Slope Stability Assessment

Bridle Path North Arva Inc.

Project Name:
Proposed Residential Development
Medway Road and Richmond Street, Arva, Ontario

Project Number:
LON-23015294-A0

Prepared By:
EXP Services Inc.
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Date Submitted:
March 11, 2024

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Type of Document:

Geotechnical Report

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Geotechnical Services

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Date Submitted:

March 11, 2024

Table of Contents

Appendices

1. Introduction and Background

1.1 Introduction

EXP Services Inc. (EXP) was retained by **Bridle Path North Arva Inc.** (Client) to carry out a slope stability assessment relating to the proposed residential development north and south of Medway Road, on the west side of Richmond Street in Arva, Ontario, hereinafter referred to as the 'Site'. It is anticipated that the overall development may consist of a combination of single-family homes, townhouses and apartment buildings.

The proposed development is within an area regulated by the Upper Thames River Conservation Authority (UTRCA). As a result, consent from the Conservation Authority is required prior to establishing the limits of the development.

This report summarizes the results of the investigation and provides geotechnical comments and recommendations with regards to the slope stability assessment.

1.2 Terms of Reference

The investigation was generally completed in accordance with the scope of work as outlined in Proposal No. 999-25001779-GE. Authorization to proceed with this investigation was received from Mr. Ali Soufan of York Developments on behalf of Bridle Path North Arva Inc. on February 3, 2021.

The purpose of the investigation was to determine net developable site and the Recommended Development Setback Limit, in accordance with the Ministry of Natural Resources Technical Guide – River & Streams Systems: Erosion Hazard Limit and the Upper Thames River Conservation Authority guidelines. A series of boreholes and test pits were advanced at the locations chosen by EXP and shown on the attached Test Hole Location Plan (**Drawing 1**).

Based on an interpretation of the factual borehole/test pit data, and a review of soil and groundwater information from test holes advanced at the site, EXP has provided comments and recommendations on slope stability and erosion hazard limits.

This report is provided on the basis of the terms of reference presented above, and on the assumption that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The information in this report in no way reflects on the environmental aspects of the soil. Should specific information in this regard be needed, additional testing may be required.

Reference is made to **Appendix E** of this report, which contains further information necessary for the proper interpretation and use of this report.

2. Methodology

2.1 Fieldwork

The fieldwork was carried out between March 1st and March 4th, 2021. In general, the geotechnical investigation consisted of the advancement of eleven (11) boreholes and ten (10) test pits at the locations denoted on **Drawing 1** as BH1 to BH9 and TP1 to TP10, inclusive. MW was suffixed to the borehole symbol (BH) where a monitoring well was installed, including two (2) of the locations being completed with sets of nested wells (BH5/MW-A/B and BH8/MW-A/B).

Prior to the drilling, buried service clearances were obtained for the test hole locations by EXP.

The boreholes were completed by a specialist drilling subcontractor under the full-time supervision of EXP geotechnical staff. The boreholes were advanced utilizing a track-mounted drill rig equipped with continuous flight solid and hollow stem augers, soil sampling and soil testing equipment. In each borehole, disturbed soil samples were recovered at depth intervals of 0.75 m to 1.5 m using conventional split spoon sampling equipment and Standard Penetration Test (SPT) methods or auger samples.

The test pits were advanced using a locally subcontracted excavator backhoe.

During the drilling, the stratigraphy in the boreholes was examined and logged in the field by EXP geotechnical personnel.

Short-term groundwater levels within the open test holes were observed. These observations pertaining to groundwater conditions at the test hole locations are recorded in the borehole logs and test pit summary found in **Appendix A**. A groundwater monitoring well consisting of 50 mm diameter PVC pipe was installed in Boreholes BH1/MW to BH9/MW, inclusive. Details of the monitoring well construction are provided on the attached Borehole Logs. Following the drilling, the remaining boreholes were backfilled with the excavated materials and bentonite, to satisfy the requirements of O.Reg. 903. Following excavation, the test pits were backfilled with the excavated materials and compacted in lifts.

Representative samples of the various soil strata encountered at the test locations were taken to our laboratory in London for further examination by a Geotechnical Engineer and laboratory classification testing with results presented on the borehole logs found in **Appendix A**.

In addition to the drilling, select slope profiles identified on Site were reviewed using the 'Slope Stability Rating Chart' (created by Ministry of Natural Recourses (MNR)), which summarizes the site observations and empirically scores various elements of the slope profile which contribute to slope stability, to provide an assessment of the potential for slope instabilities at the Site. The rating charts for the cross sections examined are provided in **Appendix C** for review and consideration.

2.2 Review of Topographic Data

A topographic site plan was provided to EXP by the Client. A site elevation survey carried out by EXP combined with the topographic mapping was used to create the cross sections for use in establishing the location of the Erosion Hazard Limit. Using engineering judgement and technical experience, various cross sections (which are considered to be representative of typical site conditions) have been reviewed.

Examination of factors of safety using Morgenstern Price methods were carried out and analysed by computer methods using the Slope/W computer program. Topographic information used for the slope sections is taken from the topographical plan and EXP's site survey. Soil strength parameters used in the analyses were based on our observations and experience with similar soil and groundwater conditions and are consistent with typical values in literature sources.

3. Site and Subsurface Conditions

3.1 Site Description

The Site is located on the north and south side of Medway Road and west of Richmond Street in Arva, Ontario. The current land use is partially agricultural and vacant open space. The proposed development area is irregular in shape and measures approximately 21 hectares in total area. The Site is bounded by agricultural lands to the north and west, woodland and residential development to the south, and residential and commercial lands to the east including a church and a cemetery along the eastern property boundary.

Medway Creek flows along the northern property boundary and continues flowing south of Medway Road west of the Site.

The slopes within proximity to the creek are approximately 2 to 10 m in height and are generally vegetated with mature trees and shrubbery. The Site slopes gently from east to west across the table lands on the Site with a grade difference of about 9.6 m across the borehole locations. The following sections provide a summary of the soil and groundwater conditions.

3.2 Soil Stratigraphy

The detailed stratigraphy encountered in each test hole is shown on the borehole logs and test pit summary found in **Appendix A** and summarized in the following paragraphs. It must be noted that the boundaries of the soil indicated on the test hole logs are inferred from non-continuous sampling and observations during drilling and excavation. These boundaries are intended to reflect transition zones for geotechnical design and should not be interpreted as exact planes of geological change.

3.2.1 Topsoil

Each test hole was surfaced with a layer of topsoil. The topsoil thickness was typically about 200 mm to 300 mm.

In cultivated areas, it should be anticipated that surficial topsoil has been blended into the underlying subgrade soils. In treed areas, the topsoil may be thicker and contain areas with significant roots.

It should be noted that topsoil quantities should not be established from the information provided at the test hole locations only. If required, a more detailed analysis (involving additional shallow test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes.

3.2.2 Fill

Beneath the topsoil and extending to between 1.4 m and 2.4 m below ground surface (bgs) in Boreholes BH3 and BH7 and Test Pits TP1 and TP7, a fill layer was observed. The fill varied in composition between sandy silt and silt and was typically brown in colour. The fill occasionally contained trace organics, concrete rubble, trace to some clay, trace to some sand and gravel and was loose in relative density (based on Standard Penetration Test (SPT) N Values of 4 to 6 blows per 300 mm split spoon penetration). Based on tactile examination, the fill was described as moist.

It should be noted that fill quantities should not be established from the information provided at the test hole locations only.

3.2.3 Sand/Sand and Gravel

At varying depths and thicknesses in select test pits and boreholes, a stratum of sand to sand and gravel encountered. The sand material was typically brown to grey in colour with trace to some silt and loose to dense in compactness (SPT N Values of 5 to 38). Based on tactile examination and observed groundwater seepage, the sand/sand and gravel was described as moist to wet.

3.2.4 Silt/Sandy Silt

A layer of silt/sandy silt was encountered in select test pits and boreholes at various depths and thicknesses. The silt material was generally described as brown to grey with trace to some sand and gravel, trace clay and loose to compact with SPT N-values ranging from 5 to 17. Based on tactile examination and observed groundwater seepage, the silt/sandy silt was described as moist to wet.

3.2.5 Glacial Till

With the exception of Boreholes BH4 to BH7, each borehole encountered a stratum of glacial till. Glacial till was only encountered within Test Pits TP2, TP9 and TP10. The till predominantly comprised silt to sandy silt was brown becoming grey in colour with depth. The till contained trace to some clay (occasionally clayey), some sand, trace gravel and occasional wet silt layering. It was stiff/compact to very dense (SPT N Values ranging from 9 to 82) and typically damp to moist based on tactile examination.

3.3 Groundwater Conditions

To allow for long-term monitoring of the water levels, eleven (11) monitoring wells were installed in nine (9) locations including two (2) of the locations being completed with sets of nested wells (BH5/MW-A/B and BH8/MW-A/B) with details shown on the Borehole Logs. The wells were installed to depths ranging between about 3.1 and 12.2 m bgs. The summary of well construction details are presented in the table below.

Table 1 – Monitoring Well Construction Details

Well ID	Ground Surface Elevation (m)	Completion Depth (m bgs)	Screen Length (m)
BH1/MW	269.0	6.7	1.5
BH2/MW	269.2	3.0	1.5
BH3/MW	262.4	3.0	1.5
BH4/MW	268.1	9.1	1.5
BH5/MW-A	261.4	7.6	1.5
BH5/MW-B	261.5	4.6	1.5
BH6/MW	261.1	6.1	1.5
BH7/MW	261.1	6.1	1.5
BH8/MW-A	266.7	12.2	3.0
BH8/MW-B	266.7	3.0	1.5
BH9/MW	271.0	3.7	1.5

The EXP monitoring wells have been registered with the Ministry of the Environment, Conservation and Parks (MECP), in accordance with Ontario Regulation 903, and remain intact for the purposes of ongoing monitoring of stabilized groundwater conditions, as required. A summary of the water levels taken to date are provided in **Appendix B**.

Over the monitored period extending from March 2021 to September 2023, the groundwater levels ranged between 256.5 m and 269.9 m. Further groundwater discussion will be provided in the final Hydrogeological Assessment prepared under separate cover.

Details of the groundwater conditions observed within the boreholes and test pits are provided on the attached borehole logs and test pit summary. Upon completion of drilling and excavation, the open test hole excavations were examined for the presence of groundwater and groundwater seepage. Water was measured near 4.6 m bgs in Borehole BH10, and between 1.2 m to 1.3 m bgs in Test Pits TP1, TP3 and TP8 to TP10 at completion. All other boreholes without monitoring wells and test pits installed were dry upon completion of drilling/excavation.

It is noted that the depth to the groundwater table may vary in response to climatic or seasonal conditions, and as such, may differ at the time of construction, with higher levels in wet seasons. Capillary rise effects should also be anticipated in fine-grained soil deposits.

3.4 Methane Gas

An RKI Gx-2003 Gas Detector was used in the upper levels of the open boreholes. The unit measures LEL combustibles, methane gas, oxygen content, carbon monoxide and hydrogen sulfide in standard confined space gases. No methane gas was detected in the boreholes.

4. Slope Stability Assessment

Medway Creek flows along the northern property boundary and continues flowing south of Medway Road west of the Site. The slopes are approximately 2 to 10 m in height and are typically vegetated with mature trees and shrubbery. The Site slopes gently from east to west across the table lands on the Site with a grade difference of about 12 m.

A Site reconnaissance completed by EXP on March 13th, 2021 consisted of completing MNR Slope Rating Charts at the cross-section locations. This reconnaissance of the slopes included detailed observations such as slope vegetation, seepage from slope face, table land drainage, toe erosion, and evidence of previous landslide activity. Based on the values recorded on the Slope Stability Rating Charts, the ratings suggest that a low to moderate potential of slope instability exists.

Seven (7) slope profiles were created using topographic mapping provided by the client and EXP's site survey. The locations of the cross sections are shown on **Drawing 2**.

Slope stability analyses were completed at seven locations on the slopes to determine the erosion hazard limits (development setback) for the Site.

Based on the cross-section profiles created from the topographic mapping and the MNR rating charts completed during the Site reconnaissance, four (4) slope sections were analyzed using the computer modelling software Slope/W. These sections were selected to represent the worse-case scenarios. The worse-case scenarios are based on the slope height, inclination, and its existing conditions, and proximity of the watercourse to the toe of the slope.

Examination of factors of safety were carried out and analyzed by computer methods utilizing the Slope/W computer program. Soil strength parameters used in the analyses were based on our observations and experience with similar soil and groundwater conditions and are consistent with typical values in literature sources.

4.1 Stable Slope Geometry

The stability of the existing slopes were investigated for a number of different Factors of Safety (FOS). The various types of failures resulting include shallow, moderate depth and deep rotational failures, occasionally through the entire height of the slope. The analyses were undertaken by computer methods using the Slope/W computer program for select slope profiles.

The soil parameters used were conservative to build in an added safety factor for the analyses. The following table summarizes the parameters for the predominant soils which were used in EXP's evaluation of the stable slope configuration:

Table 2 – Soil Parameters

Soil Type	Unit Weight (kN/m^3)	Cohesion (kPa)	Angle of Internal Friction (°)
Sand and Gravel	21.5	0	33
Sand	20.5	0	32
Silt	19.0	2	27
Silty Sand	18.5	3	28
Clayey Silt Till	21.5	10	32
Silt Till, trace to some clay	21.5	8	29

In order to determine an appropriate Erosion Hazard Limit setback from the crest of the slope, a minimum factor of safety of 1.40 was used during the computerized stable slope analyses. The following table from the MNR Technical Guide provides guidance on how to select a minimum factor of safety based on the intended land use above or below the slope.

Table 3 – Design Minimum Factor of Safety

Table 4.3

	LAND-USES	DESIGN MINIMUM FACTOR OF SAFETY
A	**PASSIVE**; no buildings near slope; farm field, bush, forest, timberland, woods, wasteland, badlands, tundra	1.10
B	**LIGHT**; no habitable structures near slope; recreational parks, golf courses, buried small utilities, tile beds, barns, garages, swimming pools, sheds, satellite dishes, dog houses	1.20 to 1.30
C	**ACTIVE**; habitable or occupied structures near slope; residential, commercial, and industrial buildings, retaining walls, storage/warehousing of non-hazardous substances	1.30 to 1.50
D	**INFRASTRUCTURE and PUBLIC USE**; public use structures or buildings (i.e., hospitals, schools, stadiums), cemeteries, bridges, high voltage power transmission lines, towers, storage/warehousing of hazardous materials, waste management areas	1.40 to 1.50

Note: Table obtained from page 60 of MNR Technical Guide – River and Stream Systems: Erosion Hazard Limit (2002).

