

GEOTECHNICAL INVESTIGATION REPORT

Proposed Development – Elmwood Senior School Addition
261 Buena Vista Road,
Ottawa, Ontario

CO680.02

FINAL REPORT

April 27, 2026

Prepared for:

FARROW PARTNERS ARCHITECT

TERRAPEX

90 Scarsdale Road
Toronto, Ontario M3B 2R7
Telephone: (416) 245-0011
geotechnical@terrapex.com
www.terrapex.com

TABLE OF CONTENTS

1.0	INTRODUCTION	3
2.0	FIELD WORK	5
3.0	LABORATORY TESTS	6
4.0	SITE AND SUBSURFACE CONDITIONS	7
4.1	SITE DESCRIPTION	7
4.2	SURFICIAL LAYER	7
4.3	FILL MATERIAL	8
4.4	NATIVE SOIL	9
4.4.1	Sand and Gravel	9
4.4.2	Silty Gravel	9
4.4.3	Silty Sand/Silty Sand and Gravel.....	9
4.5	BEDROCK CONDITIONS	10
4.6	GROUNDWATER CONDITIONS	11
4.7	MULTICHANNEL ANALYSIS OF SURFACE WAVE (MASW) TEST RESULTS.....	12
5.0	DISCUSSION AND RECOMMENDATIONS	13
5.1	SITE GRADING	13
5.2	ENGINEERED FILL.....	13
5.3	EXCAVATION	14
5.4	GROUNDWATER CONTROL	15
5.5	REUSE OF ON-SITE EXCAVATED SOIL.....	16
5.6	SERVICE TRENCHES	16
5.7	FOUNDATION DESIGN	17
5.7.1	Foundation Wall Backfill	18
5.8	FLOOR SLAB AND PERMANENT DRAINAGE.....	18
5.9	LATERAL EARTH PRESSURE.....	19
5.10	PAVEMENT DESIGN.....	21
5.11	TREES	22
5.12	FROST PROTECTION	23
5.13	EARTHQUAKE DESIGN PARAMETERS.....	23
5.14	CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL	23
6.0	CONSTRUCTION INSPECTION AND MONITORING	24
7.0	SLOPE STABILITY ASSESSMENT	25
8.0	LIMITATIONS OF REPORT	26

APPENDICES

Appendix A	Limitations of Report
Appendix B	Site Location Plan and General Site Layout
Appendix C	Borehole Log Sheets – JD Paterson & Associates
Appendix D	Borehole Log Sheets – Alston Associates (Terrapex)
Appendix E	Borehole Log Sheets
Appendix F	Geotechnical Laboratory Test Results
Appendix G	Rock Core Photos
Appendix H	MASW Test Results
Appendix I	Excavation Support
Appendix J	Permanent Drainage Recommendations
Appendix K	Certificate of Chemical Analyses
Appendix L	Slope Stability Assessment Photos

architects or engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

1.0 INTRODUCTION

Terrapex Environmental Ltd. (Terrapex) was retained by Farrow Partners Architects to carry out geotechnical investigations for the proposed addition to the existing Elmwood Senior School Building at the property located at 261 Buena Vista Road, Ottawa, Ontario (the “Site”). Authorization to proceed with this study was given by Mr. Christopher Blackwell of Farrow Partners Architects (Client).

The Site is located in the Rockcliffe Park neighborhood, a primarily residential area of Ottawa. The Site is rectangular and has an area of approximately 1.8 hectares (ha). A large Institutional building (the main school) located in the south-eastern portion and a smaller institutional building (the junior school) is located in the north-western portion of the Site. A residential building (Headmistress’s Residence) is located in the south-western portion of the Site. The remainder of the Site consists of play structures, grass covered fields, a tennis court and a parking lot. The Site is bordered by Buena Vista Road to the south, Springfield Road to the east, Hillcrest Road to the north and residential properties to the west.

Based on the architectural plan by Farrow Partners, issue for site plan control, dated April 17, 2026, provided by the Client to Terrapex, it is understood that the proposed development will consist of basement level, ground and second floors which will include a new entrance lobby, reception and lounge, a double-height gymnasium and at the rear a new fitness/athletics studio and four new classrooms all overlooking the existing playing field to the north.

A previous Geotechnical Investigation study was performed by John D. Paterson and Associates Limited in 2000. Their investigation included drilling of seventeen (17) boreholes advanced from 0.9 m to 2.9 m below the existing ground surface (mbgs) and installing ten monitoring wells. Their findings and observations are documented under Report No. G7813-1, dated July 25, 2000. Alston Associates, a Division of Terrapex Environmental Ltd., conducted a geotechnical investigation at the subject site in 2018. A total of six (6) boreholes were advanced from 1.1 m to 2.9 m below ground surface (mbgs). Their findings and observations are documented under Report No. CO680.01 dated August 23, 2018. The records of boreholes advanced in the course of the past studies are included in **Appendices C and D**.

The purpose of this investigation was to characterize the underlying soil, bedrock and groundwater conditions, to determine the relevant geotechnical properties of encountered ground condition and to provide geotechnical engineering recommendations for the proposed addition.

The geotechnical investigation was carried out in conjunction with environmental and hydrogeological investigations undertaken by Terrapex, reported under separate covers.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the owner and the design

2.0 FIELD WORK

The fieldwork for this study was carried out during the period of March 09 to March 13, 2026, and March 18 to March 19, 2026, in conjunction with the fieldwork for hydrogeological investigations and Phase Two ESA. It consisted of eleven (11) boreholes for geotechnical and hydrogeological investigations and additional three (3) boreholes for the Phase Two ESA, advanced by a drilling contractor commissioned by **Terrapex** utilizing conventional drilling techniques.

The geotechnical boreholes are designated as BH/MW204, BH205 to BH207, BH/MW208, BH209 to BH214 and were advanced to depths ranging from 0.8 m to 6.4 m below ground surface (mbgs). The environmental boreholes, designated as MW201 to MW203, were advanced to depths ranging from 2.0 m to 4.9 mbgs.

Monitoring wells were installed in boreholes BH/MW204, BH/MW208 and MW201 to MW203. The depths to the bottom of the screened intervals of the monitoring wells ranges from 2.0 m to 6.1 m below ground surface (mbgs). The screened interval depths were established to assess the surface of the groundwater table for monitoring necessary for the environmental and hydrogeological assessments.

The locations of the boreholes (monitoring wells) are shown on Figure 1 'Borehole Location Plan' in **Appendix B**. The borehole log sheets are enclosed in **Appendix E** of this report.

Standard penetration tests were carried out in the course of advancing the boreholes through the overburden soils to take representative soil samples and to measure penetration index values (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler through 300 mm depth increments was recorded and these are presented on the logs as penetration index values (N values).

Inferred bedrock surface was encountered at depths ranging from 0.8 mbgs to 3.4 mbgs at all boreholes, except in Borehole BH214. Bedrock was cored approximately to depths ranging from 5.9 mbgs to 6.4 mbgs in Boreholes BH/MW204, BH206, BH/MW208 and from BH211 to BH213.

Groundwater level observations were made during and upon completion of the borehole drilling, where applicable, as well as in the installed monitoring wells.

The ground surface elevations at the locations of the boreholes and monitoring wells were established utilizing a Trimble GNSS Receiver.

The fieldwork for this project was carried out under the supervision of an experienced technician from this office who laid out the positions of the boreholes in the field; arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets

3.0 LABORATORY TESTS

The soil samples recovered from the split spoon sampler were properly sealed, labelled and brought to Terrapex's laboratory for detailed examination. Each soil sample was examined in the laboratory for visual and textural characteristics and bedrock cores retained from the boreholes were visually classified by Terrapex. Moisture content determinations were carried out on all recovered soil samples. The results are plotted on the borehole logs attached in **Appendix E**.

Grain size analyses and hydrometer testing were carried out on four (4) soil samples: BH207 Sample SS3, BH/MW208 Sample SS3, BH210 Sample SS2A, BH212 Sample SS2; BH205 Combined Samples SS2A & SS2B. Four (4) samples were also subjected to Atterberg Limits Tests. Uniaxial Compressive Strength (UCS) tests were carried out on selected bedrock samples. The results of these tests are enclosed in **Appendix F**.

In addition, three (3) soil samples, BH211 – Sample SS3, BH207 – Sample SS4, and BH/MW204 – Sample SS2 were submitted to BV Laboratories for determination of pH and sulphate content and its potential for sulphate attack on buried concrete. The results of the tests are enclosed in **Appendix – K** and will be discussed in **Section 5.14** of this report.

4.0 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil, and groundwater conditions at the site are given on the Borehole Log Sheets attached in **Appendix E** of this report. Images of the bedrock core runs are presented in **Appendix G** of this report.

The following paragraphs present a description of the site and a commentary on the engineering properties of the various soil materials contacted in the boreholes.

It should be noted that the boundaries of the soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1 SITE DESCRIPTION

The property is located in the Rockcliffe neighborhood, a primarily residential area of Ottawa. The Site is rectangular in shape and has an area of approximately 18,444 m². A large school building (The Senior School) is located in the southeast quadrant of the site, and a smaller school building (the Junior School) is located in the northwest section of the Site. A small residential building is located in the southwest section of the Site. The remainder of the Site consists of play structures, grass covered fields, a tennis court and a parking lot. The property is bordered by Buena Vista Road to the south, Springfield Road to the east, Hillcrest Road to the north and residential properties to the west.

It is understood that a 2 m high slope exists in the area of the proposed building addition. The ground surrounding the Senior school is set approximately 2.5 m higher than the ground surrounding the Junior school. The top of the slope aligns approximately with the north edge of the asphaltic concrete parking area. There is an asphaltic concrete pathway that begins at the top of the slope and stops at the entrance way to the Junior School.

A playground is located near the base of the slope in the area of the proposed building addition.

The ground surface topography of the site is relatively uneven. The ground surface elevations established at the borehole locations range from 75.42 m at BH/MW208 to 77.97 m at BH214.

4.2 SURFICIAL LAYER

Asphaltic concrete pavement is present at borehole locations BH209, BH210 and BH212. The thickness of the asphaltic concrete ranges from approximately 30 to 40 mm. Asphaltic concrete is predominantly underlain by a gravelly sand fill layer with inclusions of silt and trace clay.

Interlock paver is present at the ground surface of borehole BH211. The thickness of the interlock paver at the borehole location was measured to be approximately 60 mm.

It should be noted that an organic surface cover consisting of topsoil is present at the locations of boreholes BH204 to BH207, BH/MW208, BH213 and BH214. The thickness of the topsoil ranges from approximately 30 to 152 mm which is underlain by fill material. The thicker topsoil than that found in the boreholes may be in the surrounding places. This renders it difficult to estimate the quantity of topsoil to be stripped based on the findings of the boreholes.

4.3 FILL MATERIAL

Fill material is present below the surficial layers in all boreholes. It extends to depths ranging from 0.8 mbgs to 3.1 mbgs. The fill material consists of silty sand and gravel, with trace to some clay, rootlets, organics, asphalt and rock fragments.

The fill materials are mostly brown, dark brown, dark grey and grey in color and moist in appearance. The water content of the samples of fill obtained from the boreholes ranged from were 3.3 to 27.7% by weight.

Standard penetration resistance testing (SPT) carried out in the fill provided N-values ranging from 11 to more than 50 blows for 300 mm of penetration for non-cohesive soils indicating compact to very dense relative density (stiff to hard for cohesive material).

Grain size analyses, Hydrometer and Atterberg Limits were conducted on three (3) samples of the fill material. The test results are presented in **Appendix F** and summarized in the following table.

Sample No. and Depth	Sample Description (According to CFEM)	Gravel %	Sand %	Silt %	Clay %	Plastic Limit	Liquid Limit	Soil Classification (According to USCS)
BH205 Samples SS2A, 2B	SAND and GRAVEL, some silt	39	44	17	-	-	-	-
BH210 Sample SS2A	SAND and SILT, some clay, trace gravel	9	41	37	13	21.1	26.1	CL-ML
BH212 Sample SS2	SILTY SAND, some gravel, trace clay	18	51	24	7	NP	NP	SM

4.4 NATIVE SOIL

The native soils below the fill material consist of layers of sand and gravel, silty gravel, silty sand/silty sand and gravel.

4.4.1 Sand and Gravel

A deposit of sand and gravel was encountered beneath the fill layer in BH206 and extended to a depth of 1.8 mbgs.

The sand and gravel layer is brown in color. The water content of the sand and gravel sample was about 14.2% by weight, generally being moist in appearance.

Standard penetration resistance testing (SPT) carried out in the sand and gravel soil provided an N-value of more than 50 blows for 300 mm of penetration indicating a very dense relative density.

4.4.2 Silty Gravel

A deposit of silty gravel with some sand, trace clay was encountered beneath the fill layer in BH/MW208 and extended to a depth of 2.3 mbgs.

The silty gravel layer is dark grey in color. The water content of the silty gravel sample was about 11.5% by weight, generally being moist in appearance.

Standard penetration resistance testing (SPT) carried out in the silty gravel soil provided an N-value of 35 blows for 300 mm of penetration indicating a dense compactness.

Grain size analyses, Hydrometer and Atterberg Limits were conducted on one (1) sample of the native material. The test results are presented in **Appendix F** and summarized in the following table.

Sample No. and Depth	Sample Description (According to CFEM)	Gravel %	Sand %	Silt %	Clay %	Plastic Limit	Liquid Limit	Soil Classification (According to USCS)
BH/MW208 Sample SS3	SILTY GRAVEL, some sand, trace clay	52	20	22	6	NP	NP	GM

4.4.3 Silty Sand/Silty Sand and Gravel

A deposit of silty sand with some clay, gravel, trace amount of rock fragments was encountered beneath the fill layer in Boreholes BH207, BH211 and BH213 and extend to depths ranging from

2.0 mbgs to 3.3 mbgs. Silty sand and gravel with trace clay was encountered below the silty sand layer in BH207 and extend to a depth of 2.9 mbgs.

The silty sand / silty sand and gravel layers are brown in color. The water content of the samples ranges from 4.2 to 11.7% by weight, generally being moist in appearance.

Standard penetration resistance testing (SPT) carried out in the silty sand / silty sand and gravel soils provided N-values ranging from 4 to more than 50 blows per 300 mm penetration indicating a loose to very dense relative density.

Grain size analyses, Hydrometer and Atterberg Limits were conducted on one (1) sample of the native material. The test results are presented in **Appendix F** and summarized in the following table.

Sample No. and Depth	Sample Description (According to CFEM)	Gravel %	Sand %	Silt %	Clay %	Plastic Limit	Liquid Limit	Soil Classification (According to USCS)
BH207 Sample SS3	SILTY SAND, some clay, trace gravel	6	60	23	11	NP	NP	SM

4.5 BEDROCK CONDITIONS

Bedrock was encountered at depths ranging from 0.8 mbgs to 3.4 mbgs at all boreholes, except in BH214, corresponding to geodetic elevations varying from 73.0 m to 76.4 m. At the location of Boreholes BH/MW204, BH206, BH/MW208 and BH211 to BH213, bedrock was proven by rock coring to depths varying from 5.9 to 6.4 mbgs.

A zone of highly weathered rock fragments/bedrock was encountered in boreholes BH/MW208 and BH212 by augering and SPT carried out in the weathered bedrock provided N-values of more than 50 blows per 300 mm penetration indicating a very dense relative density.

The approximate depth and geodetic elevations at which weathered shaley limestone bedrock was encountered at each borehole location, is provided in the Table below.

SUMMARY OF BEDROCK INFORMATION

Borehole No.	Depth to Weathered Bedrock (mbgs)	Elevation of Weathered Bedrock Surface (m)	Note
BH/MW204	1.6	74.7	Cored
BH205	1.8	74.5	Augered
BH206	1.8	74.3	Cored
BH207	2.9	73.3	Augered

BH/MW208	2.4	73.0	Cored
BH209	0.8	76.4	Augered
BH210	1.2	76.3	Augered
BH211	1.8	76.1	Cored
BH212	1.8	75.5	Cored
BH213	3.4	74.6	Cored
BH214	3.1	74.9	Augered

The bedrock surface should not be considered accurate to better than +/- 0.5 m and some variations in the bedrock surface elevation across the site should be expected.

The bedrock is of the Ottawa Formation consisting of shaley limestone with infilled and open fractures. Total Core Recovery (TCR) achieved with rock coring methods ranges from 68.9 to 100%.

Based on Table 4.26 of the Canadian Foundation Engineering manual (CFEM) 5th Edition, the bedrock is classified as “very poor to excellent” for RQD ranging from 0 to 100% and “good to excellent quality” for RQD ranging from 75 to 100% at depth below ground surface.

Rock Quality Designation (RQD) values of the bedrock are shown on the record of borehole logs. The RQD values of the recovered cores range from about 0 to 87.6%, which indicates very poor to good quality of bedrock.

Photographs of the recovered bedrock cores are presented in **Appendix G**.

Unconfined Compressive Strength (UCS) test determinations were completed on six (6) core specimens of the bedrock. The results of the unconfined compression test carried out on the core specimens indicate rock strengths ranging from 9.4 to 50.8 MPa.

Based on the UCS test results, the bedrock is classified as weak to medium strong, and its hardness grade ranges from R2 to R3 according to Table 4.21. of the CFEM (5th Edition).

The UCS Test results and values are also presented in **Appendix F**.

4.6 GROUNDWATER CONDITIONS

Groundwater levels in the monitoring wells were measured on three occasions between March and April 2026.

The groundwater levels measured in the monitoring wells are shown on the individual borehole logs and are summarized in Table 1.

TABLE 1: MEASURED GROUNDWATER LEVELS

Well ID	Ground Surface Elevation	Groundwater Measurements		
		2026		
	masl	Mar 20 mbg (masl)	Mar 27 mbg (masl)	Apr 15 mbg (masl)
MW201*	-	-	-	-
MW202*	-	1.48 (-)	1.6 (-)	1.16 (-)
MW203	75.08	2.93 (72.15)	3.30 (71.78)	2.10 (72.98)
BH/MW204	76.34	- (-)	2.89 (73.46)	2.00 (74.34)
BH/MW208	75.42	- (-)	2.12 (73.30)	1.35 (74.08)

Elevations measured by Trimble DA2 CATALYST GNSS Receiver

masl: metres above sea level

mbg: metres below ground

**Note that monitoring wells MW201 and MW202 were installed within the basement of the main school building.*

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition may likely develop in the spring and following significant rainfall events.

4.7 MULTICHANNEL ANALYSIS OF SURFACE WAVE (MASW) TEST RESULTS

Terrapex commissioned a specialized geophysics sub-consultant “Frontwave Geophysics Inc.” to conduct MASW shear velocity testing for seismic site classification. The fieldwork was completed on March 18, 2026.

Results of the MASW test are provided in **Appendix H**.

5.0 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from this investigation and are intended for use by the client and their design architects and engineers only.

