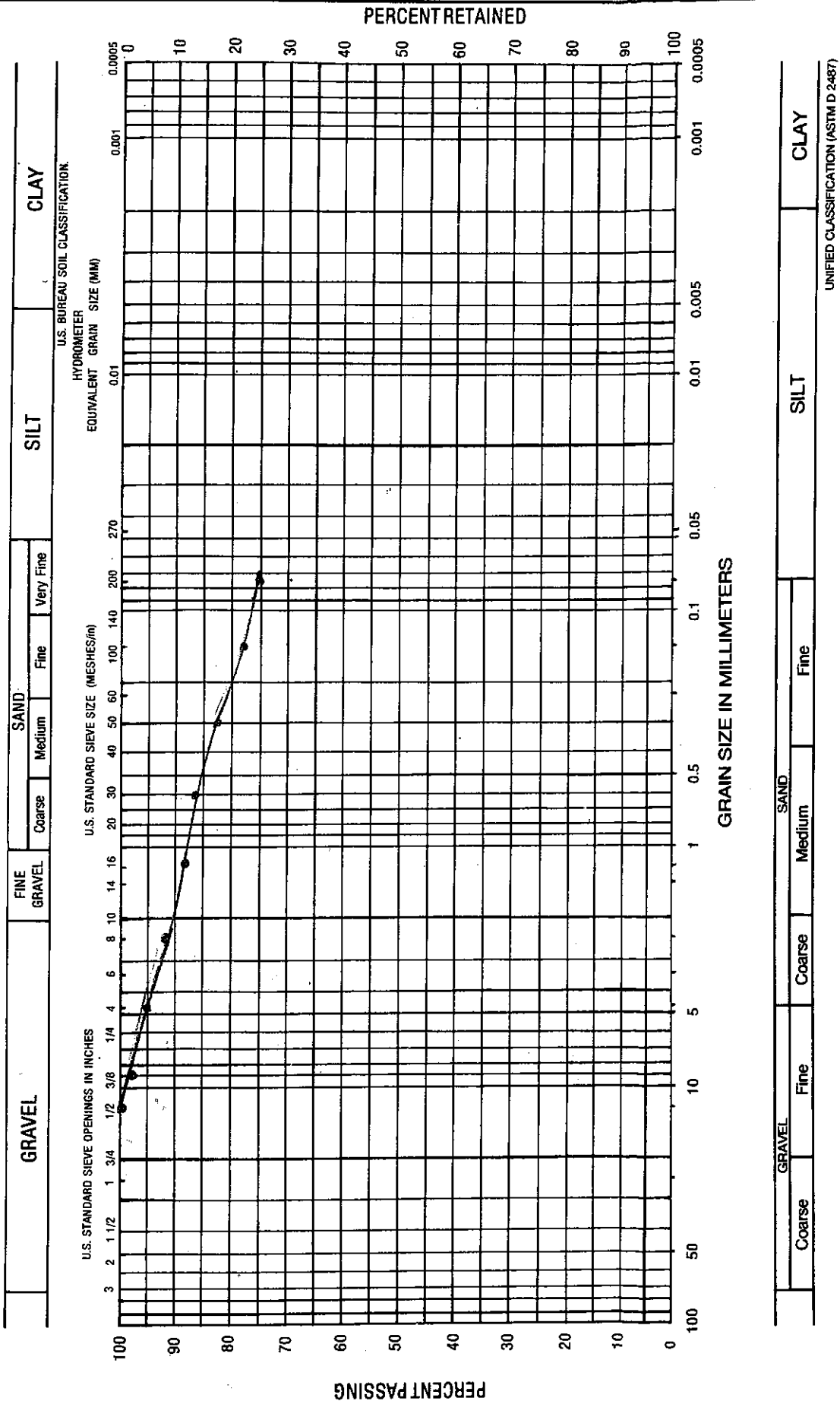
SAMPLE No.

2

BOREHOLE No.

3





Moisture Content

<u>Borehole #</u>	<u>Sample #</u>	<u>Depth</u>	<u>Moisture Content</u>
2	2	1.5 m. to 2.1 m.	13.1%
2	3	2.3 m. to 2.9 m.	27.8%
2	5	3.8 m. to 4.4 m.	39.1%
3	2	1.5 m. to 2.1 m.	19.5%
3	3	2.3 m. to 2.9 m.	8.1%
3	4	3.1 m. to 3.7 m.	19.5%
3	6	4.6 m. to 5.2 m.	42.7%

Gib McIntee

From: Gib McIntee
Sent: December 31, 2021 9:49 AM
To: Richard VanVeldhuisen
Cc: Wendy Van Keulen; bobbieleeder bobbieleeder
Subject: RE: Cardinal Soil Report

I drove to the site on December 30, 2021 and walked down South to the edge of the bank adjacent to the former Galop canal.

