Updated Slope Stability Assessment

Proposed Development
1260 & 1280 Dundas Street West, Oakville, ON

Client
Delmanor West Oak Inc.
4800 Dufferin Street
Toronto, ON, M3H 5S9

Project Number
BIGC-ENV-185C

Prepared By:
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Date Submitted
December 5, 2019

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1. Introduction

Delmanor West Oak Inc. (the "Client"), has retained B.I.G. Consulting Inc. (BIG) to undertake an updated slope stability assessment at 1260 and 1280 Dundas Street West in Oakville, Ontario (herein referred to as the "Site").

The purpose of the report is to understand the slope stability in order to inform the extent of developable area for the proposed development. The limiting factors are Sixteen Mile Creek and smaller valleys to the west (herein referred to as "west valley"), from a slope stability standpoint. Halton Region personnel has staked the top of slope and the objective of this study was to determine the safe top of slope/stable top of slope.

BIG's mandate also include a Phase I and II Environmental Site Assessment (ESA). The findings of those assessments are issued under separate cover.

This report is provided on the basis of the project scope presented above. The report has been prepared for Delmanor West Oak Inc. Third party use of this report without BIG consent is prohibited.

2. Field Investigation Procedure

For the purpose of this slope stability assessment, seven (7) boreholes (BH1, BH/MW2 to BH/MW4, BH5, BH/MW6 and BH/MW7) were advanced to a depth ranging from 6.2 to 12.6 m below ground surface (bgs) during the period between May 22 and 24, 2018. BH1, BH3 and BH6 were drilled and sampled to the bedrock surface. BH/MW2, BH/MW3 and BH/MW6 were drilled and sampled to the bedrock surface, i.e. depth of 7.4, 6.3 and 7.6 m bgs, respectively and then cored. BH/MW2, BH/MW3, BH/MW4, BH/MW6 and BH/MW7 had piezometers installed for long term groundwater level observations. Additionally, two boreholes, BH/MW103 and BH104 were advanced to a depth of 3.5 and 3.7 m bgs, respectively on November 13, 2019 to obtain further subsurface information at the west slope(s). BH/MW103 was equipped with a monitoring well for long term groundwater level observations.

The boreholes were advanced using truck mounted solid stem continuous flight auger equipment under the direction and supervision of BIG field personnel. Samples were retrieved at regular intervals of depth (0.76-1.5 m) with a 50 mm O.D. split-barrel sampler driven in accordance with the Standard Penetration Test (ASTM D1586). The samples were logged in the field and returned to the BIG laboratory for detailed visual examination by the project engineer and for laboratory testing of selected specimens for index properties (water content and plasticity).

At BH/MW2, BH/MW3 and BH/MW6, the bedrock was continually sampled (cored) for 1.9, 2.1 and 2 m lengths, respectively using the wire-line double barrel coring technique. An N-size coring barrel was used for rock coring. The recovered rock cores were preserved in core boxes and transported to BIG's laboratory for further evaluation.

Water level observations were made in the boreholes during and on completion of drilling as well as in the piezometers on June 13, 2018 and monitoring well on December 2, 2019.

The ground surface geodetic elevations at the borehole locations were surveyed by BIG personnel and referenced to Local Benchmark No. 1 taken from J.D. Barnes Topographic Plan "Reference No.: 17-30-187-00-TOPO" dated January 2nd, 2018. Benchmark description is as follows: "PK NAIL in asphalt sidewalk at Fourth Line Turn Around and Northeast Trail Entrance. A Benchmark Geodetic Elevation of 149.453 m (ASL) was taken from the J.D. Barnes Topographic Plan.

3. Subsurface Conditions

The borehole locations are shown on the site plan (Drawing 1A). Detailed subsurface conditions are presented on the borehole log sheets in Appendix A. The soil boundaries indicated on the borehole logs and discussed herein are inferred from visual observations, auger resistance and laboratory test data. They should not be regarded as exact planes of geological change.

The soil conditions encountered at the site are summarized as follows:

3.1. Topsoil

A surficial veneer of topsoil was encountered at all borehole locations. The thickness of the topsoil ranged from 50 mm to 125 mm. Topsoil across the site is expected to be variable and may vary in thickness. Exact topsoil thicknesses, when required are easily determined with a hand shovel.

3.2. Fill/Possible Fill

Fill was encountered below the surficial topsoil in BH1, BH/MW2 to BH/MW4, BH5 and BH104 and extended to a depth ranging from 0.8 to 2.3 m below ground surface (bgs). The fill generally consisted of clayey silt with inclusions of gravel and varying inclusions of organics/topsoil. A 75 mm thick black organic layer was present in the fill below 2.5 m depth. Below the surficial topsoil in BH/MW6 and BH/MW7, clayey silt with inclusions of gravel and organics and organic staining was present to 0.8 m depth. The layer had no readily apparent structure and may be possible fill used to fine grade the site.

Standard Penetration Test 'N' values in the fill ranged from 3 to 11 blows/0.3 m indicating a soft to stiff consistency. Water contents are in the order of 10 to 22 percent.

3.3. Clayey Silt/Silty Clay (Glacial) Till

Clayey silt/Silty Clay glacial till was encountered below the surficial topsoil in BH/MW103 and below the fill/possible fill in the remaining sampled boreholes. The till extended to depths ranging from 2.9 to 7.6 m bgs, i.e. the inferred bedrock surface in the boreholes. Sand and gravel sized particles, and weathered shale are present throughout the clayey till matrix. A till/shale complex was encountered below 5.5 and 6.1 m depth in BH1 and BH/MW3, respectively. The till/shale complex is the transition zone sometimes present above the shale bedrock and is characterized by a mixture of clayey silt till and weathered shale. The deposit is brown to reddish brown in colour and in a moist state.

Standard Penetration Test 'N' values in the clayey silt till ranged from 15 blows/0.3 m to in excess of 100 blows/0.3 m, typical very stiff to hard consistency. Water contents were in the order of 8 to 17 percent.

Atterberg Limits Test Results for the till are provided in Appendix B.

3.4. Shale Bedrock

Shale bedrock was contacted below the till and/or till/shale complex deposit in all boreholes. The bedrock was encountered at a depth of approximately 2.9 to 7.6 m below ground surface. Coring of the bedrock was carried out for 1.9, 2.1 and 2 m lengths at BH/MW2, BH/MW3 and BH/MW6, respectively.

The shale on the site is of the Queenston Formation of Upper Ordovician Age. It is defined as the rock unit that overlies the bluish grey shales of the Georgian Bay Formation.

The rock can be penetrated by augering for various depths; however, the core recovery was very good. The rock quality was variable ranging from very poor to poor, i.e. Rock Quality Designation (RQD) of 22 % between 9.1 and 9.6 m depth at BH/MW3 to RQD of 40 % between 7.7 and 8.1 m depth at BH/MW6 to good to excellent quality, i.e. RQD ranging from 84 to 98 % in the lower levels of BH/MW2, BH/MW3 and BH/MW6. The red shale had interbedded grey shale layers, some horizontal fractures along planes, minimal vertical cracking, minimal vertical fractures and some interbedded clayey silt at 9.1 m in BH/MW6.

The upper portion of the bedrock is commonly weathered to a depth of 600 to 1000 mm and within this weathered zone hard limestone layers or lenses are common. These hard limestone layers can result in contractual problems for augers and can provide misleading bedrock elevations. Where the weathering is more extensive a till/shale layer may be found above the bedrock, as was the case on this site. In the sound bedrock, the limestone, sandstone, dolostone inclusions are hard to very hard. Lenses of harder rock can have thicknesses as much as 750 to 900 mm as have been encountered on other site within the Queenston Shale. These lenses can vary significantly in thickness over short distances and should be anticipated on this site. It is also common to encounter closely spaced groupings of thin strong rock layers, which collectively can be as thick as 1.0 m or more.

The detailed core results for the boreholes are presented on the applicable borehole logs in Appendix A.

3.5. Groundwater Conditions

Groundwater levels were monitored in the open boreholes during the course of the fieldwork and after completion.

The groundwater levels in the piezometers were noted to be at a depth of 2.0 to 3.0 m below ground surface or at about elevation 148.42 to 148.86 m asl on June 13, 2018 and a depth of 3.1 m bgs or about elevation 148.5 on December 2, 2019. The screening intervals and depths for piezometer and monitoring well installations are shown on the appended borehole log sheets and should be referred to for groundwater data interpretations.

It should be noted that groundwater levels are subject to seasonal fluctuations and changes in the subsurface drainage domains near any site.

4. Stability Analyses of Slope

The stability analyses of the existing slopes at the site was carried out using the program SLOPE/W with the Bishop's Method. The slope conditions and the results of stability analyses are presented as follows.

4.1. Site Conditions and Profiles

The site is located south and west of Fourth Line, south of Dundas Street West East, and west of Sixteen Mile Creek in Oakville, Ontario. There are two major slopes adjacent to the site, i.e. Sixteen Mile Creek Valley, located to the immediate east and the West Valley, located to the immediate west/southwest of the site. The conditions of two major slopes was examined during a site visit on May 15, 2018. The Sixteen Mile Creek Valley Slope is located east of the Site and Fourth Line Road, and on the west side of Sixteen Mile Creek with an elevation between 150 m (ASL) at the top of bank to 114 m (ASL) at the toe of the slope. The West Valley Slope is located on the southwestern/western quadrant of the Site with an approximate elevation of 150 m ASAL at the top of bank to 140 m (ASL) at toe of the slope.

Sixteen Mile Creek Valley Slope

This northeast/east facing slope is divided into two sections by an asphalt paved walking path where approximately half the totality of the slope lies above the asphalt paved walking path, while one half lies below. Vegetation, including mature trees, young trees, small to large shrubs, and grass/shrubbery along the reviewed bank are growing vertical and upright indicating that the slope is generally stable. However, several surface erosion events of the slope in an eastward direction toward Sixteen Mile Creek were observed in the Upper half of the slope, i.e. above the asphalt paved walkway. In the areas where surface erosion was observed, only young trees and shrubs were observed to have fallen over due to the said erosion of the slope, while mature trees were upright and heavily rooted into the face of the slope. The widths of the observed erosion planes were in the order of 8 m to 16 m. The general locations of erosion areas are provided on the site plan (Drawing 1B). The observed surface erosion and other slope features are on the photographs provided in Appendix C.

Gullies, or mild dips of the slope were observed in the half of the slope below the asphalt paved walking path and vegetation including mature trees, young trees, small to large shrubs, and grass were noted at the lower half of the slope. The vegetation was observed to be vertical and upright, with no evidence of movement of the slope, indicating the slope is generally stable. Sixteen Mile Creek is located adjacent of the toe of the slope. No signs of active toe erosion were noted along the toe of the slope.

Based on Site reconnaissance, the height of the slope along the Sixteen Mile Creek Valley was in the order of 36±m. As noted earlier, the creek bed is located immediately adjacent to the toe of the slope and the Sixteen Mile Creek has steep slopes in the order of 1 vertical to 1.5 horizontal, Section A-A; 1 vertical to 1.5, Section B-B and 1 vertical to 2.1 horizontal, Section C-C.

West Valley Slope

The West Valley Slope is located on the southwestern/western quadrant of the Site and west of Fourth Line Road and is a west/south facing slope. This slope wraps around towards Fourth Line Road at the south end. A drainage ditch with free-flowing surficial runoff was observed at the toe of the reviewed slope. Vegetation, including mature trees, young trees, small to large shrubs, and grass along the banks of the slope are growing vertical and upright indicating that the slope is generally stable. Only what is to be considered minor surface erosion was occasionally observed. At the area where the slope wraps around towards Fourth Line Road, an approximately 16 m wide gabion stone retaining wall is present.

The location of the west facing West Valley Slope is also provided on the site plan (Drawing 1A) and photos of the slope are provided in Appendix C.

For the slope stability analysis, three slope sections, Section A-A, B-B and C-C at the Sixteen Mile Creek Valley Slope and six slope sections, Section D-D, E-E, F-F, G-G and H-H at the West Valley Slope as shown on the site plan (Drawing 1A) were analyzed using “Slope/W“ slope stability program. This program uses the Bishop’s Method for the stability analysis. Effective stress analysis was carried out which is indicative of long-term stability. The profile of the slope at Cross-Sections A-A, B-B, C-C, D-D, E-E, F-F, G-G and H-H were obtained from the J.D. Barnes Topographic Plan and supplemented with ARC GIS Web Map for the subject slopes.

For the purpose of the slope stability analysis, the following boreholes and applicable cross-section were used: (Cross-Section A-A (BH/MW2); Cross-Section B-B (BH/MW4); Cross-Section C-C (BH/MW6), Cross-Sections D-D and E-E (BH7), Cross Section F-F and G-G (BH104), and Cross Section

H-H (BH/MW103)). The boreholes indicated that below a thin surficial topsoil veneer, the site is covered with fill material at BH/MW2, BH/MW4, BH/MW6, BH7 and BH104 extending to 0.8 to 1.5 m depth and overlying clayey silt/silty clay glacial till which extended to the surface of the bedrock at depths of 6.1 to 7.6 m at the applicable boreholes. At BH/MW103, the clayey silt/silty clay glacial till was contacted below the surficial topsoil layer. The bedrock on the site is Queenston Shale which extended to the maximum depth explored in the applicable boreholes, i.e. 3.5 to 12.6 m below existing ground surface. Groundwater was measured at a depth of 2.0 to 3.0 m below grade (elev.: 148.5 to 148.9 m asl) on June 13, 2018 (BH/MW2, BH/MW4 and BH/MW6 and on December 2, 2019 (BH/MW103).