Terrapex understand that the Client is proposing to develop the Site with an addition to the existing Senior School building which will consist of basement level, ground and second floors which will include a new entrance lobby, reception and lounge, a double-height gymnasium and at the rear a new fitness/athletics studio and four new classrooms all overlooking the existing playing field to the north.

The construction methods described in this report are not specifications or recommendations to the contractors or as the only suitable methods. The collected data and the interpretation presented in this report may not be sufficient to assess all the factors that may influence the construction. Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations as they might deem necessary. The contractor should also select the method of construction, equipment and sequence based on their previous experience on similar projects.

5.1 SITE GRADING

Based on the Conceptual/Design plan “Architectural Drawings” prepared by Farrow Partners Architect, dated April 17, 2026, provided to Terrapex by the Client, it is understood that the proposed building will have a basement floor elevation of 75.28 m and ground elevation of 78.28 m.

According to the above drawings, the grade surrounding the site will vary between 74.28 m to 78.82 m. Comparing the proposed grading with the existing grade, the proposed grade raise will be insignificant and is not expected to cause long-term settlement at the site.

5.2 ENGINEERED FILL

The following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, loose or soft fill soils, and softened and/or disturbed soils must be removed, and the exposed subgrade soils proof-rolled under the supervision of the Geotechnical Engineer prior to placement of new fill.
- If the fill will be used to support structures, the existing fill must be removed in its entirety prior to placement of new fill.
- Soils used as engineered fill should be free of organics and/or other unsuitable material. The engineered fill must be placed in lifts not exceeding 200 mm in thickness and compacted to at least 98% Standard Proctor maximum Dry Density (SPMDD).

- Engineered fill operations should be monitored, and compaction tests should be performed on a full-time basis by a qualified engineering technician supervised by the project engineer.
- The boundaries of the engineered fill must be clearly and accurately laid out in the field by qualified surveyors prior to the commencement of engineered fill construction. The top of the engineered fill should extend a minimum of 2.5 m beyond the envelope of the proposed structures. Where the depth of engineered fill exceeds 1.5 m, this horizontal distance of 2.5 m beyond the perimeter of the structure should be increased by at least 1 m for each 1.5 m depth of fill.
- The engineered fill operation should take place in favorable climatic conditions. If the work is carried out in months where freezing temperatures may occur, all frost affected material must be removed prior to the placement of frost-free fill.
- If unusual soil conditions become apparent during construction, due to subsurface groundwater influences, our office should be contacted in order to assess the conditions and recommend appropriate remedial measures.

5.3 EXCAVATION

Based on the borehole findings, temporary excavation in the overburden soil for foundations, basements, sewer trenches and utilities are not expected to pose any difficulty. Excavation of the soils at this site can be carried out with hydraulic excavators.

Bedrock excavation is expected to be carried out using line drilling and blasting, hoe ramming or both. Provision should be made in the excavation contract to include the use of these techniques for excavation in bedrock. Any blasting should be carried out in accordance with City of Ottawa Special Provision S.P. No: F-1201 and under the supervision of a blasting specialist engineer. It will be necessary to monitor and control vibrations generated from the breaking operations to prevent impact on existing buildings.

The contractor should submit a complete and detailed blasting design and monitoring proposal prepared by a blasting/vibrations specialist prior to commencing blasting. This would have to be reviewed and accepted in relation to the requirements of the blasting specifications. Vibration monitoring of the blasting should be carried out to ensure that the blasting meets the limiting vibration criteria at all times. A pre-blast condition survey should be carried out of surrounding structures and utilities located within 75 m of the excavation site.

All excavations must be carried out in accordance with the latest Occupational Health and Safety Act (OHSA). With respect to OHSA, the near surface fill material is expected to conform to Type 3 soils. Below the water table, the soils are classified as Type 4 Soils. The bedrock is classified as Type 1 soil.

Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical. Excavations in the bedrock may be cut with vertical sidewalls. In the event very loose and/or soft

soils are encountered at shallow depths or within zones of persistent seepage, it will be necessary to flatten the side slopes as necessary to achieve stable conditions.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather. Excavation slopes consisting of sandy soils will be prone to gullyng in periods of wet weather, unless the slopes are properly sheeted with tarpaulins.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation sidewalls must be suitably sloped and/or braced in accordance with the latest Occupational Health and Safety Act and Regulations for Construction Projects.

Excavation shall be undertaken in a manner to prevent damage to adjacent properties, existing structures, utilities, roads and sidewalks. During excavations, adjacent existing structures and public right of way, if present, must be protected by proper shoring or sloping.

General guidelines for underpinning in soil and excavation support are presented in **Appendix I**.

It should be noted that the on-site fill material may contain boulders, cobbles and remnants of former buildings in the form of buried concrete. Provisions must be made in the excavation and foundation installation contracts for the removal of possible boulders and concrete.

5.4 GROUNDWATER CONTROL

Based on observations made during drilling of the boreholes, and close examination of the soil samples extracted from the boreholes, the groundwater measurements made in the monitoring wells, significant groundwater problems are not anticipated within the presumed excavation depths throughout the site.

In the event that excavations will extend below the groundwater table it will be necessary to lower the groundwater level minimum of 1 m below the lowest excavation level in the overburden, and to the base of the excavation in bedrock.

The contractors should make their own assessments for temporary control of groundwater seepage into the excavation.

The Hydrogeological Assessment Report should be referred to for further recommendations for groundwater control, the anticipated dewatering volumes during construction and during the service life of the building, and requirements for Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW).

5.5 REUSE OF ON-SITE EXCAVATED SOIL

On-site excavated inorganic soils, and soils free of construction debris and other deleterious materials are considered suitable for reuse as backfill provided their water content is within 2% of their optimum water contents (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with a heavy sheepsfoot compactor.

While the quality of the native soils is considered suitable for backfilling, the moisture content of the soils and the lift thickness for compaction must be properly controlled during the backfilling. Alternatively, imported suitable material should be used.

Based on the borehole information, the existing fill is considered unsuitable for re-use as backfill material as it contains organics and other debris. The on-site native soils below the groundwater table are significantly wetter than their optimum moisture contents. These materials may prove difficult to compact and should be dried sufficiently in order to achieve the specified degree of compaction.

5.6 SERVICE TRENCHES

We understand that sewer pipes and water mains are anticipated to be supported on undisturbed native deposits or on bedrock which are considered suitable for supporting water mains, sewer pipes, manholes, catch basins and other related structures.

The type of bedding depends mainly on the strength of the subgrade immediately below the invert levels.

Normal Class 'B' bedding is recommended for underground utilities. Granular 'A' or 19 mm crusher-run limestone can be used as bedding material; all granular materials should meet OPS 1010 specifications. The bedding material should be compacted to a minimum of 95% SPMD. Bedding details should follow the applicable governing design detail (i.e. City of Ottawa, OPSD). Trenches dug for these purposes should not be unduly left exposed to inclement weather.

Pipe bedding and backfill for flexible pipes should be undertaken in accordance with OPSD 802.010. Pipe embedment and cover for rigid pipes should be undertaken in accordance with OPSD 802.030.

All bedding and backfill materials should be in compliance with the most recent material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructures Services Branch of the City of Ottawa.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to sewer installation will be required. The subgrade may be strengthened by placing a thick mat consisting of 50 mm crusher-run limestone. Field conditions will determine the depth of stone

required. Geotextiles and/or geogrids may be helpful, and these options should be reviewed by Terrapex on a case-by-case basis.

Sand cover material should be placed as backfill to at least 300 mm above the top of pipes. Placement of additional granular material may be required for use of smaller compaction equipment for the first few lifts above the pipe to prevent damage to the pipe during the trench backfill compaction.

It is recommended that service trenches be backfilled with on-site excavated materials such that at least 95% of SPMDD is obtained in the lower zone of the trench and 98% of SPMDD for the upper 1000 mm.

Impermeable clay should be provided across the entire width of the service trenches. It is recommended that the seals be at least 1.0 m in length along the trench (in accordance with the City of Ottawa Standard S8). The seals should be constructed near the property line along all service installations.

In areas of narrow trenches or confined spaces such as around manholes, catch basins, etc., the use of aggregate fill such as Granular 'B' Type I (OPSS 1010) is required if there is to be postconstruction grade integrity.

5.7 FOUNDATION DESIGN

The proposed one-storey building with a basement floor can be supported by spread and strip footings founded on bedrock. It is recommended that the foundations of all structures be extended to the existing bedrock. Foundations installed on weathered bedrock may be designed for an allowable resistance of 500 kPa at Serviceability Limits States (SLS) and a factored geotechnical bearing resistance at Ultimate Limit States of 750 kPa (ULS). Foundations installed on sound bedrock may be designed on 1.0 MPa at ULS. The serviceability limit state is not applicable to sound bedrock as it will not undergo settlement.

Conventionally, footings of heated and unheated buildings are positioned at depths of 1.5 m and 1.8 m respectively below exterior grade in the Ottawa area, in order to provide protection to the foundation soil from freezing temperatures. It should also be noted that sound bedrock will not be subjected to frost heave, and provided that footings are extended to non-fractured sound bedrock, the minimum founding depth of 1.8 m would not apply, and the footings may be placed at shallower depths.

Alternatively, foundations may be constructed on engineered fill provided that the existing fill and native soils are removed to the top of bedrock and the engineered fill is constructed under full time supervision of Terrapex staff. Foundations installed on engineered fill may be designed based on bearing resistance of 150 kPa at Serviceability Limit States (SLS) and factored geotechnical bearing resistances at Ultimate Limit States (ULS) of 225 kPa.

The geotechnical bearing resistances recommended above are for vertical loads (no inclination) and no eccentricity. The total and differential settlements of spread footing foundations founded on the native soil designed in accordance with the recommendations provided in this report should not exceed the conventional limits of 25 mm and 19 mm respectively.

All footing subgrades must be evaluated by the Geotechnical Engineer prior to placing formwork and foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

In the event necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2-horizontal (clear horizontal distance between footings) to 1-vertical (difference in elevation) on the native soil and 1-horizontal to 1-vertical on the bedrock. No individual footing step should be greater than 0.6 m.

Rainwater or groundwater seepage entering the foundation excavations must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation and equipment traffic at all times. If unstable subgrade conditions develop, **Terrapex** should be contacted in order to assess the conditions and make appropriate recommendations.

Subgrades tend to weather and deteriorate rapidly on exposure to atmosphere or surface water, so construction scheduling should consider the amount of excavation left exposed to the elements, during foundation preparation. **Terrapex** recommends that footings placed on the exposed subgrade should be poured on the same day as they are excavated, after removal of all unsuitable founding materials and approval of the bearing surface. Alternatively, a concrete mud slab could be used to protect a bearing surface where footing construction is to be delayed.

5.7.1 Foundation Wall Backfill

Where open cut excavation will be considered, the excavation should be backfilled with engineered fill. The requirements to construct engineered fill is provided in Section 5.2. Perimeter and subfloor drainage requirements are discussed in Section 5.8.

5.8 FLOOR SLAB AND PERMANENT DRAINAGE

At the proposed depths of the basement floor slab, it is expected that the subgrade will consist of sound bedrock which is suitable for slab-on-grade construction.

Subgrade preparation should include the removal of any fractured or delaminated rock pieces. After removal of all unsuitable materials, the subgrade should be inspected and adjudged as satisfactory before preparing the granular base course. Any loose or unsuitable subgrade areas should be sub-excavated and replaced with suitable approved compacted backfill; placed in maximum lifts of 200 mm thickness and compacted to at least 98% of SPMDD.

It is recommended that a combined moisture barrier and a leveling course, having a minimum thickness of 200 mm and comprised of free draining material such as 19 mm clear stone (OPSS 1004) compacted by vibration to a dense state underlain by non-woven geotextile (filter fabric) separating the clear stone and the underlying sand.

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the above recommendations, the Modulus of Subgrade Reaction (k_s) for floor slab design will be 25 MPa/m.

A perimeter and underfloor drainage system will be required if a basement level is constructed. The installation of the perimeter drains as well as the outlet must conform to the applicable plumbing code requirements.

Part 9 of the Ontario Building Code, "Housing and Small Buildings" should be referred to for standard practices.

Subfloor drainage may not be required for slab-on-grade structures if the finished floor elevation is at least 150 mm higher than the surrounding finished grade. The surrounding ground surface should be sloped away from the building to promote proper drainage.

Recommended drainage details are provided in **Appendix J**.

5.9 LATERAL EARTH PRESSURE

Parameters used in the determination of earth pressure acting on structures subject to unbalanced pressures are defined below.

Parameter	Definition	Units
ϕ'	Angle of Internal Friction	degrees
γ	Bulk Density	kN/m ³
K_a	active earth pressure coefficient (Rankine)	dimensionless
K_o	at-rest earth pressure coefficient (Rankine)	dimensionless
K_p	passive earth pressure coefficient (Rankine)	dimensionless

The appropriate un-factored values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as follows:

SOIL PARAMETER VALUES

Soil	Parameter				
	ϕ'	γ	K_a	K_p	K_o
Fill	28°	20	0.36	2.77	0.53

Sand and gravel, Silty Sand, Silty Sand and gravel, Silty Gravel	32°	20.0	0.31	3.25	0.47
Weathered Bedrock	35°	26	0.27	3.69	0.43
Sound Bedrock	45°	26	0.17	5.83	0.29

1. *Passive and sliding resistance within the zone subject to frost action (i.e. within 1.8 m below finished grade) should be disregarded in the lateral resistance computations.*

Subsurface walls subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

$$P = K (\gamma h + q)$$

where **P** = lateral pressure in kPa acting at a depth *h* (m) below ground surface

K = applicable lateral earth pressure coefficient

γ = bulk unit weight of backfill (kN/m³)

h = height at any point along the interface (m)

q = the complete surcharge loading (kPa)

This equation assumes that free draining backfills and positive drainage is provided behind the foundation walls.

Subsurface walls that are subject to unbalanced earth and hydrostatic pressures must be designed to resist a pressure that can be calculated based on the following formula:

$$P = K [\gamma (h - h_w) + \gamma' h_w + q] + \gamma_w h_w$$

where **P** = lateral pressure in kPa acting at a depth *h* (m) below ground surface

K = applicable lateral earth pressure coefficient

H = height at any point along the interface (m)

h_w = depth below the groundwater level at point of interest (m)

γ = bulk unit weight of backfill (kN/m³)

γ' = the submerged unit weight (kN/m³) of exterior soil ($\gamma' = \gamma - \gamma_w$)

γ_w = unit weight of water, assume a value of 9.8 kN/m³

q = the complete surcharge loading (kPa)

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (*R*) depends on the normal load on the soil contact (*N*) and the frictional resistance of the soil ($\tan \Phi'$) expressed as: **$R = N \tan \Phi'$** . This is an ultimate resistance value and does not contain a factor of safety.

5.10 PAVEMENT DESIGN

Based on the existing topography of the subject site and the data collected during the field investigation, it is anticipated that the sub-grade for the asphaltic concrete pavement will generally consist of fill material. Given the frost susceptibility and drainage characteristics of the subgrade soils, the following pavement structure design is recommended for the Site:

**RECOMMENDED ASPHALTIC CONCRETE PAVEMENT STRUCTURE DESIGN
(MINIMUM COMPONENT THICKNESSES)**

Pavement Layer	Compaction Requirements	Thickness and Material (Light Duty Pavement)	Thickness and Material (Heavy Duty Pavement)
Surface Course Asphaltic Concrete	97% Marshall Density	40 mm Hot-Laid HL3	50 mm Hot-Laid HL3
Binder Course Asphaltic Concrete	97% Marshall Density	50 mm Hot-Laid HL8	70 mm Hot-Laid HL8
Granular Base	100% SPMDD	150 mm compacted depth OPSS Granular A	150 mm compacted depth Granular A
Granular Sub-Base	100% SPMDD	300 mm compacted depth Granular B	600 mm compacted depth Granular B

* SPMDD - Standard Proctor maximum dry density (ASTM-D698)

Subgrade preparation should include the removal of weak and softened soils. After removal of all unsuitable materials, the subgrade should be proof rolled with heavy rubber-tired equipment and adjudged as satisfactory before preparing the granular base course. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any soft or unsuitable subgrade areas which deflect significantly should be sub-excavated and replaced with suitable engineered fill material compacted to at least 98% of SPMDD.

The granular pavement structure materials should be placed in lifts not exceeding 150 mm thick and be compacted to a minimum of 100% SPMDD. Asphaltic concrete materials should be rolled and compacted per OPSS 310. The granular and asphaltic concrete pavement materials and their placement should conform to OPSS 310, 501, 1010 and 1150, and the pertinent Municipality specifications. Further, it is recommended that the Municipality's specifications should be referred to for use of higher grades of asphalt cement for asphaltic concrete where applicable.

The long-term performance of the proposed pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be crowned and sloped to provide effective drainage. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Sub-drains must be provided to facilitate effective and assured drainage of the pavement structures as required to intercept excess subsurface moisture and minimize subgrade softening. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

As part of the subgrade preparation, proposed pavement areas should be stripped of unsuitable earth fill and other obvious objectionable material. Fill required to raise the grades to design elevations should be free of organic material and at a water content which will permit compaction to the specified densities. Soft or spongy subgrade areas should be sub-excavated and properly replaced with suitable approved backfill compacted to 98% SPMDD. For fine-grained clay soils as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling of the roadway subgrade must be carried out and witnessed by Terrapex personnel for final recommendations of sub-base thickness.

Additional comments on the construction of pavement areas are as follows:

- As part of the subgrade preparation, the proposed pavement areas should be stripped of vegetation, topsoil, unsuitable earth fill and other obvious objectionable material. The subgrade should be properly shaped and sloped as required, and then proof rolled. Loose/soft or spongy subgrade areas should be sub-excavated and replaced with suitable approved material compacted to at least 98% of SPMDD.
- Where new fill is needed to increase the grade or replace disturbed portions of the subgrade, excavated inorganic soils or similar clean imported fill materials may be used, provided their moisture content is maintained within 2 % of the soil's optimum moisture content. All fills must be placed and compacted to not less than 98% of SPMDD.
- For fine-grained soils, as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling must be carried out and witnessed by Terrapex personnel for final recommendations of sub-base thicknesses.
- In the event that pavement construction takes place in the spring thaw, the late fall, or following periods of significant rainfall, it should be anticipated that an increase in thickness of the granular sub-base layer will be required to compensate for reduced subgrade strength.

5.11 TREES

Based on the results of the subsurface soil conditions, the site is not underlain by sensitive clay. It consists of fill material overlying native and bedrock. The silty clay soils in Ottawa are sensitive to water depletion by trees of high-water demand during periods of dry weather. When trees draw water from cohesive fill soil, it undergoes shrinkage which can result in settlement of adjacent structures.

Given the variable sand and gravel, silty sand and silty gravel fill materials, therefore no restrictions on the types or sizes of trees that may be planted or tree-to-foundation setback distances need to be considered for this development.

5.12 FROST PROTECTION

The presence of frost-susceptible soils within the frost protection depth will require that isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during the winter months be provided with minimum of 1.8 m of earth cover or equivalent insulation.

