



V.A. WOOD (GUELPH) INCORPORATED
CONSULTING GEOTECHNICAL ENGINEERS

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
TELEPHONE: 519-763-3101

January 22, 2020

Reference No. G4143-19-12

Thomasfield Homes Ltd.
c/o GM Blueplan Engineering Ltd.
650 Woodlawn Road West
Block C, Unit 2
Guelph, Ontario
N1K 1B8

Attention: Ms. Angela Kroetsch, P.Eng.

RE: Geotechnical Investigation
Mayberry Subdivision, Phase 3B
Grand Valley, Ontario

Dear Angela:

V.A. Wood (Guelph) Inc. was retained by GM Blueplan Engineering Inc. on behalf of Thomasfield Homes Ltd. to carry out a geotechnical investigation for the proposed collector road (Street C) and Stormwater Management Pond for Phase 3B of the Mayberry Subdivision in Grand Valley, Ontario.

The purpose of the investigation was to reveal the subsurface conditions and to determine the relevant soil properties for the design and construction of the collector road and storm water management pond.

The fieldwork was carried out on November 19, 2019 and consisted of four (4) test pits at the locations shown on Enclosure 1. The test pits were advanced to the sampling depths by means of a hydraulic excavator. The subsurface soils were visually inspected, logged and sampled at the test pit locations.

The fieldwork program was supervised by GM BluePlan Engineering Ltd. as well as a soils technician from our office. The test pits were laid out and the ground elevation at each test pit was supplied to us by GM Blueplan Engineering Ltd.



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SUBSURFACE CONDITIONS:

Full details of the soils encountered in each test pit are given on the Test Pit Logs, Enclosures 2 to 5, inclusive and the following notes are intended to summarize this data.

Test Pits 2 and 3 encountered a surficial deposit of topsoil ranging between 450 and 600mm± thick.

Test Pit 4 encountered a surficial deposit of clayey silty sand fill to a depth of about 0.5 metres below grade underlain by a deposit of organic fill to a depth of about 1.4 metres below grade. The natural moisture content of the clayey silty sand till was found to be about 24%.

Based on a visual examination of the subsoils, the deposits of fill are considered to be in a generally loose to compact condition.

A deposit of brown sandy silty clay was encountered from the surface at Test Pit 1 and below the topsoil at Test Pit 3. This deposit extended to depths ranging between 2.6 metres below grade and the full depth of the investigation (i.e. 3.0± metres below grade) and the natural moisture content was found to range from 12 to 13%. Typical grain size distribution curves for this material can be found on Enclosures 6 to 7, inclusive.

Based on a visual examination of the subsoils, the deposit of sandy silty clay is considered to have a generally compact relative density.

A deposit of brown clayey sand was encountered below the topsoil at Test Pit 2. This deposit extended to the full depth of the investigation (i.e. 3.0± metres below grade) and the natural moisture content was found to be about 11%. A typical grain size distribution curve for this material can be found on Enclosure 8.

Based on a visual examination of the subsoils, the deposit of clayey sand is considered to have a generally compact relative density.

The fill at Test Pit 4 was underlain by sandy silty clay which extended to the full depth of investigation (i.e. 3.0± metres below grade). A typical grain size distribution curve for clayey silty sand fill material can be found on Enclosure 9.

Based on a visual examination of the subsoils, the deposit of sandy silty clay is considered to have a generally compact relative density.

The sandy silty clay at Test Pit 1 was underlain by a deposit of grey silty clay, which extended to the full depth of the investigation (i.e. 3.0± metres below grade).

Based on a visual examination of the subsoils, the deposit of silty clay is considered to have a generally stiff consistency.

GROUNDWATER CONDITIONS:

It is noted the test pits were excavated prior to our inspection on November 19, 2019 and were dry and open to the full depth of the investigation at the time of the inspection.

An examination of the soil samples indicated that they were generally moist.

It is noted that no sub-artesian water pressures were encountered in any of the test pits.

A colour change from brown to grey was noted in Test Pit 1 at El. 471.1m± (i.e. 2.6± metres below grade).

Based on the foregoing, the permanent groundwater table is expected to be located at least 3.0 metres below grade, although a perched water condition may be expected in the looser upper zones underlain by the less permeable deposits of silty clay.

EXCAVATION AND GROUNDWATER CONTROL:

No major construction problems due to water are anticipated with excavations less than 3.0 metres below grade based on the test pit observations at the time of the investigation. Provision should, however, be made for control of any surface water run-off and minor seepage from any wet sand seams by pumping from local sumps on an as and where required basis.

Excavations to a depth of more than 1.2 metres below grade should be cut back to a side slope of 1 to 1 or, supported using adequately braced sheeting.