4.2. Soil Parameters

Based on the borehole information, soil parameters used in the slope stability analysis are given in the following Table 4.2-1.

Table 4.2-1: Soil Parameters for Slope Stability Analyses

Soil	Soil	Long-Term Strength	
Type	**Density (kN/m^3)**	**C (kPa)**	**f (degree)**
Fill – clayey silt, trace gravel	18.5	0	26
Very Stiff to Hard Clayey Silt Till	20	10	28
Shale	23	600	30

Surface sloughing of this upper slope will occur in slopes steeper than 2.5H:1V when the surface becomes saturated and as observed in our site reconnaissance visit.

4.3. Results of Slope Stability Analyses

Stability analyses of the slope at the applicable Sections was carried out for the following analysis scenario:

- **Scenario 1**: Stability of the slope at Section A-A.
- **Scenario 2**: Stability of the slope at Section B-B
- **Scenario 3**: Stability of the slope at Section C-C
- **Scenario 4**: Stability of the slope at Section D-D
- **Scenario 5**: Stability of the slope at Section E-E
- **Scenario 6**: Stability of the slope at Section F-F
- **Scenario 7**: Stability of the slope at Section G-G
- **Scenario 8**: Stability of the slope at Section H-H

Stability analyses of the slope for the above noted scenarios was conducted and the results are presented on Drawings 10 to 17. The calculated factors of safety of the slope is summarized in Table 4.3-1.

Table 4.3-1: Results of Stability Analyses of the Slope

Analysis Scenario	Slope Profile	Calculated Factor of Safety (FS) (Long-Term Stability)
Scenario 1	Stability of the slope at Section A-A (For minimum FS, see Drawing 10)	1.544
Scenario 2	Slope at Section B-B Revised Top of Bank (4 m from top of bank of existing slope) (For minimum FS, see Drawing 11)	1.518
Scenario 3	Stability of the slope at Section C-C (For minimum FS, see Drawing 12)	2.386
Scenario 4	Stability of the slope at Section D-D (For minimum FS, see Drawing 13)	1.996
Scenario 5	Stability of the slope at Section E-E (For minimum FS, see Drawing 14)	2.059
Scenario 6	Stability of the slope at Section F-F (For minimum FS, see Drawing 15)	4.069
Scenario 7	Stability of the slope at Section G-G (For minimum FS, see Drawing 16)	4.681
Scenario 8	Stability of the slope at Section H-H (For minimum FS, see Drawing 17)	4.303

The calculated factors of safety are as follows: Scenario 1 was about 1.544; Scenario 2 was about 1.518; Scenario 3 was about 2.386; Scenario 4 was about 1.996; Scenario 5 was about 2.059; Scenario 6 was about 4.069; Scenario 7 was about 4.681 and Scenario 8 was about 4.303. The calculated factors of safety of 1.544 and 2.386 at the Sixteen Mile Valley Slope and 1.996, 2.059, 4.069, 4.681 and 4.303 at the West Valley Slope faces are greater than the acceptable safe value of 1.5, and the proposed slope/grading at all Sections A-A, B-B, C-C, D-D, E-E, F-F, G-G and H-H are considered stable in terms of long term stability. This factor of safety is for shallow failure and would be significantly higher for deep seated failure.

5. Final Stable Slopes

The slope stability analysis results indicated that the factor of safety of the slopes would be 1.544 at Section A-A, 1.518 at Section B-B, 2.386 at Section C-C, 1.996 at Section D-D, 2.059 at Section E-E, 4.069 at Section F-F, 4.681 at Section G-G and 4.303 at Section H-H. The existing slope at Section A-A, B-B, C-C, D-D, E-E, F-F, G-G and H-H is considered stable in terms of long-term stability; therefore, the stable top of bank is considered to correspond with the physical top of bank (TOB) at the applicable slope sections.

6. General Comments

At the ground surface at the top of the slope, the failure surfaces are about 2.5 to 4.8 m away from the edge of the existing slope when the factors of safety exceed the minimum value of 1.5.

The following additional comments related to the slope stability are provided in relation to future construction at the site:

1. Sixteen Mile runs adjacent to the toe of the eastern slope however the start of the shale bedrock is much higher than the toe of the slope. Erosion at the toe of the subject slope is not considered to be a problem.
2. The vegetation on the existing slope surfaces must be preserved and must not be removed.
3. No additional surcharge can be applied in the area within 8 m from the top of the slope.
4. Building walls and footings must be at least 7 m away from the top of the existing slope. Footings must be founded below an imaginary 3 horizontal to 1 vertical line drawn up from the face of the slope at the bedrock surface (See Cross-Section Drawings 2 to 9).
5. Where erosion planes are present, slope treatment such as rip-wrap drainage and/or geogrid reinforcement and seeding of the slope surface is recommended.

The content of this report is based on the information obtained from the project site and information from BIG's previous slope stability assessment and current geotechnical investigation. BIG should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, BIG will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information in this report in no way reflects on the environmental aspects of the soil and has not been addressed in this report.

This report was prepared by BIG for the account of the Client and their representatives. The material in it reflects BIG's judgment considering 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, are the responsibility of such Third Parties. BIG accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Respectfully submitted,

B.I.G. Consulting Inc.

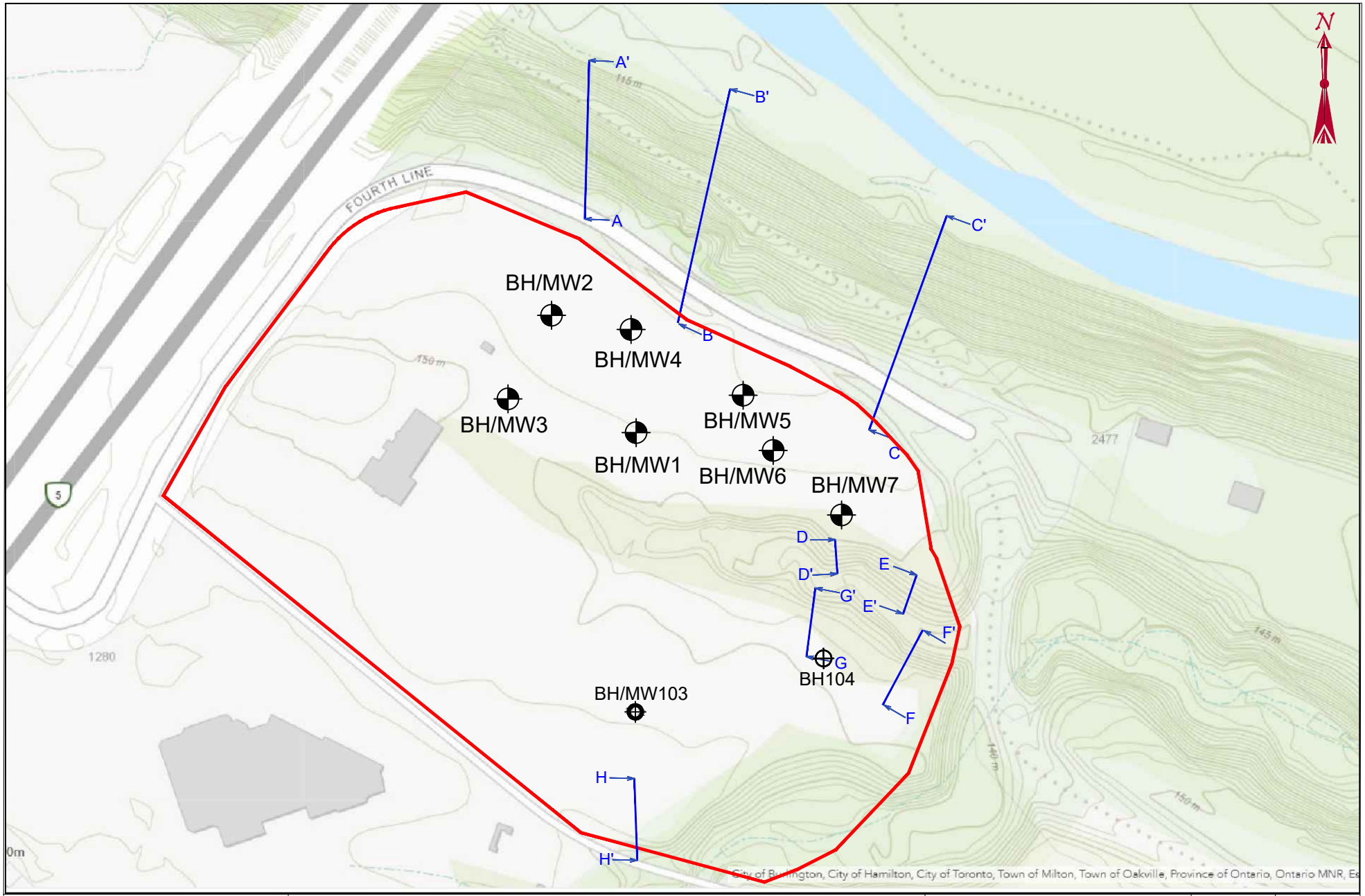
Darko Strajin, P.Eng.
Managing Partner

Drawings

Borehole Location Plan

Slope Stability Analysis Results

B.I.G. Consulting Inc.



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LEGEND

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE BOREHOLE LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2018)
- APPROXIMATE BOREHOLE LOCATION (BIG, 2019)
- APPROXIMATE BOREHOLE/MONITORING WELL LOCATION (BIG, 2019)