Frost protection may not be required for footings placed on sound bedrock.

5.13 EARTHQUAKE DESIGN PARAMETERS.

The Ontario Building Code (2024) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.18.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.-A of the Ontario Building Code (2024). The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (v_s) measurements have been taken.

The shear-wave velocity survey of the overburden soils at the site was conducted by Frontwave Geophysics Inc. The survey and test results are enclosed in **Appendix H**. Based on the test results, the average velocity in the 30 m of the soil below grade is established at 1372 m/s. On this basis, the site designation for seismic analysis is X_{1372} .

5.14 CHEMICAL CHARACTERIZATION OF SUBSURFACE SOIL

Three (3) soil samples obtained from Borehole BH/MW204 sample 2, Borehole BH207 sample 4 and Borehole BH211 sample 4 were submitted to BV Laboratories for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in **Appendix K** of this report.

The test results revealed that the pH index values of the soil samples are 7.95 and 7.48, indicating a slight alkalinity.

The water-soluble sulphate content of the tested samples is 0.0660% and 0.0060%. The concentration of water-soluble sulphate content of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack are therefore not required for the sub-surface concrete of the proposed building.

6.0 CONSTRUCTION INSPECTION AND MONITORING

The recommendations presented in this report are based on the assumption that adequate and satisfactory inspections and monitoring during construction by qualified geotechnical personnel will be provided. This will include:

- Review and approval of all subgrades and footing base inspections by geotechnical staff.
- Part time compaction testing of bedding, and cover soils.
- Periodic testing of concrete

7.0 SLOPE STABILITY ASSESSMENT

Terrapex carried out a visual inspection of the existing slope at the site, as well as a review of the existing topography and proposed grading to assess the slope stability at the site.

Based on the review of the site topography, the top of slope is located along the north and west edges of the existing asphalt-paved parking. The ground generally slopes towards north from the north parking edge and towards west from the west parking edge. The ground elevation drops approximately 2 m over an approximate 15 m length (i.e. 1.0V:7.5H).

A visual inspection of the existing slope was conducted by **Terrapex** in March 2026. Given the subsurface conditions at site and existing structure, we observed the followings:

- The top of the slope aligns approximately with the north edge of the asphaltic concrete parking area.
- There is an asphaltic concrete pathway that begins at the top of the slope (northwest of the existing Senior School Building) and stops at the entrance way to the Junior School.
- There is an existing concrete step with handrail that also begin at the northern top edge of the asphaltic concrete parking and stops at the entrance way to the Junior School.
- To evaluate the stability of the existing slope, five data points were collected at strategic locations by utilizing a Trimble GNSS Receiver: Data confirms that the existing grading surrounding the parking area, existing Senior School towards the existing Junior School, varies from 1.62 m to 2.37 m in elevation.
- Our visual assessment revealed that the slope was covered with snow which made it difficult to check for any existing signs of overall instability such as tension cracks or subsidence at the crest or bulging or heaving close to the toe of the slope.
- No evidence of channelized stormwater flow and/or evidence of groundwater seeps/springs were observed.

The photographs and elevations survey are presented in **Appendix L** to depict the general conditions of the site.

Based on the observations made at the site, as well as the review of the proposed site plan, it is our opinion that slope stability is not a concern.

8.0 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

Yours respectfully,

TERRAPEX ENVIRONMENTAL LTD.



A handwritten signature in black ink that reads "Meysam Najari".

Yacouba Doro, MBA-PM, P.Eng.
Senior Geotechnical Project Manager

Meysam Najari, Ph.D. P.Eng.
Vice President - Geotechnical Services

APPENDIX A
LIMITATIONS OF REPORT

LIMITATIONS OF REPORT

This report has been completed in accordance with the terms of reference for this project as agreed upon by **Farrow Partners Architect** (the Client) and Terrapex Environmental Ltd. (Terrapex) and generally accepted engineering consulting practices in this area.

The conclusion and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation. If new or different information is identified, Terrapex should be requested to reevaluate its conclusions and recommendations and amend the report as appropriate.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

This report was prepared for the sole use of **Farrow Partners Architect**. Terrapex accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than **Farrow Partners Architect**. The material herein reflects Terrapex's judgement in light of the information available to it at the time of preparation. We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations, or the assumptions made in our analysis. We also recommend that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, Terrapex's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. Contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

APPENDIX B

SITE LOCATION PLAN AND GENERAL SITE LAYOUT

- LEGEND**
-  SITE BOUNDARY
 -  PROPOSED ADDITION
 -  BOREHOLE
 -  MONITORING WELL



DATA SOURCE: CITY OF OTTAWA
 MAP PROJECTION: NAD 1983 UTM ZONE 18N

CLIENT:

ELIMWOOD SCHOOL INCORPORATED

SITE LOCATION:

261 BUENA VISTA ROAD
 OTTAWA, ONTARIO



TITLE:

BOREHOLE LOCATION PLAN

DRAWN BY: JS/SW	PROJECT NO.: C0680.02	CHECKED BY: KB
REVISION: 00	DATE: APRIL 2026	FIGURE: 1



APPENDIX C
BOREHOLE LOG SHEETS
BY
JD PATERSON & ASSOCIATES



JOHN D. PATERSON & ASSOCIATES LTD.
 Consulting Geotechnical and Environmental Engineers
 28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
 Elmwood School Addition, Buena Vista Road
 Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. G7813

REMARKS

HOLE NO. BH 2

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	77.68					
Asphaltic concrete	0.05											
Crushed stone	0.30											
FILL: Grey to brown silt, trace sand and weathered rock												
	0.91	SS	3	100	7							
End of Borehole												
Auger refusal on inferred bedrock @ 0.91m depth												

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.
 Consulting Geotechnical and Environmental Engineers
 28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
 Elmwood School Addition, Buena Vista Road
 Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. **G7813**

REMARKS

HOLE NO. **BH 3**

BORINGS BY CME 45 Power Auger

DATE 30 June 2000

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	77.32					
Asphaltic concrete	0.05											
Crushed stone	0.30											
FILL: Grey to brown, mixture of silt, sand, gravel, some asphalt pieces		SS	4	33	6	1	76.32					
		SS	5	42	4							
						2	75.32					
End of Borehole	2.74											
Auger refusal on inferred bedrock @ 2.74m depth												

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO.
G7813

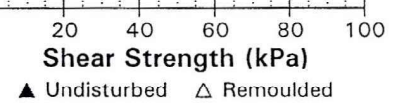
REMARKS

HOLE NO.
BH 4

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	77.17					
Asphaltic concrete	0.08											
Crushed stone	0.15											
FILL: Brown, mixture of silt, sand and gravel, some clay, occasional asphalt pieces												
		SS	6	67	4	1	76.17					
		SS	7	50	5							
Loose, brown SAND, trace to some silt						2	75.17					
End of Borehole	2.44											
Auger refusal on inferred bedrock @ 2.44m depth.												





JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. G7813

REMARKS

HOLE NO. BH 5

BORINGS BY CME 45 Power Auger

DATE 30 June 2000

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	77.63					
Asphaltic concrete	0.08											
Crushed stone	0.23											
FILL: Reddish brown, mixture of silt, sand and gravel, occasional asphalt pieces												
		SS	8	21	6	1	76.63					
Compact, grey SILT, some weathered rock pieces	1.78	SS	9	80	13							
End of Borehole	2.03					2	75.63					
Auger refusal on inferred bedrock @ 2.03m depth												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. **G7813**

REMARKS

HOLE NO. **BH 6**

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	78.09					
Asphaltic concrete	0.05											
Crushed stone	0.15											
FILL: Brown silty sand, some wood chips and organics												
	0.99	SS	10	78	12	1	77.09					
Compact SILT, trace organics and rock fragments	1.22											
End of Borehole												
Auger refusal on inferred bedrock @ 1.22m depth.												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 30 June 00

FILE NO. G7813

HOLE NO. BH 7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	76.02	20	40	60	80	
Topsoil over FILL: Brown, mixture of silt, sand and gravel, some organics												
0.82	△	SS	11		1	1	75.02					
Compact, brown SILT, some sand and rock fragments												
1.42												
BEDROCK: Weathered, black to grey, fine-grained shaley limestone, soil infilling @ 2.8m depth		RC	1	57	25	2	74.02					
2.87												
End of Borehole												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. **G7813**

REMARKS

HOLE NO. **BH 8**

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION	
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %					
GROUND SURFACE								20	40	60	80		
Topsoil over FILL: Mixture of silt, sand and gravel, some organics						0	75.08						
0.83		SS	12		4	1	74.08						
Compact, brown SILT, trace organics and weathered rock fragments													
1.32													
End of Borehole													
Auger refusal on inferred bedrock @ 1.32m depth													

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

REMARKS

BORINGS BY CME 45 Power Auger

DATE 30 June 00

FILE NO. G7813

HOLE NO. BH 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
Topsoil over FILL: brown, mixture of silt, sand and gravel		AU	13			0	75.13					
End of Borehole						1	74.13					
Auger refusal on inferred bedrock @ 1.37m depth (GWL @ 1.04m-July 10/00)							1.37					

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO.
G7813

REMARKS

HOLE NO.
BH12

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE								20	40	60	80	
Topsoil over FILL: brown, mixture of silt, sand and gravel End of Borehole 0.91 Auger refusal on inferred bedrock @ 0.91m depth (BH dry-July 10/00)						0	75.30					
								20	40	60	80	
								20	40	60	80	100

Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.
 Consulting Geotechnical and Environmental Engineers
 28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
 Elmwood School Addition, Buena Vista Road
 Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. **G7813**

REMARKS

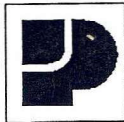
HOLE NO. **BH13**

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	75.26					
Dark brown TOPSOIL	0.15											
Very dense, dark brown SANDY SILT, some weathered rock pieces		SS	15	75	50+	1	74.26					
End of Borehole	1.52											
Auger refusal on inferred bedrock @ 1.52m depth (BH dry-July 10/00)												

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. G7813

REMARKS

HOLE NO. BH14

BORINGS BY CME 45 Power Auger

DATE 30 June .00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	RECOVERY %	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	74.93					
Dark brown TOPSOIL	0.15											
Loose, brown to grey FINE SAND, trace to some silt		SS	16	67	6	1	73.93					
End of Borehole	1.52											
Auger refusal on inferred bedrock @ 1.52m depth (GWL @ 0.81m-July 10/00)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO.
G7813

REMARKS

HOLE NO.
BH15

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	74.97	20	40	60	80	
Brown TOPSOIL	0.15											
Compact, brown SILTY SAND	SS	17	42	6		1	73.97					
End of Borehole	1.07											
Auger refusal on inferred bedrock @ 1.07m depth (BH dry-July 10/00)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.

Consulting Geotechnical and Environmental Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
Elmwood School Addition, Buena Vista Road
Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO.
G7813

REMARKS

HOLE NO.
BH16

BORINGS BY CME 45 Power Auger

DATE 30 June '00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
GROUND SURFACE						0	74.75	20	40	60	80	
Brown TOPSOIL	0.15											
Loose, brown SILTY SAND	SS	18			5	1	73.75					
End of Borehole	1.52											
Auger refusal on inferred bedrock @ 1.52m depth (BH dry-July 10/00)												

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



JOHN D. PATERSON & ASSOCIATES LTD.
 Consulting Geotechnical and Environmental Engineers
 28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Geotechnical Investigation
 Elmwood School Addition, Buena Vista Road
 Rockcliffe Park, Ontario

DATUM TBM - Top NW arm of fire hydrant at SE corner of Buena Vista Road and Springfield Road. Geodetic elevation = 78.657m.

FILE NO. **G7813**

REMARKS

HOLE NO. **BH17**

BORINGS BY CME 45 Power Auger

DATE 30 June 00

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone				PIEZOMETER CONSTRUCTION
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD			○ Water Content %				
								20	40	60	80	
GROUND SURFACE						0	74.84					
Brown TOPSOIL	0.15											
Compact, light brown SAND	1.07					1	73.84					
End of Borehole												
Auger refusal on inferred bedrock @ 1.07m depth (GWL @ 0.86m-July 10/00)												

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded

APPENDIX D
BOREHOLE LOG SHEETS
BY
ALSTON ASSOCIATES(TERRAPEX)

CLIENT: Elmwood School		METHOD: Split Spoon Sampling		BH No.: 101									
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 100.466										
LOCATION: Rockcliffe Park		NORTHING: 5033291	EASTING: 446786	PROJECT NO.: CO680.01									
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
		40 mm ASPHALTIC CONCRETE very dense, damp, grey crusher run limestone (FILL)	0	100						1A			The borehole was dry on completion and the sidewalls caved in at 1.04 m bgs. Refusal to advancement on presumed bedrock at 1.22 m bgs.
		very dense, moist, light brown silty sand some gravel (FILL)	0.5		59					1B			
		very dense, moist to damp, light brown and grey, stratified sandy silt, trace gravel, trace organics, trace shale fragments	1	99.5	50/76mm					2A	50/76mm		
		BEDROCK								2B			
		END OF BOREHOLE											
					LOGGED BY: RH		DRILLING DATE: August 7, 2018						
					REVIEWED BY: VN		Page 1 of 1						

CLIENT: Elmwood School		METHOD: Split Spoon Sampling		BH No.: 102											
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 100.45												
LOCATION: Rockcliffe Park		NORTHING: 446783	EASTING: 5033339	PROJECT NO.: CO680.01											
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		30 mm of ASPHALTIC CONCRETE compact, damp, grey crusher run limestone (FILL)	0	100	20	2					1		20		The borehole was dry on completion and the sidewalls caved in at 2.0 m bgs. Refusal to advancement on presumed bedrock at 2.89 m bgs.
		compact, moist, brown sand, trace gravel (FILL)	0.5	99.5	10	3					2		10		
		loose, moist, brown to dark brown, sand, some silt, trace gravel, trace organics, occasional rootlets	1.5	99							3		4		
			2	98.5	4	20					4		9		
		END OF BOREHOLE	2.5	98	9	13									
				LOGGED BY: RH		DRILLING DATE: August 7, 2018									
				REVIEWED BY: VN		Page 1 of 1									

CLIENT: Elmwood School		METHOD: Split Spoon Sampling		BH No.: 103								
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 100.647									
LOCATION: Rockcliffe Park		NORTHING: 5033343	EASTING: 446800	PROJECT NO.: CO680.01								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON												
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
					40 80 120 160	PL W.C. LL						
		75 mm ASPHALTIC CONCRETE loose, damp, grey crusher run limestone (FILL)	0	100.5	6			1A			The borehole was dry on completion and the sidewalls caved in at 0.76 m bgs. Refusal to advancement on presumed bedrock at 1.06 m bgs.	
		loose to very dense, moist, dark brown, sand, some silt, trace large gravel, trace organics (FILL)	0.5	100	17			1B	6			
		END OF BOREHOLE	1		50/76mm			2	50/76mm			
					LOGGED BY: RH	DRILLING DATE: August 7, 2018						
					REVIEWED BY: VN	Page 1 of 1						

CLIENT: Elmwood School		METHOD: Split Spoon sampling		BH No.: 104									
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 100.862										
LOCATION: Rockcliffe Park		NORTHING: 446814	EASTING: 5033343	PROJECT NO.: CO680.01									
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		106 mm TOPSOIL	0										
		loose, moist, brown silty sand, trace gravel, trace organics (FILL)	0.5	100.5	6				1A		6		The borehole was dry and open on completion
		moist, light brown sand, some silt, trace shale fragments	1	100		11			1B				
			1.5	99.5		22			2A		50/50mm		Augered into bedrock 1.26 m - 1.45 m bgs.
			2	99		46			2B				First Run (1.45 m - 1.9 m) RQD = 48%
		weak black-grey, fine grained, shaley limestone, frequent fractures	3	98.5									Second Run (1.9 m - 3.4 m) RQD = 22%
			3.5	98									
			4	97.5									
			4.5	97									Third Run (3.4 m - 4.9 m) RQD = 60 %
			4.5	96.5									
		END OF BOREHOLE		96									
					LOGGED BY: RH		DRILLING DATE: August 7, 2018						
					REVIEWED BY: VN		Page 1 of 1						

CLIENT: Elmwood School		METHOD: Split Spoon Sampling		BH No.: 105											
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 98.583												
LOCATION: Rockcliffe Park		NORTHING: 446788	EASTING: 5033360	PROJECT NO.: CO680.01											
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		200 mm TOPSOIL	0	98.5							1A				The borehole was dry and open on completion.
		compact, damp, sand and gravel (FILL)									1B				
		loose, moist, brown, sand, trace silt, trace coal fragments (FILL)	0.5	98							1C				
		loose, moist, brown sand, trace silt, trace organics	1	97.5							2A				
		loose, moist to wet layered silty sand, trace organics with oxidized fissures	1.5	97							2B				Refusal to advancement on presumed bedrock at 1.83 m bgs.
		greyish brown silty sand, trace organics									3A				
		greyish black silty sand, trace organics									3B				
		END OF BOREHOLE													

LOGGED BY: RH

DRILLING DATE: August 8, 2018

REVIEWED BY: VN

Page 1 of 1

CLIENT: Elmwood School		METHOD: Spilt Spoon Sampling		BH No.: 106									
PROJECT: 261 Buena Vista Road, Rockcliffe Park		PROJECT ENGINEER: VN	ELEV. (m) 98.093										
LOCATION: Rockcliffe Park		NORTHING: 446774	EASTING: 5033360	PROJECT NO.: CO680.01									
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)	20	40	60	80				
		206 mm TOPSOIL	0	98						1A			The borehole sidewalls caved in at 3.96 m bgs.
		loose, damp, dark brown sand trace silt	0.5	97.5	7					1B	7		
		loose to very dense, wet, grey sand trace silt, trace shale fragments	1	97	8					2	8		
			1.5	96.5	50/50mm					3	50/50mm		Water in spoon on retrieval. Refusal to advancement on bedrock at 1.83 m bgs.
			2	96									
			2.5	95.5									First Run (1.72 m - 3.25 m) RQD = 57 %
			3	95									
		strong black-grey, fine grained shaley limestone with occassional fractures	3.5	94.5									
			4	94									
			4.5	93.5									Second Run (3.25 m - 4.87 m) RQD = 83 %
		END OF BOREHOLE											
					LOGGED BY: RH		DRILLING DATE: August 8, 2018						
					REVIEWED BY: VN		Page 1 of 1						