SEWERS:

Where sewer trench grades are below the groundwater table, provisions may be required to lower the groundwater table through pumping from local sumps as and where required or through the use of well points. The sides of the excavation to a depth of more than 1.2 metres (and above the water table) should either be cut back at a side slope of 1 to 1 or supported using adequately braced closed sheeting.

The excavated materials will be generally suitable for use as trench backfill provided that they are free of topsoil and boulders. If the on-site materials are or become wet, they should be air dried prior to re-use as trench backfill. The trench backfill should be placed in 150 to 200mm thick layers and uniformly compacted to at least 95% of its Standard Proctor maximum dry density. The backfill around manholes should consist of well-graded and well-compacted granular material.

To minimize potential problems and wetting of the subgrade material, backfilling operations should follow closely after excavations, so that only a minimal length of trench is exposed at a time. Should construction be carried out in the winter season, particular attention should be given to make sure no frozen material is used for backfill.

STORMWATER MANAGEMENT:

Grain size distribution curves were prepared for representative samples of the subsoils obtained at the test pits. These grain size distribution analyses were performed following applicable ASTM laboratory procedures and are found on Enclosures 6 to 9, inclusive.

The grain size distribution curves were compared to the family of curves presented in the Supplementary Standard SB-6 of the 2012 Building Code Compendium. According to the Unified Soils Classification System and taking into consideration the specific physical nature of the soils, the samples in question are considered to have the properties noted in the following charts.

Test Pit Nos.	Sample No.	Material					Unified Soils Classification Group	Estimated Co-efficient of Permeability (k) (cm/sec.)
		Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
1	1	Sandy Silty Clay, trace gravel	4.9	29.9	30.2	35.0	(ML-CL)	$10^{-5} - <10^{-6}$
2	1	Clayey Sand, some silt, some gravel	11.4	46.8	19.0	22.8	(SM-SC)	$10^{-3} - 10^{-6}$

Test Pit No.	Sample No.	Material				Unified Soils Classification Group	Estimated Co-efficient of Permeability (k) (cm/sec.)	
		Description	Gravel (%)	Sand (%)	Silt (%)			Clay (%)
3	2	Sandy Silty Clay, trace gravel	3.8	26.1	32.0	38.1	(CL)	<10 ⁻⁶
4	2	Clayey Silty Sand Fill, some gravel	19.4	29.7	26.0	24.9	(ML-CL)	10 ⁻⁵ - <10 ⁻⁶

PAVEMENT DESIGN:

All topsoil, fill and any deleterious materials encountered should be stripped from the pavement areas. The proposed subgrade should then be re-compacted from the surface to at least 98% of its Standard Proctor maximum dry density prior to pavement construction. Any loose areas which are detected should be sub-excavated and backfilled with suitable on-site material or approved imported granular fill. All fill should be placed in 150 to 200mm thick lifts and compacted to at least 98% of its Standard Proctor maximum dry density. Considering the nature of the subsoils we recommend installation of sub-drains along the edges of the proposed roadway connected to the municipal storm sewer.

Considering the probable traffic requirements, subsoil conditions and Town of Grand Valley Specifications, the following pavement design is recommended for Street C.

	Collector Road ¹ (mm)
Asphaltic Concrete	110
Granular 'A' Base Course	150
Granular 'B' Sub-base Course	600

¹ Town of Grand Valley Specification

The base and sub-base granular materials should be compacted to at least 100% Standard Proctor maximum dry density. The asphalt should be compacted to OPS Specifications.

Frequent inspections by geotechnical personnel from V. A. Wood (Guelph) Inc. should be carried out during construction to verify the compaction of the subgrade, base courses and asphaltic concrete by in-situ density testing using nuclear gauges.

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We trust this report has been completed within our terms of reference; however, should you have any questions, please do not hesitate to contact this office.

The Statement of Limitations presented on Appendix 'A' is an integral part of this report.

V. A. WOOD (GUELPH) INC.



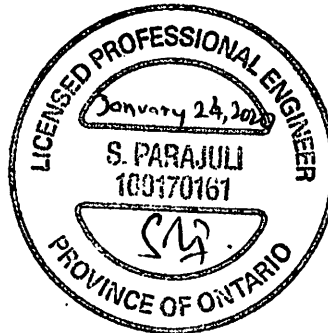
J. Broad, B.A.
President & General Manager



S. Parajuli, M.A.Sc., P.Eng.
Geotechnical Engineer

JB:sm

Encls.