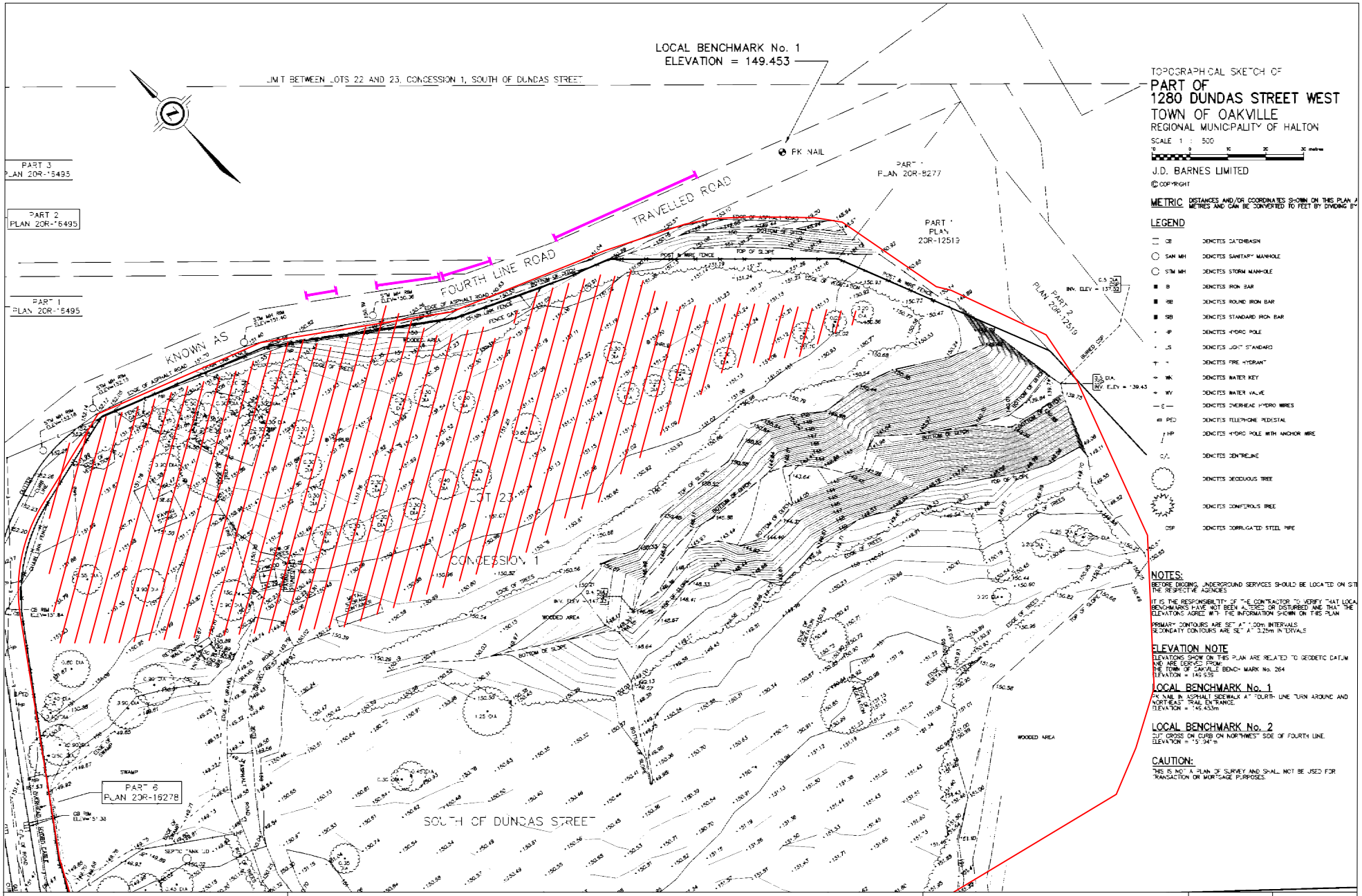
SCALE: 25m 0m 75m

BASEMAP SOURCED FROM ARCGIS, 2018

TITLE AND LOCATION

SITE LAYOUT PLAN
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	1A



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LEGEND

APPROXIMATE SITE BOUNDARY

OVERBURDEN EROSION PLANE

SCALE
20m 0m 30m

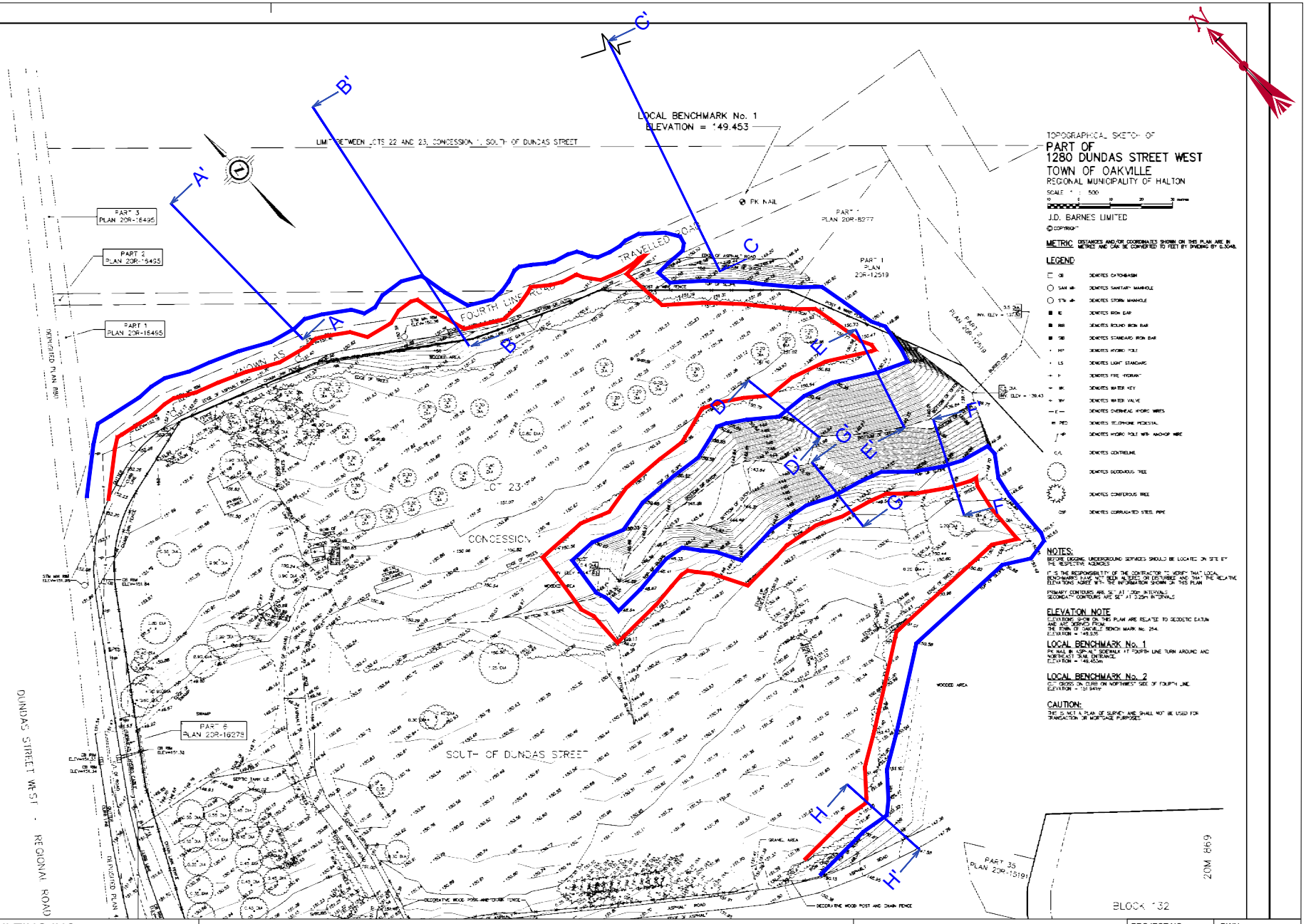
BASEMAP SOURCED J.D. BARNES LIMITED, TOPOGRAPHICAL SKETCH OF PART OF 1280 DUNDAS STREET WEST

TITLE AND LOCATION

OVERBURDEN EROSION PLANE LOCATION PLAN

1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	1B



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LEGEND

EXISTING TOP OF BANK

7m SETBACK FROM EXISTING TOP OF BANK

SCALE 20m 0m 30m

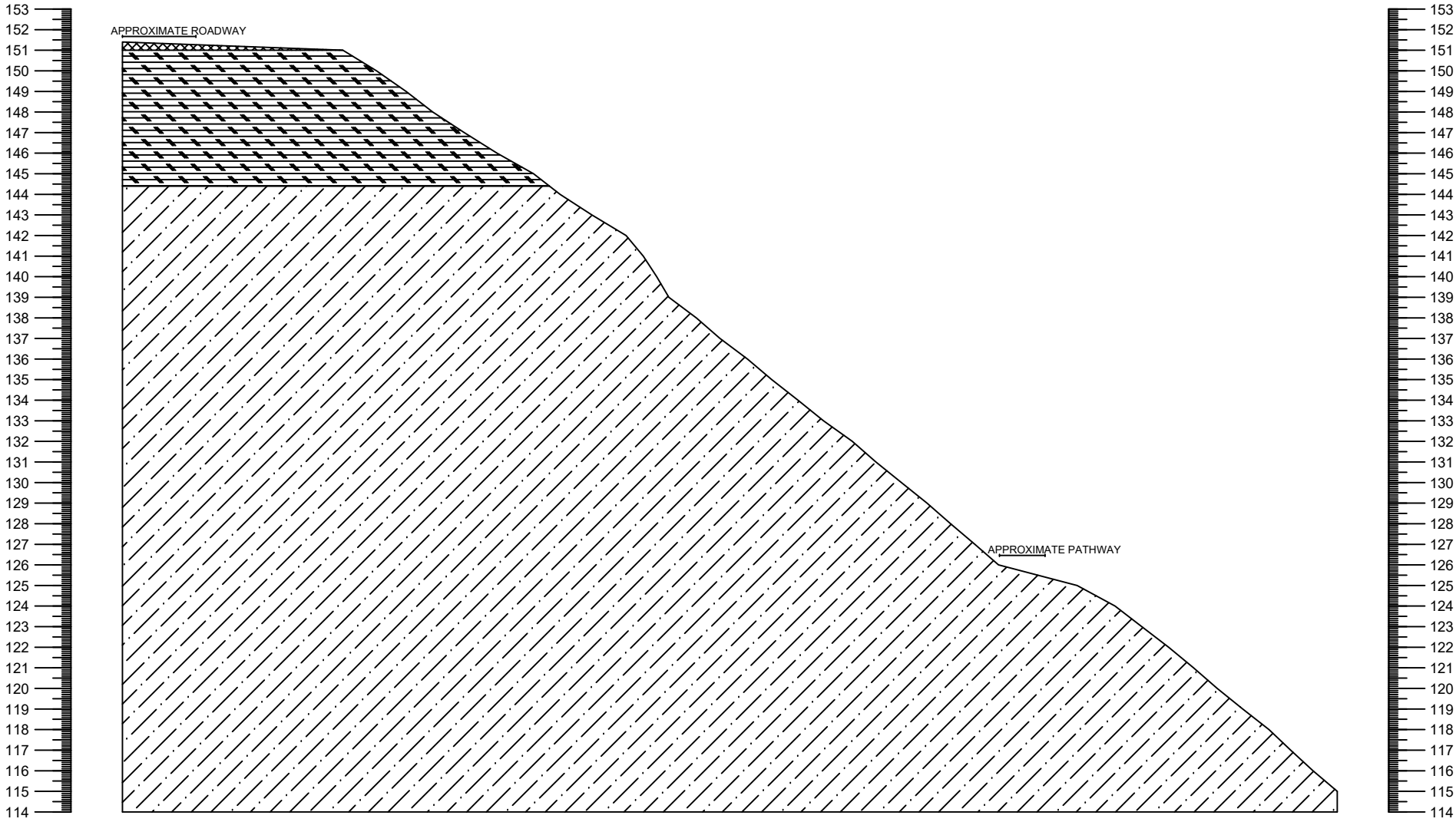
BASEMAP SOURCED J.D. BARNES LIMITED, TOPOGRAPHICAL SKETCH OF PART OF 128O DUNDAS STREET WEST

TITLE AND LOCATION

TOP OF BANK/SETBACK PLAN

1280 DUNDAS STREET WEST, OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	1C



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LEGEND

FILL

CLAYEY SILT/ SILTY CLAY TILL

SHALE

SCALE

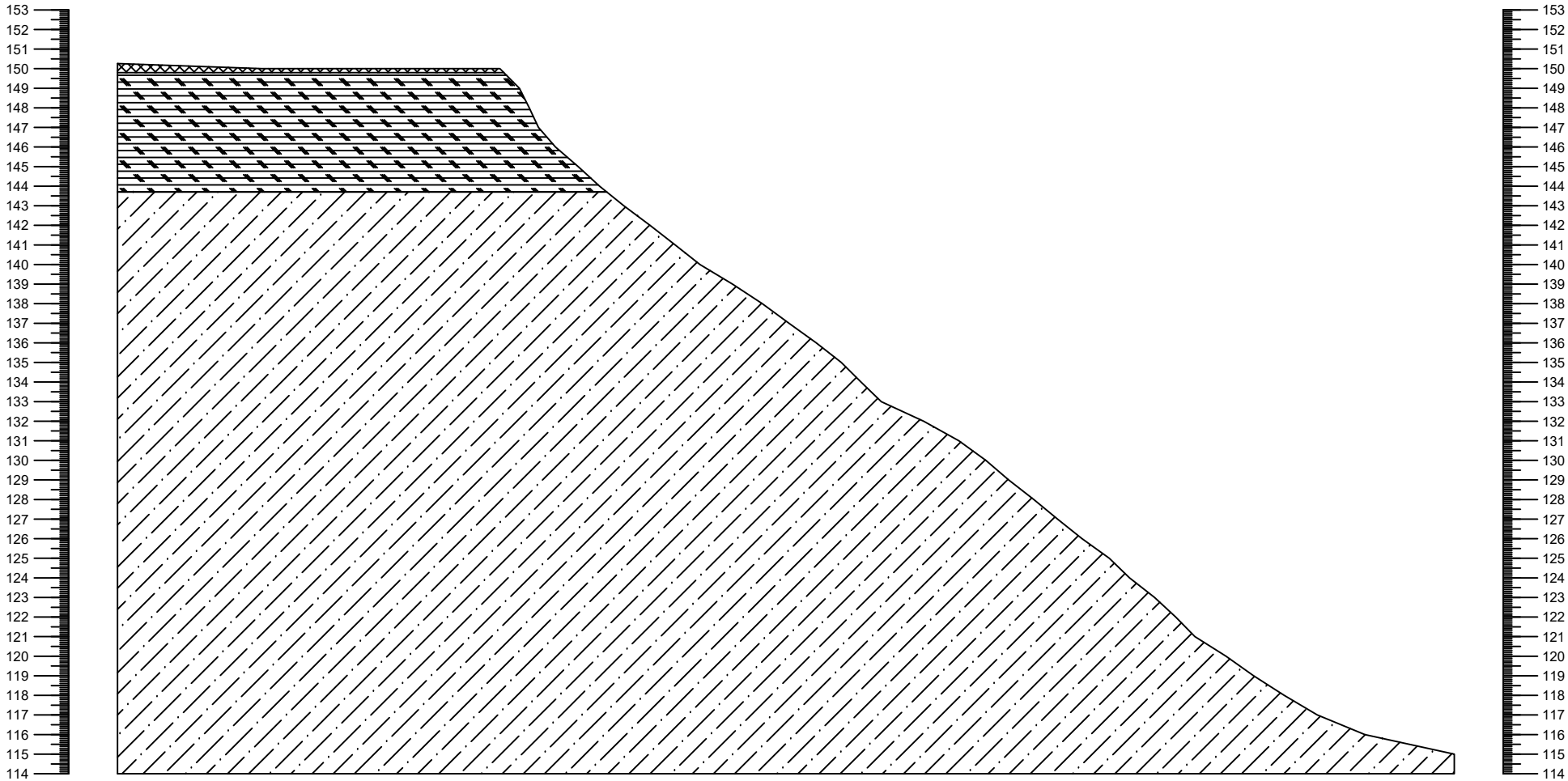
5m 0m 10m

TITLE AND LOCATION

CROSS SECTION A-A'