APPENDIX E
BOREHOLE LOG SHEETS

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH/MW204											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033361.41		EASTING (m): 446859.92		ELEV. (m) 76.34												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): 3		SCREEN SLOT #: 10		SAND TYPE: #2		SEALANT TYPE: BENTONITE											
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON		GRAB					
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					N-VALUE (Blows/300mm)				PL W.C. LL										
		TOPSOIL (50 mm)	0																
		FILL very dense, moist, brown silty sand and gravel some organics	0.5	76									1	50	-		M&I, PAHs, BTEX, PHCs		
		FILL dense, moist, brown silty sand trace clay, gravel, rootlets	1	75.5									2	80	-				
		SHALE/LIMESTONE BEDROCK	1.5	75									3	10	-				
			2	74.5									1	100					Hammer Bouncing TCR = 100% RQD = 47%
			2.5	74									2	100					TCR = 100% RQD = 0
			3	73.5									3	100					TCR = 100% RQD = 55%
			3.5	73									4	100					TCR = 100% RQD = 85.9%
			4	72.5									5	100					TCR = 100% RQD = 41.7%
			4.5	72									6	100					TCR = 100% RQD = 14%
			5	71.5															
			5.5	71															
			6	70.5															
		END OF BOREHOLE																	



LOGGED BY: HM

DRILLING DATE: 9-MAR-2026

INPUT BY: SAF

MONITORING DATE: 27-MAR-2026

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF:												
ADDRESS: 261 BUENA VISTA ROAD				STATION:				BH205												
CITY/PROVINCE: OTTAWA, ONTARIO				NORTHING (m): 5033360.24		EASTING (m): 446841.92		ELEV. (m) 76.29												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING																
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE												
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> GRAB												
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION		DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
						N-VALUE (Blows/300mm)				PL W.C. LL										
						40	80	120	160	20	40	60	80							
		TOPSOIL (50 mm)		0																
		FILL very dense, moist, brown grey silty sand and gravel, trace rootlets		0.5	76					4.1				1A		75		M&I, PAHs, BTEX, PHCs		
		FILL compact, moist, brown sand and gravel some silt, pieces of vaneer brick compact grey to brown		1	75.5					13				2A		75		GR 39% SA 44% SI/CL 17%		
		FILL dense, moist, dark brown sand and rock fragments		1.5	75					20.5				2B						
		END OF BOREHOLE AUGER REFUSAL ON INFERRED BEDROCK @1.78 m bgs		1.78	74.5					50				3						
				LOGGED BY: HM				DRILLING DATE: 9-MAR-2026												
				INPUT BY: SAF				MONITORING DATE:												
				REVIEWED BY: YD				PAGE 1 OF 1												



CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH206											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033361.41		EASTING (m): 446824.79		ELEV. (m) 76.17												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE			SHELBY	SPLIT SPOON	GRAB									
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					40	80	120	160	N-VALUE (Blows/300mm)		PL	W.C.							
		TOPSOIL (40 mm)	0	76															
		FILL compact, moist, brown/grey silty sand and gravel trace organics	0.5	75.5	29					8.2			1	65					
		rock fragments	1	75	17					5.5			2	20					
		very dense, moist, brown SAND AND GRAVEL	1.5	74.5	50					14.2			3	30					
		SHALE/LIMESTONE BEDROCK	2	74															Hammer Bouncing
			2.5	73.5									1	100					TCR = 100% RQD = 13.8%
			3	73															
			3.5	72.5															
			4	72									2	100					TCR = 100% RQD = 78%
			4.5	71.5															
			5	71															
			5.5	70.5									3	100					TCR = 95.7% RQD = 72.2%
			6	70															
		END OF BOREHOLE																	



LOGGED BY: HM


DRILLING DATE: 11-MAR-2026

INPUT BY: SAF

MONITORING DATE:

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH207											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033352.98		EASTING (m): 446811.59		ELEV. (m) 76.24												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> GRAB											
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					N-VALUE (Blows/300mm)				PL W.C. LL										
					40 80 120 160				20 40 60 80										
		TOPSOIL (50 mm)	0	76	32				15.0			1	85				M&I, PAHs, BTEX, PHCs		
		FILL dense, moist silty sand and gravel trace asphalt	0.5	75.5															
		FILL compact, moist, grey silty sand and gravel trace clay	1	75	11				14.9			2	90						
		loose, moist, brown SILTY SAND some clay, trace gravel	1.5	74.5	4				11.4			3	70				GR 6% SA 60% SI/CL 34%		
		very dense, moist, dark grey SILTY SAND AND GRAVEL trace clay	2.5	74					10.8			4	80						
		END OF BOREHOLE AUGER REFUSAL ON INFERRED BEDROCK @2.9 m bgs		73.5	63														
												LOGGED BY: HM				DRILLING DATE: 9-MAR-2026			
												INPUT BY: SAF				MONITORING DATE:			
												REVIEWED BY:				PAGE 1 OF 1			

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH/MW208											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033351.81		EASTING (m): 446797.23		ELEV. (m) 75.42												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): 3		SCREEN SLOT #: 10		SAND TYPE: #2		SEALANT TYPE: BENTONITE											
SAMPLE TYPE																			
<input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> GRAB																			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					N-VALUE (Blows/300mm)				PL	W.C.	LL								
		TOPSOIL (30 mm)	0																
		FILL dense, wet, brown sand and gravel some organics, rootlets	0.5	75								1	65	-		M&I, PAHs, BTEX, PHCs			
			1	74.5	43							2	100	-					
		dense, dark grey SILTY GRAVEL trace clay	1.5	74															
			2	73.5	35							3	25	-		GR 52% SA 20% SI/CL 28%			
		very dense, weathered ROCK FRAGMENTS SHALE/LIMESTONE BEDROCK	2.5	73	50+							4							
			3	72.5								1	100					TCR = 100% RQD = 62.6%	
			3.5	72															
			4	71.5								2	100					TCR = 100% RQD = 44%	
			4.5	71															
			5	70.5															
			5.5	70								3	100					TCR = 100% RQD = 57.2%	
			6	69.5															
		END OF BOREHOLE																	



LOGGED BY: HM



DRILLING DATE: 10-MAR-2026


INPUT BY: SAF

MONITORING DATE: 27-MAR-2026

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF:												
ADDRESS: 261 BUENA VISTA ROAD				STATION:				BH209												
CITY/PROVINCE: OTTAWA, ONTARIO				NORTHING (m): 5033336.44		EASTING (m): 446798.32		ELEV. (m) 77.20												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING																
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE												
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> GRAB																				
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION		DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		40	80			120	160	PL	W.C.	LL	LL									
		ASPHALT (40 mm) FILL compact, moist, brown silty sand trace gravel, asphalt		0 0.5	77 76.5	18				25.4				1		60				
		END OF BOREHOLE AUGER REFUSAL ON INFERRED BEDROCK @0.8 m bgs																		
												LOGGED BY: HM				DRILLING DATE: 10-MAR-2026				
												INPUT BY: SAF				MONITORING DATE:				
												REVIEWED BY: YD				PAGE 1 OF 1				

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF:											
ADDRESS: 261 BUENA VISTA ROAD				STATION:				BH210											
CITY/PROVINCE: OTTAWA, ONTARIO				NORTHING (m): 5033323.67		EASTING (m): 446801.41		ELEV. (m) 77.56											
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE <input type="checkbox"/> AUGER <input type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> GRAB																			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					40	80	120	160	PL	W.C.	LL	LL							
		ASPHALT (40 mm)	0	77.5															
		FILL compact, moist, dark grey silty sand	0.5	77	19					13.1			1	90					
		some gravel, trace clay, pieces of asphalt								15.7			2A	90					
		FILL very dense to hard, moist, brown sand and silt some clay, trace gravel	1	76.5	60					9.8			2B						
		FILL moist, brown silt trace gravel, sand																	
		END OF BOREHOLE AUGER REFUSAL ON INFERRED BEDROCK @1.22 m bgs																	
												LOGGED BY: HM				DRILLING DATE: 10-MAR-2026			
												INPUT BY: SAF				MONITORING DATE:			
												REVIEWED BY:				PAGE 1 OF 1			

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH211											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 446812.65		EASTING (m): 5033324.32		ELEV. (m) 77.89												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE																			
<input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON <input type="checkbox"/> GRAB																			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					40	80	120	160	PL	W.C.	LL								
					N-VALUE (Blows/300mm)														
					20	40	60	80	20	40	60	80							
		INTERLOCK PAVER (60 mm) FILL dense, moist, brown silty sand some gravel, trace clay rock fragments	0 0.5 1	77.5 77	31 41				17.6 11.1				1 2	80 45					
		very dense, moist, brown SILTY SAND some gravel, rock fragments	1.5	76.5	50				11.7				3	80					
		SHALE/LIMESTONE BEDROCK	2	76															
			2.5	75.5									1	25				TCR = 68.9% RQD = 41.2%	
			3	75															
			3.5	74.5															
			4	74									2	95				TCR = 93% RQD = 59.6%	
			4.5	73.5															
			5	73									3	90				TCR = 86.8% RQD = 48.4%	
			5.5	72.5									4	90				TCR = 88.2% RQD = 57%	
		END OF BOREHOLE	72	72															



LOGGED BY: HM

DRILLING DATE: 13-MAR-2026

INPUT BY: SAF

MONITORING DATE:

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH212											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033337.70		EASTING (m): 446810.66		ELEV. (m) 77.37												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON <input checked="" type="checkbox"/> GRAB																			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					40	80	120	160	PL	W.C.	LL								
					N-VALUE (Blows/300mm)														
					20	40	60	80	20	40	60	80							
		ASPHALT (30 mm)	0	77															
		FILL compact, moist, brown sand and gravel trace clay, asphalt	0.5	76.5	16				11.5				1	60					
		FILL very dense, moist, brown silty sand some gravel, trace clay (possible boulder)	1	76					22.7				2	50		GR 18%	SA 51%	SI/CL 31%	
		very dense, grey/brown ROCK FRAGMENTS trace sand, silt	1.5	75.5	50				13.7				3	25					
		SHALE/LIMESTONE BEDROCK interbedded clay	2	75									1						
			2.5	74.5									2	90				TCR = 86.3%	
			3	74									3	100				RQD = 18.4%	
			3.5	73.5									4	90				TCR = 87.9%	
			4	73														RQD = 53%	
			4.5	72.5															
			5	72									5	100				TCR = 98.8%	
			5.5	71.5														RQD = 87.6%	
			6																
		END OF BOREHOLE																	



LOGGED BY: HM

DRILLING DATE: 12-MAR-2026

INPUT BY: SAF

MONITORING DATE:

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF: BH213											
ADDRESS: 261 BUENA VISTA ROAD				STATION:															
CITY/PROVINCE: OTTAWA, ONTARIO			NORTHING (m): 5033352.93		EASTING (m): 446833.40		ELEV. (m) 77.91												
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING/ROCK CORING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE			SHELBY	SPLIT SPOON	GRAB									
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					40	80	120	160	PL	W.C.	LL								
					N-VALUE (Blows/300mm)														
					20	40	60	80	20	40	60	80							
		TOPSOIL (100 mm)	0																
		FILL																	
		dense, moist, brown silty sand																	
		rock fragments																	
		compact	1	77	33				21.9				1	100					
		dense	1.5	76.5	11				10.7				2	40					
		compact	2	76	34				4.3				3	75					
		wet	2.5	75.5	21				13.5				4	0					
		compact	3	75	11				4.2				5	85					
		compact SILTY SAND	3.5	74.5	12								6	100					
		SHALE/LIMESTONE BEDROCK	3.5	74.5									1						TCR = 70.4% RQD = 0
			4	74									2						TCR = 90.1% RQD = 34.1%
			4.5	73.5									3						TCR = 100% RQD = 49.8%
			5	73									4						TCR = 88.5% RQD = 46.3%
			5.5	72.5															
			6	72															
		END OF BOREHOLE																	



LOGGED BY: HM

DRILLING DATE: 19-MAR-2026

INPUT BY: SAF

MONITORING DATE:

REVIEWED BY: YD

PAGE 1 OF 1

CLIENT: ELMWOOD SCHOOL				PROJECT NO.: CO680.02				RECORD OF:											
ADDRESS: 261 BUENA VISTA ROAD				STATION:				BH214											
CITY/PROVINCE: OTTAWA, ONTARIO				NORTHING (m): 5033355.02		EASTING (m): 446850.75		ELEV. (m) 77.97											
CONTRACTOR: STRATA DRILLING INC.				METHOD: SPLIT SPOON SAMPLING															
BOREHOLE DIAMETER (cm): 10		WELL DIAMETER (cm): -		SCREEN SLOT #: -		SAND TYPE: -		SEALANT TYPE: BENTONITE											
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON	<input type="checkbox"/> GRAB											
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa)				WATER CONTENT (%)				SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	CSV/TOV (ppm or %LEL)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
					N-VALUE (Blows/300mm)				PL W.C. LL										
					40	80	120	160	20	40	60	80							
		TOPSOIL (152 mm) FILL very dense, moist, grey silty sand trace clay, gravel, organics	0	77.5									1		100				
		FILL compact, wet, brown sand and gravel	0.5	77									2		80				
		FILL compact, moist, brown/grey silty sand and gravel	1	76.5									3		60				
		--- very dense --- rock fragments	1.5	76									4		85				
		--- compact	2	75.5									5		60				
		END OF BOREHOLE	2.5	75															
			3																



LOGGED BY: HM

DRILLING DATE: 19-MAR-2026

INPUT BY: SAF

MONITORING DATE:

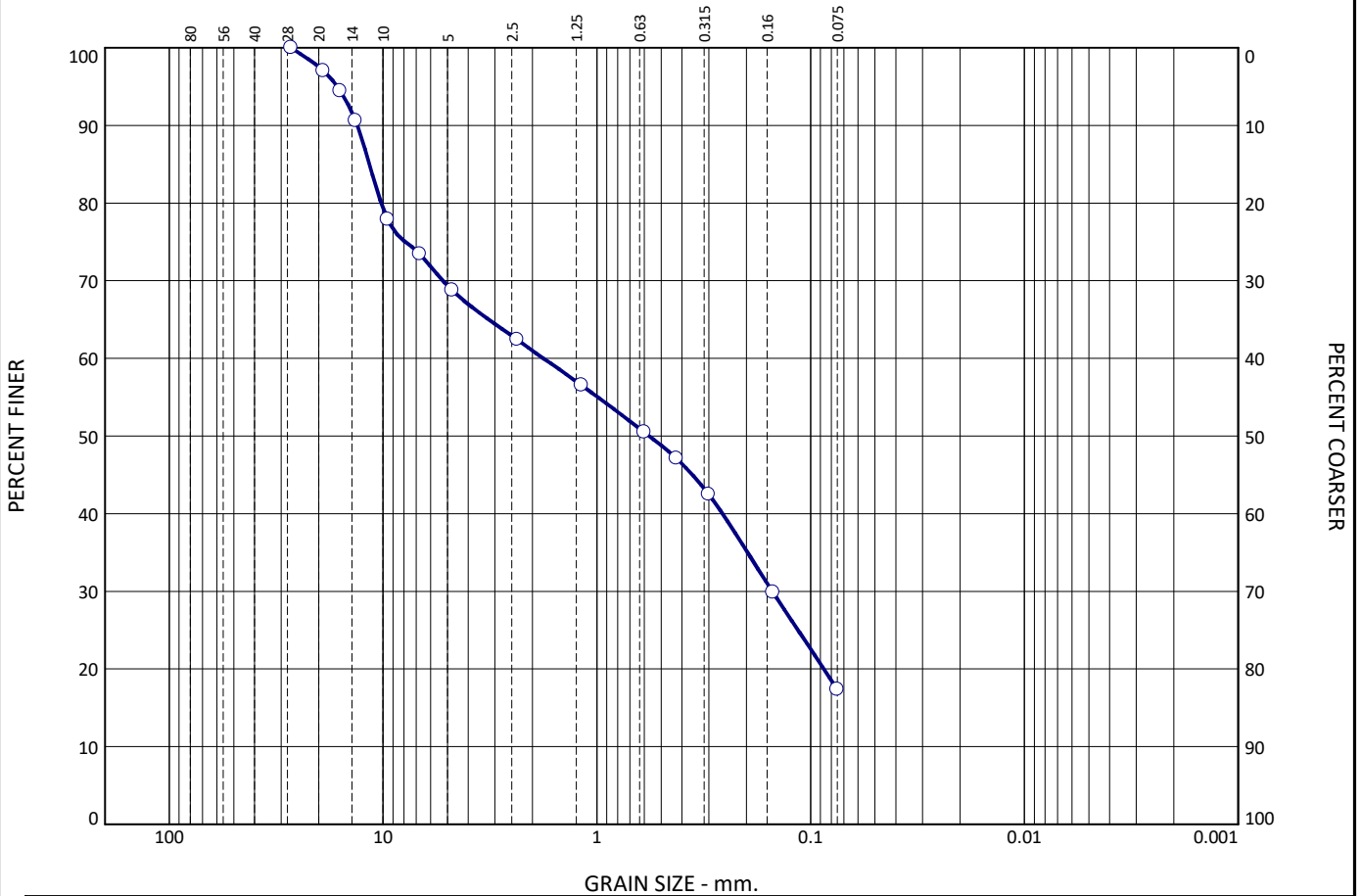
REVIEWED BY: YD

PAGE 1 OF 1

APPENDIX F
GEOTECHNICAL LABORATORY TEST RESULTS

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
<input type="radio"/>	0	39	14	30	17	

	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input checked="" type="checkbox"/>			11.5955	1.7766	0.5693	0.1511				

Material Description	Test Date	USCS	NM
<input type="radio"/> SAND AND GRAVEL some silt	Apr 6/26		

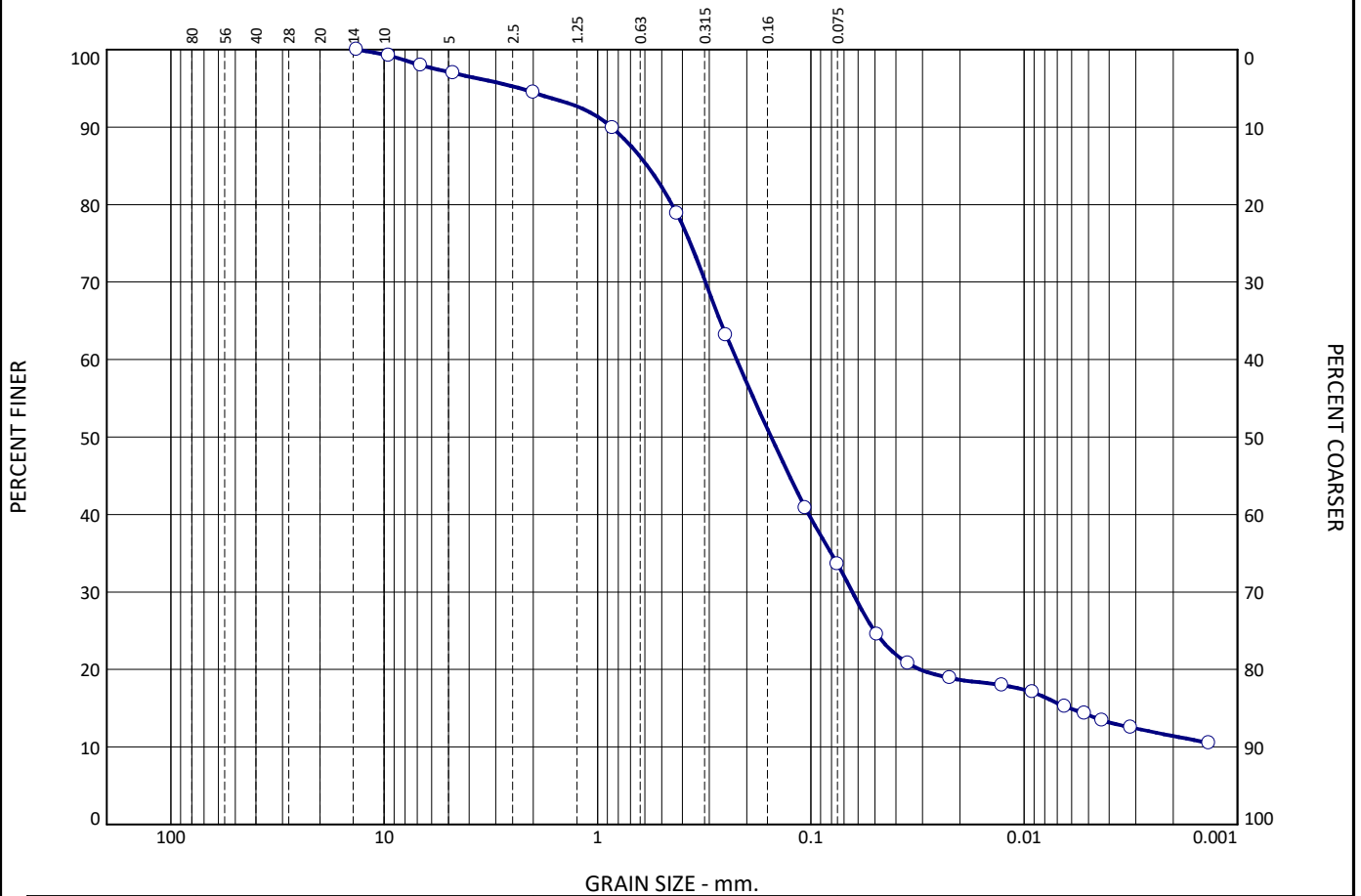
<p>Project No. CO680.02 Client: Elmwood School</p> <p>Project: 261 Beuna Vista</p> <p><input type="radio"/> Sample Number: BH205 SS2A, 2B</p>	<p>Remarks:</p>
<p>Terrapex</p> <p>Toronto, Ontario</p>	

Figure 5

Tested By: AR

Particle Size Distribution Report

ASTM D422



GRAIN SIZE - mm.