APPENDIX

STATEMENT OF LIMITATIONS:

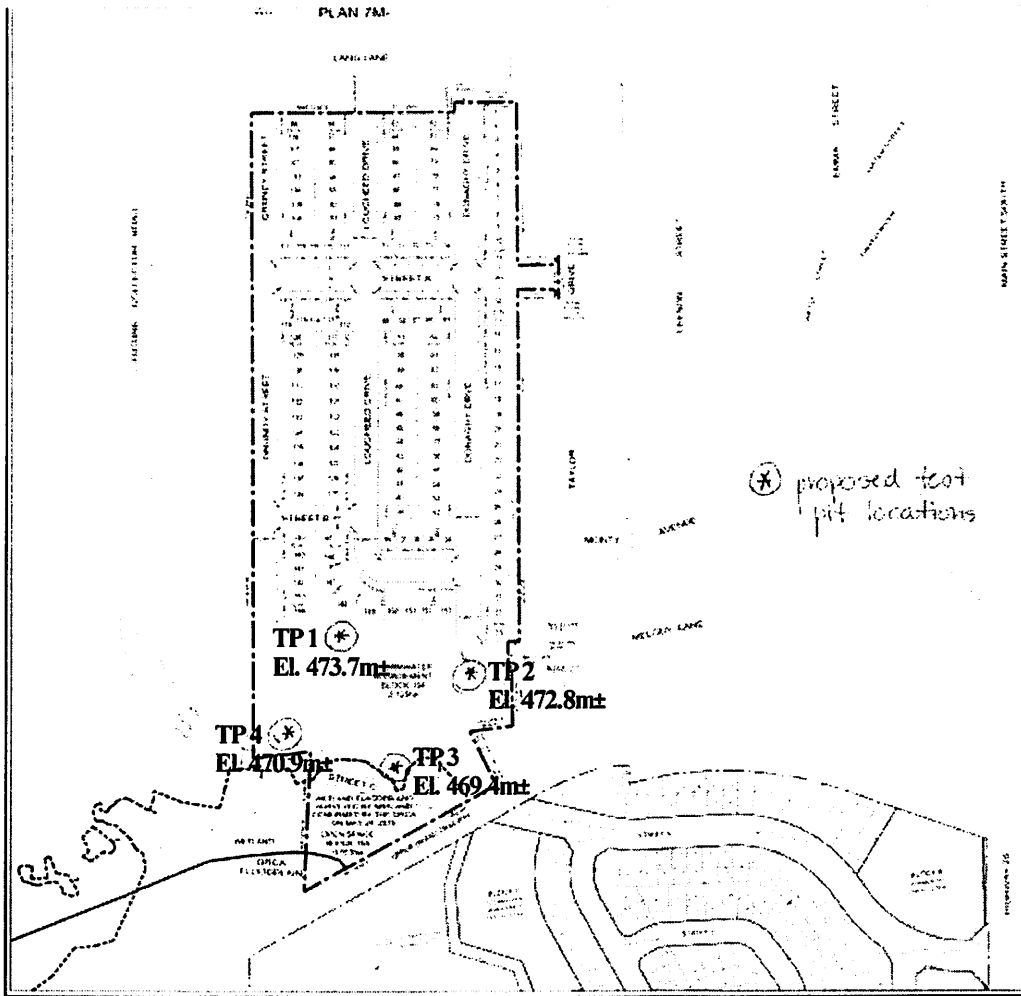
The conclusions and recommendations in this report are based on information determined at the Test Pit locations and on geological data of a general nature, which may be available, for the area investigated. Soil and groundwater conditions between and beyond the test pits may differ from those encountered at the test pit locations and conditions may become apparent during construction, which would not be detected or anticipated at the time of the soil investigation.

*We recommend that we be retained to ensure that all necessary stripping, subgrade preparation and compaction requirements are met, and to confirm that the soil conditions do not deviate materially from those encountered in the boreholes. **In cases where this recommendation is not followed the company's responsibility is limited to interpreting accurately the information encountered at the test pits.***

This report is applicable only to the project described in the introduction, constructed substantially in accordance with details of alignment and elevations quoted in the text.

This report was prepared by V. A. Wood (Guelph) Inc. for Thomasfield Homes Ltd. and GM BluePlan Engineering Ltd. The material in it reflects V.A. Wood (Guelph) Inc. judgment in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Parties. V. A. Wood (Guelph) Inc. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