Four (4) cross-sections were reviewed and assessed using a computerized slope stability analyses for the slope assessment at the Site. The sections evaluated were selected to represent the worst-case-scenario of the slope. The cross-section locations are shown on **Drawing 2** and the profiles are provided on **Drawings 3** to **9**. The information plotted in the cross-sections was based on topographic mapping provided by the Client and EXP's Site survey.

The failures at the cross-section consisted of shallow, moderate and deep failures throughout the depth of the slope. After completing the computerized stable slope analysis on the cross-section, the minimum calculated factor of safety (FOS) under the existing conditions for shallow to moderate and deep failures are summarized results are provided in the following table. It should be noted that all failure modes for Cross Sections D-D' and G-G' were above the recommended minimum FOS values of 1.40.

Table 4 – Summary of Pertinent Slope Stability Analyses

Cross Section Condition	Description of Failure Mode	Computer Factor of Safety
Cross Section A-A'	Shallow to Moderate Depth Failure	1.04
	Deep Failure	1.36
Cross Section C-C'	Shallow to Moderate Depth Failure	1.29
	Deep Failure	1.51
Cross Section D-D'	Shallow to Moderate Depth Failure	2.16
	Deep Failure	2.15
Cross Section G-G'	Shallow to Moderate Depth Failure	2.02
	Deep Failure	2.22
Cross Section A-A' (2.2H:1V)	Minimum Failure Mode	1.95

The soil conditions encountered in the boreholes near the assessed areas of the Site typically consist of glacial till with layers of silt, sandy silt, sand and sand and gravel.

A stable slope inclination of 2.2H:1V was applied to the critical cross section based on the slope analyses carried out. To ensure that a satisfactory factor of safety (FOS) is applied for the Erosion Hazard Limit along the slopes at the Site, the stable slope setback line should be drawn from the toe erosion allowance, where applicable. The stable slope allowance of 2.2H:1V has been applied based on a conservative evaluation and to exceed the target FOS of 1.40.

4.2 Toe Erosion Component

The extent of potential erosion damage is a function of the competence of the natural subgrade soils, the type and quality of vegetative cover, and the frequency with which the slope is subject to erosive forces. Active erosion of the soil on the face of the riverbank slope is most likely caused by normal or increased flow volumes and velocities moving through the drainage creek. The figure below provides guidance on how to determine a minimum toe erosion allowance for a confined system.

MINIMUM TOE EROSION ALLOWANCE - River Within 15 m of Slope Toe*

Type of Material Native Soil Structure	**Evidence** of Active Erosion** OR Bankfull Flow Velocity > Competent Flow Velocity*** RANGE OF SUGGESTED TOE **EROSION ALLOWANCES**	**No evidence** of Active Erosion** OR Bankfull Flow Velocity <Competent Flow Velocity*** Bankfull Width		
		< 5m	5-30m	> 30m
1.Hard Rock (granite) *	0 - 2 m	0 m	0 m	1 m
2.Soft Rock (shale, limestone) Cobbles, Boulders *	2 - 5 m	0 m	1 m	2 m
3.Stiff/Hard Cohesive Soil (clays, clay silt), Coarse Granular (gravels) Tills *	5 - 8 m	1 m	2 m	4 m
4.Soft/Firm Cohesive Soil, loose granular, (sand, silt) Fill *	8 - 15 m	1-2 m	5 m	7 m

*Where a combination of different native soil structures occurs, the greater or largest range of applicable toe erosion allowances for the materials found at the site should be applied

****Active Erosion** is defined as: bank material is exposed directly to stream flow under normal or flood flow conditions where undercutting, oversteepening, slumping of a bank or down stream sediment loading is occurring. An area may have erosion but there may not be evidence of 'active erosion' either as a result of well rooted vegetation or as a result of a condition of net sediment deposition. The area may still suffer erosion at some point in the future as a result of shifting of the channel. The toe erosion allowances presented in the right half of Table 3 are suggested for sites with this condition. See Step 3.

*****Competent Flow Velocity** is the flow velocity that the bed material in the stream can support without resulting in erosion or scour. For *bankfull width* and *bankfull flow velocity*, see Section 3.1.2.

Figure obtained from page 38 of MNR Technical Guide – River and Stream Systems: Erosion Hazard Limit

Medway Creek is located near the toe of the slope at Cross Sections A-A', B-B', C-C', F-F' and G-G'. Where detailed slope stability analyses have not been carried out, the Natural Hazards Manual by Ministry of Natural Resources indicates that a minimum toe erosion allowance of 5 m to 8 m is recommended where natural soils at the toe of the slope comprise compact to dense granular soils/tills (sand/silt till) and evidence of active erosion is present.

Considering the nature of the soils at the base of the slope, a conservative toe erosion allowance of 8 metres has been assigned to the base of the slope where the water course was within approximately 15 m of the toe of the slope.

In the area of Cross Sections D-D' and E-E' where the watercourse was more than 15 m away from the toe of the slope no toe erosion allowance was applied.

4.3 Erosion Access Allowance

The Erosion Access Allowance as specified in Section 3.4 of the MNR Technical Guide is a distance of 6 m from the top of the slope. This allowance is required in order to provide access for repairs to the slope from the top of the slope. EXP recommends that a distance of 6 m for the erosion access allowance be provided on the table land. No permanent structures should be constructed within the 6 m of the erosion access allowance.

4.4 Erosion Hazard Limit

As defined by the MNR Technical Guide, the Erosion Hazard Limit for confined systems includes the following three elements in determining the setback limits from a geotechnical standpoint:

- Erosion Access Allowance
- Stable Slope Setback
- Toe Erosion Allowance

The table below summarizes the components to the Development Limit Setback.

Table 8 – Erosion Hazard Limit Components

Cross Section	Toe Erosion Allowance (m)	Stable Slope Allowance (From Top of Slope, m)	Emergency Access Allowance (m)	Erosion Hazard Limit (From Top of Slope, m)
A-A'	8.0*	20.1	6.0	26.1
B-B'	8.0*	17.5	6.0	23.5
C-C'	8.0*	18.9	6.0	24.9
D-D'	0.0	0.3	6.0	6.3
E-E'	0.0	1.3	6.0	7.3
F-F'	8.0*	0.0	6.0	6.0
G-G'	8.0*	7.9	6.0	13.9

*Note: The Toe Erosion Allowance generally terminates within the slope from an aerial point of view, where the stable slope line is then applied. In this regard, the toe erosion allowance is factored into the stable slope allowance and no additional setback is required. Refer to cross sectional drawings.

The Toe Erosion Allowance, Stable Slope Setback and Erosion Hazard Limit are shown on **Drawings 2** to **9**. The footprint of the proposed structures should not encroach on the Erosion Hazard Limit.

4.5 UTRCA Generic Regulation

In May 2006, Ontario Regulation 157/06 came into effect in the Long Point Region Conservation Authority (LPRCA) watershed, which locally implements the Generic Regulation (Development, Interference with Wetlands and Alterations to Shoreline and Watercourses). This regulation replaces the former Fill, Construction and Alteration to Waterways regulations, and is intended to ensure public safety, prevent property damage and social disruption, due to natural hazards such as flooding and erosion. Ontario Regulation 178/06 is implemented by the local Conservation Authority, by means of permit issuance for works in or near watercourses, valleys, wetlands, or shorelines, when required.

Property owners must obtain permission from the LPRCA before beginning any development, site alteration, construction, or placement of fill within the regulated area. Permits are also required for any wetland interference, or for altering, straightening, diverting or interfering in any way with the existing channel of a creek, stream or river. Proposed development within the study area will be subject to the above referenced Regulation. Consultation with the local Conservation Authority for review of site-specific development plans is recommended in this regard.

4.6 Additional Comments

It is imperative that future development generally not occur within the Erosion Hazard Limit identified at the site. To this end, the following comments are provided, and measures are recommended.

- The site should be graded such that surface water is directed away from the slope. No water from the table land should be out-letted down the slope.
- Water from downspouts and perimeter weeping tile etc. should be collected in a controlled manner and directed away from the slope.
- Spoils from any excavation should be removed from the site. Excavated soils should not be placed over the table land near the crest of slope, unless the soil is placed as engineered structural fill. No net surcharge should be placed on the slope.
- During construction, stockpiles of materials, supplies and construction debris should be located away from the slope crest. Additional loading from stockpiled materials should be avoided in proximity to the slope crest.
- Debris littering the slope should be removed and vegetation on the slope should be maintained.
- Any bare spot or cracks observed at the slope should be revegetated.
- **Drawings 2** to **9** show the location of the Toe Erosion Allowance, Stable Slope Setback and Erosion Hazard Limit, where applicable.
- Based on the existing slope inclinations, heights, and stability analyses completed, it is acceptable for any structural footings to be founded on competent soils outside of the erosion hazard limit, being at least 6.0 m away from the top of the stable slope.
- A regular maintenance program should be implemented such as tree preservation, grading, and drainage control.

Final design drawings including building locations, services etc. should be reviewed by a geotechnical consultant to ensure that the Erosion Hazard Limit is properly interpreted. Geotechnical inspection and testing are recommended during construction to confirm that all recommendations set out will be followed.

5. General Comments

The information presented in this report is based on a limited investigation designed to provide information to support an assessment of the current geotechnical conditions within the subject property. The conclusions and recommendations presented in this report reflect site conditions existing at the time of the investigation. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent. Should this occur, EXP Services Inc. should be contacted to assess the situation, and the need for additional testing and reporting. EXP has qualified personnel to provide assistance in regards to any future geotechnical and environmental issues related to this property.

Our undertaking at EXP, therefore, is to perform our work within limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession.

The comments given in this report are intended only for the guidance of design engineers. The number of test holes required to determine the localized underground conditions between test holes 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.

EXP Services Inc. 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 afforded the privilege of making this review, EXP Services Inc. will assume no responsibility for interpretation of the recommendations in this report.

This report was prepared for the exclusive use of **Bridle Path North Arva Inc.** and may not be reproduced in whole or in part, without the prior written consent of EXP, or used or relied upon in whole or in part by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services 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.

We trust that this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Drawings

BH11
BH8/MW-A/B
BH9/MW
TP8
TP10
TP9
BH7/MW
TP7
Medway Road
Richmond Street
BH10
BH2/MW
BH3/MW
TP1
TP5
BH1/MW
TP4
TP2
TP6
BH4/MW
TP3
BH5/MW-A/B
BH6/MW

-LEGEND-

	Approximate Property Boundary
BH1/MW	Approximate Borehole Location
TP1	Approximate Test Pit Location

-NOTES-

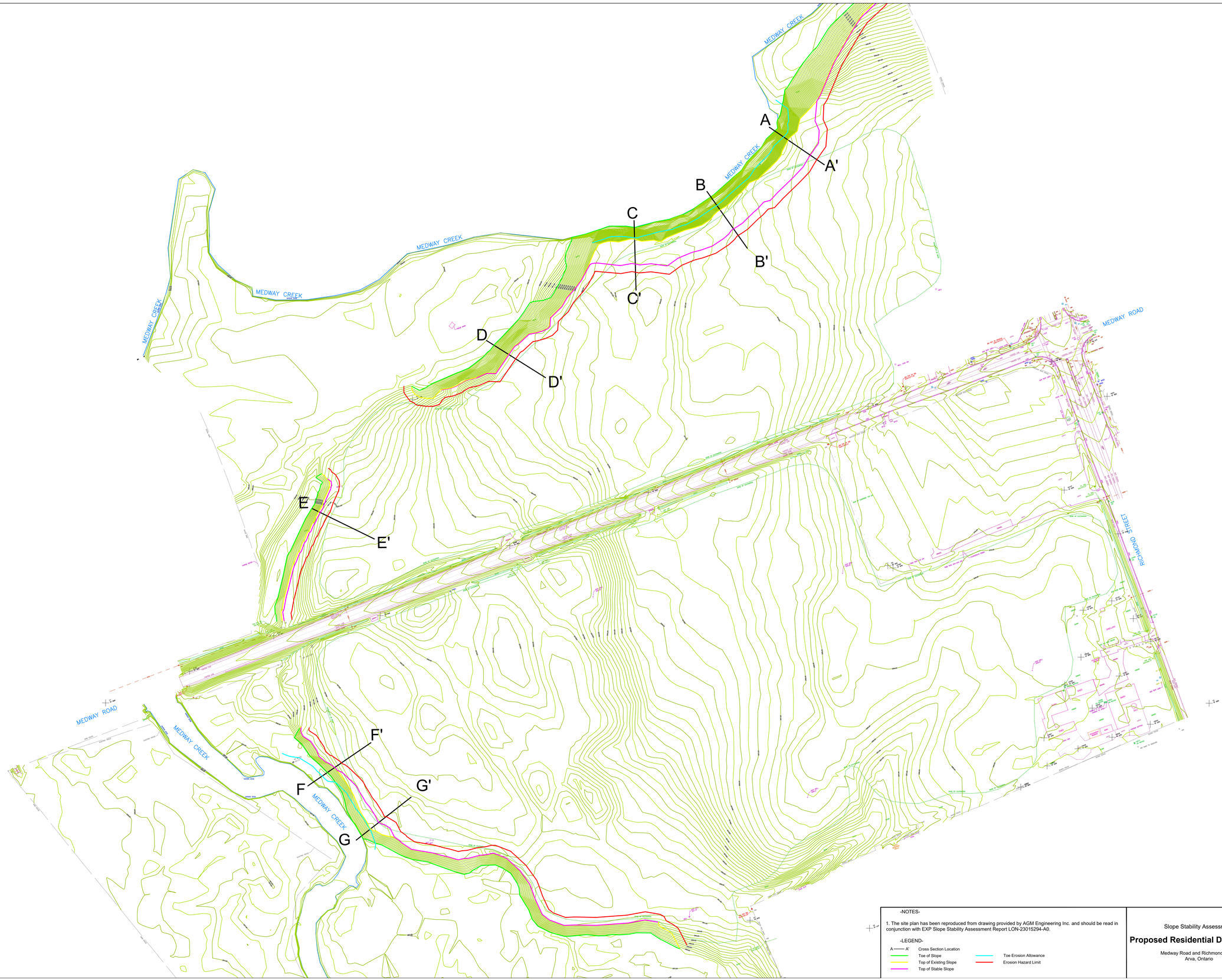
1. The site plan was reproduced from Google Earth Pro (July 2018) and should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

Slope Stability Assessment

Proposed Residential Development

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Test Hole Location Plan
DRAWN BY: E.B. / REVIEWED BY: C.S. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
APPROXIMATE SCALE: 1:4,000 / PROJECT NO.: LON-23015294-A0 / DWG.: 1	



-NOTES-

1. The site plan has been reproduced from drawing provided by AGM Engineering Inc. and should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

-LEGEND-

A——A' Cross Section Location
Toe of Slope
Top of Existing Slope
Top of Stable Slope
Toe Erosion Allowance
Erosion Hazard Limit