	% +3"	% Gravel	% Sand		% Fines		
			Coarse	Fine	Silt	Clay	
<input type="radio"/>	0	6	15	45	23	11	

	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>	NV	NP	0.5846	0.2230	0.1536	0.0639	0.0061			

Material Description	Test Date	USCS	NM
<input type="radio"/> SILTY SAND some clay trace gravel	Apr 2/26	SM	

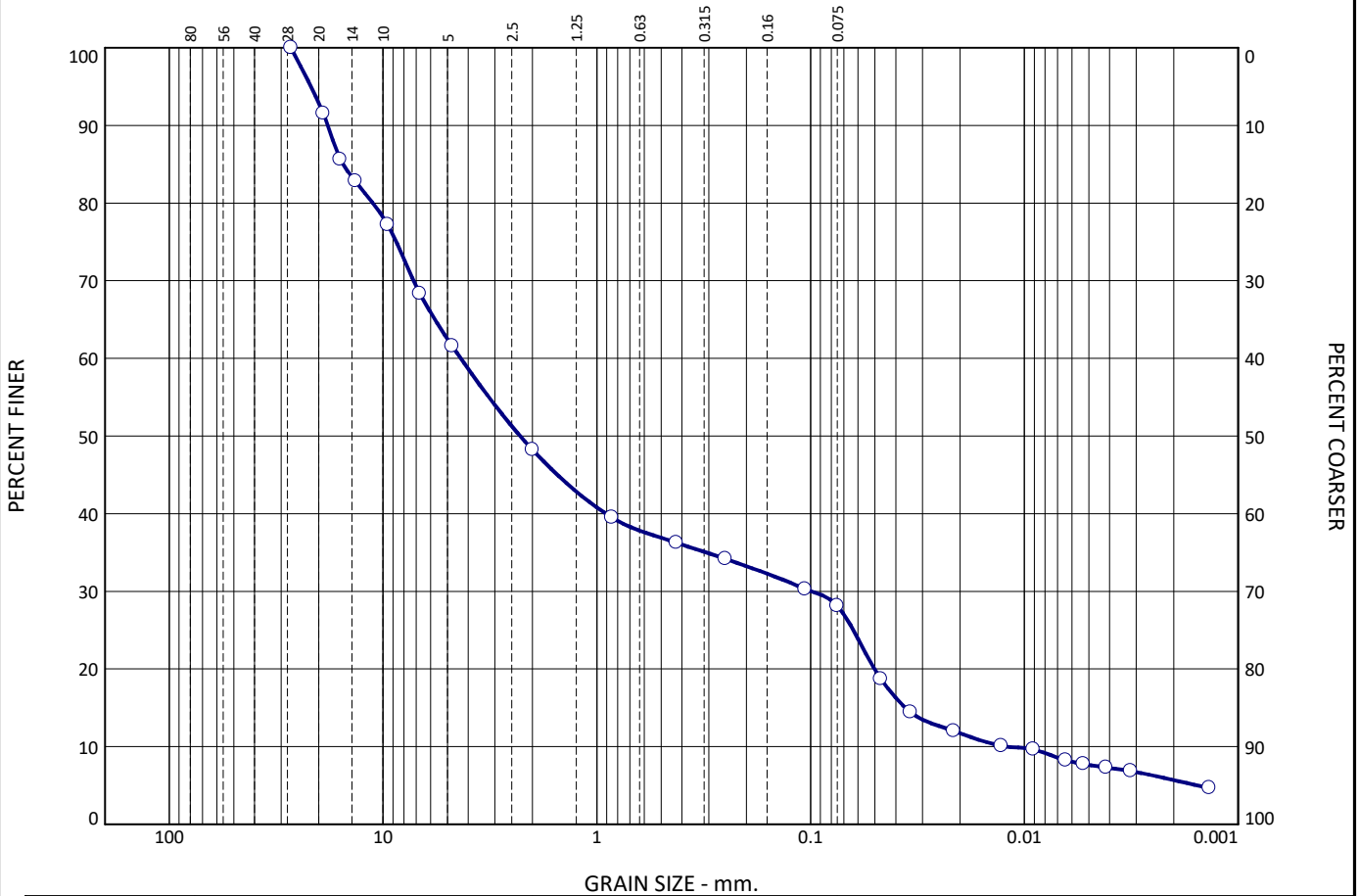
Project No. CO680.02 Client: Elmwood School Project: 261 Beuna Vista <input type="radio"/> Depth: 5'-7' Sample Number: BH207 SS3	Remarks: <input type="radio"/> Hydrometer Details: Sp. Grav. = 2.75(assumed); Vb=53cm ³ ; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm ² ; Mass of Disp. Agent=40g/l
Terrapex Toronto, Ontario	

Figure 4

Tested By: Anna Matthews

Particle Size Distribution Report

ASTM D422



	% +3"	% Gravel	% Sand		% Fines	
			Coarse	Fine	Silt	Clay
<input type="radio"/>	0	52	12	8	22	6

	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>	NV	NP	15.4419	4.3326	2.2844	0.0996	0.0360	0.0122	0.19	355.76

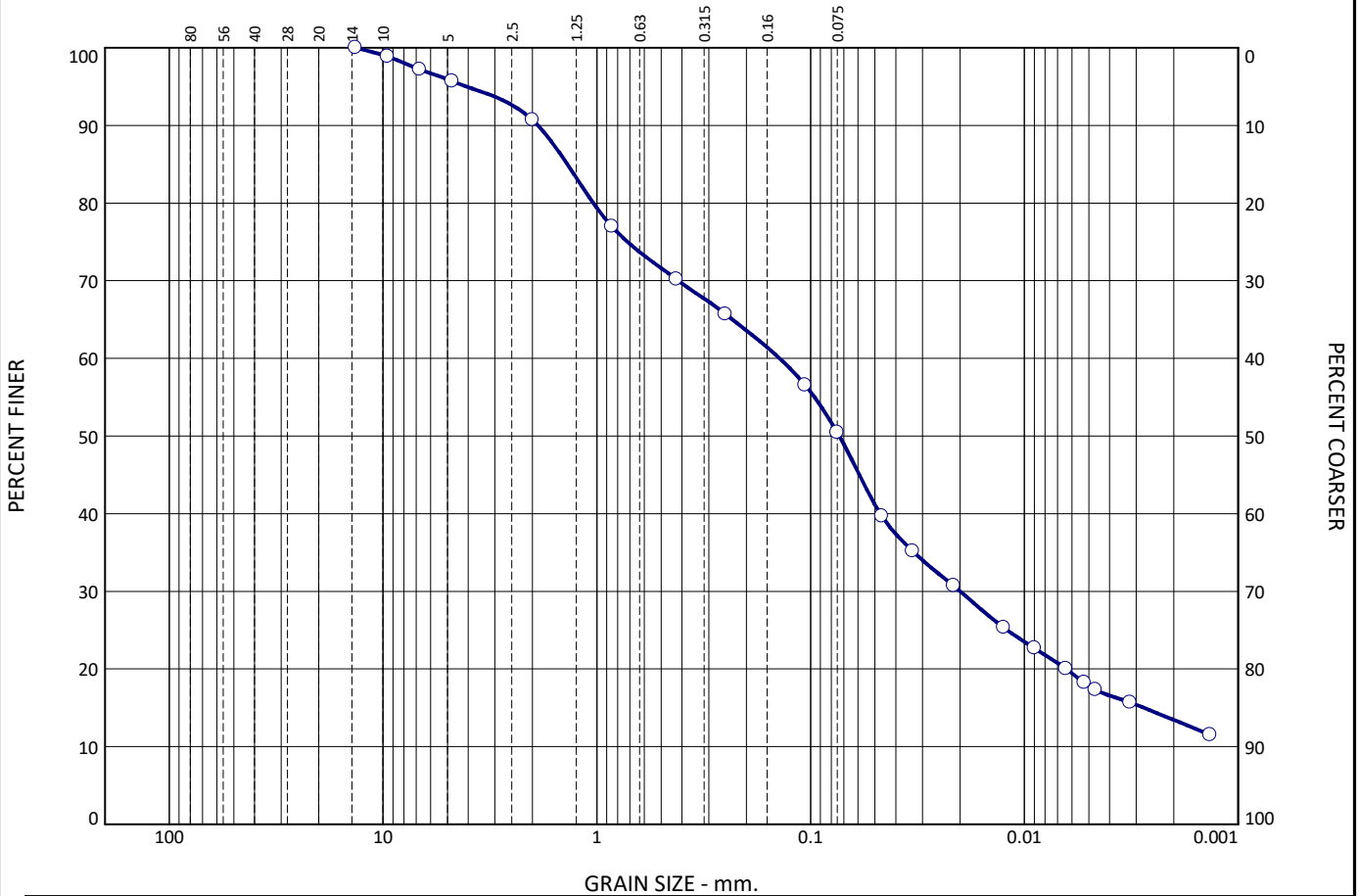
Material Description	Test Date	USCS	NM
<input type="radio"/> SILTY GRAVEL some silt trace clay	Apr 2/26	GM	

<p>Project No. CO680.02 Client: Elmwood School</p> <p>Project: 261 Beuna Vista</p> <p><input type="radio"/> Depth: 5'-7' Sample Number: BH/MW208 SS3</p>	<p>Remarks:</p> <p><input type="radio"/> Hydrometer Details: Spc. Grav. = 2.75(assumed); Vb=53cm³; L2=13.8cm; L1=10.7cm; hs=0.16cm/Div; A=30.2cm²; Mass of Disp. Agent=40g/l</p>
<p>Terrapex</p> <p>Toronto, Ontario</p>	
<p>Figure 3</p>	

Tested By: Anna Matthews

Particle Size Distribution Report

ASTM D422



GRAIN SIZE - mm.

	% +3"	% Gravel	% Sand		% Fines					
			Coarse	Fine	Silt	Clay				
<input type="radio"/>	0	9	21	20	37	13				
<input checked="" type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>	26.1	21.1	1.3747	0.1397	0.0733	0.0200	0.0028			

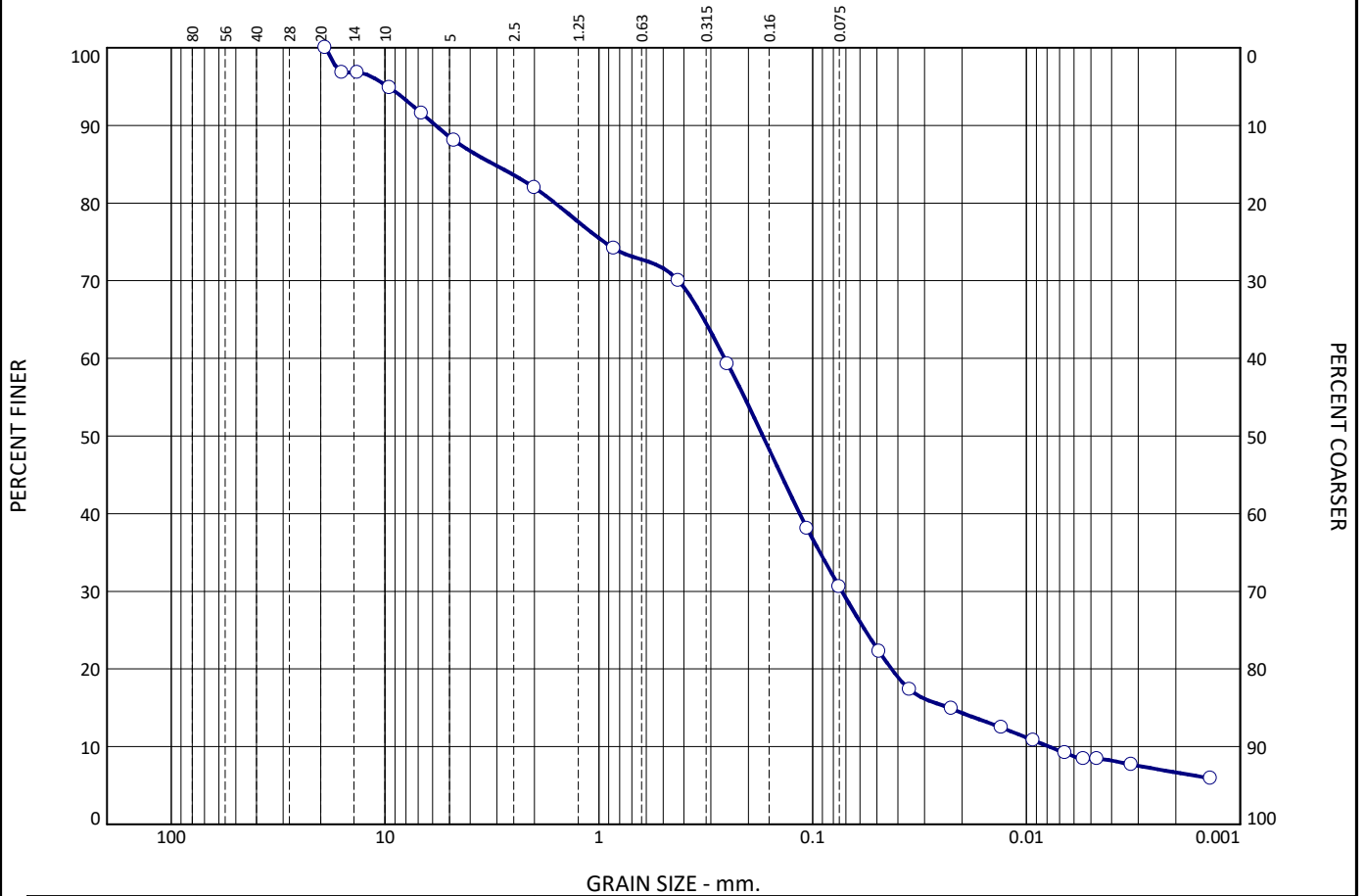
Material Description	Test Date	USCS	NM
<input type="radio"/> SAND AND SILT some clay trace gravel	Apr 2/26	CL-ML	

Project No. CO680.02 Client: Elmwood School Project: 261 Beuna Vista <input type="radio"/> Depth: 2.5' - 4' Sample Number: BH210 SS2A	Remarks: <input type="radio"/> Hydrometer Details: Spc. Grav. = 2.75(assumed); Vb=53cm ³ ; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm ² ; Mass of Disp. Agent=40g/l
Terrapex Toronto, Ontario	
Figure 1	

Tested By: Anna Matthews

Particle Size Distribution Report

ASTM D422



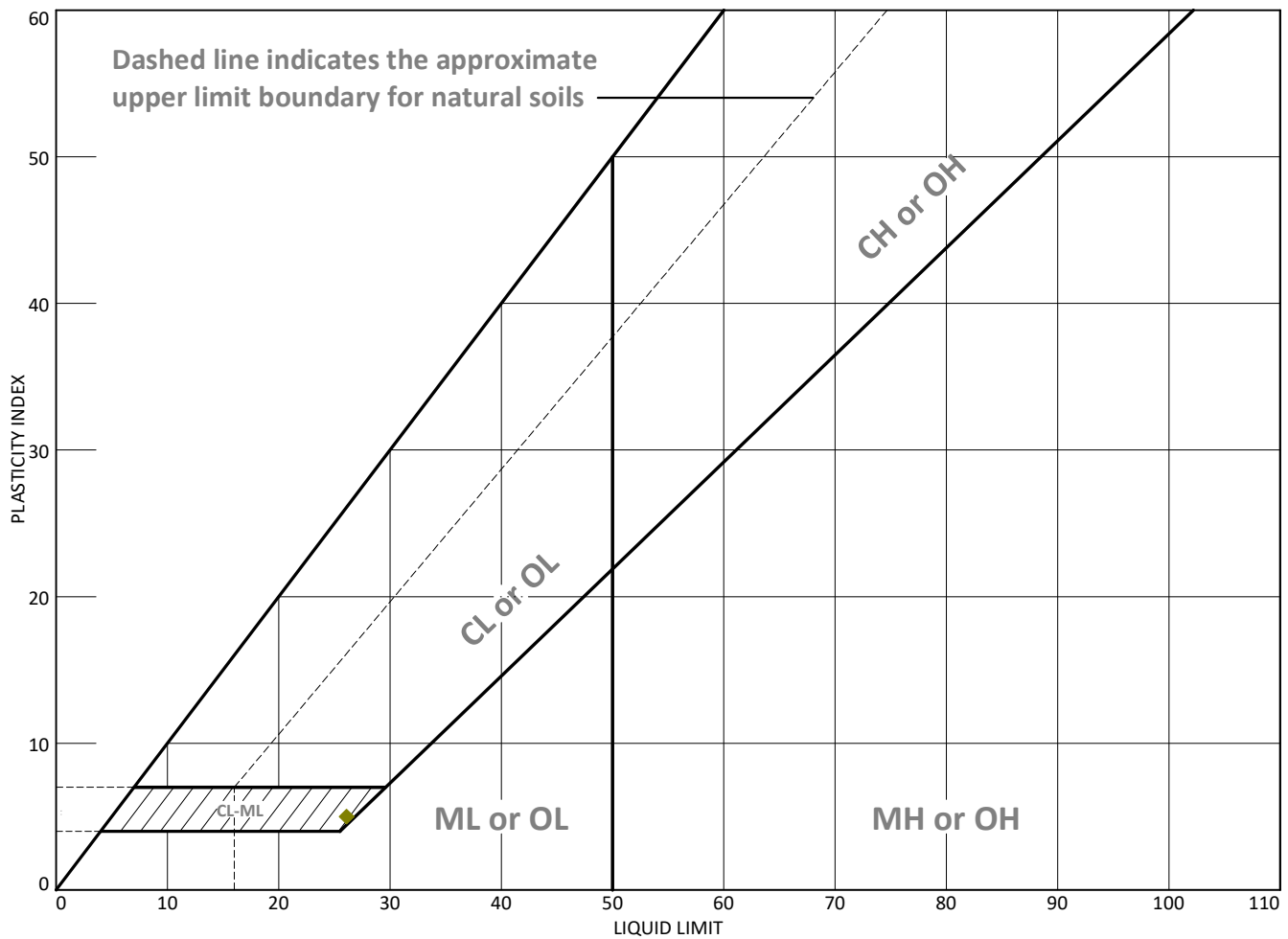
	GRAIN SIZE - mm.									
	% +3"	% Gravel			% Sand		% Fines			
				Coarse	Fine	Silt		Clay		
○	0	18			12	39	24		7	
⊗	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	NV	NP	3.0982	0.2582	0.1709	0.0729	0.0229	0.0078	2.63	32.96