ENCLOSURES



MAYBERRY HILL PHASE 3B DRAFT PLAN OF SUBDIVISION 22T-201501													
DATE: 12/19/2019	DRAWN BY: A.W.												
PROJECT NO.: 22T-201501	SCALE: 1:500												
LEGAL DESCRIPTION Part of Lot 20, Concession 2 Township of Grand Valley Part of Block 10, Adjacent to 111 E. 37th Highway, S.W. 14th St. County of Dufferin													
LAND USE SCHEDULE <table border="1"> <thead> <tr> <th>CLASSIFICATION</th> <th>DESCRIPTION</th> <th>AREA</th> <th>PERCENTAGE</th> </tr> </thead> <tbody> <tr> <td>...</td> <td>...</td> <td>...</td> <td>...</td> </tr> <tr> <td>TOTAL</td> <td></td> <td>0.1176</td> <td>100%</td> </tr> </tbody> </table>		CLASSIFICATION	DESCRIPTION	AREA	PERCENTAGE	TOTAL		0.1176	100%
CLASSIFICATION	DESCRIPTION	AREA	PERCENTAGE										
...										
TOTAL		0.1176	100%										
NOTES 1. This plan is a draft and is not to be used for construction purposes. 2. All dimensions are in meters unless otherwise specified. 3. The owner warrants that the information provided is true and correct.													
ADDITIONAL INFORMATION This plan was prepared in accordance with the requirements of the Planning Act, R.S.O. 1990, c. 305.													
OWNER'S CERTIFICATE I, the undersigned, being the owner of the land described in this plan, hereby certify that the information provided is true and correct.													
Surveyor's Certificate I, the undersigned, being a duly qualified and licensed surveyor, hereby certify that this plan was prepared in accordance with the requirements of the Planning Act, R.S.O. 1990, c. 305.													

Ground Elevations @ TPs supplied by GM BluePlan Engineering Ltd.

	V.A. WOOD (GUELPH) INC Consulting Geotechnical Engineers 405 York Road, Guelph, Ontario N1E 3H3 Ph. (519) 763-3101 Fax. (519) 763-5912	
	Test Pit Location Plan Mayberry Subdivision, Phase 3B Grand Valley, Ontario	
Scale: As Noted	Ref. No. G4143-20-1	
Date: Nov 19, 2019	Enclosure 1	

REFERENCE No: G4143-19-12

TEST PIT No: 1

V.A. WOOD (GUELPH) INC.
CONSULTING GEOTECHNICAL ENGINEERS

CLIENT: Thomasfield Homes Ltd.


PROJECT: Mayberry Hill Subdivision, Ph 3B

ENCLOSURE No: 2

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Grand Valley, ON

SUPERVISOR: DH/AA

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)	SYMBOL	GROUND WATER	SAMPLES
0.0	GROUND SURFACE	473.7			
	brown, compact SANDY SILTY CLAY trace gravel moist			DRY (19-Nov-2019)	1
2.6		471.1			
3.0	grey, stiff SILTY CLAY moist	470.7			
	END OF TEST PIT				

EXCAVATED BY: Hamilton Construction

TEST PIT DIMENSIONS: 1.5m x 2m

METHOD: Excavator

DATUM ELEVATION: Geodetic

DATE: Nov 19, 2019

SHEET: 1 of 1

REFERENCE No: G4143-19-12

TEST PIT No: 2

V.A. WOOD (GUELPH) INC.
CONSULTING GEOTECHNICAL ENGINEERS

CLIENT: Thomasfield Homes Ltd.

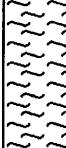
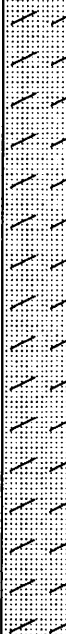
PROJECT: Mayberry Hill Subdivision, Ph 3B

ENCLOSURE No: 3

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Grand Valley, ON

SUPERVISOR: DH/AA

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)	SYMBOL	GROUND WATER	SAMPLES
0.0	GROUND SURFACE	472.8			
0.6	600mm Topsoil	472.2		DRY (19-Nov-2019)	
3.0	brown, compact CLAYEY SAND some silt, some gravel moist	469.8			1
	END OF TEST PIT				

EXCAVATED BY: Hamilton Construction

TEST PIT DIMENSIONS: 1.5m x 2m

METHOD: Excavator

DATUM ELEVATION: Geodetic

DATE: Nov 19, 2019

SHEET: 1 of 1

REFERENCE No: G4143-19-12

TEST PIT No: 3

CLIENT: Thomasfield Homes Ltd.