1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	2



SCALE
5m 0m 10m

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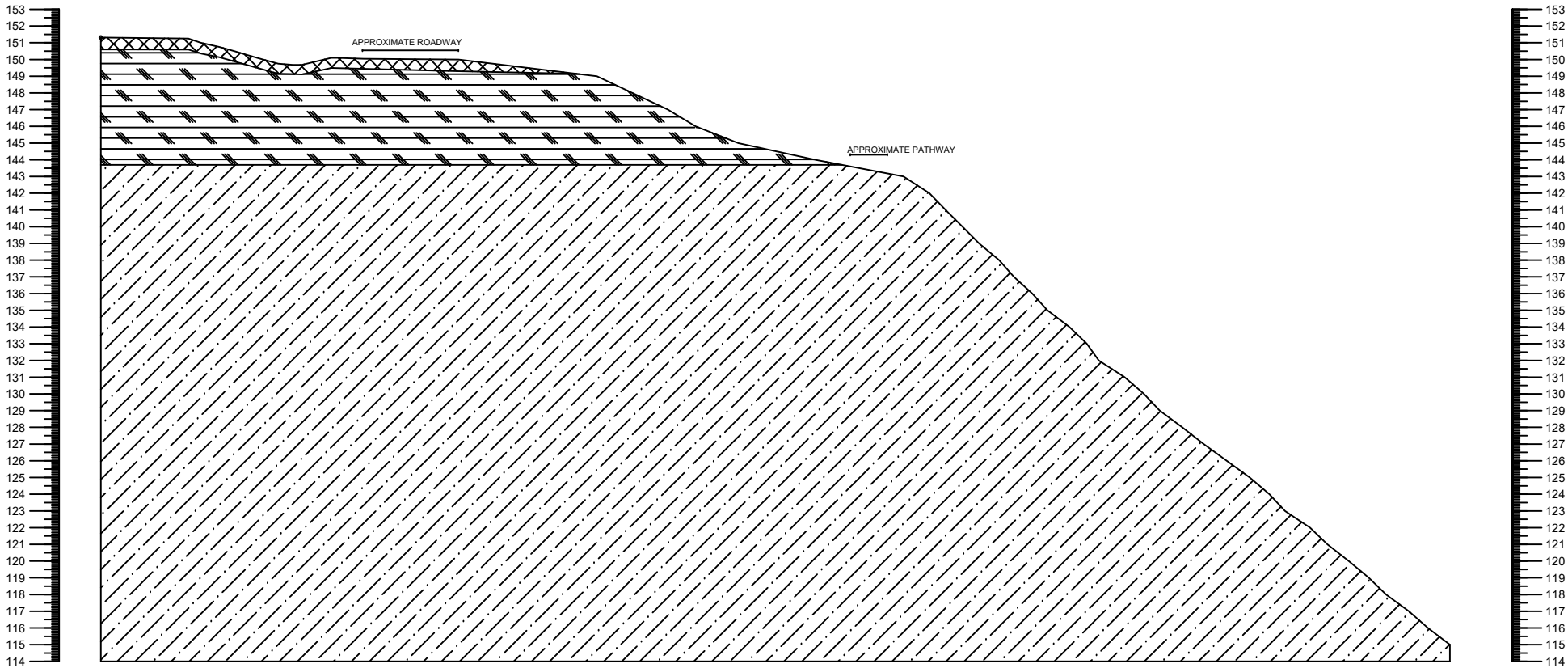
LEGEND