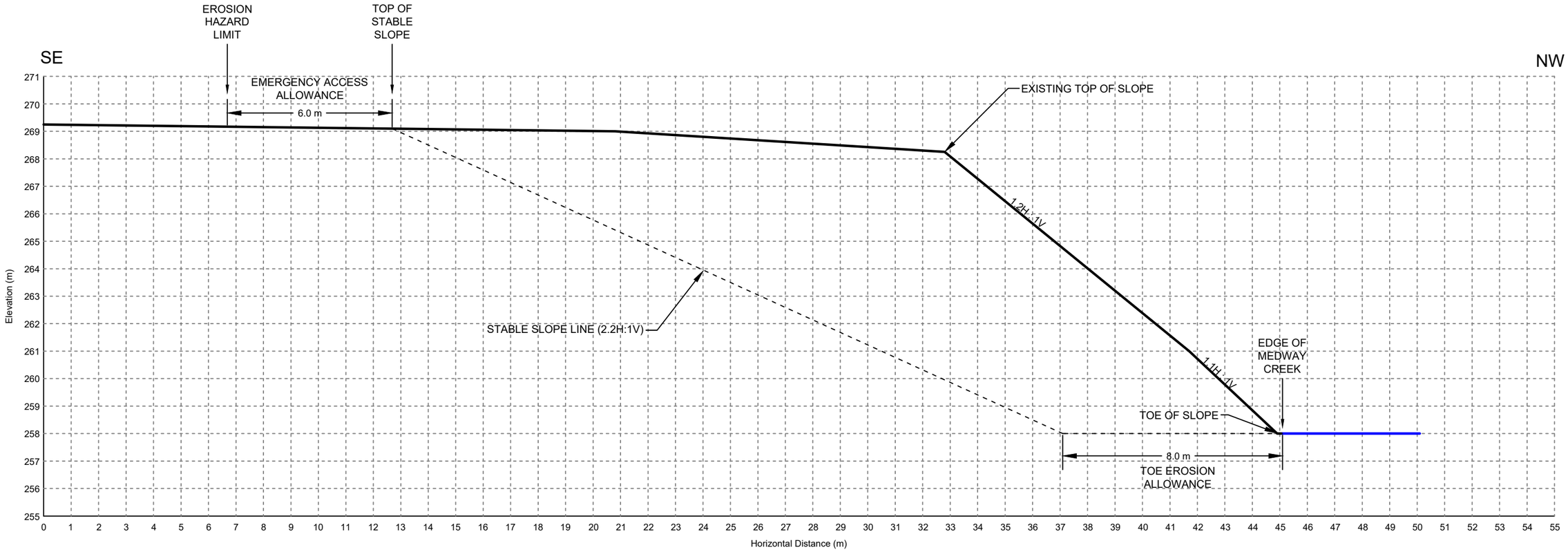
Slope Stability Assessment

Proposed Residential Development

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section Location Plan
DRAWN BY: C.S.	REVIEWED BY: E.B.
exp	EXP Services Inc. 15701 Robin's Hill Road, London, ON, N5V 0A5
DATE: MARCH 2024	SCALE: 1 : 1,250
PROJECT NO.: LON-23015294-A0	DWG: 2

Cross Section A - A'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

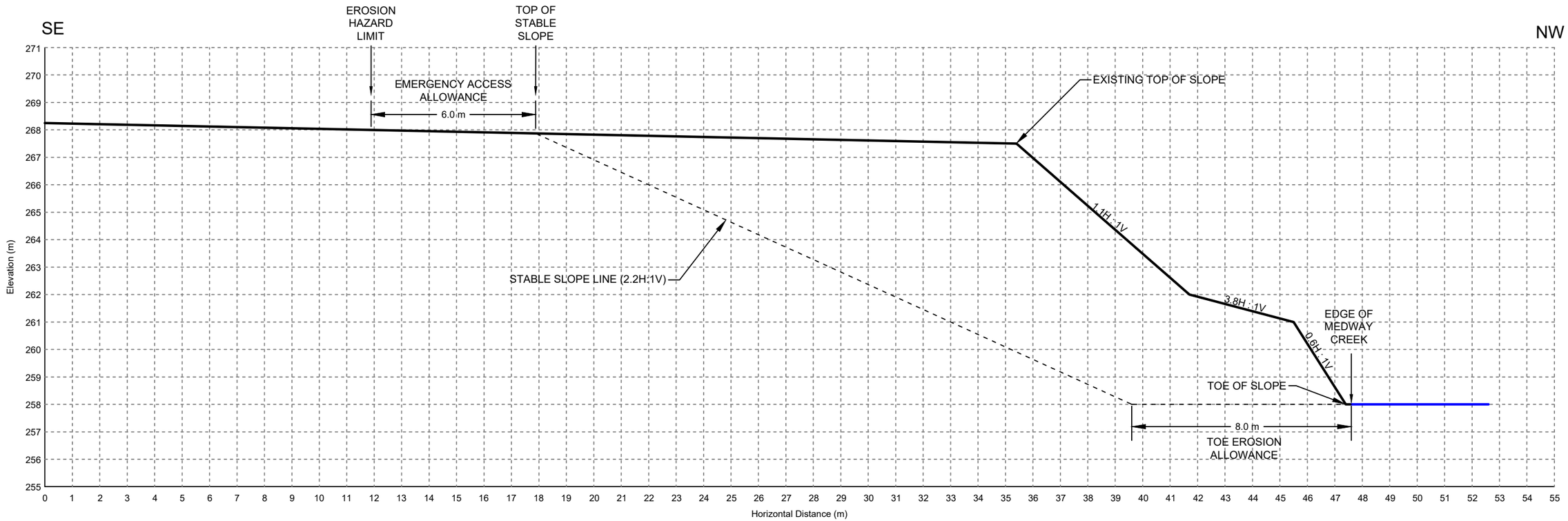
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section A - A'
DRAWN BY: C.S. / REVIEWED BY: E.B. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150 / PROJECT NO.: LON-23015294-A0 / DWG.: 3	

Cross Section B - B'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

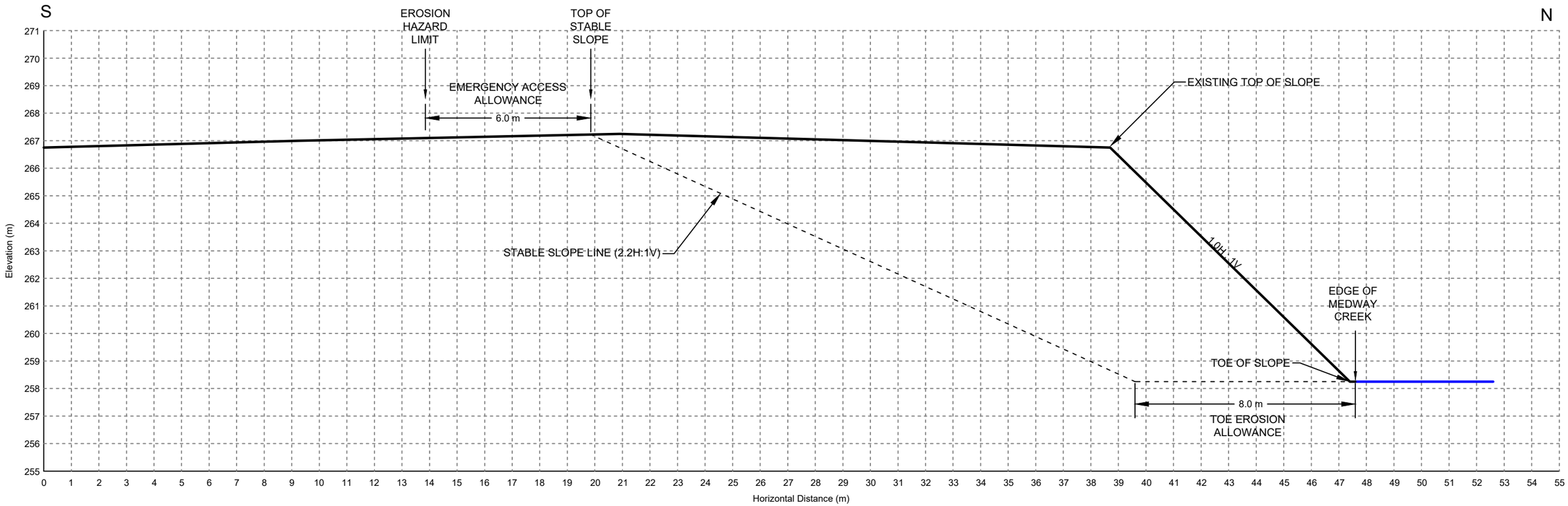
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section B - B'
DRAWN BY: C.S. / REVIEWED BY: E.B. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150 / PROJECT NO.: LON-23015294-A0 / DWG.: 4	

Cross Section C - C'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

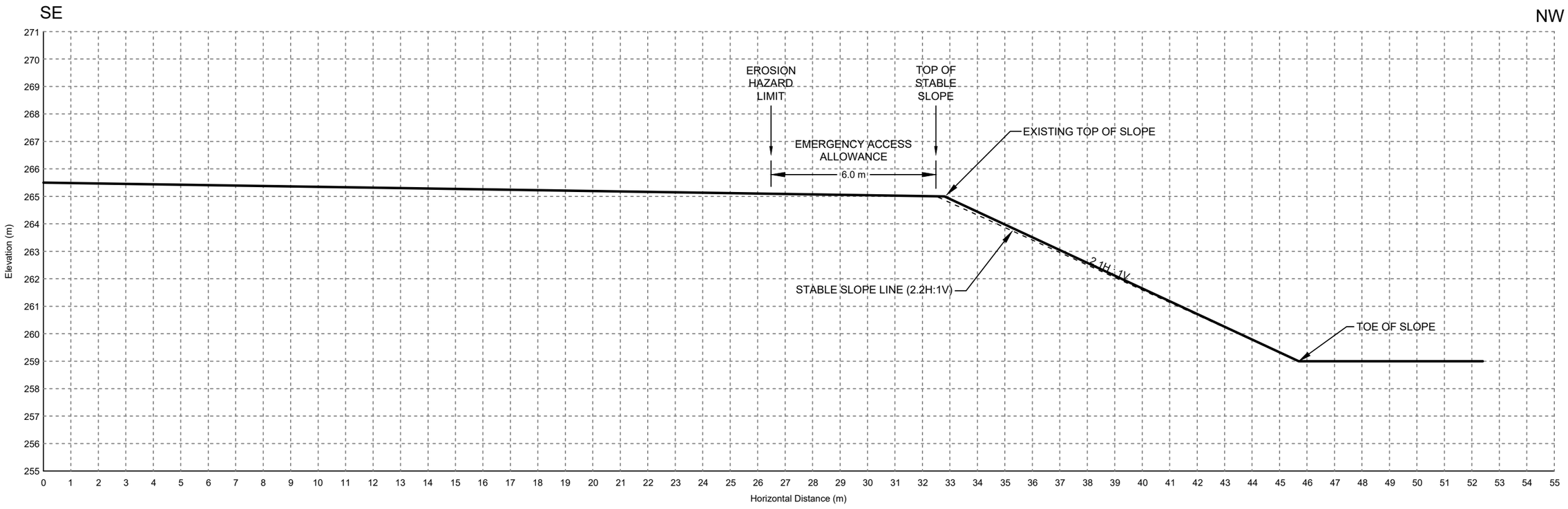
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT: Bridle Path North Arva Incorporated			
TITLE: Cross Section C - C'			
DRAWN BY: C.S.	REVIEWED BY: E.B.	DATE: MARCH 2024	
EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5			
SCALE: 1:150	PROJECT NO.: LON-23015294-A0	DWG.: 5	

Cross Section D - D'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

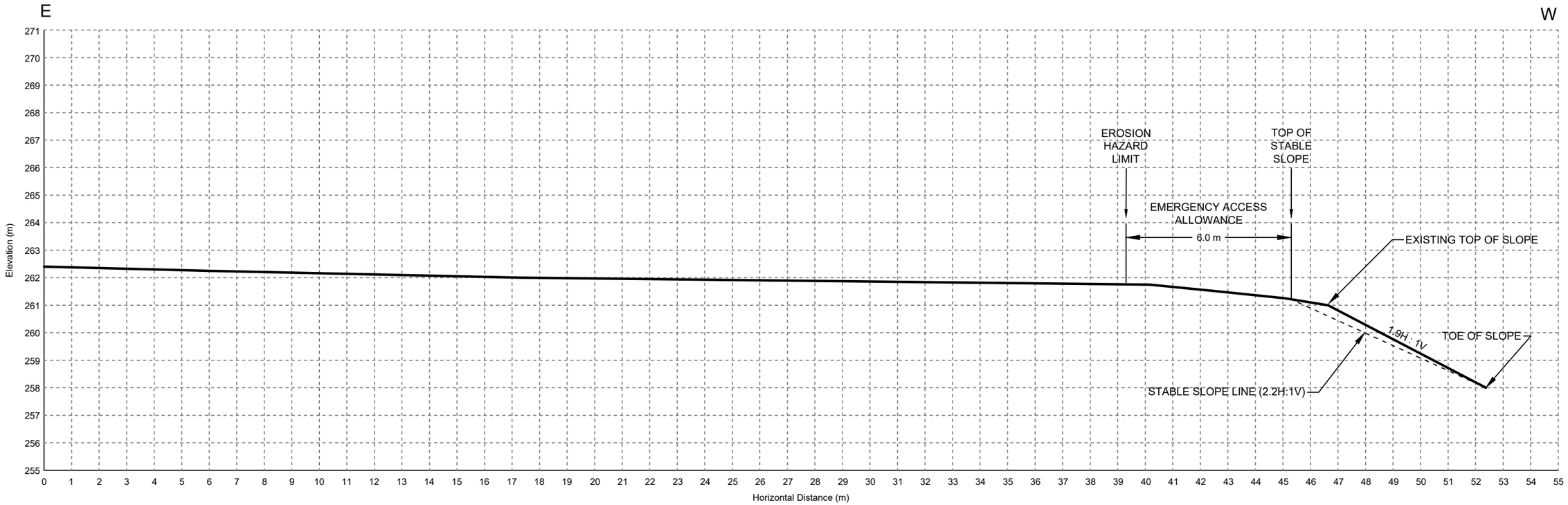
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section D - D'
DRAWN BY: C.S. / REVIEWED BY: E.B.	MARCH 2024
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150	PROJECT NO.: LON-23015294-A0 / DWG.: 6