Material Description	Test Date	USCS	NM
○ SILTY SAND some gravel trace clay	Apr 2/26	SM	

<p>Project No. CO680.02 Client: Elmwood School</p> <p>Project: 261 Beuna Vista</p> <p>○ Depth: 2.5'-4.5' Sample Number: BH212 SS2</p>	<p>Remarks:</p> <p>○ Hydrometer Details: Spc. Grav. = 2.75(assumed); Vb=53cm³; L2=13.8cm; L1=10.7cm; hs= 0.16cm/Div; A=30.2cm²; Mass of Disp. Agent=40g/l</p>
<p>Terrapex</p> <p>Toronto, Ontario</p>	
<p>Figure 2</p>	

Tested By: Anna Matthews

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	SILTY GRAVEL some silt trace clay	NV	NP	NP	36	28	GM
■	SILTY SAND some gravel trace clay	NV	NP	NP	70	31	SM
▲	SILTY SAND some clay trace gravel	NV	NP	NP	79	34	SM
◆	SAND AND SILT some clay trace gravel	26.1	21.1	5.0	70	50	CL-ML

Project No. CO680.02 **Client:** Elmwood School
Project: 261 Beuna Vista

● **Depth:** 5'-7' **Sample Number:** BH/MW208 SS3
■ **Depth:** 2.5'-4.5' **Sample Number:** BH212 SS2
▲ **Depth:** 5'-7' **Sample Number:** BH207 SS3
◆ **Depth:** 2.5' - 4' **Sample Number:** BH210 SS2A

Terrapex
Toronto, Ontario

Remarks:
● Test Date: April 10, 2026
■ Test Date: April 10, 2026
▲ Test Date: April 10, 2026
◆ Test Date: April 10, 2026

Figure 6

Tested By: JC _____

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-13

Borehole BH-D

Sample ID
 Run : 2

Depth : 10'7⁵/₈" - 11'3²/₁₆"

Specimen Parameter	
Diameter in mm	47.76
Length in mm	98.68
Mass of the specimen in g	445
Bulk Density Kg/m ³	24.69
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	91.2
Height to diameter ratio	2.1
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as described by client)	Shale/Limestone
Compressive Strength MPa	50.8

Pictures of the specimen:

Before Break



After Break



Note:

1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

**** End of report ****

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-12

Borehole BH-G

Sample ID
 Run : 5

Depth : 16'7" - 17'2½"

Specimen Parameter	
Diameter in mm	46.99
Length in mm	107.79
Mass of the specimen in g	488
Bulk Density Kg/m ³	25.61
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	16.3
Height to diameter ratio	2.3
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as decribed by client)	Shale/Limestone
Compressive Strength MPa	9.4

Pictures of the specimen:

Before Break



After Break



Note:

1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

**** End of report ****

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-10

Borehole BH-H

Sample ID
 Run : 1

Depth : 10'10⁵/₁₆" - 11'5³/₄"

Specimen Parameter	
Diameter in mm	47.23
Length in mm	92.88
Mass of the specimen in g	424.5
Bulk Density Kg/m ³	25.59
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	49.9
Height to diameter ratio	2.0
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as described by client)	Shale/Limestone
Compressive Strength MPa	28.4

Pictures of the specimen:

Before Break



After Break



Note:

1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

**** End of report ****

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-11

Borehole BH-J

Sample ID
 Run : 2

Depth : 14'9¼" - 15'6½"

Specimen Parameter	
Diameter in mm	47.09
Length in mm	95.92
Mass of the specimen in g	433.2
Bulk Density Kg/m ³	25.44
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	22.1
Height to diameter ratio	2.0
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as described by client)	Shale/Limestone
Compressive Strength MPa	12.7

Pictures of the specimen:

Before Break



After Break



Note:

1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

**** End of report ****

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-09

Borehole BH-L

Sample ID
 Run : 3

Depth : 9'7¼" - 10'2½"

Specimen Parameter	
Diameter in mm	48.07
Length in mm	98.84
Mass of the specimen in g	455
Bulk Density Kg/m ³	24.88
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	77.6
Height to diameter ratio	2.1
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as described by client)	Shale/Limestone
Compressive Strength MPa	42.7

Pictures of the specimen:

Before Break



After Break



Note:

1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

**** End of report ****

Project No. : CO680.02
Client: Elmwood School
Location : 261 Buena Vista Road, Ottawa, Ontario.

Testing Date: 2026-Apr-13
Date Sampled: 2026-Mar-19

Borehole BH-N

Sample ID
 Run : 2

Depth : 12'10½" - 13'6"

Specimen Parameter	
Diameter in mm	49.18
Length in mm	99.32
Mass of the specimen in g	493.5
Bulk Density Kg/m ³	25.66
Moisture condition of specimen	as received

Compressive Strength	
Maximum Load in kN	60.1
Height to diameter ratio	2.0
Allowable height to diameter ratio	2.0 - 2.5
Lithology (as described by client)	Shale/Limestone
Compressive Strength MPa	31.6

Pictures of the specimen:

Before Break



After Break



Note:

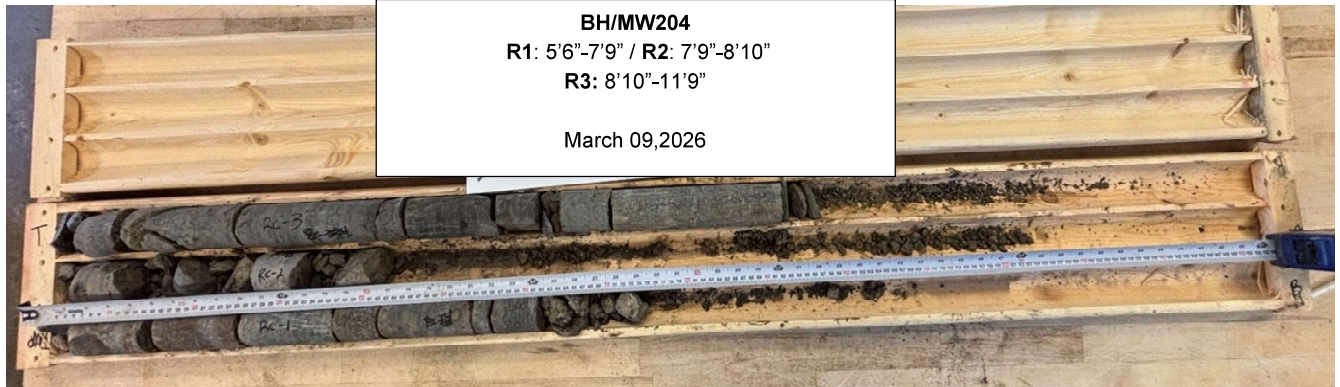
1. Core ends were levelled before testing
2. Pictures are not to scale

Tested By : John Ramachandran

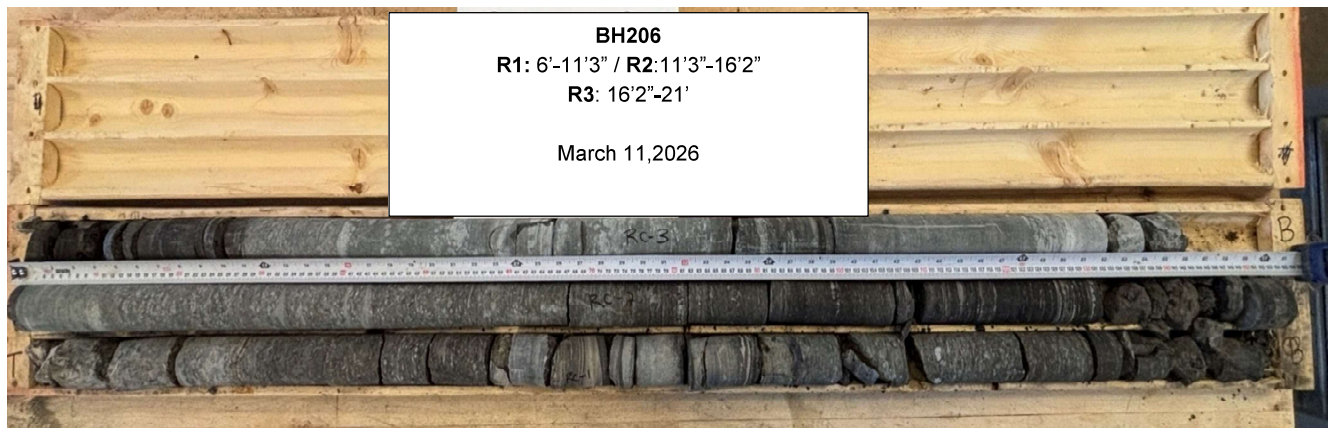
**** End of report ****

APPENDIX G
ROCK CORE PHOTOS

BH/MW204 CORE PHOTOGRAPHS



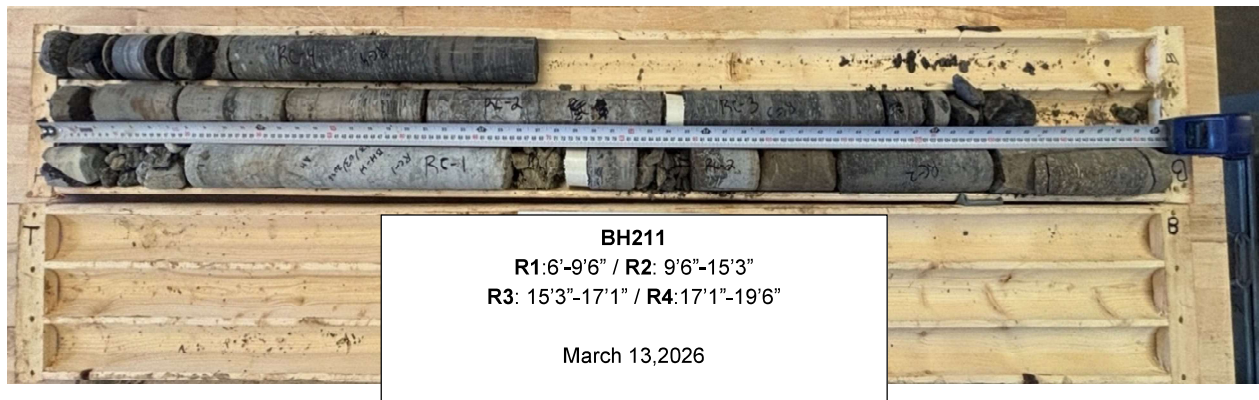
BH206 CORE PHOTOGRAPH



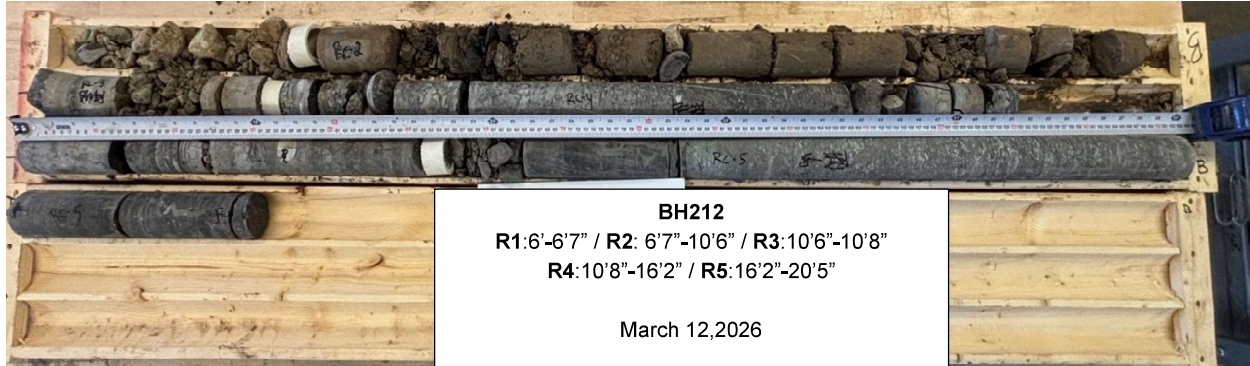
BH/MW208 CORE PHOTOGRAPH



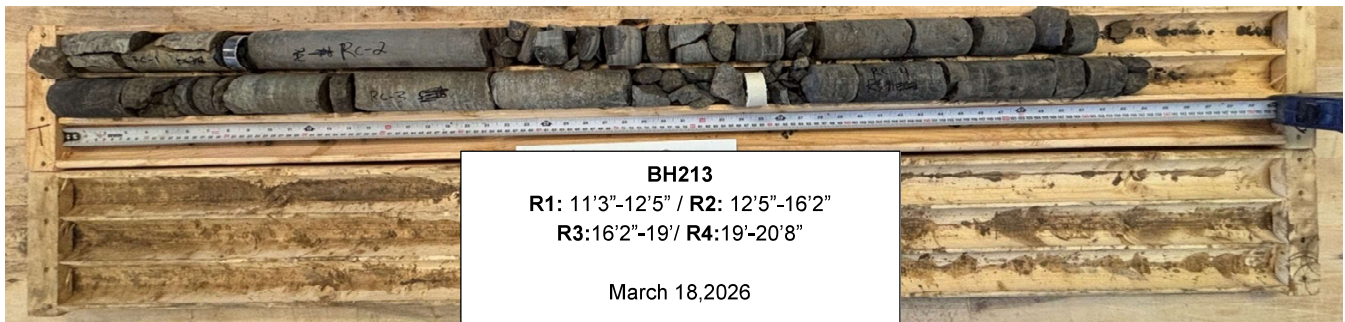
BH211 CORE PHOTOGRAPH



BH212 CORE PHOTOGRAPH



BH213 CORE PHOTOGRAPH



APPENDIX H
MASW TEST RESULTS



FRONTWAVE
G E O P H Y S I C S

**SHEAR WAVE VELOCITY TESTING
FOR SEISMIC SITE CLASSIFICATION
ELMWOOD SCHOOL
261 BUENA VISTA ROAD, OTTAWA, ONTARIO**

Submitted to:

Terrapex

20 Gurdwara Road, Unit 1
Ottawa, Ontario K2E 8B3

Attention:

Mr. Yacouba Doro, BScEng, MBA-PM, P.Eng., PMP

Email: y.doro@terrapex.com

File No. F-26498

March 23, 2026

Rev. March 24, 2026

Frontwave Geophysics Inc.
Brampton, ON
(647) 514-4724
www.frontwave.ca

TABLE OF CONTENTS

1	INTRODUCTION	1
2	INVESTIGATION METHODOLOGY	1
	2.1 Multichannel Analysis of Surface Waves (MASW)	1
	2.2 Seismic Refraction	4
3	RESULTS	5
4	CLOSURE	9

LIST OF FIGURES

Figure 1.	Survey location plan	2
Figure 2.	The procedure of MASW data processing using the SeisImager SW software package	3
Figure 3.	Seismic model showing the basic principle of refraction method	4
Figure 4.	Data examples displaying a stacked S-wave refraction shot record and MASW dispersion image	6
Figure 5.	Interpreted depth to bedrock from S-wave refraction	7
Figure 6.	Shear wave velocity profile from MASW sounding and S-wave refraction	7

LIST OF TABLES

Table 1.	Shear wave velocities from MASW sounding and S-wave refraction	8
Table 2.	V_{s30} values from MASW sounding and S-wave refraction	8

1 INTRODUCTION

Frontwave Geophysics Inc. was retained by Terrapex to carry out a geophysical investigation for the proposed addition to the Elmwood School building located at 261 Buena Vista Road in Ottawa, Ontario.

The objective of the survey was to determine site designation for seismic site response based on the average shear wave velocity value measured over the upper 30 m (V_{s30}). The multi-channel analysis of surface waves (MASW) and seismic refraction methods were employed for this investigation. The MASW aimed to obtain shear wave velocity depth profiles in the overburden; the purpose of the seismic refraction survey was to obtain shear wave velocity values for the top of bedrock.

The fieldwork was conducted on March 18, 2026. The location of the seismic survey line is shown in Figure 1.

This report describes the basic principles of the seismic refraction and MASW methods, survey design, interpretation method, and presents the results of the investigation in the chart and table format.