- FILL
- CLAYEY SILT/ SILTY CLAY TILL
- SHALE

TITLE AND LOCATION

CROSS SECTION B-B'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	3



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LEGEND

FILL

CLAYEY SILT/ SILTY CLAY TILL

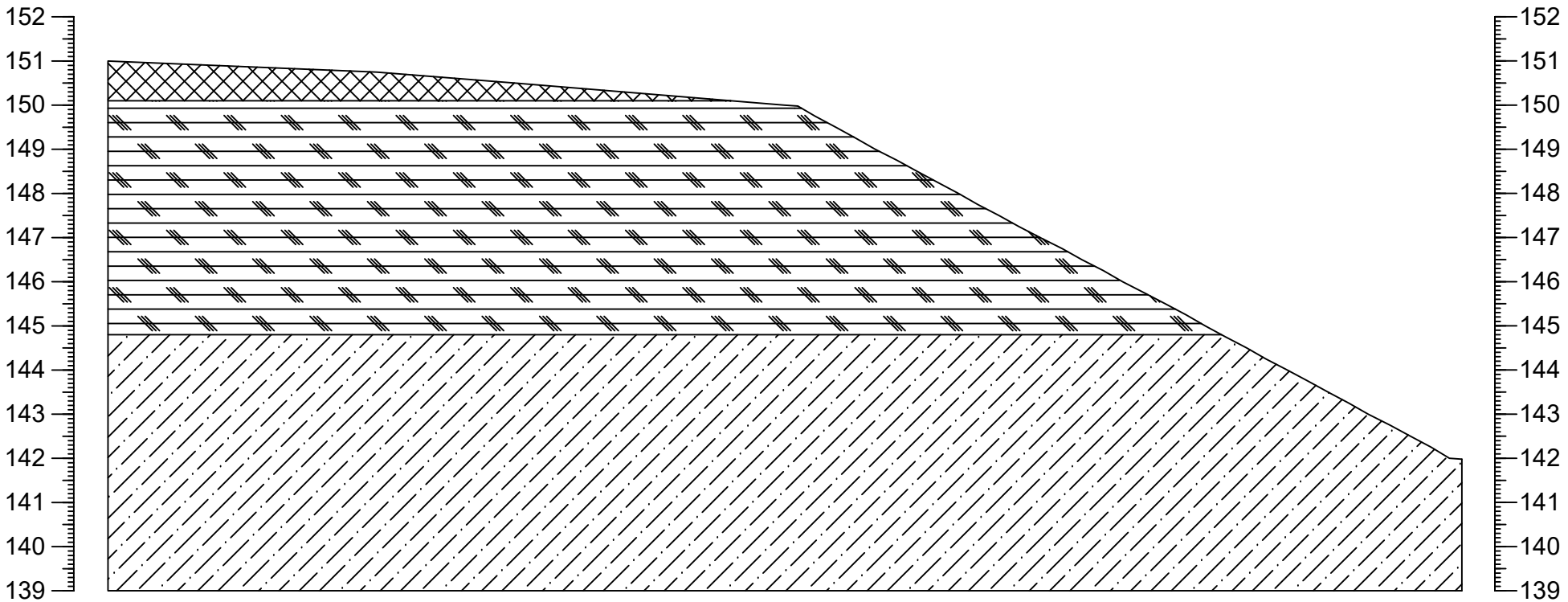
SHALE

SCALE
5m 0m 10m

TITLE AND LOCATION

CROSS SECTION C-C'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	4



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LEGEND

FILL

CLAYEY SILT/ SILTY CLAY TILL

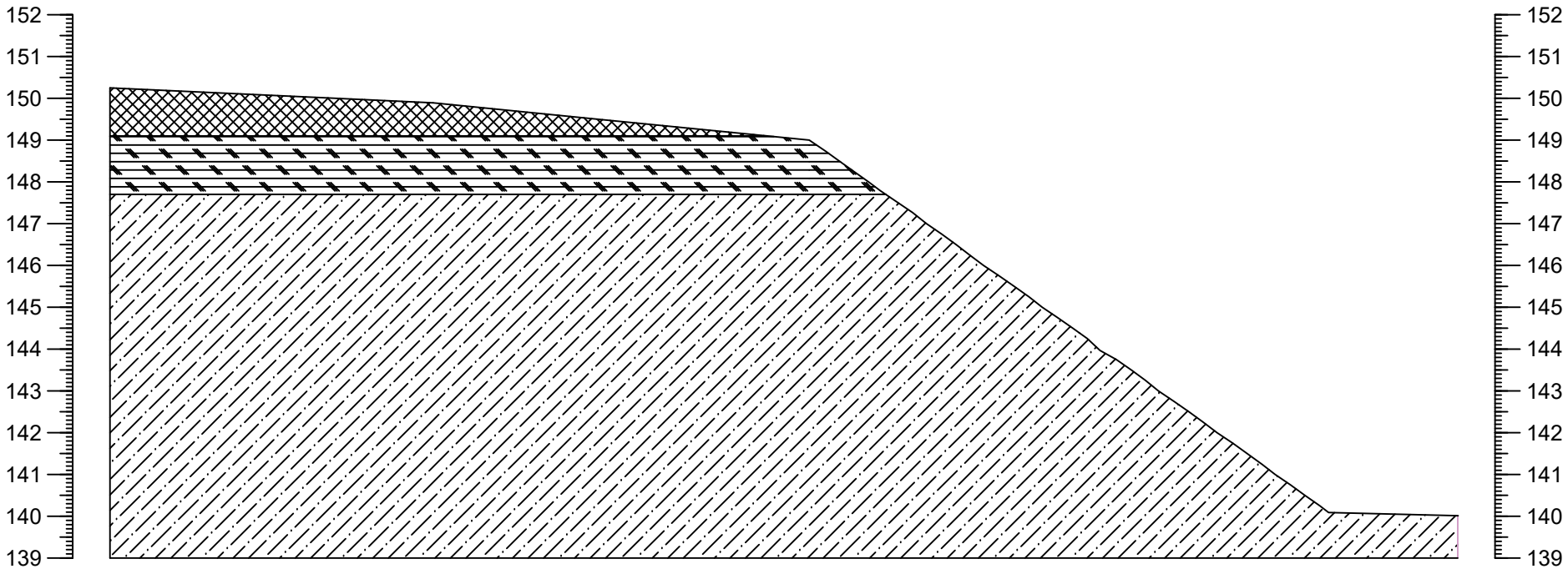
SHALE

SCALE
0m 5m
1m

TITLE AND LOCATION

CROSS SECTION D-D'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	5



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LEGEND

CLAYEY SILT/ SILTY CLAY TILL

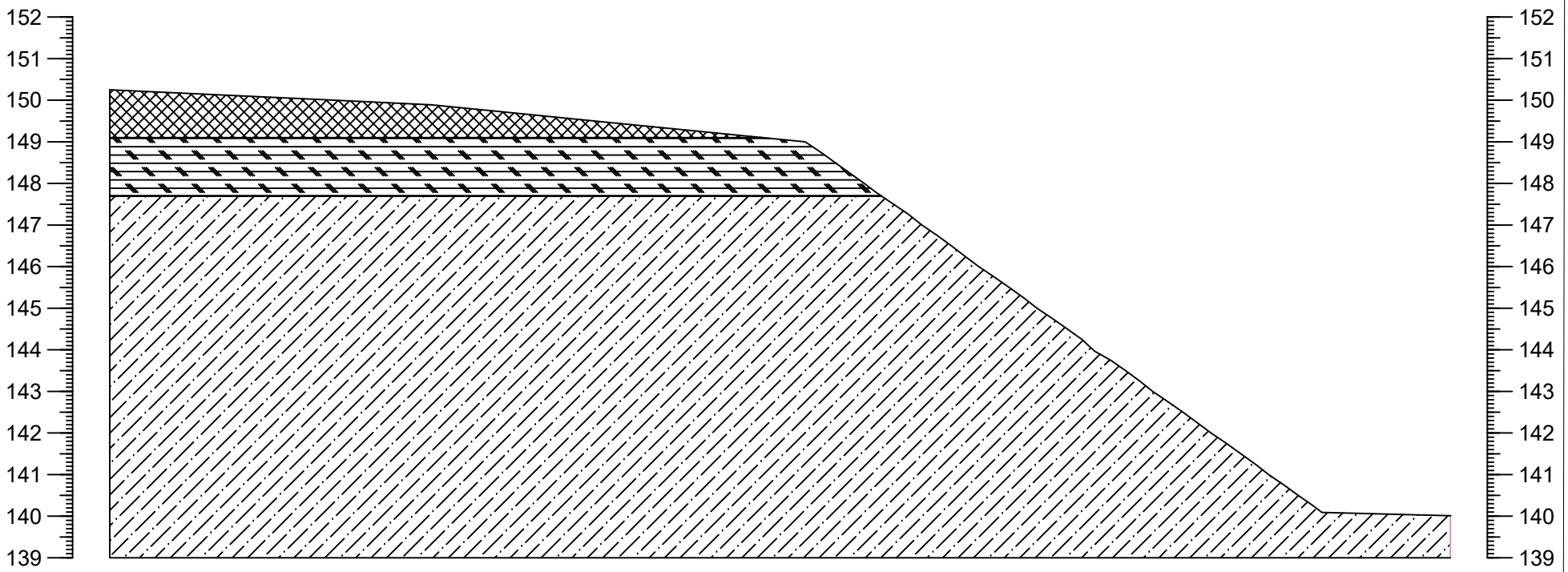
SHALE

SCALE
0m 5m
1m

TITLE AND LOCATION

CROSS SECTION E-E'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	6



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LEGEND

FILL

CLAYEY SILT/ SILTY CLAY TILL

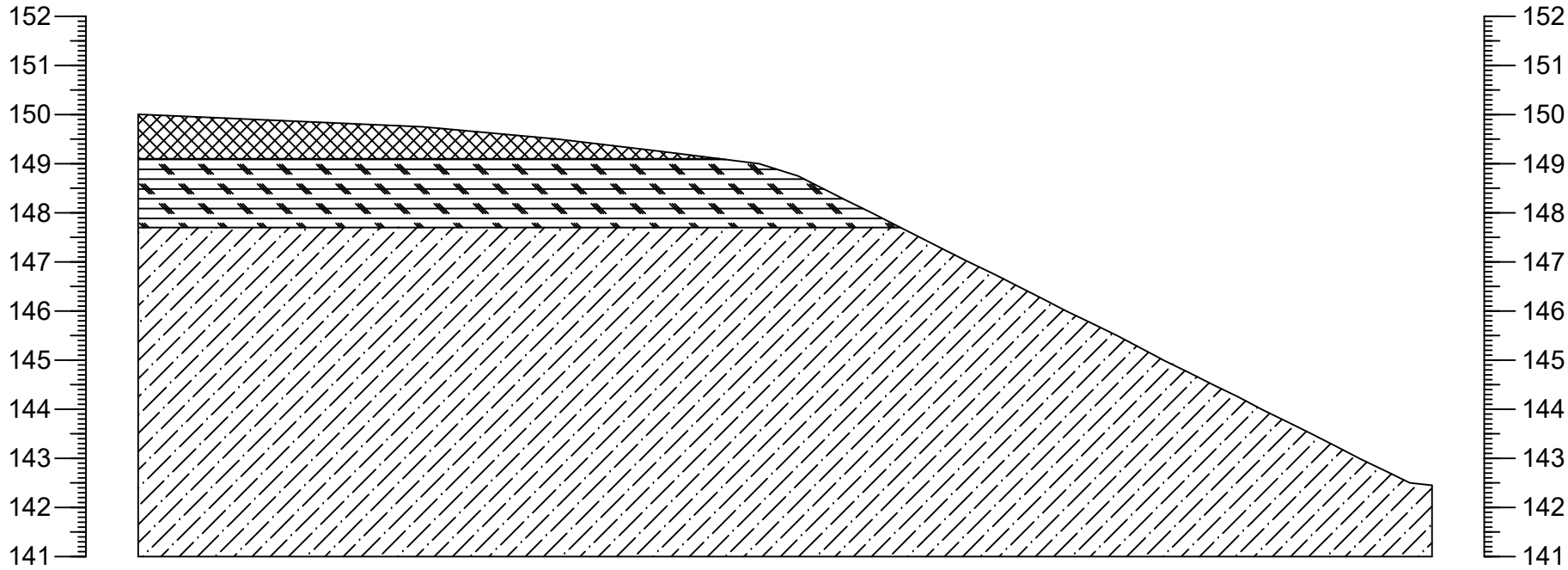
SHALE

SCALE
0m 5m
1m

TITLE AND LOCATION

CROSS SECTION F-F'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	7



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LEGEND

FILL

CLAYEY SILT/ SILTY CLAY TILL

SHALE

SCALE

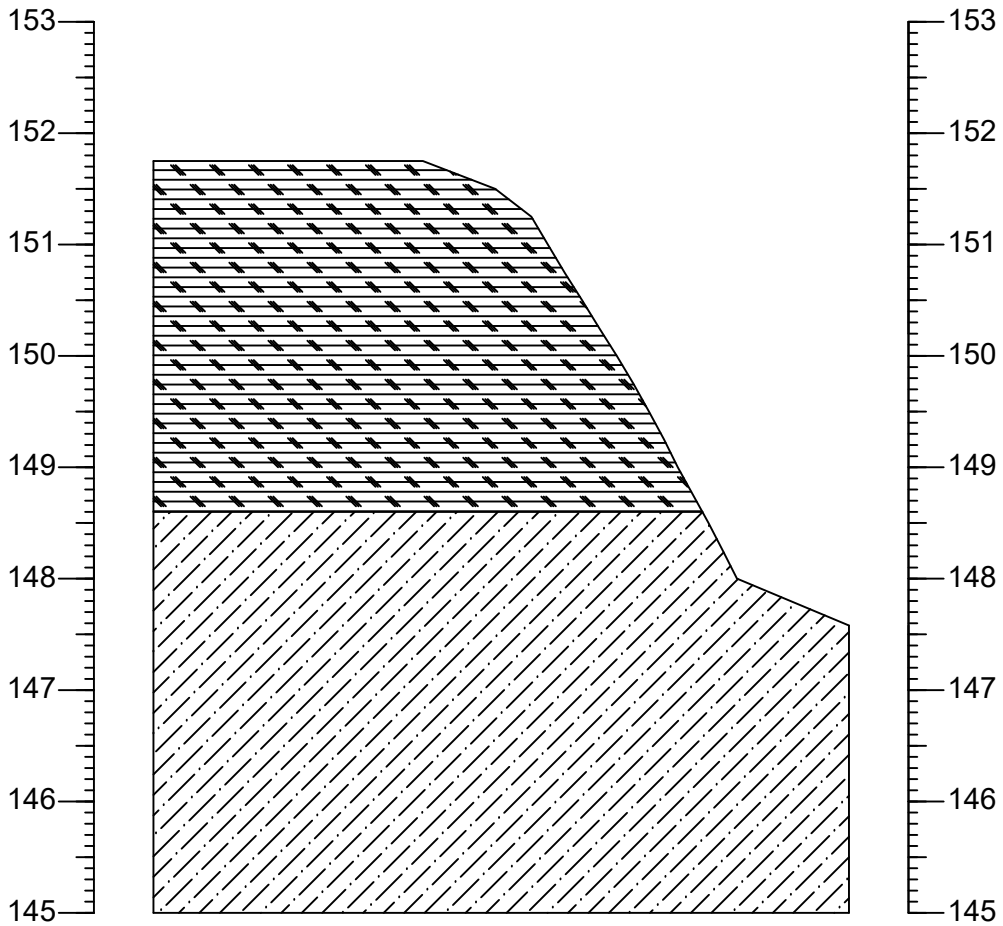
0m 5m

1m

TITLE AND LOCATION

CROSS SECTION G-G'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	8



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LEGEND

CLAYEY SILT/ SILTY CLAY TILL

SHALE

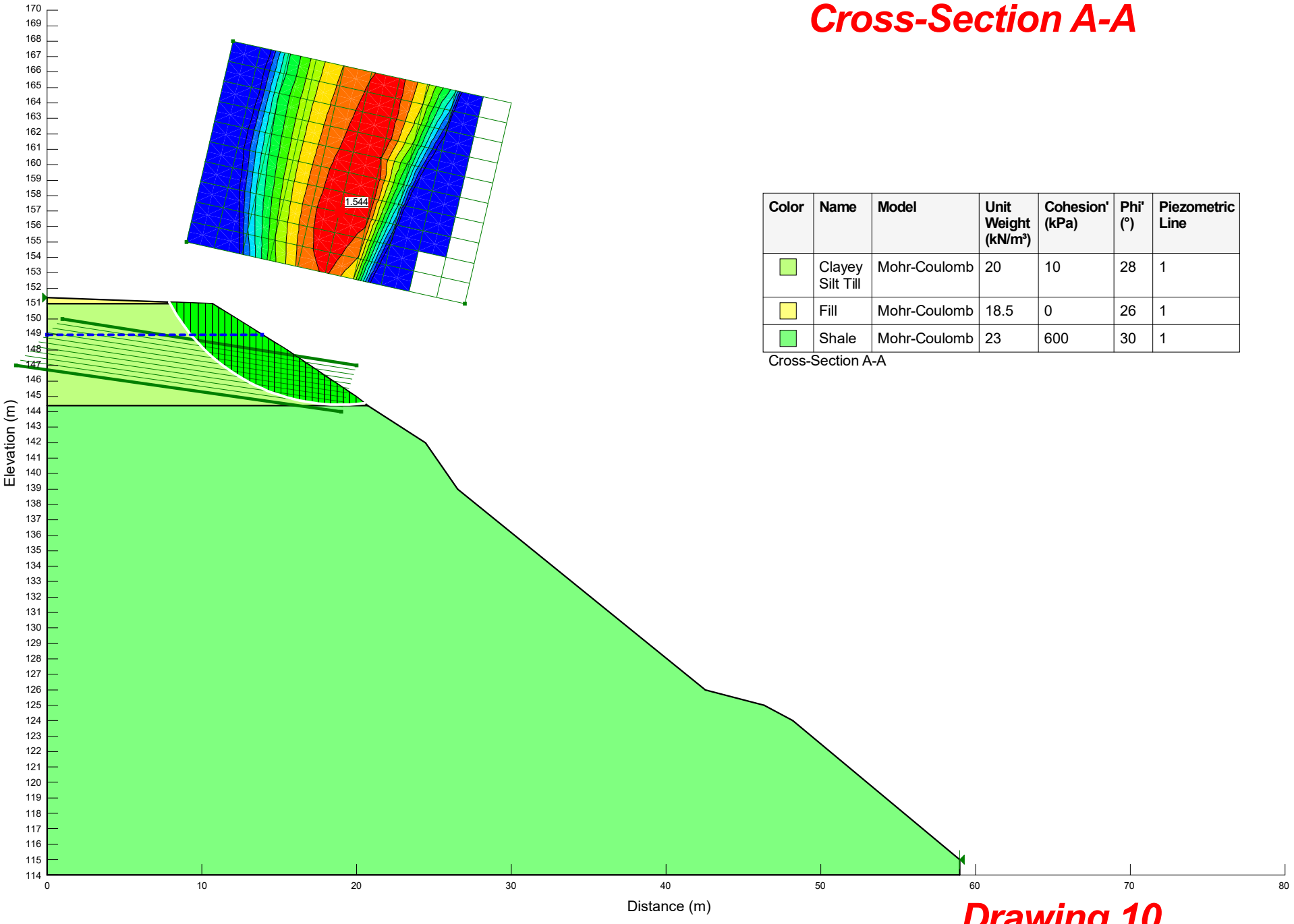
SCALE
5m 0m 10m

TITLE AND LOCATION

CROSS SECTION H-H'
1280 DUNDAS STREET WEST,
OAKVILLE, ONTARIO

PROJECT NO.	DWN.
BIGC-GEO-185B	S.M.
SCALE	CK.
AS NOTED	O.B.
DATE	FIG NO.
NOVEMBER 2019	9

Cross-Section A-A

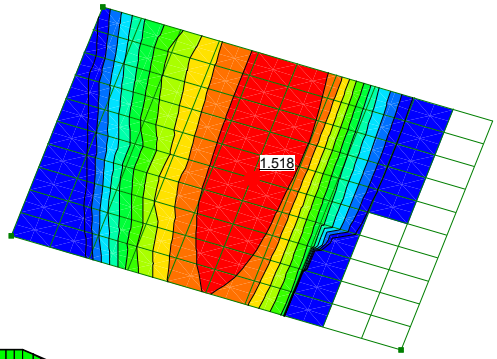


Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	Clayey Silt Till	Mohr-Coulomb	20	10	28	1
	Fill	Mohr-Coulomb	18.5	0	26	1
	Shale	Mohr-Coulomb	23	600	30	1