Visually, the southern 30 ft. is approximately 10 ft. high from the water's edge. This is a 3 to 1 slope. The next 30 ft. going North is approximately 6 ft. high for a slope of 5 to 1. The elevation going further North has a very mild slope going up to the road embankment. Based on my many years of experience of working on the Galop canal, I would guess that the fill has been in place for about 100 years, which means that it is stable.

Our report 21C067 specifies that the house is to be supported on piles. This is because of the loose fill which gets very thick going from the North side to the South side of the house. Below the fill is a very moist to wet, firm to soft silty clay. It was necessary to specify piles because of the sharp angle of the fill over the silty clay going down from the North to South.

In checking my field notes after writing the above, I had a notation that Borehole 3, as shown on the plan, was approximately 10 ft. above the canal level. Borehole 3 was noted to be approximately 15 ft. North of the rounded top of slope going down to the canal.

There was a notation that the water depth at the edge of the slope was approximately 3 ft. deep. The soil went South in a fairly flat manner, dropping about 2 feet over a 20 ft. length from the edge of the bank.

From the point of view of measurements, 10 ft. can be considered 3.0 m, 20 ft. can be considered 6.0 m and 30 ft. can be considered 9.0 m.

The issue of slope stability is dealt by the piling for the house. The land South of the house is stable with a slope stability between 3 to 1 on the canal bank and 5 to 1 North of the canal bank. The 9 by 10 m mantle East of Borehole 3 can have a mantle thickness up to 0.75 m based on the Standard Penetration test data at Borehole 3.

Best regards,

Gib McIntee, P.Eng.
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814 Second St. West
Cornwall, ON CANADA K6H 5V1
Tel: (613) 938-2521
Fax: (613) 938-7395
E-mail: gib@stlawrencetesting.com

From: Richard VanVeldhuisen <rvanveldhuisen@gmail.com>
Sent: December 24, 2021 2:28 PM
To: Gib McIntee <gib@stlawrencetesting.com>
Cc: Wendy Van Keulen <Wvankeulen@twpec.ca>; bobbieleeder bobbieleeder <bobbieleeder@sympatico.ca>
Subject: Cardinal Soil Report

Gib:

Wendy Van Keulen of the Township has asked for additional information about soil stability. See her statement below.

"The Geotechnical Report was to support the location of the building envelope due to the steep slopes on the property. The report does not appear to address the slope stability concern to confirm a safe setback from the top of the slope. The Township has asked the South Nation Conservation Authority to review this report on our behalf. They will require this additional information to review. You/your engineer could reach out to SNC directly by contacting James Holland at jholland@nation.on.ca to confirm the information that is needed."

Can you respond to her inquiry, and connect with the Conservation, and keep us in the loop?

Thanks and enjoy your holiday time off

Richard

Dick Van Veldhuisen P Eng.
Home Phone 613-342-2450
Cell Phone 613-340-3912
rvanveldhuisen@gmail.com

Gib McIntee

From: Wendy Van Keulen <wvankeulen@twpec.ca>
Sent: January 5, 2022 12:03 PM
To: Gib McIntee; Richard VanVeldhuisen
Cc: bobbieleeder bobbieleeder; James Holland
Subject: RE: Cardinal Soil Report

Hello Gib and Richard,

Thank you for sending these additional comments by email. A stamped report or technical letter is required, that provides analysis following the Provinces' technical guidelines.

<https://www.scrca.on.ca/wp-content/uploads/2018/09/MNR-Understanding-Natural-Hazards.pdf>

<https://www.scrca.on.ca/wp-content/uploads/2018/09/MNR-Technical-Guide-River-and-Stream-Erosion-Hazard.pdf>

The analysis would typically determine a stable top of slope, plus a toe erosion analysis and an access allowance. This results in a safe setback requirement from the top of slope, and a description of what can be permitted within the setback. If a specific design is being considered to mitigate the unstable slope, it must be acknowledged and confirmed in the engineering report.

As the Township has asked the Conservation Authority to review the report on our behalf, I think it would be helpful for Gib to discuss directly with SNC. James Holland (cc'd here) is the Planner that has been managing the file on SNC's end and could arrange a call with the reviewer.

With Kind Regards,

Wendy Van Keulen
Community Development Coordinator
613.658.3055 x101

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