2 INVESTIGATION METHODOLOGY

2.1 Multichannel Analysis of Surface Waves (MASW)

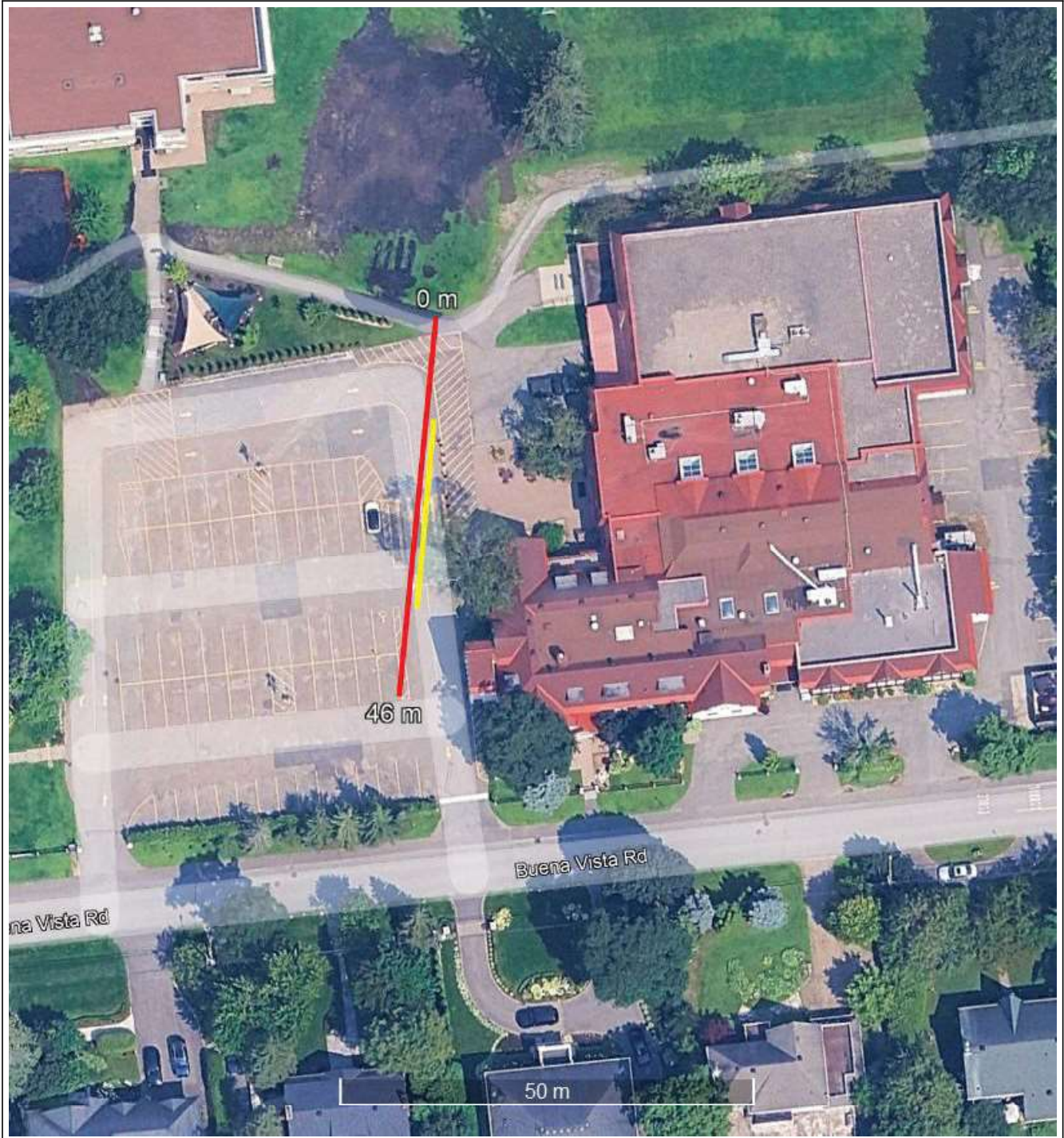
Overview

The Multi-channel Analysis of Surface Waves (MASW) is a seismic method widely applied to produce shear wave velocity (V_s) profiles. It is based on the dispersive nature of Rayleigh or Love surface waves in layered media. Surface waves with longer wavelengths propagate deeper in the subsurface, hence, their phase velocity is more influenced by the elastic properties of deeper layers. The velocity of surface waves depends mainly on the shear wave velocity of the medium. The distribution of surface waves phase velocities as a function of wavelength (or frequency) can be visualized as a dispersion curve. The inverse problem is then solved by modelling the experimental data with a theoretical dispersion curve; the model parameters are typically limited to layer thickness and shear wave velocity with an assumption of horizontally layered strata. As a result of the inversion, a shear wave velocity depth profile is obtained. Figure 2 illustrates the overall procedure of the MASW method.

Survey Design

The acquisition layout consisted of 24 receivers in a linear array (spread), connected with a multicore cable to a DAQLink 4 seismograph. 4.5 Hz natural frequency vertical geophones were used for this survey. The measurements were conducted with a spread length of 23 m (1 m spacing between geophones).

An 8-kg sledgehammer was used as an energy source. Shots were executed at five locations per spread: one shot in the middle of the spread, two shots close to the ends of the spread, and two shots with an offset of 10 m from the ends of the spread. The record length was set to 1500 ms with a 0.125 ms sampling interval.



Legend

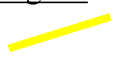


-  Location of 23 m, 24-geophone MASW spread
-  Location of 46 m, 24-geophone seismic refraction spread

Image: Google Earth 2024

Date: 2026-03-23	
File No: F-26498	
Title: Survey location plan	
Location: 261 Buena Vista Rd Ottawa, ON	Figure: 1

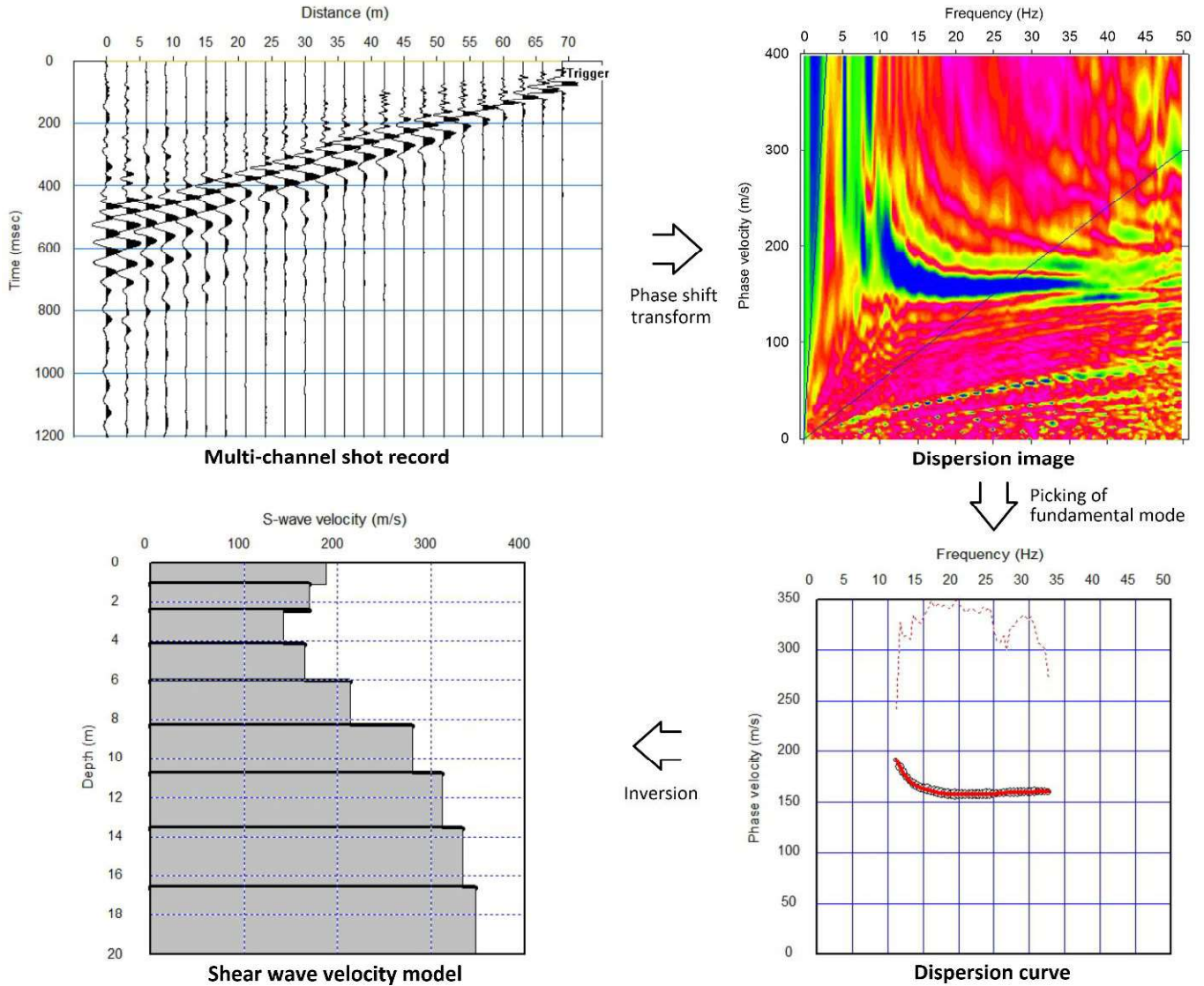


Figure 2 The procedure of MASW data processing using the SeisImager SW software package.

Interpretation

A dispersion curve is obtained from each field record by converting the shot gather into a dispersion image and then identifying and picking the fundamental mode. A shear wave velocity profile is obtained through inversion of the dispersion curve by modelling the subsurface as a horizontally layered medium with the model parameters limited to the number of layers, their thickness and shear-wave velocity.

ZondST2D software package was used for processing, picking and inversion of the MASW data.

Accuracy of the results

The accuracy of MASW generally depends on the complexity of the subsurface and specific site conditions (noise levels, topography, etc.). Lateral velocity variations and steeper bedrock topography increase the dispersion uncertainty. The presence of high-velocity contrast layers such as bedrock will require the use of a-priori information to optimize model parameters for more accurate results. Hence, if the a-priori information is not available (e.g. when the data are overly noisy to carry out refraction analysis), the accuracy decreases.

At bedrock sites and sites with very shallow overburden overlying bedrock, the MASW method performs poorly. Very strong velocity contrast between layers at shallow depths often results in a superposition of fundamental and higher Rayleigh wave modes which, when superimposed, cannot be distinguished. At sites where the thickness of the overburden is sufficient to obtain a coherent dispersion, the inversion would significantly underestimate the S-wave velocity within the rock. For this reason, it is preferred to supplement the MASW with shear wave refraction data which provide accurate shear wave velocity values for bedrock.

2.2 Seismic Refraction

Overview

The seismic refraction method is based on the measurement of arrival times of seismic waves refracted at interfaces between geological layers. The method is used to obtain velocity depth models and to map interfaces between layers with significant velocity contrast such as water table and bedrock surface. Compressional (P) wave or shear (S) wave refracted arrivals can be recorded using vertically or horizontally oriented sensors and sources, respectively. Figure 3 is a schematic of a simplified seismic model showing the basic principle of the refraction method.

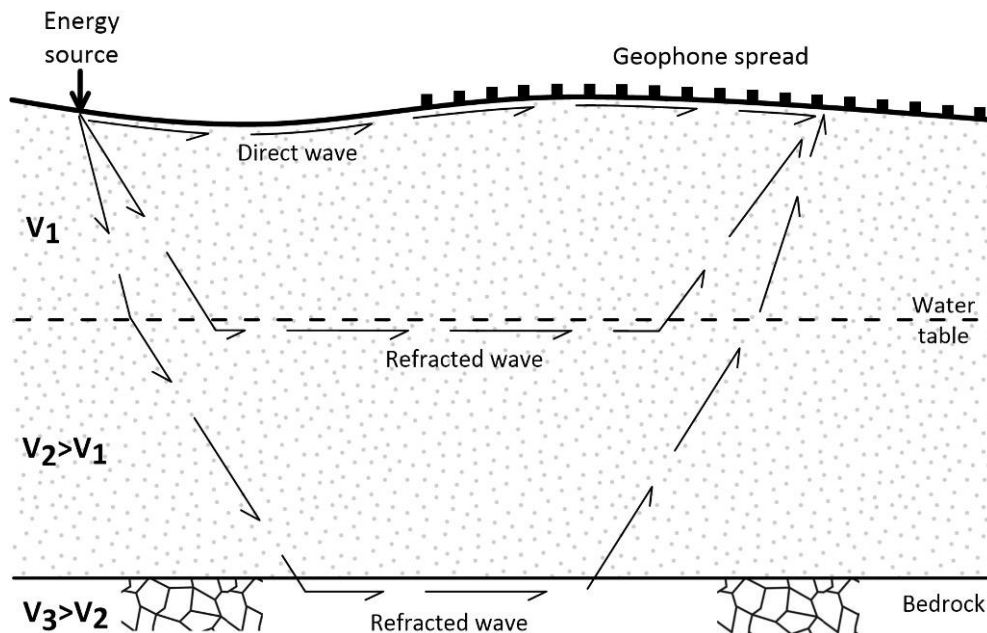


Figure 3 Seismic model showing the basic principle of refraction method.

Survey Design

The acquisition layout consisted of 24 receivers in a linear array (spread), connected with a multicore cable to a DAQLink 4 seismograph. 10 Hz natural frequency horizontal geophones were used for this survey. The measurements were conducted with a spread length of 46 m (2 m spacing between geophones).

An 8-kg sledgehammer was used as an energy source. Shots were executed at four locations per spread: two shots at the ends of the spread and two shots with an offset of 25 m from the ends of the spread. Preferential S-wave energy was generated by horizontally striking a metal bar in a direction perpendicular to the survey line. Shots in two opposite directions were recorded at each shot location to record S-wave arrivals of opposite polarity. The record length was set to 500 ms with a 0.1 ms sampling interval.

Interpretation

The reciprocal (plus-minus) method was used for the interpretation of the seismic refraction data. The method assumes the subsurface as a series of discrete layers (refractors) with simple velocity distributions. It allows calculating the depth and velocity of a continuous undulating refractor, providing the target layer is of sufficient thickness and the dip angles are moderate.

ZondST2D software package was used for processing of the refraction data. The processing involved stacking of shot records obtained with opposite source directions, identification and picking of S-wave first arrivals.

Accuracy of the results

The accuracy of bedrock velocity determination at this site was estimated to be within 10%.

3 RESULTS

The quality of seismic data was good; first arrivals of refracted waves and MASW dispersion curves were well defined. Example shot record and MASW dispersion image obtained at this site are presented in Figure 4.

The results of the interpretation of S-wave refraction data are presented in Figure 5 in the form of a bedrock profile. The interpreted depth to bedrock ranged approximately from 1.4 to 2.5 m below the ground surface. The shear wave velocity in the competent bedrock measured using the refraction method was 2093 m/s.

Refraction data were used for parameterization of the initial MASW inversion model. The measured shear wave velocity for the bedrock is representative of the top of the rock. According to Commentary J (Paragraph 145) of the National Building Code of Canada 2020 (NBC 2020), the measured value may be extrapolated if the rock conditions are known to be continuous to a depth of 30 m.

The resulting shear wave velocity depth profile is presented in Figure 6. The average S-wave velocity is plotted in the chart as a solid line. The dashed lines represent the upper and lower bound S-wave velocity profiles.

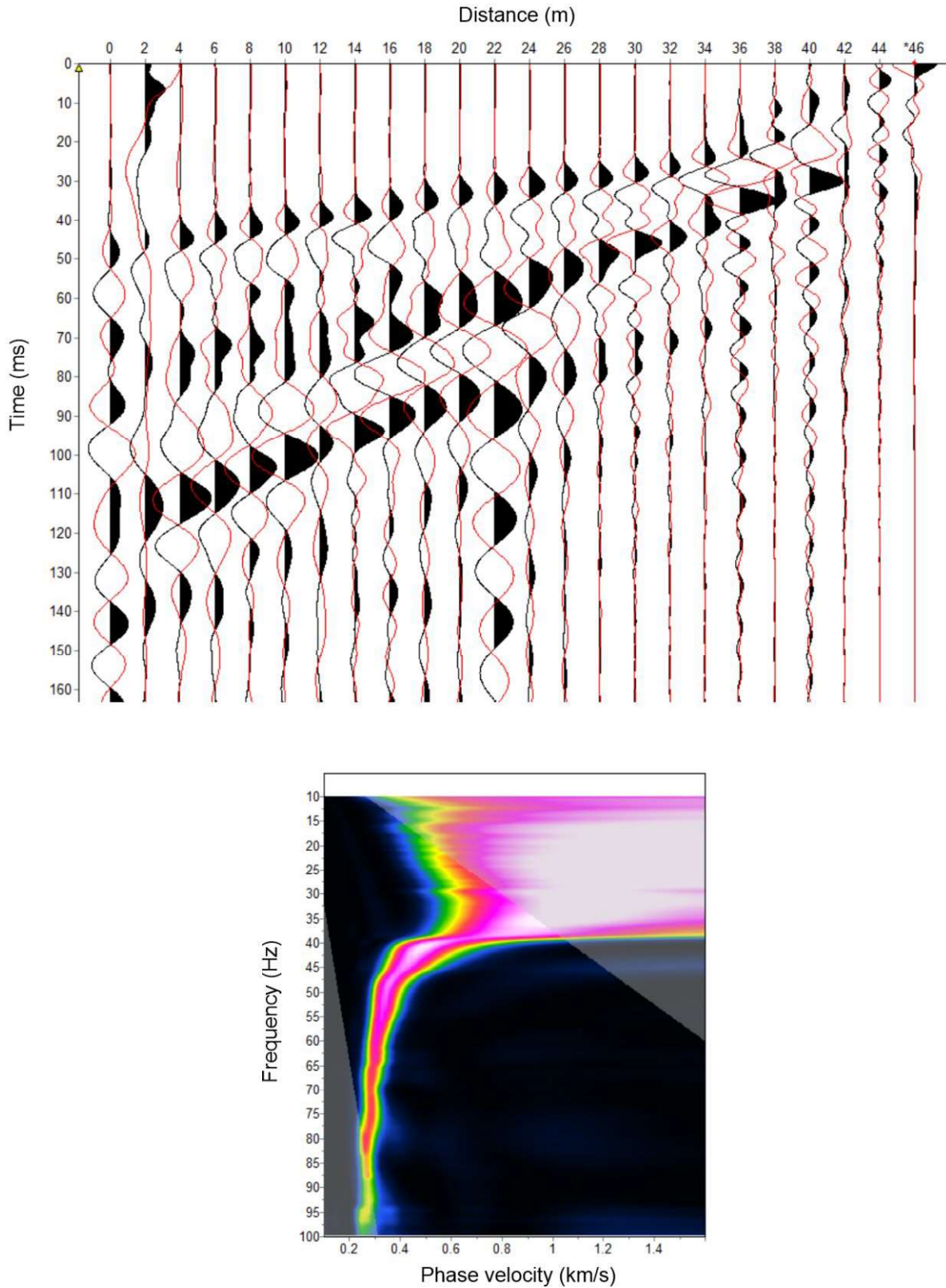


Figure 4 Data examples displaying a stacked S-wave refraction shot record (top), and MASW dispersion image (bottom).