Cross-Section A-A

Drawing 10

Cross-Section B-B

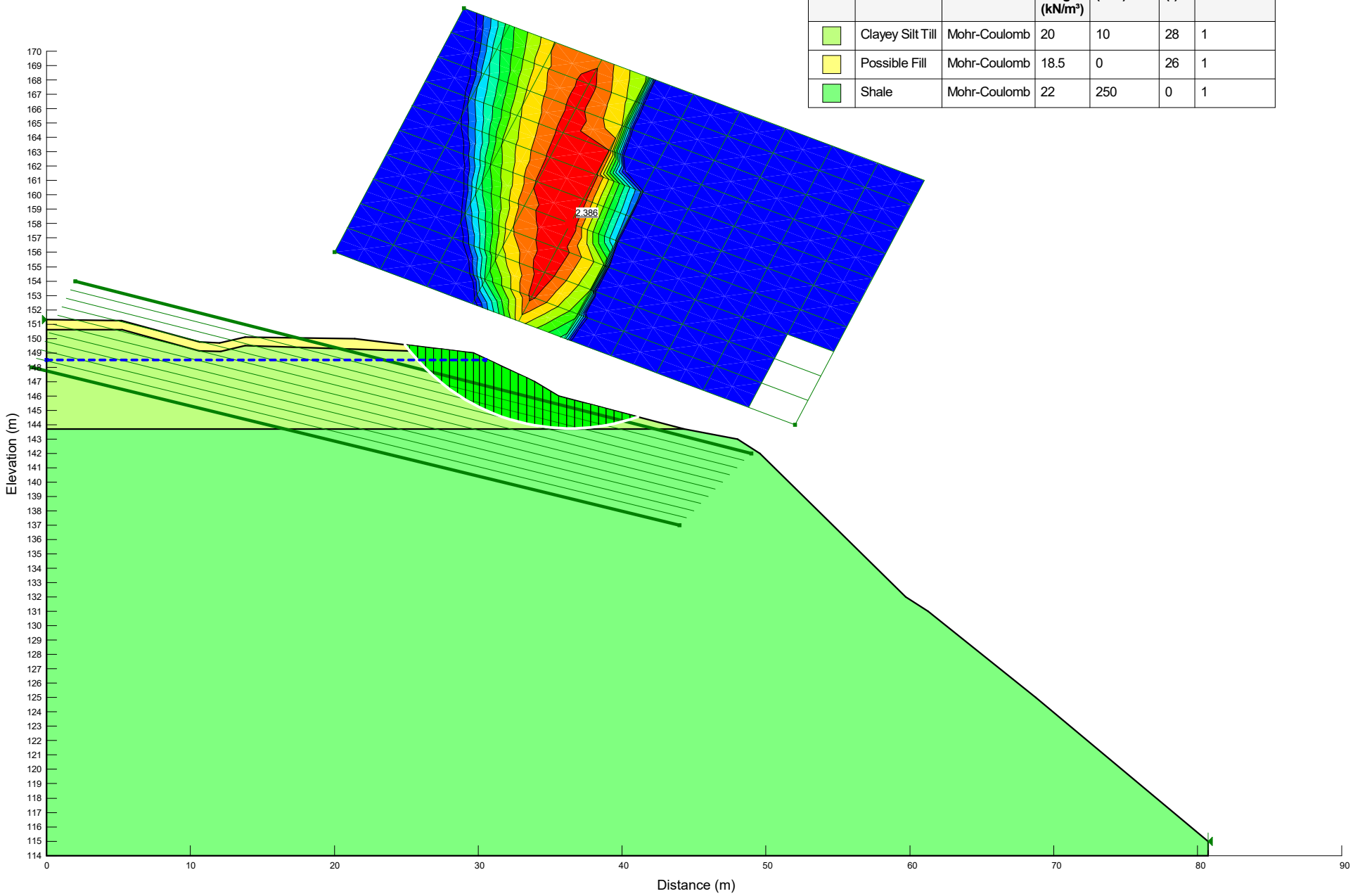


Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	Clayey Silt Till	Mohr-Coulomb	20	10	28	1
	Fill	Mohr-Coulomb	18.5	0	26	1
	Shale	Mohr-Coulomb	23	600	30	1

Drawing 11

Cross-Section C-C

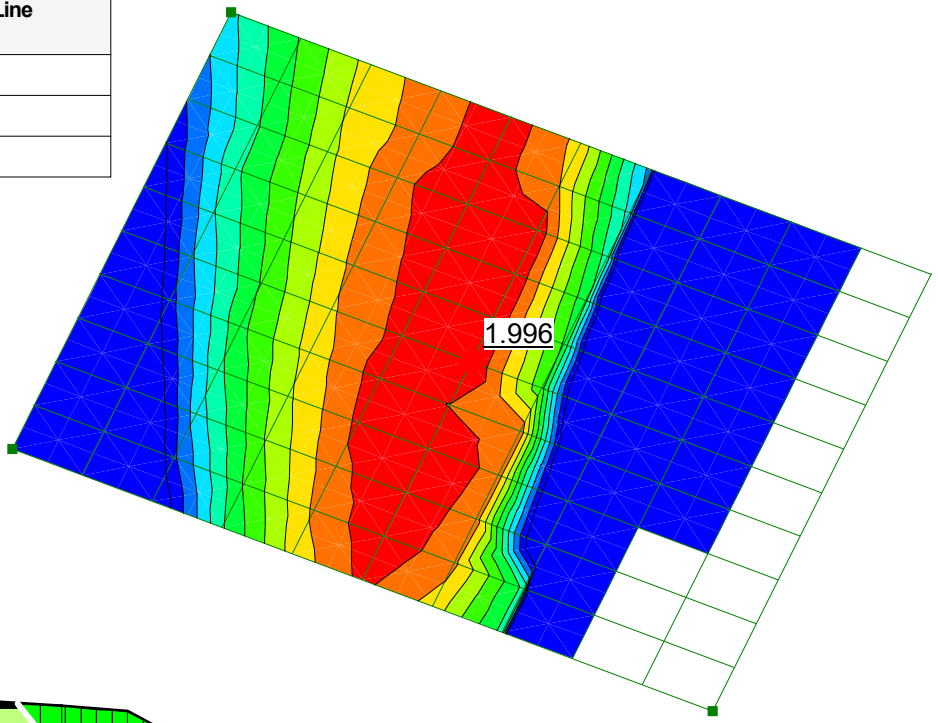
Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	Clayey Silt Till	Mohr-Coulomb	20	10	28	1
	Possible Fill	Mohr-Coulomb	18.5	0	26	1
	Shale	Mohr-Coulomb	22	250	0	1



Drawing 12

Cross-Section D-D

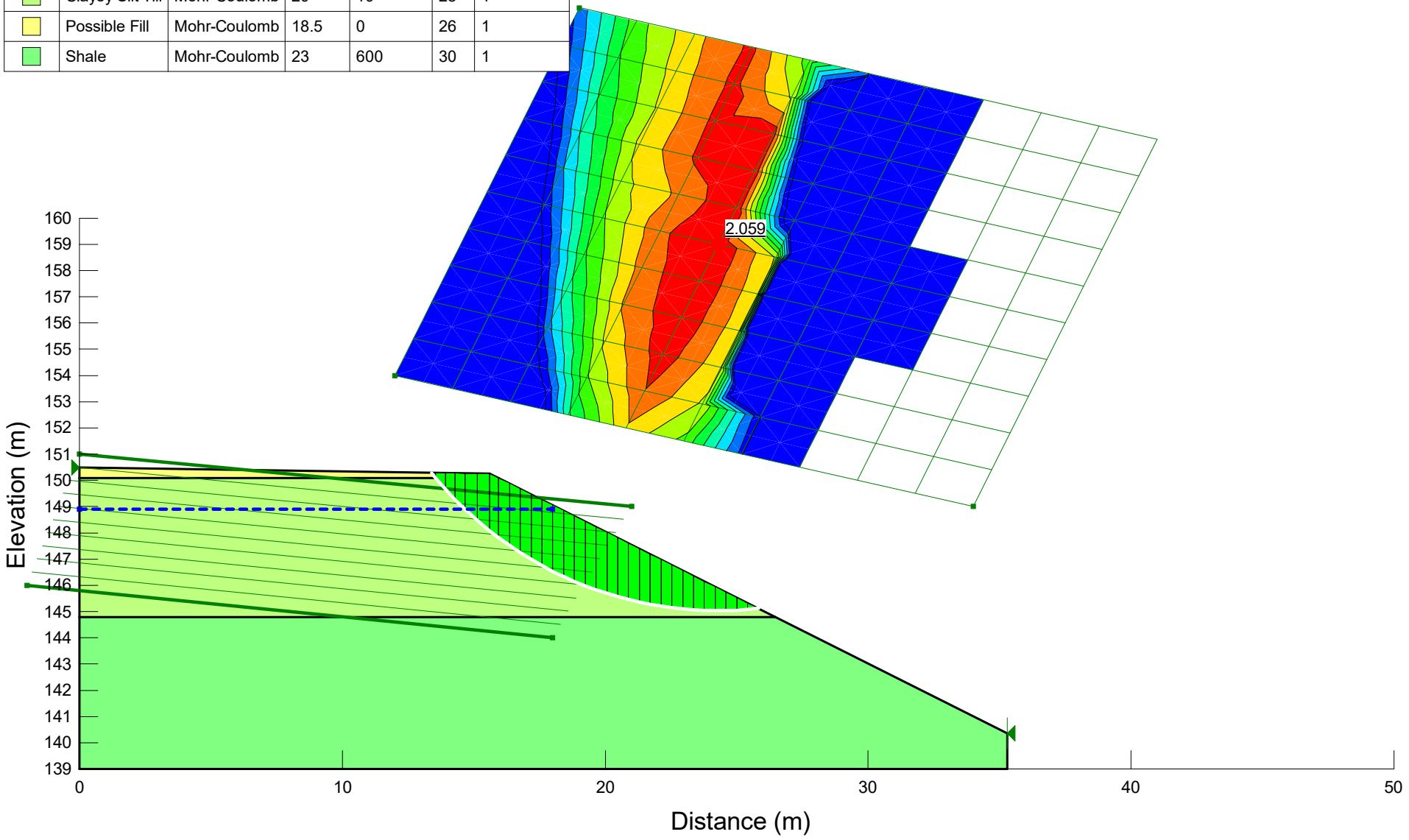
Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	Clayey Silt Till	Mohr-Coulomb	20	10	28	1
	Possible Fill	Mohr-Coulomb	18.5	0	26	1
	Shale	Mohr-Coulomb	23	600	30	1



Drawing 13

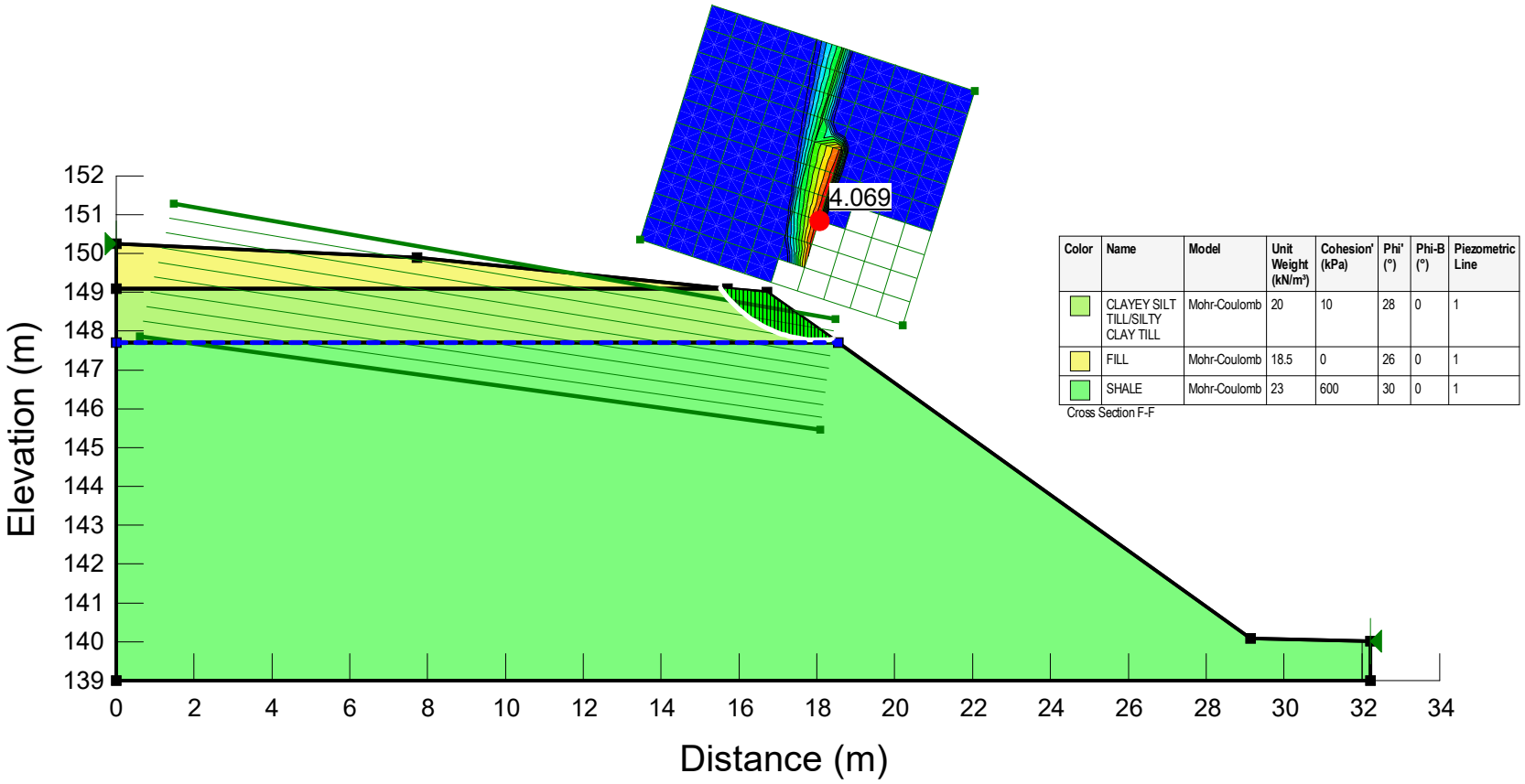
Cross-Section E-E

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	Clayey Silt Till	Mohr-Coulomb	20	10	28	1
	Possible Fill	Mohr-Coulomb	18.5	0	26	1
	Shale	Mohr-Coulomb	23	600	30	1