PROJECT: Mayberry Hill Subdivision, Ph 3B



ENCLOSURE No: 4

LOCATION: Grand Valley, ON

SUPERVISOR: DH/AA

V.A. WOOD (GUELPH) INC.
CONSULTING GEOTECHNICAL ENGINEERS

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
PH. (519) 763-3101 FAX (519) 763-5912

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)	SYMBOL	GROUND WATER	SAMPLES
0.0	GROUND SURFACE	469.4			
0.5	450mm Topsoil	468.9		DRY (19-Nov-2019)	
	brown, compact SANDY SILTY CLAY trace gravel moist				1
3.0		466.4			2
	END OF TEST PIT				

EXCAVATED BY: Hamilton Construction

TEST PIT DIMENSIONS: 1.5m x 2m

METHOD: Excavator

DATUM ELEVATION: Geodetic

DATE: Nov 19, 2019

SHEET: 1 of 1

REFERENCE No: G4143-19-12

TEST PIT No: 4

V.A. WOOD (GUELPH) INC.
CONSULTING GEOTECHNICAL ENGINEERS

CLIENT: Thomasfield Homes Ltd.

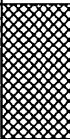
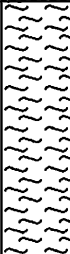

PROJECT: Mayberry Hill Subdivision, Ph 3B

ENCLOSURE No: 5

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Grand Valley, ON

SUPERVISOR: DH/AA

DEPTH (m)	SOIL DESCRIPTION	ELEVATION (m)	SYMBOL	GROUND WATER	SAMPLES
0.0	GROUND SURFACE	470.9		DRY (19-Nov-2019)	
0.5	brown, compact Clayey Silty Sand FILL some gravel	470.4			2
1.4	Organic FILL	469.4			
3.0	brown, compact SANDY SILTY CLAY trace gravel moist	467.9			1
	END OF TEST PIT				