Cross Section E - E'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

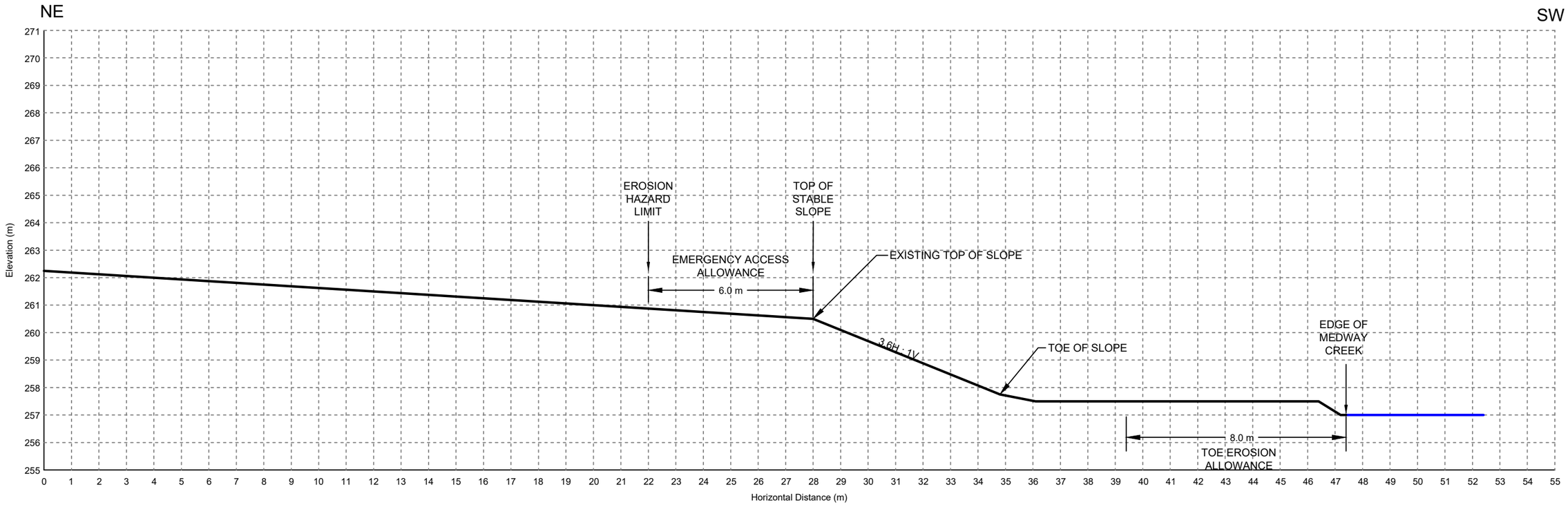
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section E - E'
DRAWN BY: C.S. / REVIEWED BY: E.B. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150 / PROJECT NO.: LON-23015294-A0 / DWG.: 7	

Cross Section F - F'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

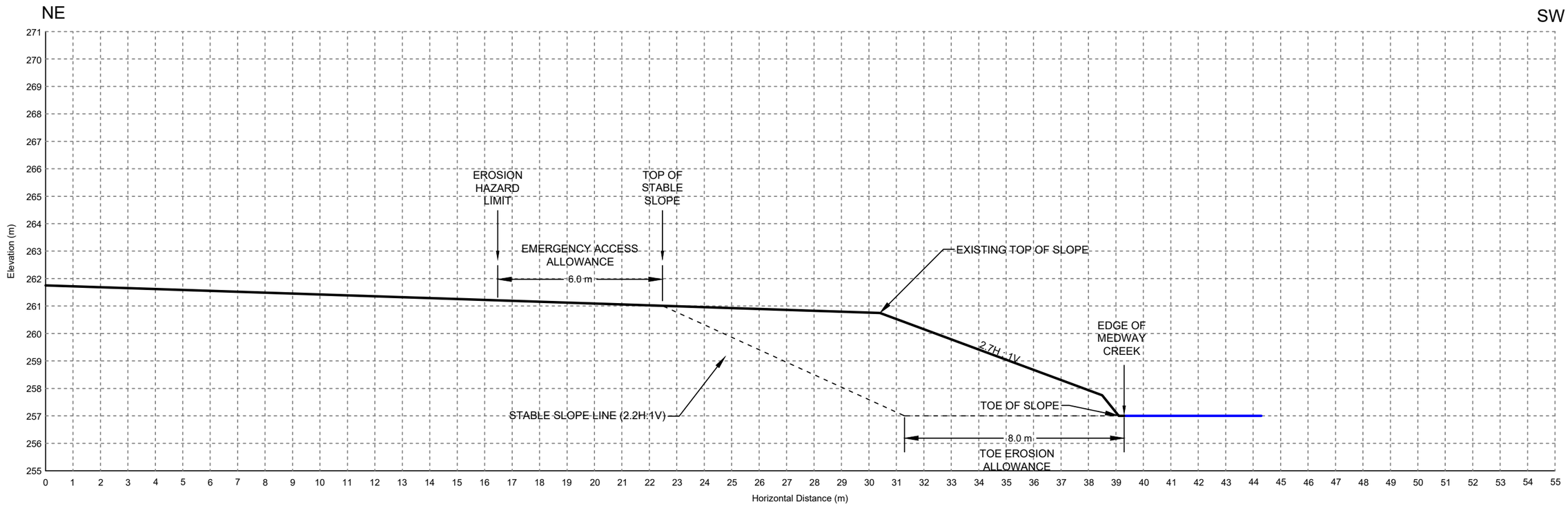
Geotechnical Investigation

Slope Stability Assessment

Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section F - F'
DRAWN BY: C.S. / REVIEWED BY: E.B. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150 / PROJECT NO.: LON-23015294-A0 / DWG.: 8	

Cross Section G - G'



-NOTES-

1. The cross section should be read in conjunction with EXP Slope Stability Assessment Report LON-23015294-A0.

Geotechnical Investigation

Slope Stability Assessment

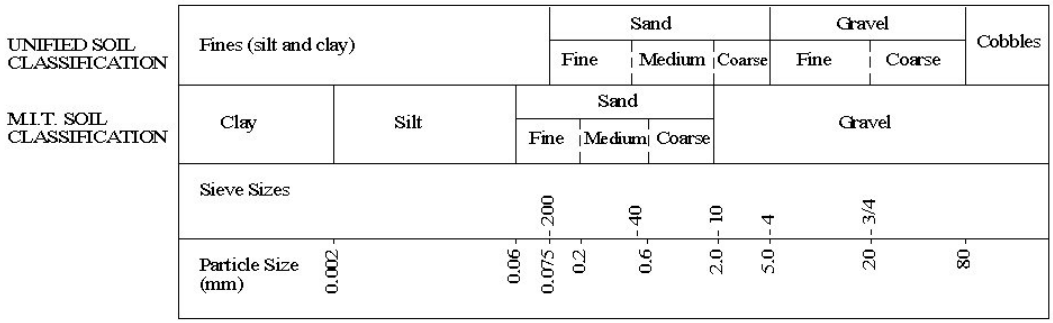
Medway Road and Richmond Street
Arva, Ontario

CLIENT	Bridle Path North Arva Incorporated
TITLE	Cross Section G - G'
DRAWN BY: C.S. / REVIEWED BY: E.B. / DATE: MARCH 2024	
	EXP Services Inc. 15701 Robin's Hill Road London, ON, N5V 0A5
SCALE: 1:150 / PROJECT NO.: LON-23015294-A0 / DWG.: 9	

Appendix A – Borehole Logs and Test Pit Summary

NOTES ON SAMPLE DESCRIPTIONS

1. All descriptions included in this report follow the 'modified' Massachusetts Institute of Technology (M.I.T.) soil classification system. The laboratory grain-size analysis also follows this classification system. Others may designate the Unified Classification System as their source; a comparison of the two is shown for your information. Please note that, with the exception of those samples where the grain size analysis has been carried out, all samples are classified visually and the accuracy of the visual examination is not sufficient to differentiate between the classification systems or exact grain sizing. The M.I.T. system has been modified and the EXP classification includes a designation for cobbles above the 75 mm size and boulders above the 200 mm size.



2. **Fill**: Where fill is designated on the borehole log, it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description therefore, may not be applicable as a general description of the site fill material. All fills should be expected to contain obstructions such as large concrete pieces or subsurface basements, floors, tanks, even though none of these obstructions may have been encountered in the borehole. Despite the use of borehole, the heterogeneous nature of fill will leave some ambiguity as to the exact and correct composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. The fill at this site has been monitored for the presence of methane gas and the results are recorded on the borehole logs. The monitoring process neither indicates the volume of gas that can be potentially generated or pinpoints the source of the gas. These readings are to advise of a potential or existing problem (if they exist) and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic waste that renders the material unacceptable for deposition in any but designated land fill sites; unless specifically stated, the fill on the site has not been tested for contaminants that may be considered hazardous. This testing and a potential hazard study can be carried out if you so request. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common, but not detectable using conventional geotechnical procedures.

3. **Glacial Till**: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process, the till must be considered heterogeneous in composition and as such, may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (75 to 200 mm in diameter) or boulders (greater than 200 mm diameter) and therefore, contractors may encounter them during excavation, even if they are not indicated on the borehole logs. It should be appreciated that normal sampling equipment can not differentiate the size or type of obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited area; therefore, caution is essential when dealing with sensitive excavations or dewatering programs in till material.

BOREHOLE LOG

BH1/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 2, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
	269.0								
0	268.7	**TOPSOIL** - 300 mm							
		SANDY SILT TILL - brown, trace clay, trace gravel, dilatant, very moist, compact			SS	SA 1	350	12	
1	267.6								
		SILT TILL - brown, some clay, some sand, trace gravel, damp to moist, compact			SS	SA 2	450	20	
2		- wet seam encountered near 2.0 m bgs			SS	SA 3	450	20	
3		- becoming grey near 2.7 m bgs			SS	SA 4	450	19	
4	265.0								
		SAND - brown, fine to medium-grained, trace silt, trace gravel, loose to compact, damp			SS	SA 5	450	28	
5		- becoming wet near 5.3 m bgs							
6					SS	SA 6	200	9	
7	261.9								
		SILT TILL - grey, trace to some clay, some clay, trace gravel, very dense, damp			SS	SA 7	450	62	
8	260.9								
		End of borehole at 8.1 m bgs.							
9									
10									
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

62

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH2/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**

PROJECT **Proposed Residential Development** DATUM **Geodetic**

LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 2, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	**269.2**								
	268.9	**TOPSOIL** - 300 mm							
1		**SAND and GRAVEL** - brown, trace silt, moist, compact - becoming wet near 1.1 m bgs			SS	SA 1	250	22	
2					SS	SA 2	150	18	
	266.5				SS	SA 3	200	13	
3	266.0	**SANDY SILT** - brown, trace clay, moist, compact							
		SILT TILL - grey, some clay, some sand, trace gravel, moist, compact to dense			SS	SA 4	325	11	
4									
5					SS	SA 5	450	11	
6									
					SS	SA 6	400	15	
7		- dilatant silt layering encountered near 6.4 m bgs - wet and fine grained sand layer encountered near 6.6 m bgs							
8		- possible cobble encountered near 7.9 m bgs			SS	SA 7	400	36	
	260.6								
9		**SILT TILL** - grey, some coarse gravel, trace clay, damp, dense							
	259.6				SS	SA 8	450	43	
10		**End of borehole at 9.6 m bgs.**							
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH3/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 2, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	262.4								
	262.1	**TOPSOIL** - 300 mm							
1	261.0	**FILL** - sandy silt, dark brown, trace clay, trace gravel, trace organics, moist, loose			SS	SA 1	300	5	
2	259.9	**SAND and GRAVEL** - brown, trace silt, moist, compact - becoming wet near 1.9 m bgs			SS	SA 2	300	10	
3	258.3	**SILT TILL** - brown, clayey to trace clay, some sand, trace gravel, moist, stiff/compact - dilatant layering encountered near 3.4 m bgs			SS	SA 3	400	9	
4					SS	SA 4	450	13	
5		**SAND** - brown/grey, fine to medium grained, trace silt, wet, loose to compact - silt layering encountered near 4.8 m bgs - becoming grey near 5.3 m bgs			SS	SA 5	450	9	
6	255.8				SS	SA 6	450	15	
7		**End of borehole at 6.6 m bgs.**							
8									
9									
10									
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH4/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 1, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)
0	268.1					
	267.9	**TOPSOIL** - 200 mm				
		SAND and GRAVEL - brown, trace silt, moist, dense	SS	SA 1	300	38
1						
	266.5	- becoming wet near 1.4 m bgs	SS	SA 2	350	16
		SILT - brown, some sand, some gravel, trace clay, very moist to wet, compact	SS	SA 3	450	17
2						
		- becoming grey near 2.9 m bgs	SS	SA 4	200	17
3						
4						
			SS	SA 5	450	26
5						
	262.6					
		SAND - fine to medium grained, grey, trace silt, moist, compact	SS	SA 6	350	28
6						
7						
			SS	SA 7	300	24
8						
		- becoming wet near 8.6 m bgs				
9						
	258.5		SS	SA 8	450	28
10		**End of borehole at 9.6 m bgs.**				
11						
12						
13						

MOISTURE CONTENT (%)

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH5/MW - A
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 1, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	261.4								
	261.2	**TOPSOIL** - 250 mm							
		SANDY SILT - brown, trace clay, weathered, moist to very moist, dilatant, compact							
1					SS	SA 1	300	11	
					SS	SA 2	300	12	
2		- becoming wet near 1.9 m bgs			SS	SA 3	400	13	
3					SS	SA 4	450	15	
4		- becoming grey near 3.8 m bgs							
		- stiff clay layering near 3.8 m bgs			SS	SA 5	450	9	
5	255.9								
		SAND - grey, fine to medium grained, trace silt, wet, compact							
6					SS	SA 6	400	23	
7									
8	253.4				SS	SA 7	400	15	
		End of borehole at 8.1 m bgs.							
9									
10									
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH5/MW - B
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**

PROJECT **Proposed Residential Development** DATUM **Geodetic**

LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 1, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
0	261.5									S Field Vane Test (#=Sensitivity); Penetrometer; Torvane; 100 200 kPa; W_P W W_L; SPT N Value; Dynamic Cone; 10 20 30 40
0	261.2	**TOPSOIL** - 250 mm								
		SANDY SILT - brown, trace clay, weathered, moist to very moist, dilatant, compact								
1										
2		- becoming wet near 1.9 m bgs								
3										
4		- becoming grey near 3.8 m bgs								
	256.9									
5		**End of borehole at 4.6 m bgs.**								
6										
7										
8										
9										
10										
11										
12										
13										

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) bgs denotes below ground surface.