Drawing 14

Cross-Section F-F



Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)	Piezometric Line
	CLAYEY SILT TILL/SILTY CLAY TILL	Mohr-Coulomb	20	10	28	0	1
	FILL	Mohr-Coulomb	18.5	0	26	0	1
	SHALE	Mohr-Coulomb	23	600	30	0	1

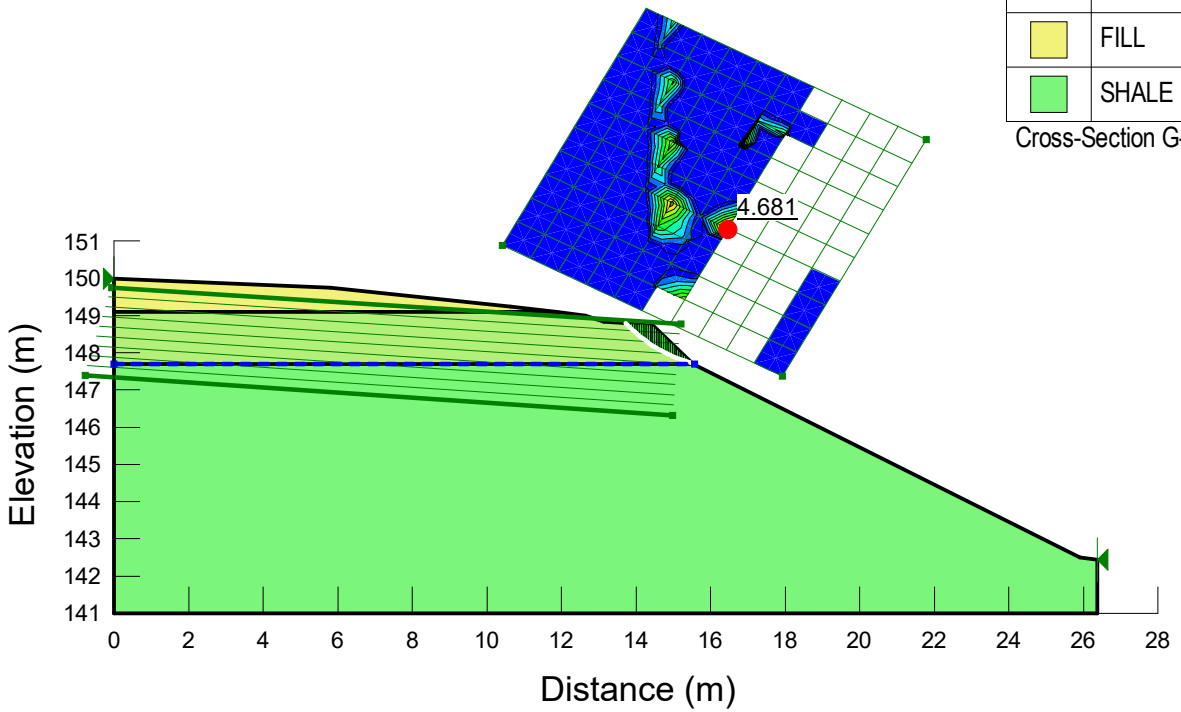
Cross Section F-F

Drawing 15

Cross-Section G-G

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Piezometric Line
	CLAYEY SILT TILL/SILTY CLAY TILL	Mohr-Coulomb	20	10	28	1
	FILL	Mohr-Coulomb	18.5	0	26	1
	SHALE	Mohr-Coulomb	23	600	30	1

Cross-Section G-G

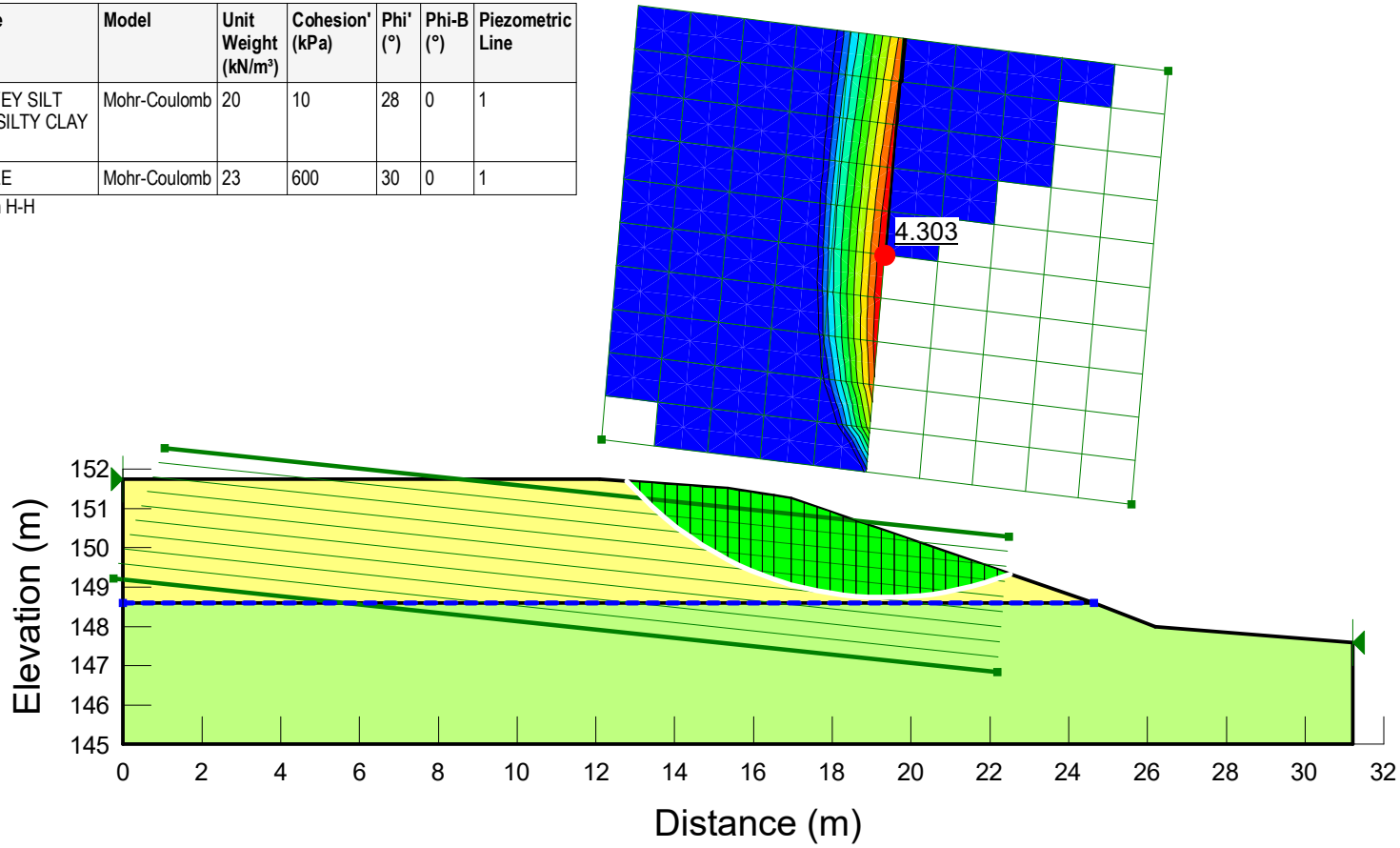


Drawing 16

Cross-Section H-H

Color	Name	Model	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)	Phi-B (°)	Piezometric Line
	CLAYEY SILT TILL/SILTY CLAY TILL	Mohr-Coulomb	20	10	28	0	1
	SHALE	Mohr-Coulomb	23	600	30	0	1

Cross-Section H-H



Drawing 17

Appendix A
Borehole Logs

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RECORD OF BOREHOLE No BH/MW103

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.6											
151.5 / 0.1	**TOPSOIL:** 125 mm										
	CLAYEY SILT TILL/SILTY CLAY TILL: disturbed upper 300 mm, brown, moist, very stiff to hard		1	SS1	6		151				
			2	SS2	19						
			3	SS3	36		150				
	- reddish brown, shale inclusions below 2.29 m		4	SS4	46		149				
148.6											
3.0 / 148.1	**SHALE:** weathered, red, damp		5	SS5	100						
3.5	**Borehole terminated at 3.5 m**										

Notes:
1. Open to 3.5 m bgs upon completion of drilling.
2. Dry upon completion of drilling.
3. Water level was at 3.32 m bgs November 25, 2019.
4. Water level was as 3.09 m bgs on December 2, 2019.

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH104

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1260 Dundas Street West, Oakville, ON | ORIGINATED BY F.G.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.C.

PROJ. NAME Geo/HG/PII Investigations | DATE 2019.11.13 - 2019.11.13 | CHECKED BY F.C.

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
150.6	**TOPSOIL:** 50 mm										
150.1	**FILL:** clayey silt to silty clay, trace organic staining, brown, moist		1	SS1	7		150		○		Metals & Inorganics, Pesticides, Herbicides Analysis PAHs Analysis
149.1			2	SS2	8				○		
1.5	**CLAYEY SILT TILL/SILTY CLAY TILL:** reddish brown, moist, stiff to hard (Pocket Penetrometer: > 225 kPa)		3	SS3	26		149		○		
147.7	-weathered shale inclusion below 2.7 m		4	SS4	59		148		○		
2.9	**SHALE:** highly weathered, red, damp		5	SS5	100		147		○		
146.9											
3.7	**Borehole terminated at 3.7 m**										

Notes:
1. Open to 3.7 m bgs upon completion of drilling.
2. Dry upon completion of drilling.

$+^3, \times^3$ Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH1

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.22 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
150.8											
150.7 / 0.1	**TOPSOIL:** 100 mm										
	FILL: clayey silt, trace gravel and organics, mottled reddish brown, moist		1	SS1	10				○		
	- trace rootlets at 0.8 m		2	SS2	4		150		○		
			3	SS3	8		149		○		
148.5 / 2.3	- 75 mm black organic layer at 2.0 m										
	CLAYEY SILT TILL: trace gravel, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		4	SS4	37		148		○		
147.8 / 3.1	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		5	SS5	57				○		
			6	SS6	55		147		○		
	- grey and very stiff below 4.6 m (Pocket Penetrometer: 200 kPa)		7	SS7	23		146		○		
145.2 / 5.6	Till/Shale Complex below 5.5 m		8	SS8	100				○		
144.7 / 6.1	**SHALE:** weathered, red, damp						145				
	Borehole terminated at 6.2 m		9	SS9	100				○		

Notes:
1. Open to 6.2 m bgs upon completion of drilling
2. Water at 4.1 m bgs upon completion of drilling

+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW2

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B./F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.23 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.8											
151.9 / 0.1	**TOPSOIL:** 100 mm										
	FILL: clayey silt, trace gravel, some rootlets, topsoil inclusions above 0.3 m, reddish brown, moist		1	SS1	6						
151.0 / 0.8	- 150 mm topsoil inclusion at 0.15m										
	CLAYEY SILT TILL: trace gravel, mottled, reddish brown, moist, very stiff, (Pocket Penetrometer: > 225 kPa) - red shale inclusions and hard below 1.5 m		2	SS2	18		151				
			3	SS3	33		150				
			4	SS4	41		149				
			5	SS5	43		148				
147.2 / 4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, grey, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	31		147				
			7	SS7	29		146				
144.4 / 7.4	**SHALE:** weathered, red, damp		8	SS8	36		145				
			9	SS9	100		144				
			10	SS10	100		143				
							142				
141.1 / 10.7	—Run #1: 10.7 to 11.2 m RQD=81% Recovery=84% - red shale, interbedded grey shale - fractive along horizontal plane - minimal vertical cracking		1	CORE			141				
140.6 / 11.2	—Run #2: 11.2 to 12.6 m RQD=92% Recovery=100% - red shale, interbedded grey shale - minimal vertical fractures		2	CORE			140				
139.1 / 12.8	**Borehole terminated at 12.6 m**										

Notes:
1. Open to 12.6 m upon completion of drilling
2. Water at 3.2 m upon completion of drilling
3. Water level at 3.0 m bgs on June 13, 2018
4. Water level at 4.2 m bgs on December 2, 2019.

+ ³, × ³. Numbers refer to Sensitivity ○ ³% STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW3

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY A.B.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.22 - 2018.05.22 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.1											
151.0	**TOPSOIL:** 150 mm										
0.2	**FILL:** clayey silt, trace gravel, rootlets, asphalt fragments, brown, moist		1	SS1	11		151				
149.9			2	SS2	7						
1.2	**CLAYEY SILT TILL:** trace gravel, mottled, brown, moist, firm to very stiff, (Pocket Penetrometer: 225 kPa) - mottled, red shale inclusions and very stiff to hard below 1.5 m		3	SS3	27		150				
148.1			4	SS4	33		149				
3.1	**CLAYEY SILT TILL:** trace gravel, mottled, red shale inclusion, orange-brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		5	SS5	65	▽	148				
	- oxidized red and grey at 4.6		6	SS6	60		147				
144.8	- Till/Shale Complex below 6.1 m						146				
6.3	**SHALE:** weathered, red, damp		7	SS7	100		145				
			8	SS8	100		144				
142.0							143				
9.1	—Run #1: 9.1 to 9.6 m RQD=22% Recovery=77%		1	CORE			142				
141.5	- weathered red shale - some mottling - vertical and horizontal fractures										
9.6	—Run #2: 11.2 to 12.6 m RQD=92% Recovery=100%		2	CORE			141				
140.0	- red shale, interbedded grey shale - minimal vertical fractures										
11.2	**Borehole terminated at 11.2 m**						140				

Notes:
1. Open to 11.2 m bgs upon completion of drilling
2. Water at 2.5 m bgs upon completion of drilling
3. Water level at 2.7 m bgs on June 13, 2018.
4. Water level at 3.495 m bgs on December 2, 2019.