EXCAVATED BY: Hamilton Construction

TEST PIT DIMENSIONS: 1.5m x 2m

METHOD: Excavator

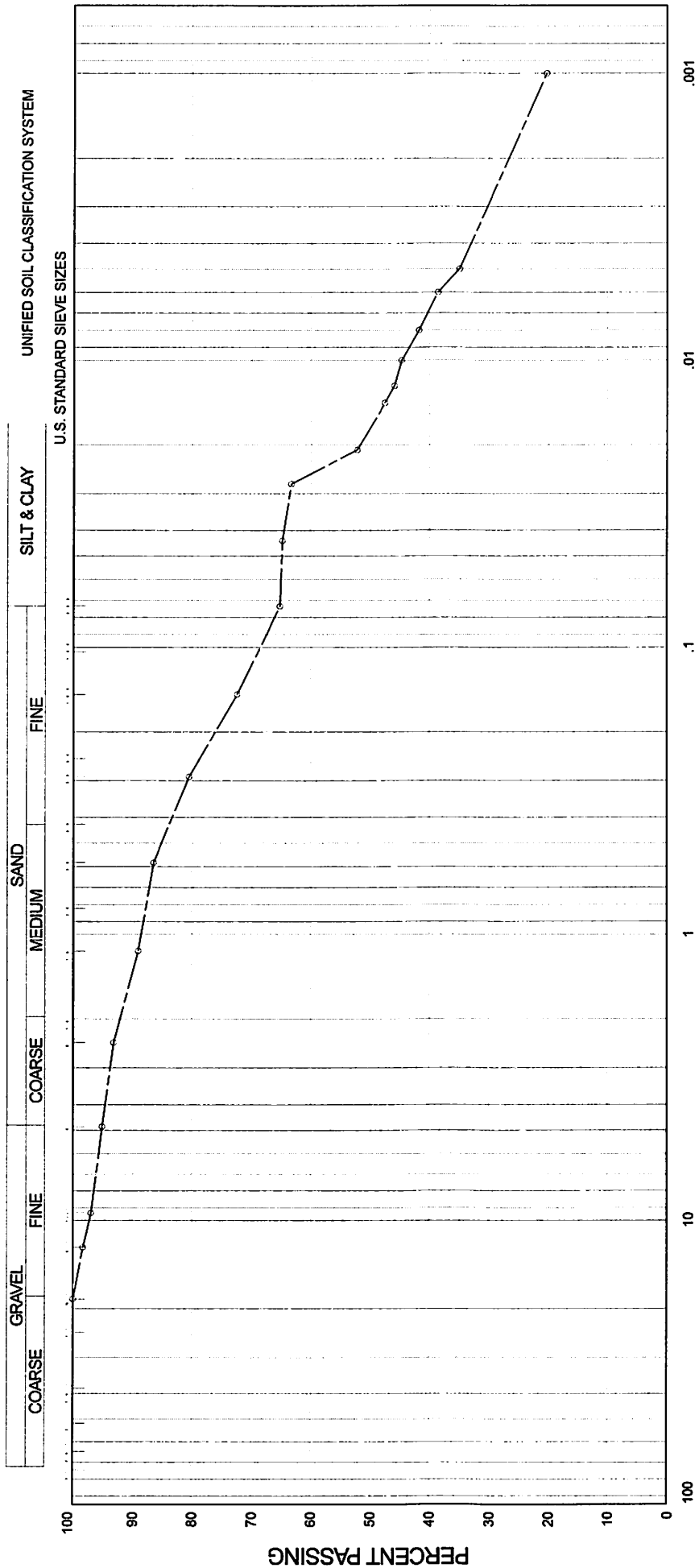
DATUM ELEVATION: Geodetic

DATE: Nov 19, 2019

SHEET: 1 of 1

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4143-20-1



ENCLOSURE N° 6

PROJECT: Mayberry Subdivision, Phase 3B
 LOCATION: Grand Valley, ON
 TESTPIT N°: 1
 SAMPLE N°: 1
 DEPTH: 1.0m±
 ELEVATION: 472.7m±

PLASTIC PROPERTIES
 LIQUID LIMIT % = 22.8
 PLASTIC LIMIT % = 17.1
 PLASTICITY INDEX % = 5.6
 MOISTURE CONTENT % = 12.7

Grain Size in Millimeters

COEFFICIENT OF UNIFORMITY:
 COEFFICIENT OF CURVATURE:

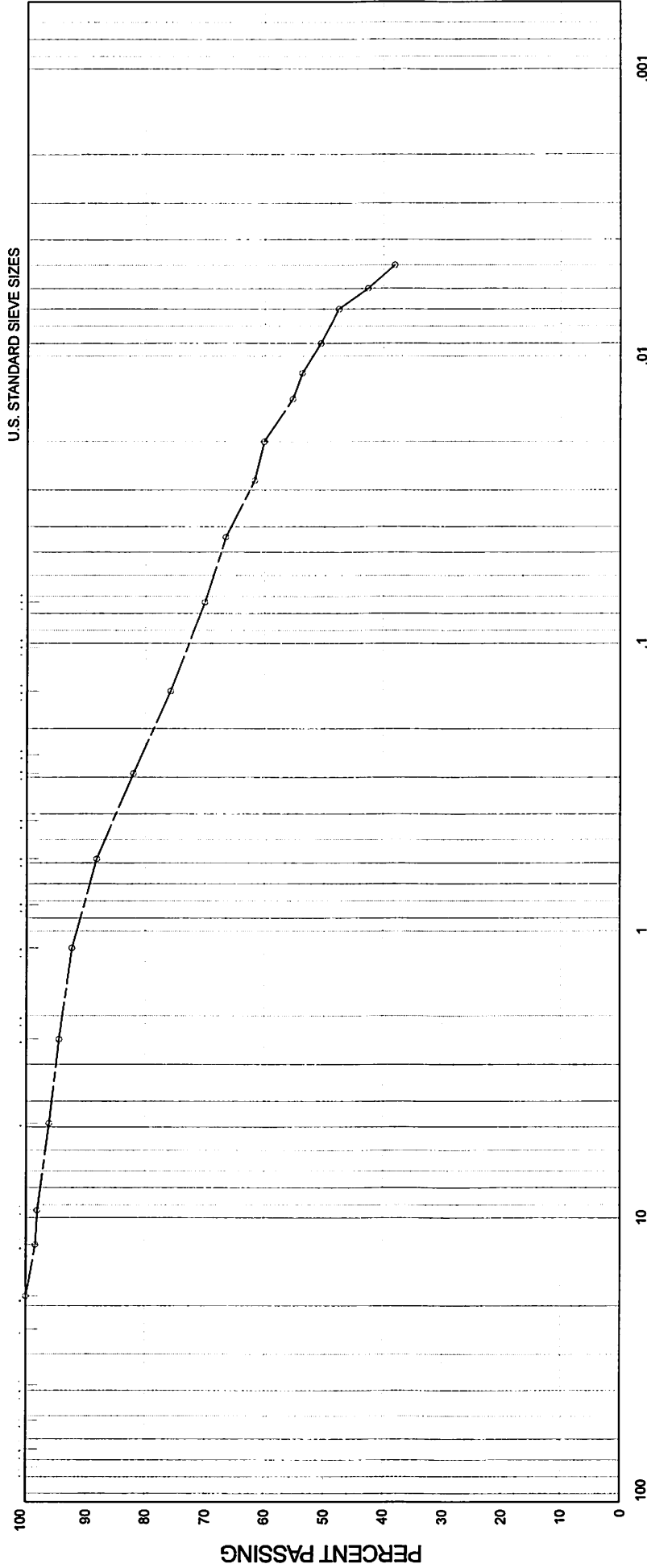
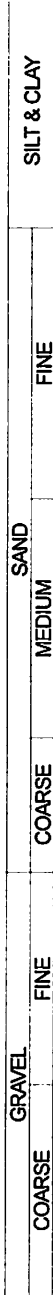
Classification of Sample and Group Symbol:
 SANDY SILTY CLAY, trace gravel (ML-CL)



GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4143-20-1

UNIFIED SOIL CLASSIFICATION SYSTEM



ENCLOSURE N° 7

PROJECT: Mayberry Subdivision, Phase 3B
 LOCATION: Grand Valley, ON
 TEST PIT N°: 3
 SAMPLE N°: 2
 DEPTH: 2.6m±
 ELEVATION: 466.8m±

Grain Size in Millimeters

COEFFICIENT OF UNIFORMITY:
 COEFFICIENT OF CURVATURE:

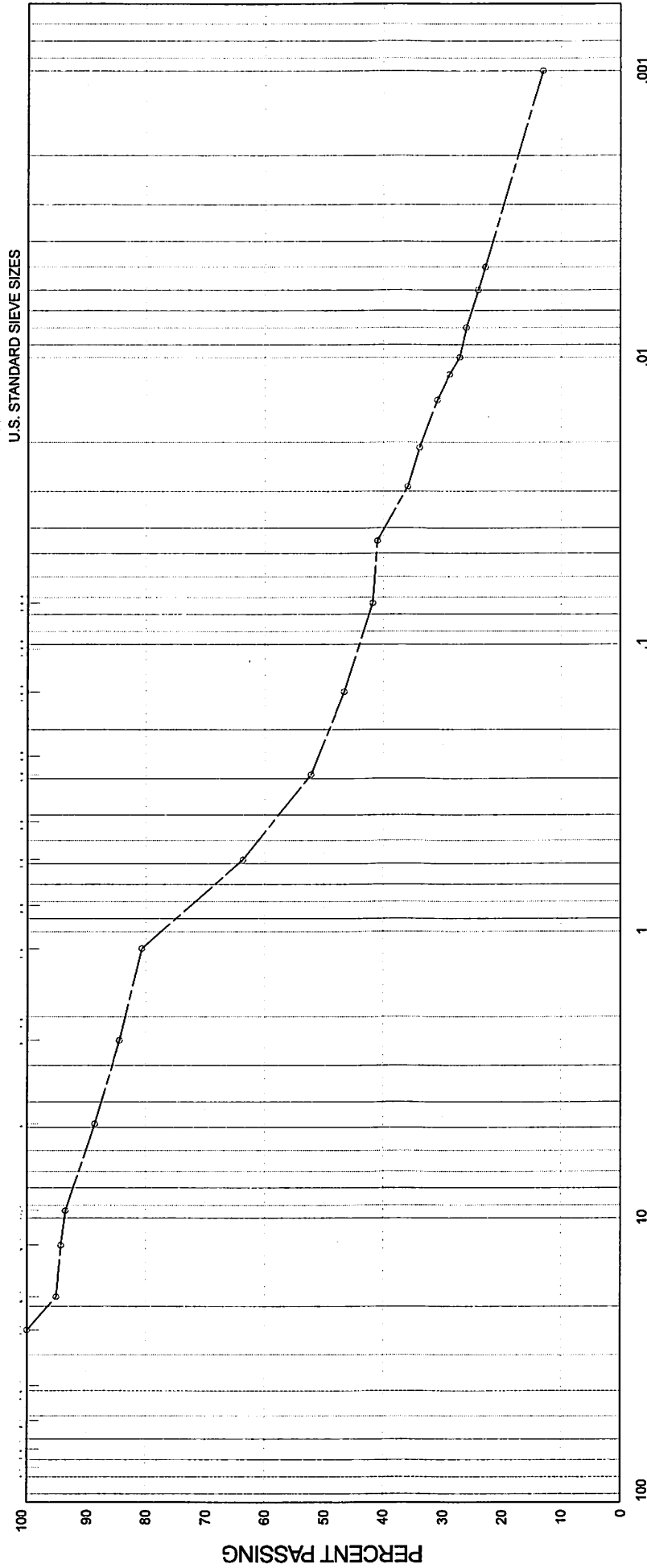
PLASTIC PROPERTIES
 LIQUID LIMIT % = 21.8
 PLASTIC LIMIT % = 14.6
 PLASTICITY INDEX % = 7.2
 MOISTURE CONTENT % = 12.4

Classification of Sample and Group Symbol:
 SANDY SILTY CLAY, trace gravel (CL)



GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4143-20-1



Grain Size in Millimeters

ENCLOSURE N° 8

PROJECT: Mayberry Subdivision, Phase 3B
 LOCATION: Grand Valley, ON
 TEST PIT N°: 2
 SAMPLE N°: 1
 DEPTH: 2.6m±
 ELEVATION: 470.2m±