SAMPLE LEGEND
- AS Auger Sample
- SS Split Spoon
- ST Shelby Tube
- Rock Core (eg. BQ, NQ, etc.)
- VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
- Apparent
- Measured
- Artesian (see Notes)

BOREHOLE LOG

BH6/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 1, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	261.1								
	260.9	**TOPSOIL** - 200 mm							
	260.2	**SANDY SILT** - brown, trace organics, moist							
1	259.7	**SAND and GRAVEL** - brown, trace silt, moist, dense			SS	SA 1	250	38	
		SILT - brown, trace to some sand, trace clay, very moist to wet, loose compact			SS	SA 2	300	7	
2		- dilatant layering encountered near 2.3 m bgs			SS	SA 3	450	13	
3		- becoming grey near 2.9 m bgs			SS	SA 4	400	6	
	257.3								
4		**SAND** - brown, fine to medium grained, trace silt, wet, compact							
5					SS	SA 5	450	29	
6									
	254.5				SS	SA 6	450	11	
7		**End of borehole at 6.6 m bgs.**							
8									
9									
10									
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

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2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH7/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 3, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
	261.1									S Field Vane Test (#=Sensitivity); ▲ Penetrometer; ■ Torvane; 100 – 200 kPa; W_P W W_L; ● SPT N Value; × Dynamic Cone; 10 20 30 40
0	260.9	**TOPSOIL** - 250 mm								
		FILL - silt, brown, trace to some clay, some sand, trace gravel, moist, loose								
1		- dilatant layering encountered near 1.1 m bgs			SS	SA 1	300	6		
					SS	SA 2	400	4		
2	258.7									
		SAND - brown, fine to medium grained, trace to some silt, moist, compact			SS	SA 3	300	10		
3		- becoming wet near 2.7 m bgs			SS	SA 4	300	14		
4										
5	255.6				SS	SA 5	400	10		
		SANDY SILT - brown, dilatant, very moist to wet, compact								
6	254.6				SS	SA 6	450	13		
		End of borehole at 6.6 m bgs.								
7										
8										
9										
10										
11										
12										
13										

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▯ Rock Core (eg. BQ, NQ, etc.) ▯ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

BH8/MW - A
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 3, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	266.7								
	266.4	**TOPSOIL** - 300 mm							
1		**SAND and GRAVEL** - brown, trace silt, damp to moist, compact to dense			SS	SA 1	250	30	
2	264.6				SS	SA 2	300	21	
		SANDY SILT - brown, dilatant, wet, compact			SS	SA 3	300	14	
3	263.8	**CLAYEY SILT TILL** - grey, trace to some sand, moist, stiff to very stiff			SS	SA 4	450	16	
4		- damp silt laminations throughout							
5	261.1				SS	SA 5	450	12	
		SILT TILL - grey, trace clay, some sand, trace gravel, damp, dense to very dense							
6					SS	SA 6	450	26	
7									
8					SS	SA 7	300	70	
		- dilatant silt layering encountered near 8.4 m bgs							
9					SS	SA 8	300	46	
10									
11					SS	SA 9	450	45	
		- wet, medium to coarse grained sand layering encountered near 11.0 m bgs							
12	254.1				SS	SA 10	450	41	
13		**End of borehole at 12.7 m bgs.**							

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH8/MW - B
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 3, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
0	266.7									
	266.4	**TOPSOIL** - 300 mm								
		SAND and GRAVEL - brown, trace silt, damp to moist, compact to dense								
1										
2	264.6									
		SANDY SILT - brown, dilatant, wet, compact								
	263.8									
3	263.7	**CLAYEY SILT TILL** - grey, trace to some sand, moist, stiff to very stiff - damp silt laminations throughout								
		End of borehole at 3.0 m bgs.								
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH9/MW
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**

PROJECT **Proposed Residential Development** DATUM **Geodetic**

LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 4, 2021** Water Level **Mar 30/22**

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	271.0								
	270.8	**TOPSOIL** - 200 mm							
		SANDY SILT - brown, trace clay, trace organics, moist, very loose			SS	SA 1	300	3	
1	269.6								
		SILT - brown, trace clay, trace sand, weathered, moist, loose to compact			SS	SA 2	350	8	
2	268.8								
	268.4	**SAND and GRAVEL** - brown, trace silt, wet, loose			SS	SA 3	400	6	
3		**SILT** - brown, some clay, trace to some sand, trace gravel, dilatant, moist, loose			SS	SA 4	200	5	
4	266.9								
		CLAYEY SILT TILL - grey, trace sand, trace gravel, moist, stiff to very stiff			SS	SA 5	450	8	
5									
6					SS	SA 6	450	16	
7	263.9								
		SILT TILL - grey, trace clay, some sand, trace gravel, moist, very dense			SS	SA 7	450	60	
8									
9	261.4				SS	SA 8	400	64	
10		**End of borehole at 9.6 m bgs.**							
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value × Dynamic Cone
10 20 30 40

60
64

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) No significant methane gas detected upon completion of drilling.
3) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH9-DCT
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 4, 2021** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)	SHEAR STRENGTH / Atterberg Limits and Moisture
0	271.0									
6	264.9	**End of borehole at 6.1 m bgs.**								

SHEAR STRENGTH
✤ S Field Vane Test (#=Sensitivity)
▲ Penetrometer ■ Torvane
100 200 kPa
Atterberg Limits and Moisture
W_P W W_L
● SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) Dynamic Cone Penetration Testing performed adjacent to BH9. Please refer to the stratigraphy from BH9.
3) bgs denotes below ground surface.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▯ Rock Core (eg. BQ, NQ, etc.) ▯ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

BH10
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 2, 2021** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	269.5								
	269.3	**TOPSOIL** - 250 mm							
		CLAYEY SILT TILL - brown, trace sand, dilatant layering, moist, stiff			SS	SA 1	300	11	
1									
	267.8				SS	SA 2	350	11	
2		**SILT TILL** - brown, some clay, some sand, trace gravel, moist, compact							
	267.1				SS	SA 3	300	23	
	266.6	**SAND and GRAVEL** - brown, trace silt, very moist, compact							
3		**SILT TILL** - grey, some clay, some sand, trace gravel, moist, compact			SS	SA 4	300	13	
4									
	264.6				SS	SA 5	450	14	
5		- dilatant sandy silt lens encountered near 4.7 m bgs							
	263.9	**SAND** - brown, fine to medium grained, trace silt, wet, compact							
6		**CLAYEY SILT TILL** - grey, trace sand, trace gravel, moist, stiff			SS	SA 6	450	14	
	262.4								
7		**SILT TILL** - grey, trace to some clay, some sand, damp, very dense							
8					SS	SA 7	350	54	
9		- very moist to wet silt layering encountered near 8.6 m bgs.							
	259.9				SS	SA 8	450	82	
10		**End of borehole at 9.6 m bgs.**							
11									
12									
13									

SHEAR STRENGTH
S Field Vane Test (#=Sensitivity)
Penetrometer Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
SPT N Value Dynamic Cone
10 20 30 40

54
82

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) Borehole open to 5.2 m bgs and water observed near 4.6 m bgs upon completion of drilling.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.

SAMPLE LEGEND
AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
Apparent Measured Artesian (see Notes)

BOREHOLE LOG

BH11
Sheet 1 of 1

CLIENT **Bridle Path North Arva Incorporated** PROJECT NO. **LON-23015294-A0**
PROJECT **Proposed Residential Development** DATUM **Geodetic**
LOCATION **Medway Road & Richmond Street, Arva, ON** DATES: Boring **March 4, 2021** Water Level

DEPTH (m bgs)	ELEVATION (~m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm)	SAMPLES N VALUE (blows)	MOISTURE CONTENT (%)
0	268.8								
	268.6	**TOPSOIL** - 200 mm							
		SAND and GRAVEL - brown, trace silt, occasional cobbles, moist, loose			SS	SA 1	50	5	
1	267.4								
		SAND - light brown, fine to medium grained, trace silt, moist, compact			SS	SA 2	400	15	
2	266.6								
		SILT - brown, trace clay, trace sand, moist, compact			SS	SA 3	450	17	
3		- becoming grey near 2.9 m bgs			SS	SA 4	450	16	
4	264.7								
		CLAYEY SILT TILL - grey, trace sand, trace gravel, moist, stiff			SS	SA 5	450	11	
5									
6	262.3				SS	SA 6	450	41	
		SILTY SAND - grey, wet, dense							
7									
8	260.7				SS	SA 7	450	50*	
		End of borehole at 8.1 m bgs.							
9									
10									
11									
12									
13									

SHEAR STRENGTH
✤ S Field Vane Test (#=Sensitivity)
▲ Penetrometer ■ Torvane
100 200 kPa

Atterberg Limits and Moisture
W_P W W_L
● SPT N Value × Dynamic Cone
10 20 30 40

NOTES

1) Borehole Log interpretation requires assistance by EXP before use by others. Borehole Log must be read in conjunction with EXP Report LON-23015294-A0.
2) * denotes 50 blows per less than 150 mm split spoon sampler penetration.
3) No significant methane gas detected upon completion of drilling.
4) bgs denotes below ground surface.

SAMPLE LEGEND
☒ AS Auger Sample ▨ SS Split Spoon ■ ST Shelby Tube
▣ Rock Core (eg. BQ, NQ, etc.) ▣ VN Vane Sample

OTHER TESTS

G Specific Gravity	C Consolidation
H Hydrometer	CD Consolidated Drained Triaxial
S Sieve Analysis	CU Consolidated Undrained Triaxial
γ Unit Weight	UU Unconsolidated Undrained Triaxial
P Field Permeability	UC Unconfined Compression
K Lab Permeability	DS Direct Shear

WATER LEVELS
▽ Apparent ▼ Measured ▲ Artesian (see Notes)

Depth (m below grade)	**Soil Description**
TP1	Approximate Elevation: 267.7 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 1.8	FILL – silt, brown, trace clay, some sand, some gravel, loose, moist
1.2	- concrete rubble encountered near 1.2 m bgs
1.8 – 3.0	SANDY SILT – brown, trace clay, some gravel, compact, moist to very moist
3.0	*Test pit terminated.*
	Test pit sidewalls caved near 1.2 m below grade during excavation; minor groundwater seepage was observed near 1.2 m below grade upon completion of excavation.
TP2	Approximate Elevation: 267.2 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 0.50	SILT – dark brown, weathered, some sand, trace organics, loose, moist
0.50 – 1.5	SAND AND GRAVEL – brown, trace silt, compact, moist
1.5 – 3.0	SILT TILL – brown, trace to some clay, some sand, trace gravel, compact, moist
3.0	*Test pit terminated.*
	Test pit was open upon completion of excavation; no groundwater seepage was observed upon completion of excavation.
TP3	Approximate Elevation: 266.6 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 2.0	SAND AND GRAVEL – brown, trace silt, compact, moist
1.2	- becoming wet near 1.2 m bgs
2.0	*Test pit terminated.*
	Test pit sidewalls caved near 0.9 m below grade during excavation; groundwater seepage was observed near 1.2 m below grade upon completion of excavation.
TP4	Approximate Elevation: 264.2 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 0.90	SAND AND GRAVEL – brown, trace silt, compact, moist
0.90 – 3.0	SAND – brown, fine to medium grained, trace silt, compact, moist
3.0	*Test pit terminated.*
	Test pit was open upon completion of excavation; no groundwater seepage was observed upon completion of excavation.

TP5	Approximate Elevation: 262.5 m
0.00 – 0.20	TOPSOIL – 200 mm
0.20 – 1.4	SAND AND GRAVEL – brown, trace silt, compact, moist
1.4 – 3.0	SAND – brown, medium to coarse grained, trace silt, some fine gravel, compact, moist
3.0	*Test pit terminated.*
	Test pit was open to 2.3 m below grade upon completion of excavation; no groundwater seepage was observed upon completion of excavation.
TP6	Approximate Elevation: 262.2 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 2.6	SAND AND GRAVEL – brown, trace silt, compact, moist
2.6 – 3.0	SAND – brown, fine to medium grained, trace silt, compact, moist
3.0	*Test pit terminated.*
	Test pit was open upon completion of excavation; no groundwater seepage was observed upon completion of excavation.
TP7	Approximate Elevation: 263.6 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 2.0	FILL – sandy silt, brown, trace clay, some gravel, loose, moist
2.0 – 3.0	SAND AND GRAVEL – brown, trace silt, compact, moist
3.0	*Test pit terminated.*
	Test pit sidewalls caved near 2.0 m below grade during excavation; no groundwater seepage was observed upon completion of excavation.
TP8	Approximate Elevation: 265.8 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 0.60	SILT – brown, trace clay, trace sand, some gravel, loose, moist
0.60 – 1.6	SAND AND GRAVEL – brown, trace silt, compact, moist
1.6 – 2.5	SAND – brown, fine to medium grained, trace silt, trace to some gravel, compact, moist
2.5	*Test pit terminated.*
	Test pit was open upon completion of excavation; minor groundwater seepage was observed near 1.2 m below grade upon completion of excavation.
TP9	Approximate Elevation: 266.7 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 0.60	SILT – brown, some clay, trace sand, cobbles/boulder, loose, moist
0.60 – 1.2	SAND AND GRAVEL – brown, trace silt, compact, moist
1.2 – 2.5	SILT TILL – brown, some clay, some sand, trace gravel, compact, moist
1.2	- becoming wet near 1.2 m bgs
2.5	*Test pit terminated.*
	Test pit was open upon completion; minor groundwater seepage was observed near 1.2 m below grade upon completion of excavation.

TP10	Approximate Elevation: 268.0 m
0.00 – 0.30	TOPSOIL – 300 mm
0.30 – 1.3	SILTY SAND – brown, occasional silt layering, loose, moist to very moist
1.3 – 1.6	SAND AND GRAVEL – brown, trace silt, compact, wet
1.6 – 2.5	SILT TILL – grey, some clay, some sand, some gravel, compact, moist
2.5	*Test pit terminated.*
	Test pit was open upon completion of excavation; groundwater seepage was observed near 1.3 m bgs upon completion of excavation.

Notes: Test pits were excavated on March 1, 2021.

Ground surface elevations inferred from topographic plan provided by client.