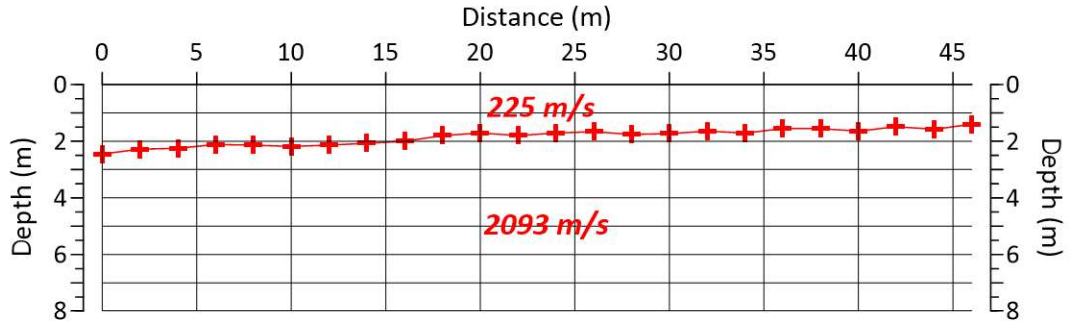


Figure 5 *Interpreted depth to bedrock from S-wave refraction.*

Shear Wave Velocity Profile

261 Buena Vista Rd, Ottawa, ON

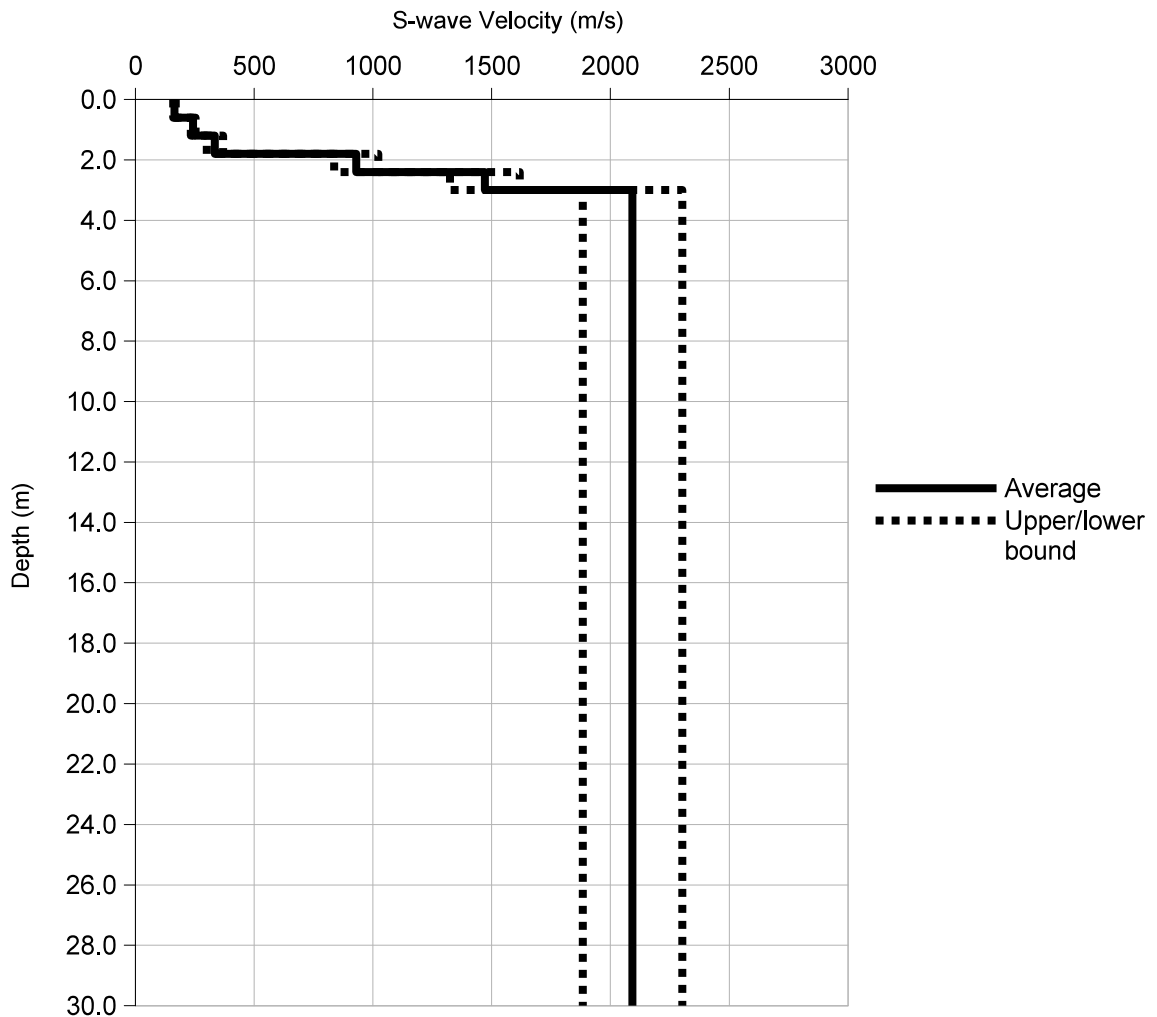


Figure 6 *Shear wave velocity profile from MASW sounding and S-wave refraction.*

The tabulated shear wave velocity model is presented in Table 1.

Table 1 Shear wave velocities from MASW sounding and S-wave refraction.

Depth Interval (m)		S-wave Velocity (m/s)
From	To	
0.0	0.6	164
0.6	1.2	244
1.2	1.8	335
1.8	2.4	930
2.4	3.0	1471
3.0	30.0	2093

The average shear wave velocity within the upper 30 meters (V_{s30}) is defined as the travel-time weighted average velocity from surface to a depth of 30 m and calculated using the following formula:

$$V_{s30} = 30 / \Sigma (d/V_s),$$

where d is the thickness of any layer and V_s is the layer S-wave velocity. In other words, V_{s30} is calculated as 30 m divided by the sum of the S-wave travel times for each layer within the topmost 30 m.

The calculated V_{s30} values are presented in Table 2.

Table 2 V_{s30} values from MASW sounding.

Depth Range (m)	Minimum V_{s30} (m/s)	Average V_{s30} (m/s)	Maximum V_{s30} (m/s)	NBC 2020 Site Designation
0 to 30	1258	1372	1483	X₁₃₇₂

The V_{s30} values obtained from the MASW sounding varied from 1258 m/s to 1483 m/s with an average of 1372 m/s.

Based on Sentence 4.1.8.4.(2b) of the 2024 Ontario Building Code (2024 OBC), the **Site Designation** is **X₁₃₇₂**.

4 CLOSURE

Shear wave velocity testing involving the MASW and seismic refraction methodologies was carried out for the proposed addition to the Elmwood School building located at 261 Buena Vista Road in Ottawa, Ontario.

The average shear wave velocity (V_{s30}) value calculated from in situ shear wave velocity measurements was **1372 m/s**. Based on Sentence 4.1.8.4.(2b) of the 2024 Ontario Building Code (2024 OBC), the applicable **Site Designation** is **X₁₃₇₂**.

Based on the requirements of Table 4.1.8.4.-A of 2024 OBC, if the ground profile contains more than 3 m of soil between rock and the underside of footing or mat foundations, the applicable Site Designation is X₇₆₀ even if the calculated V_{s30} value is greater than 760 m/s.

We hope you find this report satisfactory. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Frontwave Geophysics Inc.



Ilia Gusakov, P.Geo.

Geophysicist

(647) 514-4724

ilia.gusakov@frontwave.ca

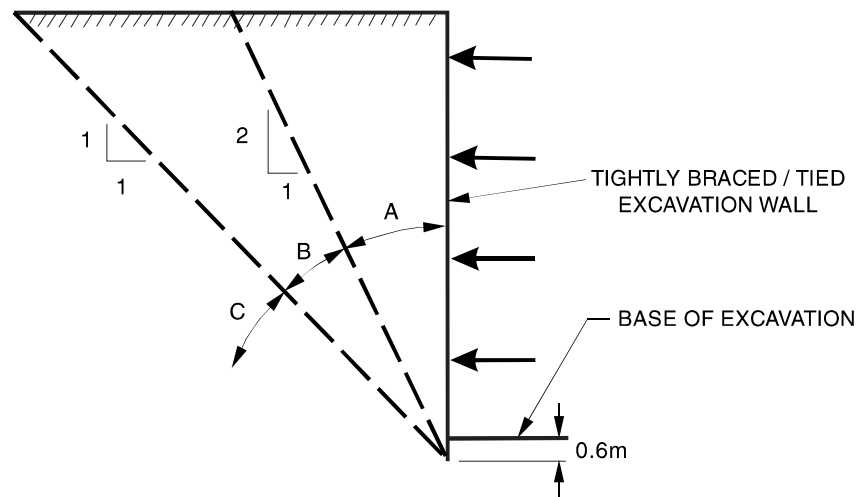


APPENDIX I

EXCAVATION SUPPORT

Guidelines for Underpinning in Soil and Excavation Support

Existing foundations located within Zone A normally require underpinning, especially for heavy structures. For some foundations in Zone A, it may be possible to eliminate underpinning and control foundation movement by tightly braced excavation walls, such as caisson walls.



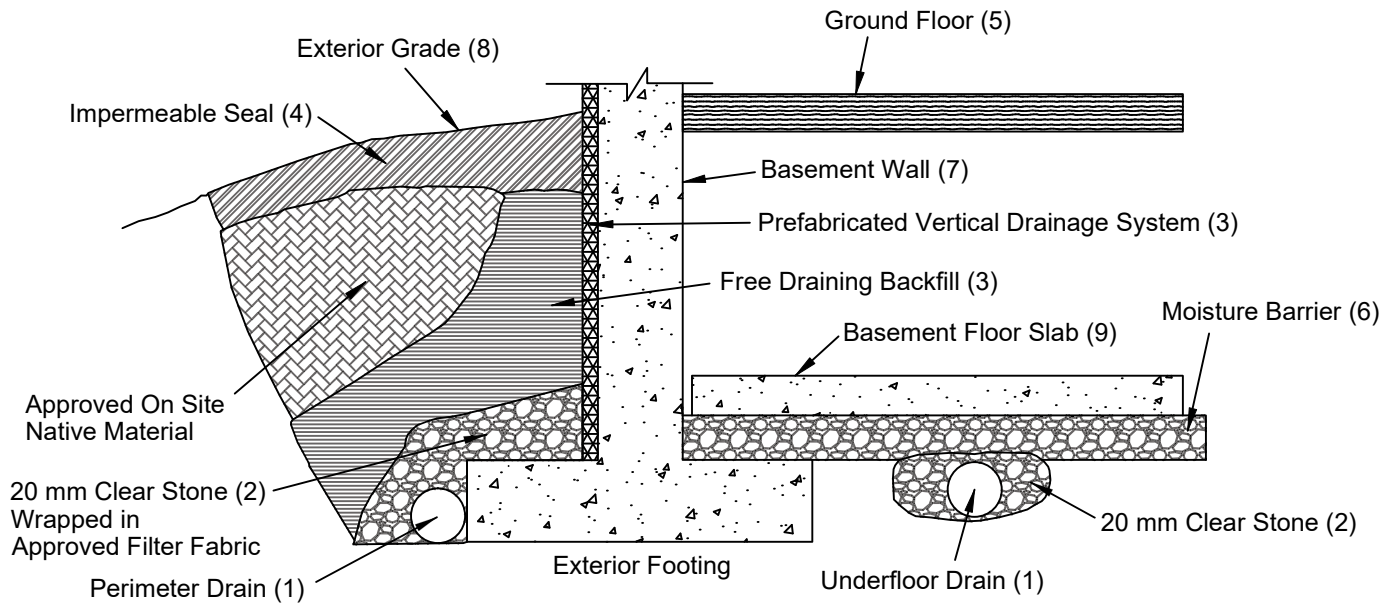
Zone A: Foundations located within this zone may require underpinning. Horizontal and vertical pressures on the excavation wall of non-underpinned foundations must be considered. Horizontal and vertical deformations of foundations within this zone must be considered relative to underpinned and non-underpinned foundations.

Zone B: Foundations located within this zone do not normally require underpinning. Horizontal and vertical forces on the excavation wall for non-underpinned foundations must be considered. Horizontal and vertical deformations of foundations within this zone must be considered relative to underpinned and non-underpinned foundations.

Zone C: Underpinning to structures is normally founded in this zone. Lateral Lateral pressure from underpinning is not normally considered.

(Reference: Figure 20.39 from Canadian Foundation Engineering Manual, 5th Edition, 2023)

APPENDIX J
PERMANENT DRAINAGE RECOMMENDATIONS

**Notes**

1. Perimeter and underfloor drains shall consist of 100 mm diameter weeping tile with fabric sock or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 300 mm below underside of basement floor slab.
2. 20 mm Clear Stone - 150 mm top and side of drain, surrounded by approved filter fabric (Terrafix 270R or equivalent).
3. Free draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm of the wall. Use hand controlled light compaction equipment within 1.8 m of the wall. Free draining backfill is not required if a prefabricated vertical drainage system (such as Terradrain 600) is installed on the exterior of the basement wall.
4. Impermeable backfill seal (min. 600 mm) - relatively impervious compacted silty clay, clayey silt, or equivalent. If on-site native backfill is impermeable, seal may be omitted.
5. Do not backfill until wall is supported by ground floor and basement slabs and ground floor framing, or adequate bracing is provided.
6. Moisture barrier to be at least 200 mm of compacted 20 mm clear stone or equivalent free draining material.
7. Basement wall to be damp-proofed.
8. Exterior grade to slope away from building at minimum gradient of 2%.
9. Underfloor drain invert to be at least 300 mm below underside of floor slab. Drainage tile placed in parallel rows at 8 m centre to centre. Place drain on 100 mm of 20 mm clear stone with 150 mm of clear stone on top and sides. Do not connect the underfloor drains to perimeter drains.

DRAINAGE AND BACKFILL RECOMMENDATIONS
(Not to Scale)

APPENDIX K
CERTIFICATE OF CHEMICAL ANALYSES



Your Project #: CO680.02
 Your C.O.C. #: C#1097844-02-01

Attention: Yacouba Doro

Terrapex Environmental Ltd
 1-20 Gurdwara Rd.
 Ottawa, ON
 CANADA K2E 8B3

Report Date: 2026/04/07
 Report #: R8720067
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C632291

Received: 2026/03/27, 16:32

Sample Matrix: Soil
 # Samples Received: 3

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
pH CaCl2 EXTRACT (1)	3	2026/04/02	2026/04/02	CAM SOP-00413	EPA 9045 D m
Sulphate (20:1 Extract) (1)	3	2026/04/07	2026/04/07	CAM SOP-00464	MOE E3013 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bureau Veritas Mississauga, 6740 Campobello Rd , Mississauga, ON, L5N 2L8



Your Project #: CO680.02
Your C.O.C. #: C#1097844-02-01

Attention: Yacouba Doro

Terrapex Environmental Ltd
1-20 Gurdwara Rd.
Ottawa, ON
CANADA K2E 8B3

Report Date: 2026/04/07
Report #: R8720067
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C632291

Received: 2026/03/27, 16:32

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Katherine Szozda, Project Manager
Email: Katherine.Szozda@bureauveritas.com
Phone# (613)274-0573 Ext:7063633

=====

This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.



BUREAU
VERITAS

Bureau Veritas Job #: C632291
Report Date: 2026/04/07

Terrapex Environmental Ltd
Client Project #: CO680.02
Sampler Initials: HM

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		BBFV56	BBFV57	BBFV58		
Sampling Date		2026/03/27 11:55	2026/03/27 12:00	2026/03/27 12:05		
COC Number		C#1097844-02-01	C#1097844-02-01	C#1097844-02-01		
	UNITS	BH211-SS3 (BH-D)	BH207-SS4 (BH-I)	MW204-SS2 (MW-L)	RDL	QC Batch
Inorganics						
Available (CaCl2) pH	pH	7.95	7.74	7.48		A126751
Soluble (20:1) Sulphate (SO4)	ug/g	60	660	120	20	A128324
RDL = Reportable Detection Limit						
QC Batch = Quality Control Batch						



TEST SUMMARY

Bureau Veritas ID: BBFV56
Sample ID: BH211-SS3 (BH-D)
Matrix: Soil

Collected: 2026/03/27
Shipped:
Received: 2026/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	A126751	2026/04/02	2026/04/02	Helen He
Sulphate (20:1 Extract)	SKAL/EC	A128324	2026/04/07	2026/04/07	Massarat Jan

Bureau Veritas ID: BBFV57
Sample ID: BH207-SS4 (BH-I)
Matrix: Soil

Collected: 2026/03/27
Shipped:
Received: 2026/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	A126751	2026/04/02	2026/04/02	Helen He
Sulphate (20:1 Extract)	SKAL/EC	A128324	2026/04/07	2026/04/07	Massarat Jan

Bureau Veritas ID: BBFV58
Sample ID: MW204-SS2 (MW-L)
Matrix: Soil

Collected: 2026/03/27
Shipped:
Received: 2026/03/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
pH CaCl2 EXTRACT	AT	A126751	2026/04/02	2026/04/02	Helen He
Sulphate (20:1 Extract)	SKAL/EC	A128324	2026/04/07	2026/04/07	Massarat Jan



GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	22.3°C
-----------	--------

Samples received above an average of 10 degrees with no cooling media, results may be biased. Proceeded with client consent.

Results relate only to the items tested.



QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A126751	HH	Spiked Blank	Available (CaCl2) pH	2026/04/02		100	%	97 - 103
A126751	HH	RPD	Available (CaCl2) pH	2026/04/02	0.38		%	N/A
A128324	MJ1	Matrix Spike	Soluble (20:1) Sulphate (SO4)	2026/04/07		NC	%	70 - 130
A128324	MJ1	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2026/04/07		99	%	75 - 125
A128324	MJ1	Method Blank	Soluble (20:1) Sulphate (SO4)	2026/04/07	<20		ug/g	
A128324	MJ1	RPD	Soluble (20:1) Sulphate (SO4)	2026/04/07	7.6		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)



BUREAU
VERITAS

Bureau Veritas Job #: C632291
Report Date: 2026/04/07

Terrapex Environmental Ltd
Client Project #: CO680.02
Sampler Initials: HM

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

A handwritten signature in cursive script that reads 'Louise A. Harding'.

Louise Harding, Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

APPENDIX L
SLOPE STABILITY ASSESSMENT PHOTOS



PHOTO 1: SLOPE CONDITION - NORTHEAST VIEW



PHOTO 2: SLOPE CONDITION - SOUTH VIEW



PHOTO 3: SLOPE CONDITION - SOUTHEAST VIEW



PHOTO 4: SLOPE CONDITION - SOUTHEAST VIEW





PHOTO 7: SLOPE/BENCH CONDITION - NORTH SIDE OF SENIOR SCHOOL

LEGEND

-  SITE BOUNDARY
-  ELEVATION (m)



DATA SOURCE: CITY OF OTTAWA
MAP PROJECTION: NAD 1983 UTM ZONE 18N

CLIENT:

ELIMWOOD SCHOOL INCORPORATED

SITE LOCATION:

261 BUENA VISTA ROAD
OTTAWA, ONTARIO



TITLE:

ELEVATION SURVEY

DRAWN BY:

JS/SW

PROJECT NO.:

C0680.02

CHECKED BY:

HM

REVISION:

00

DATE:

APRIL 2026

FIGURE:

2