$+^3$, $\times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW4

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.23 - 2018.05.23 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.3 / 0.0	**TOPSOIL:** 125 mm										
151.2 / 0.1	**FILL:** clayey silt, trace gravel, brown, moist		1	SS1	10		151		○		
	- mottled, inclusions of black organics, orange-brown at 0.8 m		2	SS2	6		150		○		
149.8 / 1.5	**CLAYEY SILT TILL:** trace gravel, mottled, reddish brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa)		3	SS3	24		149		○		
			4	SS4	43		148		○		
			5	SS5	51	▽	147		○		
146.8 / 4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, oxidized fissures, brown/reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	49		146		○		
	- grey and very stiff to hard at 6.1 m, (Pocket Penetrometer: > 225 kPa)		7	SS7	25		145		○		
143.7 / 7.6	**SHALE:** weathered, red, damp		8	SS8	100		144		○		
	Borehole terminated at 7.6 m										

Notes:
1. Water at 3.0 m bgs upon completion of drilling
2. Open to 7.6 m bgs upon completion of drilling
3. Water level at 2.6 m bgs on June 13, 2018.
4. Water level at 3.295 m bgs on December 2, 2019.

$+^3$, $\times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH5

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.23 - 2018.05.23 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.2											
151.0 / 0.1	**TOPSOIL:** 125 mm										
	FILL: clayey silt, trace gravel, top soil inclusion, brown, moist		1	SS1	3		151		○		
150.2 / 0.9	- 125 mm granular fill at 0.8 m										
	CLAYEY SILT TILL: trace gravel, reddish brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa)		2	SS2	26		150		○		
			3	SS3	44				○		
148.9 / 2.3	**CLAYEY SILT TILL:** trace gravel, red shale inclusion, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		4	SS4	54		149		○		
			5	SS5	54		148		○		
			6	SS6	42		147		○		
	- grey and very stiff below 6.1 m (Pocket Penetrometer 175 kPa)		7	SS7	18		146		○		
143.5							145				
143.3 / 7.6	**SHALE:** weathered, red, damp		8	SS8	100		144		○		
7.9	**Borehole terminated at 7.9 m** Notes: 1. Open to 7.9 m bgs upon completion of drilling 2. Water not measured upon completion of drilling										

$+^3, \times^3$: Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW6

1 OF 1 **METRIC**

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.24 - 2018.05.24 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
151.3											
150.6	**TOPSOIL:** 125 mm **POSSIBLE FILL:** clayey silt, trace gravel, rootlets, organic stains, reddish brown, moist		1	SS1	6		151		○		
0.8	**CLAYEY SILT TILL:** trace gravel, shale inclusion, reddish brown, moist, very stiff to hard (Pocket Penetrometer: > 225 kPa)		2	SS2	28		150		○		
			3	SS3	26	▽			○		
	- hard below 2.3 m		4	SS4	31		149		○		
146.7			5	SS5	43		148		○		
4.6	**CLAYEY SILT TILL:** trace gravel, red shale inclusions, brown, moist, very stiff to hard, (Pocket Penetrometer: > 225 kPa) - grey below 5.0 m		6	SS6	29		147		○		
			7	SS7	15		146		○		
143.7							145		○		
143.6	**SHALE:** weathered, red, damp		8	SS8	100		144		○		
7.7	——Run #1: 7.7 to 8.1 m		1	CORE							
143.2	RQD=40% Recovery=78% - weathered red shale, interbedded grey shale - one vertical fracture						143				
8.1	——Run #2: 8.1 to 9.6 m RQD=94% Recovery=98% - red shale, interbedded grey shale - minimal vertical fractures - some horizontal fractures along planes - some interbedded clayey silt at 9.1 m		2	CORE			142				
141.7											
9.6	**Borehole terminated at 9.6 m**										

Notes:
1. Open to 9.6 m bgs upon completion of drilling
2. Water at 1.09 m bgs upon completion of drilling
3. Water level at 2.8 m bgs on June 13, 2018.
4. Water level at 2.01 m bgs on December 2, 2019.

$+^3$, $\times^3$ Numbers refer to Sensitivity $\circ^{3\%}$ STRAIN AT FAILURE

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RECORD OF BOREHOLE No BH/MW7

1 OF 1

METRIC

PROJ. NO. BIGC-ENV-185C | LOCATION 1280 Dundas Street West, Oakville, ON | ORIGINATED BY F.C.

DATUM Geodetic | BOREHOLE TYPE Continuous flight solid stem auger, split spoon samples and augered core samples | COMPILED BY F.D.

PROJ. NAME Geo/HG/PII Investigations | DATE 2018.05.24 - 2018.05.24 | CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
150.9											
150.8 / 0.1	**TOPSOIL:** 100 mm										
	POSSIBLE FILL: clayey silt, reworked and distributed, trace rootlets and organic staining, brown, moist		1	SS1	3				○		
150.1 / 0.8	**CLAYEY SILT TILL:** trace gravel, shale inclusions, reddish brown, moist, stiff to very stiff, (Pocket Penetrometer: > 225 kPa)		2	SS2	26		150		○		
	- very stiff below 1.5 m		3	SS3	44		149		○		
	- hard below 2.3 m		4	SS4	54		148		○		
			5	SS5	54		147		○		
146.3 / 4.6	**CLAYEY SILT TILL:** red shale inclusions, reddish brown, moist, hard, (Pocket Penetrometer: > 225 kPa)		6	SS6	42		146		○		
144.8 / 6.2	**SHALE:** weathered, red, damp		7	SS7	18		145		○		
	Borehole terminated at 6.2 m										

Notes:
1. Open to 6.2 m bgs upon completion of drilling
2. Water not measured completion of drilling
3. Water level at 2.0 m bgs on June 13, 2018.
4. Water level at 0.63 m bgs on December 2, 2019.

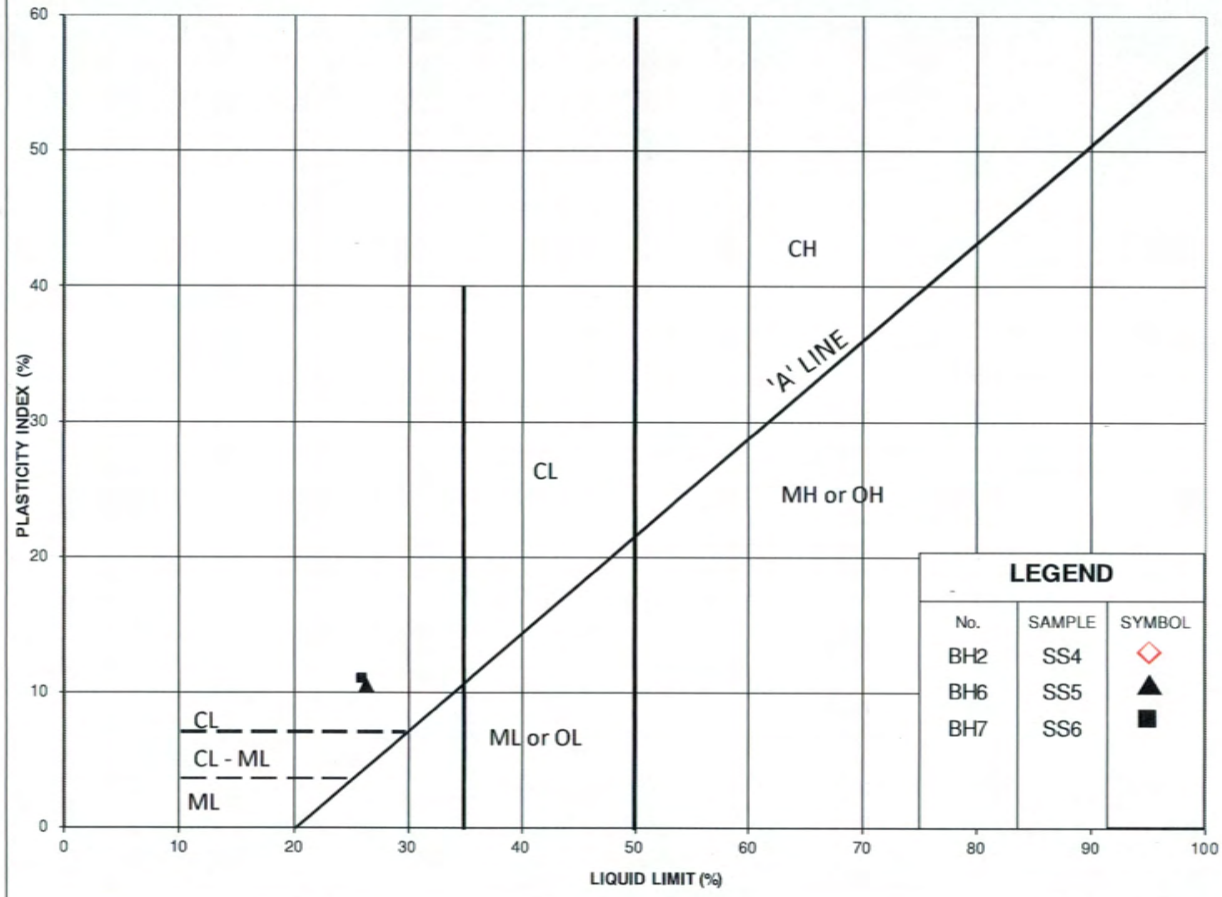
+ 3, × 3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

Appendix B

Atterberg Limits Test Results

B.I.G. Consulting Inc.

1280 Dundas Street West, Oakville



B.I.G. CONSULTING INC.

PLASTICITY CHART

Clayey Silt Till

FIGURE: 1

PROJECT NO:BIGC-GEO-185B

DATE: 18/06/2018

Appendix C:
Site Photographs

B.I.G. Consulting Inc.

West Slope – Looking south, Cross Section C

West Slope – Looking North, Gabion Retaining Wall

West Slope – Looking West, drainage flowing east toward Sixteen Mile Creek, Cross Section E

West Slope – Looking South, Cross Section E

West Slope – Looking South, Cross Section D

West Slope – Looking South, Cross Section D

Sixteen Mile Creek Slope – Looking South, Cross Section C

Sixteen Mile Creek Slope – Looking Northwest, Cross Section C

Sixteen Mile Creek Slope – Trail dividing the slope, looking Southeast

Sixteen Mile Creek Slope – Looking Northwest, slope overburden erosion, Cross Section B

Sixteen Mile Creek Slope – Looking Southwest, slope overburden erosion impeding path, Cross Section B

Sixteen Mile Creek Slope – Trail dividing the slope impeded by upper slope overburden erosion, looking South, Cross Section B

Sixteen Mile Creek Slope – Slope overburden erosion, looking East

Sixteen Mile Creek Slope – Slope overburden erosion, looking West

Sixteen Mile Creek Slope – Toe of slope, looking West

Sixteen Mile Creek Slope – Toe of slope, looking southwest, Cross Section C

Sixteen Mile Creek Slope – Erosion of overburden on top of Queenston Shale, looking southwest, Cross Section A


BH2 1280 Dunsis St. W, Oakville
RUNS #1-2 BIGC-GEO-185B
May 19, 2018 Depth: 35ft —
Box #1 Run #1: 35ft - 36ft 7" —
Run #2: 36ft 7" —
RUN 2 - 4ft - 10"


BH2 1280 Dundas St. W, Oakville
RUNS#1-2 BIGC-GEO-18SB
May 19, 2018 Depth: 35ft —
Box #1 Run #1: 35ft - 36ft 7"
Run #2: 36ft 7" —
RUN1 - 4ft - 7"
RUN2 - 4ft - 10"
4ft 10"
RUN 2 - 4ft - 10"


BIGC-GEO-185B
May 24, 2018
BH6 Core 1280 DUNDAS STN. OAKVILLE
RUNS 1-2 → Depth → 25ft - 31ft - 6"
Run 1 → 25ft - 26ft 5"
Box #1
Run 2 → 26ft 5" - 31ft 6"


BIGC-GEO-185B
May 24, 2018
BH6 Core 1280 DUNDAS STW. OAKVILLE
RUNS 1-2 → Depth → 25ft - 31ft - 6"
Run 1 → 25ft - 26ft 5"
Box #1
Run 2 → 26ft 5" - 31ft 6"


BIGC-GEO-185A
May 22, 2018
BH3
Run 1-2
Box #1
RUN 2
RUN 1