Appendix B – Water Level Readings

KCH-21002415-A0

Medway Creek, Arva, Ontario

Groundwater Elevation Monitoring

Well ID	BH1/MW	BH2/MW	BH3/MW	BH4/MW	BH5/MW-A	BH5/MW-B	BH6/MW	BH7/MW	BH8/MW-A	BH8/MW-B	BH9/MW
Ground Surface Elevation (m amsl)	269.01	269.20	262.37	268.12	261.44	261.49	261.06	261.14	266.70	266.70	270.95
Top of Pipe Elevation (m amsl)	270.02	270.14	263.53	269.06	262.52	262.53	262.14	262.31	267.54	267.79	271.96
Groundwater Elevation (m amsl)											
12-Mar-21	262.76	268.17	260.20	Dry	257.53	259.99	258.07	258.16	260.55	265.07	269.91
30-Apr-21	262.83	267.43	Dry	Dry	256.54	259.40	257.81	257.61	260.39	264.90	269.84
05-May-21	262.82	267.37	Dry	Dry	256.52	259.28	257.78	257.58	260.35	264.88	269.42
28-Jun-21	262.74	267.25	Dry	260.62	256.63	257.99	257.68	257.59	260.14	264.90	269.16
30-Jul-21	262.68	--	--	260.55	256.55	257.36	257.53	257.42	260.10	264.76	269.11
26-Aug-21	262.62	--	--	260.43	256.67	257.07	257.42	257.39	260.01	264.69	268.96
22-Sep-21	262.66	266.89	Dry	260.53	256.87	257.07	257.50	257.51	260.06	264.69	269.05
12-Oct-21	262.72	267.83	--	Dry	256.86	258.50	257.78	257.83	260.31	265.01	269.56
23-Nov-21	262.83	267.85	Dry	Dry	256.72	260.09	257.91	257.89	260.74	264.89	269.68
07-Dec-21	262.87	268.05	260.08	Dry	256.86	260.36	258.04	258.09	260.62	265.02	269.84
07-Jan-22	262.87	267.70	Dry	Dry	256.64	259.93	257.97	257.84	260.52	264.95	269.61
10-Feb-22	262.82	267.29	Dry	Dry	256.52	259.08	257.82	257.59	260.34	264.82	269.32
30-Mar-22	262.94	267.98	260.35	Dry	256.82	260.28	258.09	258.02	260.63	265.02	269.41
22-Jun-22	262.88	267.23	Dry	Dry	256.49	258.44	257.83	257.55	260.32	264.86	269.26
20-Sep-22	262.76	266.76	259.51	Dry	256.67	Dry	257.72	257.35	260.01	264.59	268.81
21-Dec-22	262.70	266.67	259.50	Dry	256.55	Dry	257.65	257.52	260.06	264.50	268.85
17-Mar-23	262.82	268.14	259.52	Dry	257.36	Dry	257.97	258.76	260.43	264.95	269.83
13-Jun-23	262.90	267.27	259.52	Dry	256.45	258.57	257.89	257.65	260.40	264.86	269.31
22-Sep-23	262.82	267.18	259.53	Dry	256.52	Dry	257.79	257.56	260.28	264.77	269.09

Groundwater Level Monitoring

Well ID	BH1/MW	BH2/MW	BH3/MW	BH4/MW	BH5/MW-A	BH5/MW-B	BH6/MW	BH7/MW	BH8/MW-A	BH8/MW-B	BH9/MW
Groundwater Level (m bgs)											
12-Mar-21	6.25	1.04	2.18	Dry	3.92	1.50	2.98	2.98	6.15	1.63	1.04
30-Apr-21	6.18	1.78	Dry	Dry	4.91	2.09	3.24	3.53	6.31	1.80	1.11
05-May-21	6.19	1.84	Dry	Dry	4.93	2.21	3.27	3.56	6.35	1.82	1.53
28-Jun-21	6.27	1.96	Dry	7.49	4.82	3.50	3.37	3.55	6.56	1.80	1.79
30-Jul-21	6.33	--	--	7.56	4.90	4.13	3.52	3.72	6.60	1.94	1.84
26-Aug-21	6.39	--	--	7.68	4.78	4.42	3.63	3.75	6.69	2.01	1.99
22-Sep-21	6.35	2.32	Dry	7.58	4.58	4.42	3.55	3.63	6.64	2.01	1.90
12-Oct-21	6.29	1.38	--	Dry	4.59	2.99	3.27	3.31	6.39	1.69	1.39
23-Nov-21	6.18	1.36	Dry	Dry	4.73	1.40	3.14	3.25	5.96	1.81	1.27
07-Dec-21	6.14	1.16	2.30	Dry	4.59	1.13	3.01	3.05	6.08	1.68	1.11
07-Jan-22	6.14	1.51	Dry	Dry	4.81	1.56	3.08	3.30	6.18	1.75	1.34
10-Feb-22	6.19	1.92	Dry	Dry	4.93	2.41	3.23	3.55	6.36	1.88	1.63
30-Mar-22	6.07	1.23	2.03	Dry	4.63	1.21	2.96	3.12	6.07	1.68	1.54
22-Jun-22	6.13	1.98	Dry	Dry	4.96	3.05	3.22	3.59	6.38	1.84	1.69
20-Sep-22	6.25	2.45	2.87	Dry	4.78	Dry	3.33	3.79	6.69	2.11	2.14
21-Dec-22	6.31	2.54	2.88	Dry	4.90	Dry	3.40	3.62	6.64	2.20	2.10
17-Mar-23	6.19	1.07	2.86	Dry	4.09	Dry	3.08	2.38	6.27	1.75	1.12
13-Jun-23	6.11	1.94	2.86	Dry	5.00	Dry	3.16	3.49	6.30	1.84	1.64
22-Sep-23	6.19	2.03	2.85	Dry	4.93	Dry	3.26	3.58	6.42	1.93	1.86

Notes:

-- indicates not measured

Appendix C – MNR Slope Rating Charts

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section A-A

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	16
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	6
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	8
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	4
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	0
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	6
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	6
Yes	6	
Slope Instability Rating		55

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section B-B

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	16
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	6
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	8
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	4
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	0
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	6
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	6
Yes	6	
Slope Instability Rating		55

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section C-C

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	16
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	6
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	8
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	8
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	0
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	6
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	6
Yes	6	
Slope Instability Rating		59

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section D-D

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	6
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	0
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	4
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	4
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	2
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	0
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	0
Yes	6	
Slope Instability Rating		25

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section E-E

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	16
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	0
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	2
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	0
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	2
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	0
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	0
Yes	6	
Slope Instability Rating		29

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section F-F

Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	0
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	0
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	2
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	0
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	2
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	6
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	0
Yes	6	
Slope Instability Rating		19

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

Slope Stability Rating Chart

Geotechnical Principles for Stable Slopes
Ontario Ministry of Natural Resources

Cross Section G-G

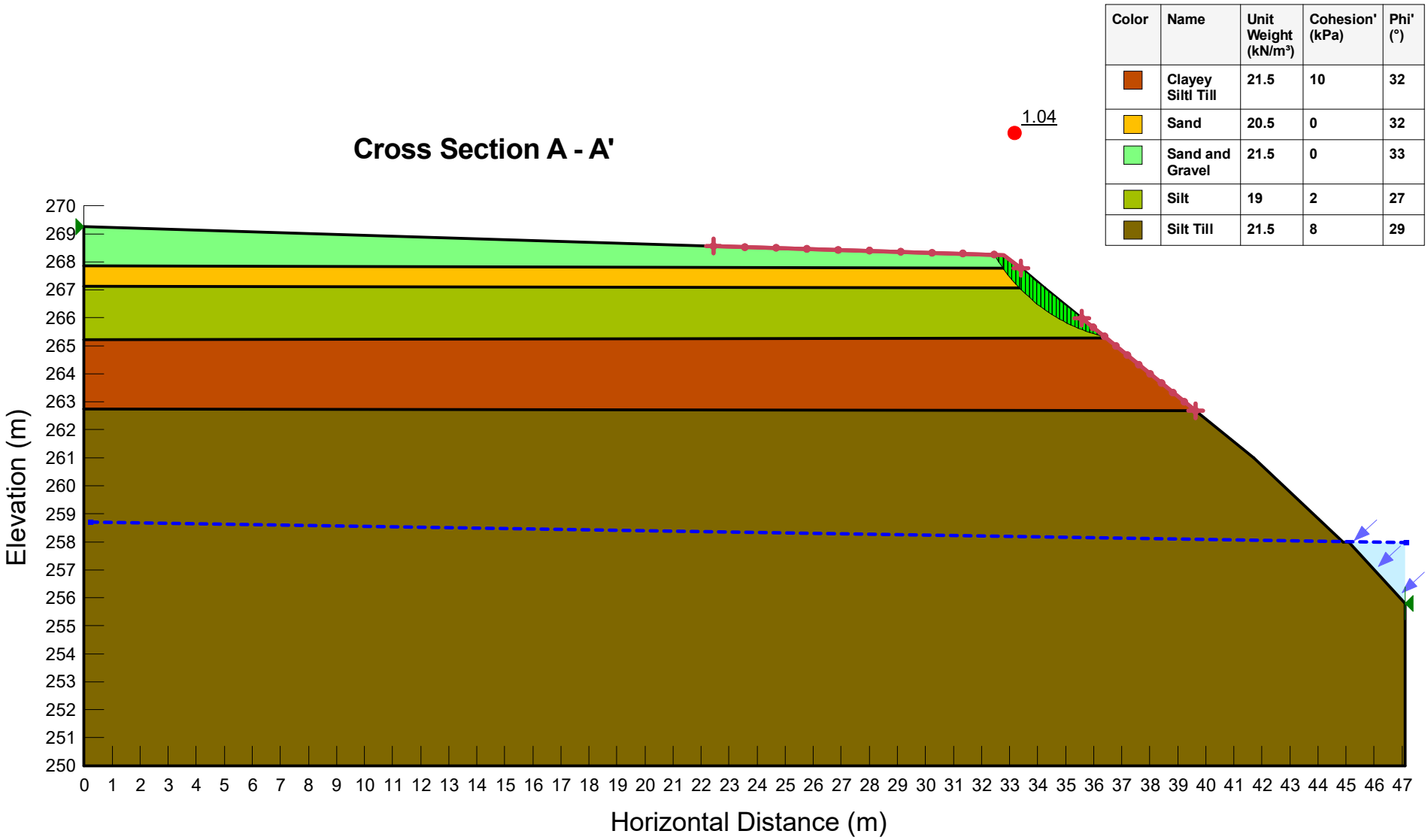
Site Location: Medway Rd and Richmond St	**Project No.:** LON-23015294-A0
Town/City: Arva, ON	**Inspection Date:** March 13, 2021
Inspected by: M Bertens	**Weather:** Cloudy, 2ºC

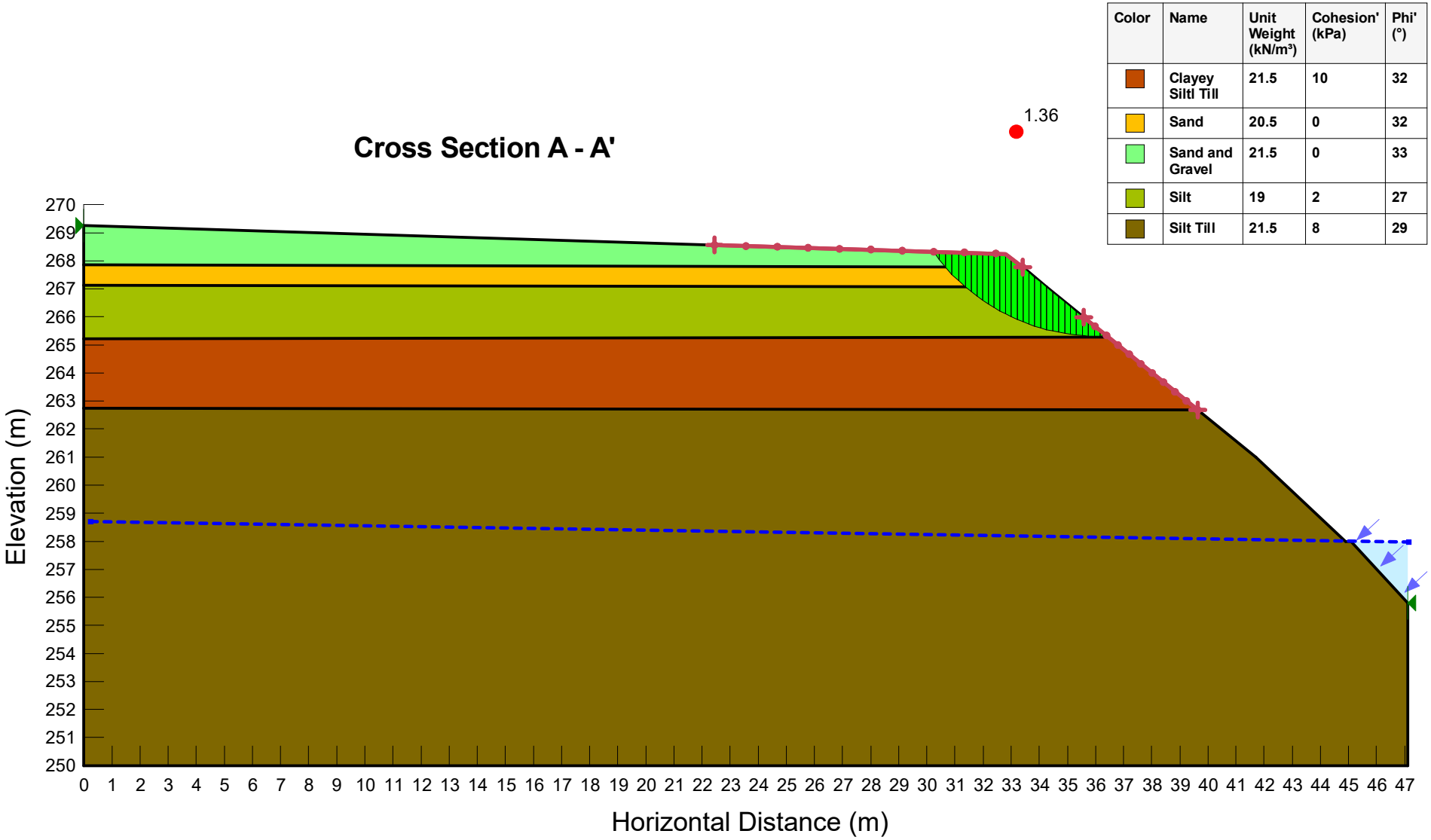
	Rating Value	Slope Rating
Slope Inclination		
degrees or less (3H:1V or flatter)	0	6
to 28 degrees (2H:1V to 3H:1V)	6	
degrees or more (steeper than 2H:1V)	16	
Soil Stratigraphy		
shale / limestone	0	9
sand, gravel	6	
till	9	
clay, silt	12	
fill	18	
leda clay	24	
Seepage from Slope Face		
none, or near bottom only	0	0
near mid-slope only	6	
near crest only, or from several levels	12	
Slope Height		
2 m or less	0	2
2.1 to 5 m	2	
5.1 to 10 m	4	
more than 10 m	8	
Vegetation Cover on Slope Face		
well vegetated: heavy shrubs or forested with mature trees	0	0
light vegetation: grass, weeds, occasional trees, shrubs	4	
no vegetation: bare	8	
Table Land Drainage		
table land flat, no apparent drainage over slope	0	2
minor drainage over slope, no active erosion	2	
drainage over slope, active erosion, gullies	4	
Proximity of Watercourse to Slope Toe		
15 m or more from slope toe	0	6
Less than 15 m from slope toe	6	
Previous Landslide Activity		
No	0	0
Yes	6	
Slope Instability Rating		25

Low Potential	< 24	Site Inspection only, confirmation, report letter
Slight Potential	25-35	Site Inspection and surveying, preliminary study, detailed report
Moderate Potential	> 35	BH Investigation, piezometers, lab tests, surveying, detailed report

Notes:
Is there is a water body (stream, creek, river, pond, bay, lake) at the toe of slope?
If YES - the potential for toe erosion and undercutting should be evaluated in detail.