COEFFICIENT OF UNIFORMITY:
 COEFFICIENT OF CURVATURE:

PLASTIC PROPERTIES
 LIQUID LIMIT % = 22.1
 PLASTIC LIMIT % = 16.8
 PLASTICITY INDEX % = 5.3
 MOISTURE CONTENT % = 10.7

Classification of Sample and Group Symbol:
 CLAYEY SAND, some silt, some gravel (SM-SC)



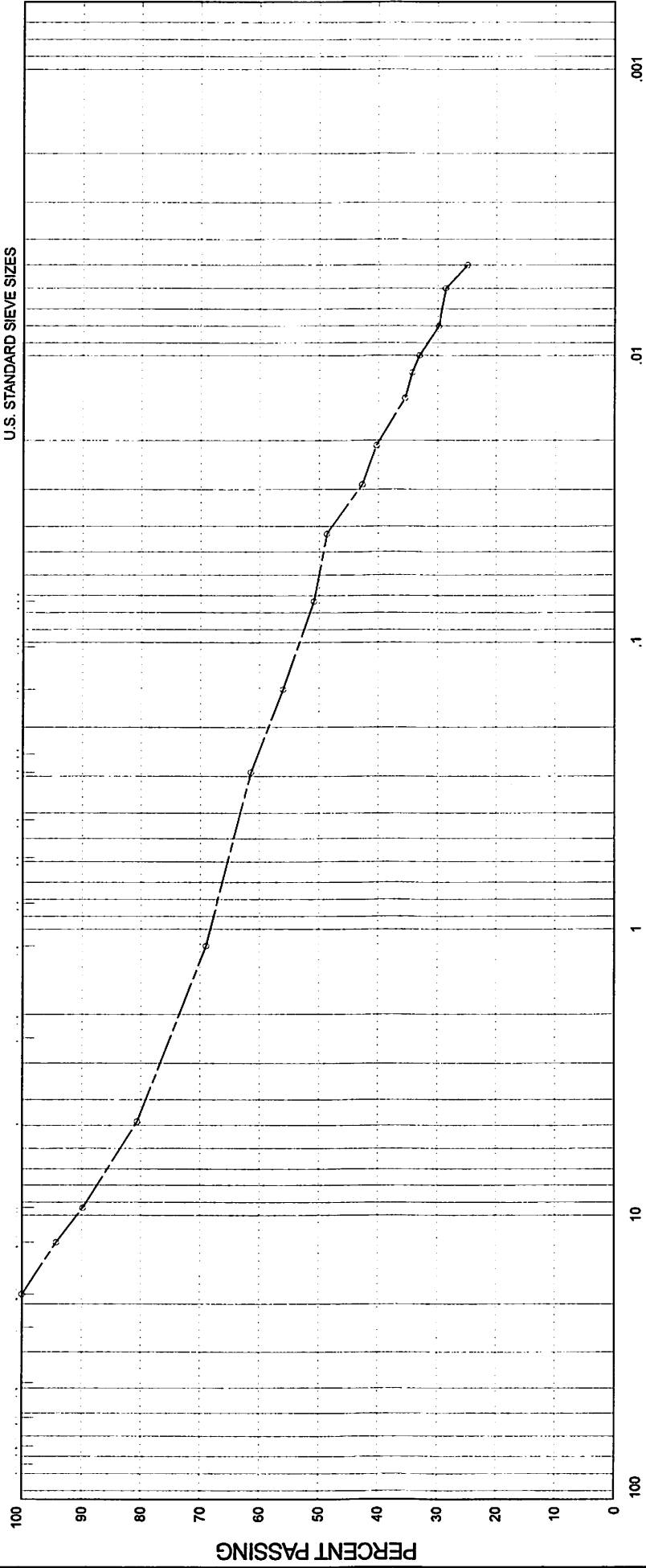
GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4143-20-1

UNIFIED SOIL CLASSIFICATION SYSTEM

GRAVEL: COARSE, FINE
 SAND: MEDIUM, FINE
 SILT & CLAY

U.S. STANDARD SIEVE SIZES



Grain Size in Millimeters

ENCLOSURE N° 9

PROJECT: Mayberry Subdivision, Phase 3B
 LOCATION: Grand Valley, ON
 TEST PIT N°: 4
 SAMPLE N°: 2
 DEPTH: 0.5m±
 ELEVATION: 470.4m±

PLASTIC PROPERTIES
 LIQUID LIMIT % = 23.8
 PLASTIC LIMIT % = 17.0
 PLASTICITY INDEX % = 6.7
 MOISTURE CONTENT % = 13.7

Classification of Sample and Group Symbol:
 Clayey Silty Sand FILL, some gravel (ML - CL)