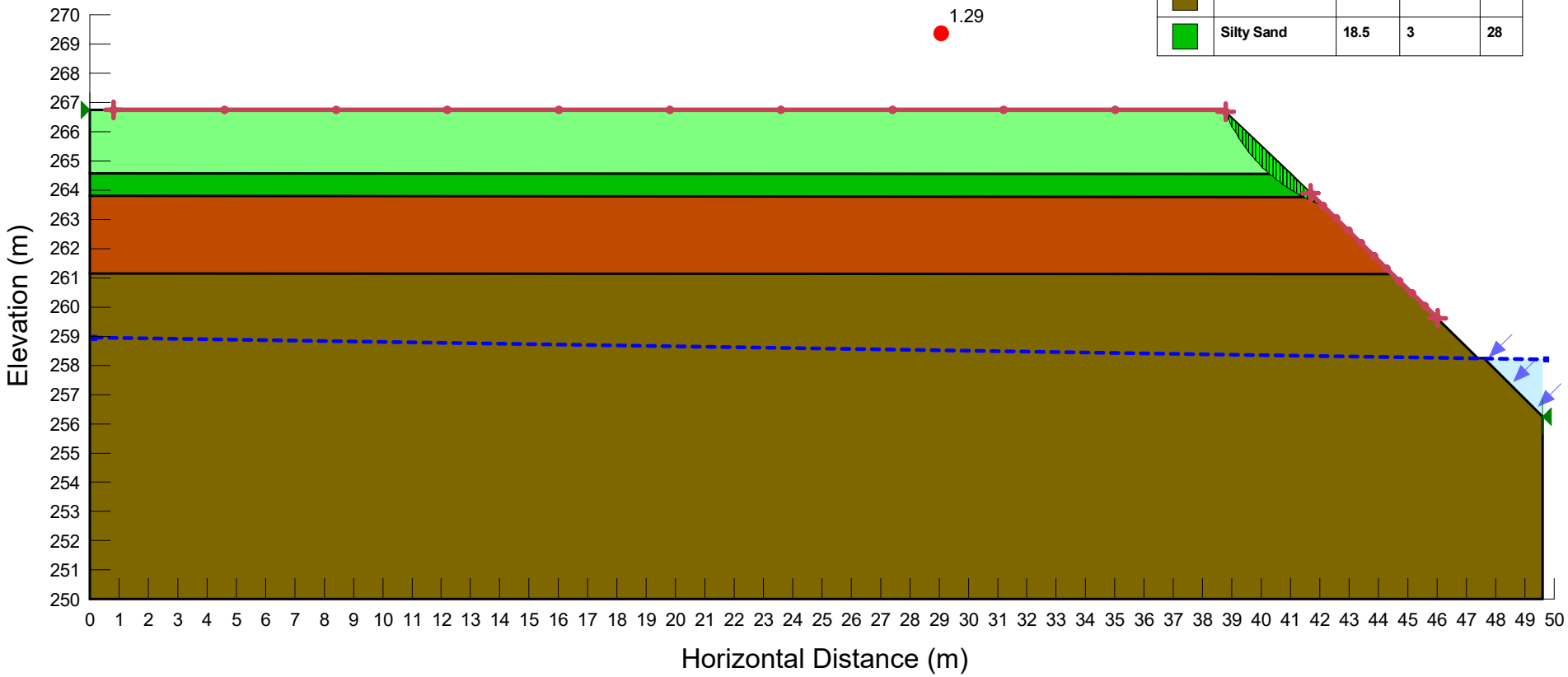
Appendix D – Slope Stability Analyses


Cross Section A - A'
1.04
Color
Name
Unit Weight (kN/m³)
Cohesion' (kPa)
Phi' (°)
Clayey Silt Till
21.5
10
32
Sand
20.5
0
32
Sand and Gravel
21.5
0
33
Silt
19
2
27
Silt Till
21.5
8
29
Elevation (m)
270
269
268
267
266
265
264
263
262
261
260
259
258
257
256
255
254
253
252
251
250
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Horizontal Distance (m)


Cross Section A - A'
1.36
Color
Name
Unit Weight (kN/m³)
Cohesion' (kPa)
Phi' (°)
Clayey Siltl Till
21.5
10
32
Sand
20.5
0
32
Sand and Gravel
21.5
0
33
Silt
19
2
27
Silt Till
21.5
8
29
Elevation (m)
270
269
268
267
266
265
264
263
262
261
260
259
258
257
256
255
254
253
252
251
250
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
Horizontal Distance (m)

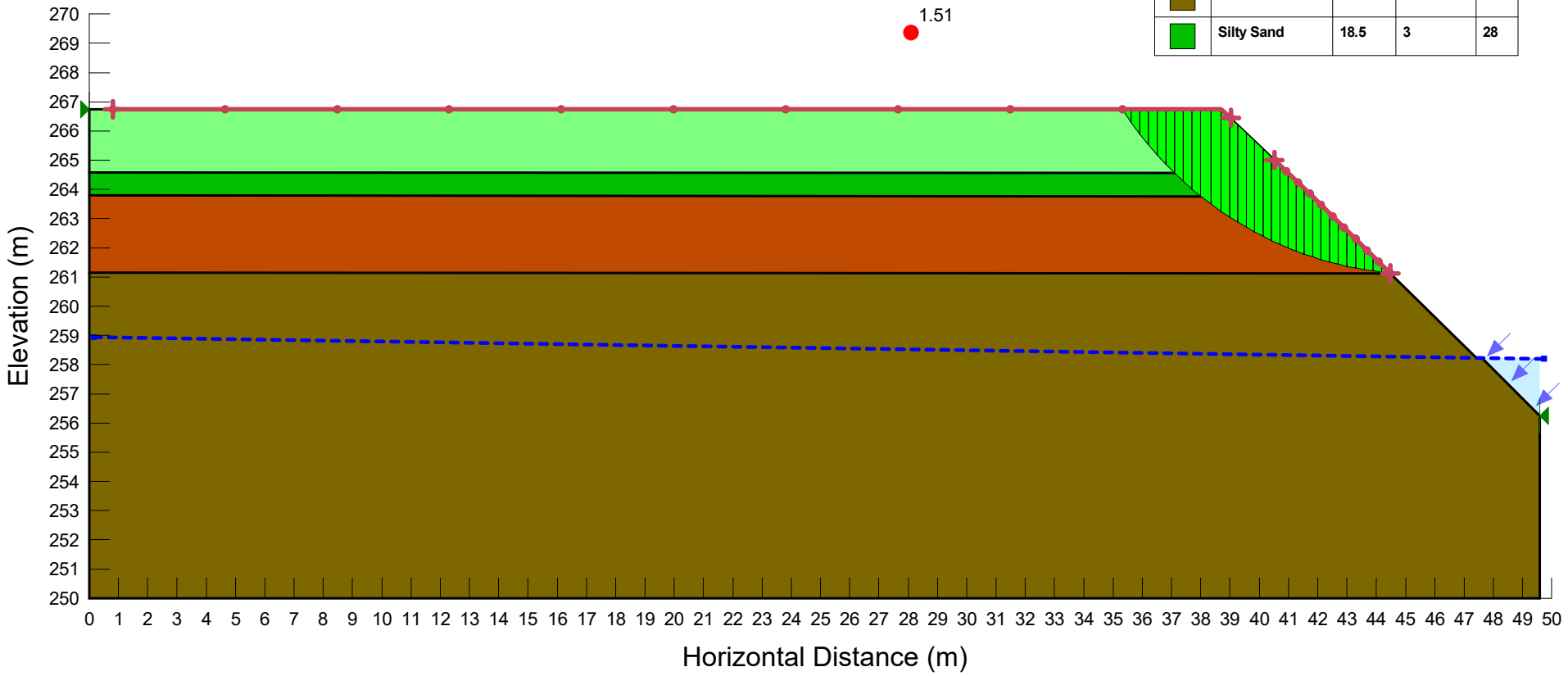
Cross Section C - C'

Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Clayey Siltl Till	21.5	10	32
	Sand and Gravel	21.5	0	33
	Silt Till	21.5	8	29
	Silty Sand	18.5	3	28



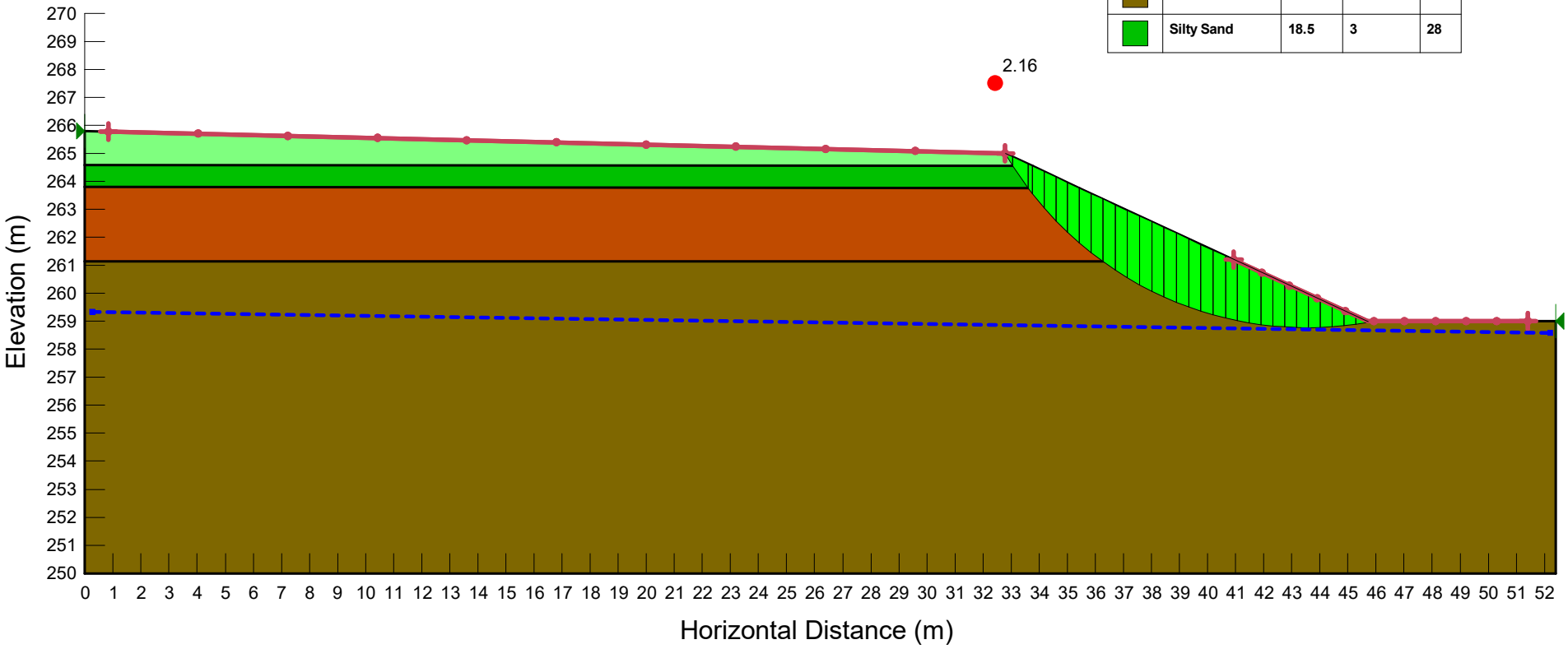
Cross Section C - C'

Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Clayey Siltl Till	21.5	10	32
	Sand and Gravel	21.5	0	33
	Silt Till	21.5	8	29
	Silty Sand	18.5	3	28



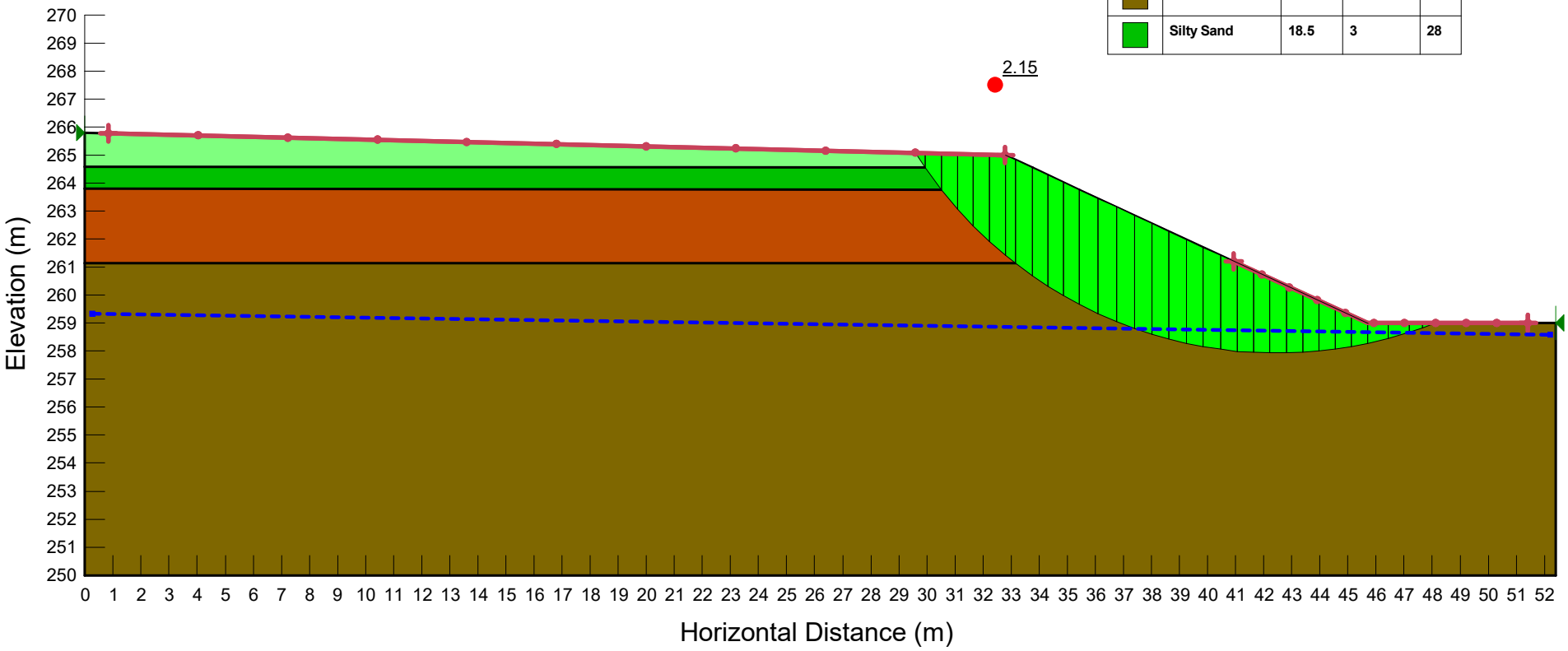
Cross Section D - D'

Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Clayey Siltl Till	21.5	10	32
	Sand and Gravel	21.5	0	33
	Silt Till	21.5	8	29
	Silty Sand	18.5	3	28



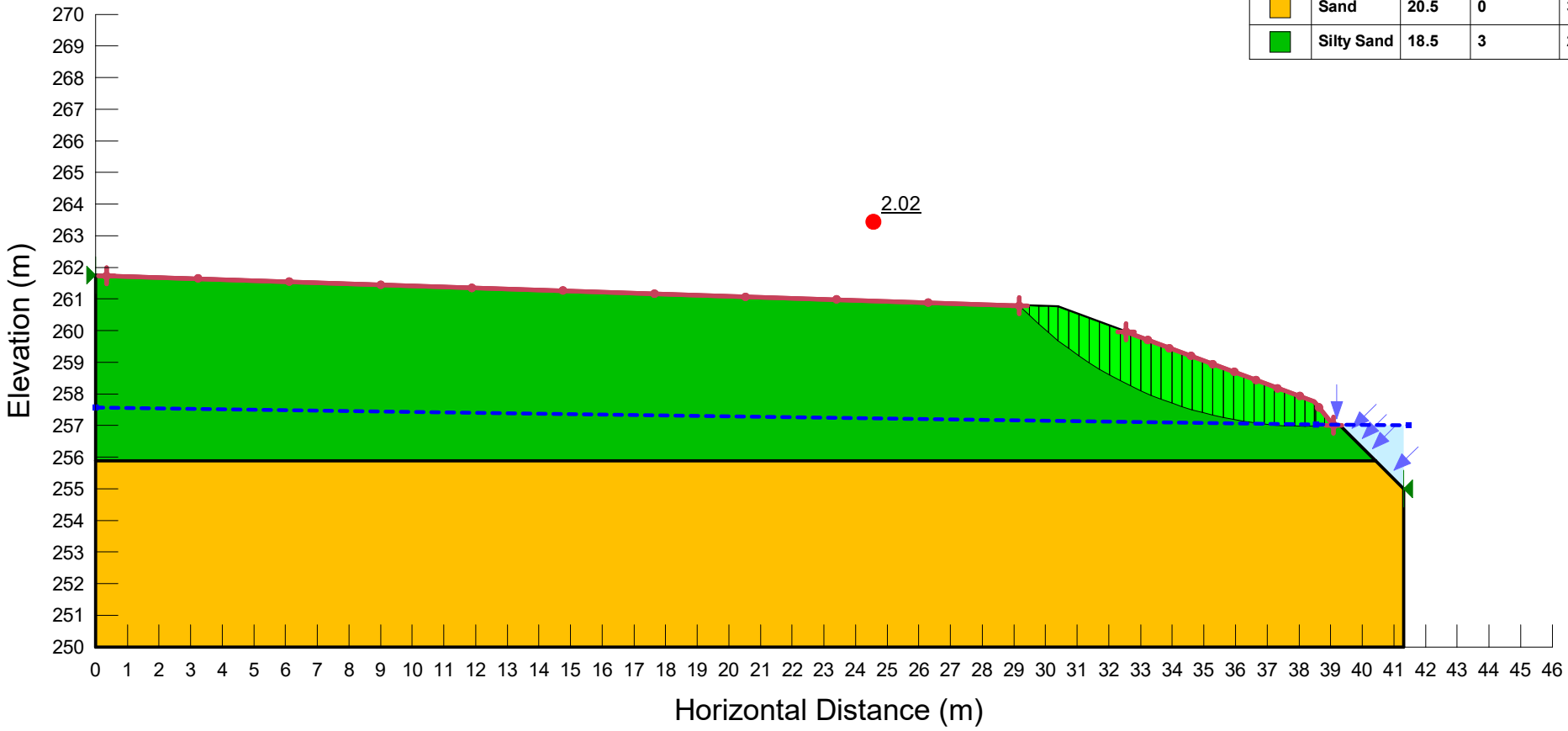
Cross Section D - D'

Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°)
	Clayey Siltl Till	21.5	10	32
	Sand and Gravel	21.5	0	33
	Silt Till	21.5	8	29
	Silty Sand	18.5	3	28



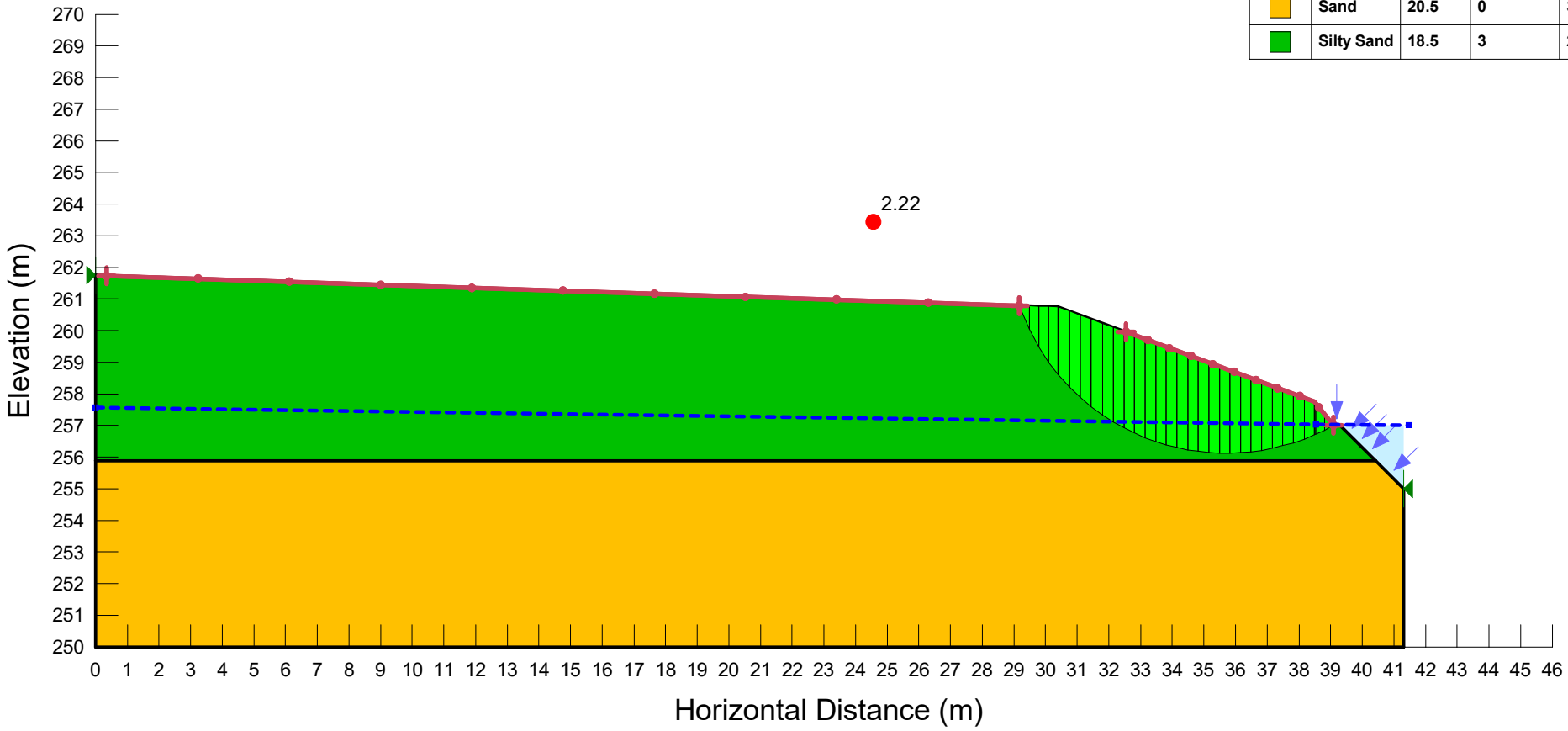
Cross Section G - G'

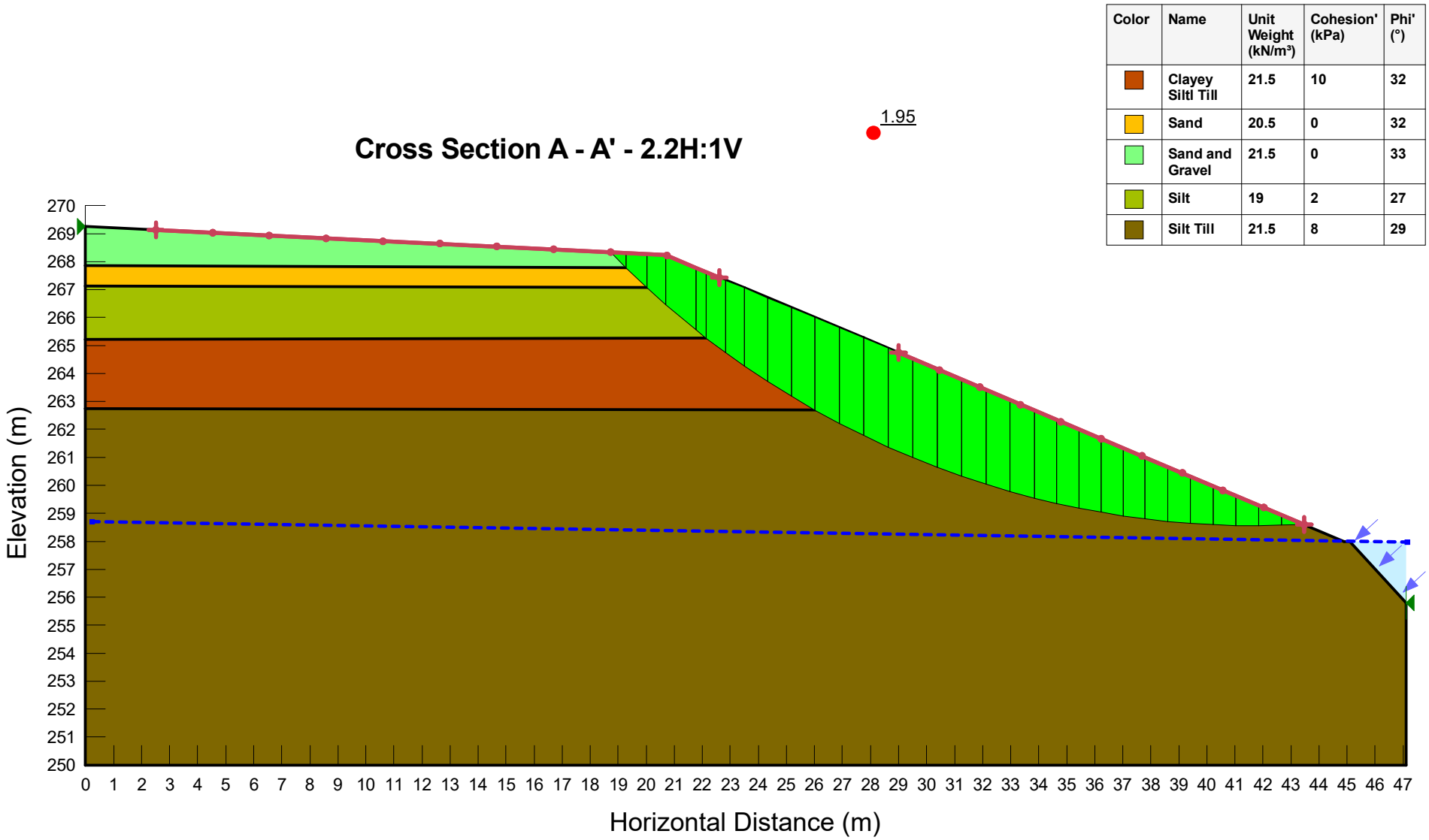
Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°
	Sand	20.5	0	32
	Silty Sand	18.5	3	28



Cross Section G - G'

Color	Name	Unit Weight (kN/m³)	Cohesion' (kPa)	Phi' (°
	Sand	20.5	0	32
	Silty Sand	18.5	3	28




Cross Section A - A' - 2.2H:1V
1.95
Color
Name
Unit Weight (kN/m³)
Cohesion' (kPa)
Phi' (°)
Clayey Silt Till
21.5
10
32
Sand
20.5
0
32
Sand and Gravel
21.5
0
33
Silt
19
2
27
Silt Till
21.5
8
29
Elevation (m)
Horizontal Distance (m)

Appendix E – Limitations and Use of Report

LIMITATIONS AND USE OF REPORT

BASIS OF REPORT

This report ("Report") is based on site conditions known or inferred by the geotechnical investigation undertaken as of the date of the Report. Should changes occur which potentially impact the geotechnical condition of the site, or if construction is implemented more than one year following the date of the Report, the recommendations of EXP may require re-evaluation.

The Report is provided solely for the guidance of design engineers and on the assumption that the design will be in accordance with applicable codes and standards. Any changes in the design features which potentially impact the geotechnical analyses or issues concerning the geotechnical aspects of applicable codes and standards will necessitate a review of the design by EXP. Additional field work and reporting may also be required.

Where applicable, recommended field services are the minimum necessary to ascertain that construction is being carried out in general conformity with building code guidelines, generally accepted practices and EXP's recommendations. Any reduction in the level of services recommended will result in EXP providing qualified opinions regarding the adequacy of the work. EXP can assist design professionals or contractors retained by the Client to review applicable plans, drawings, and specifications as they relate to the Report or to conduct field reviews during construction.

Contractors contemplating work on the site are responsible for conducting an independent investigation and interpretation of the test hole results contained in the Report. The number of test holes necessary to determine the localized underground conditions as they impact construction costs, techniques, sequencing, equipment and scheduling may be greater than those carried out for the purpose of the Report.

Classification and identification of soils, rocks, geological units, contaminant materials, building envelopment assessments, and engineering estimates are based on investigations performed in accordance with the standard of care set out below and require the exercise of judgment. As a result, even comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations or building envelope descriptions involve an inherent risk that some conditions will not be detected. All documents or records summarizing investigations are based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated. Some conditions are subject to change over time. The Report presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, these should be disclosed to EXP to allow for additional or special investigations to be undertaken not otherwise within the scope of investigation conducted for the purpose of the Report.

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