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CODE REQUIREMENTS

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
GLENVIEW PUBLIC SCHOOL GYM REPLACEMENT
143 TOWNSEND AVENUE EAST
BURLINGTON, ONTARIO

for

HALTON DISTRICT SCHOOL BOARD

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PML Ref.: 23HF019
Report: 1
November 2023

Peto MacCallum Ltd.
CONSULTING ENGINEERS

November 16, 2023

PML Ref.: 23HF019
Report: 1

Mr. Michael Wildfong
Halton District School Board
Manager - Capital Projects
Facility Services and Planning
J.W. Singleton Education Centre
2050 Guelph Line
Burlington, Ontario
L7P 5A8

Dear Mr. Wildfong

Geotechnical Investigation
Glenview Public School Gym Replacement
143 Townsend Avenue East
Burlington, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed for this project. Authorization to proceed with this assignment was provided by Mr. Michael Wildfong in Purchase Order No. 144478 dated September 28, 2023.

It is understood that the existing school gym was recently demolished and a new gym is proposed, together with additional parking and asphalt pedestrian walkways.

The purpose of the geotechnical investigation was to determine and assess the subsurface soil and ground water conditions at the site and based on the findings, provide geotechnical comments and recommendations for the design and construction of the new gym and parking lot pavement structure with pedestrian walkways.

The subsurface stratigraphy in the boreholes typically comprised of a pavement underlain by sand at location for gym addition and silt topsoil underlain by native sand at location for parking lot addition.

Based on the findings of this investigation and assessment, it is considered feasible to construct the gym replacement utilizing conventional shallow foundations and slab-on grade construction.

The results of the limited chemical testing program indicate the chemical quality of the tested soil samples met the applicable O. Reg. 153/04, as amended, Site Condition Standards (SCSs) for Table 1 (T1) Residential/Parkland/ Institutional/Industrial/Commercial/Community (RPI/ICC) and O. Reg. 406/19 Table 3.1 (full depth generic ESQSs, non-potable ground water condition) for all parameter except for sodium absorption ratio (SAR). In this regard, on-site reuse and/or off-site beneficial reuse of excess soil is considered feasible subject to certain environmental handling and reuse restrictions.

Detailed comments and recommendations concerning the design and construction of the proposed building and pavement structure are provided in the attached report.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are applicable only to the planned works as addressed in the report. Any changes in the plans will require review by Peto MacCallum Ltd. to assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis. Final design drawings should be provided to PML for review to confirm that the geotechnical recommendations have been incorporated as intended.

We trust this report has been completed within our terms of reference and is sufficient for your current needs.

Should you have further questions, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

Scott Jeffrey, P.Eng., $QP_{ESA,}$ $LEED_{GA}$
Director
Regional Manager, Geotechnical and Geoenvironmental Services

SR/SJ:ld

TABLE OF CONTENTS

1. INTRODUCTION

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed for this project. Authorization to proceed with this assignment was provided by Mr. Michael Wildfong in Purchase Order No. 144478 dated September 28, 2023.

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The subsurface stratigraphy in the boreholes typically comprised of a pavement underlain by sand at location for gym addition and silt topsoil underlain by native sand at location for parking lot addition. The comments and recommendations provided in this report are based on the site conditions at the time of the investigation and are applicable only to the proposed development as described in the report. Any changes in development, including finished grades and layout will require review by PML to assess the validity of the report and may require modified recommendations, additional investigation and/or analysis. Final design drawings should be provided to PML for review to confirm that the geotechnical recommendations have been incorporated as intended.

2. INVESTIGATION PROCEDURES

Field work was carried out on October 19, 2023 and consisted of three boreholes (Boreholes 1 to 3) drilled to termination depths of 3.6 to 6.7 m. The borehole locations are shown on Drawing 1, appended.

The borehole locations were selected and established in the field by PML at locations provided by the client. Ground surface elevations at the borehole locations were also determined by PML.

The boreholes were advanced using continuous flight solid stem augers, powered by a track-mounted Geoprobe 7822DT drill rig, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of PML's engineering staff.

Representative samples of the overburden were recovered at frequent depth intervals using a conventional split-spoon sampler during drilling. Standard penetration tests along with pocket penetrometer tests and in situ vane testing were conducted simultaneously with the sampling operation to assess the strength characteristics of the substrata.

The ground water conditions at the borehole locations were assessed during drilling by visual examination of the soil, the sampler and the drill rods as the samples were retrieved and when appropriate by measurement of the water level in the open borehole. Selected boreholes were instrumented with monitoring wells in order to facilitate long term ground water level monitoring.

Upon completion of drilling, the boreholes were decommissioned in accordance with O. Reg. 903/90, as amended.

The recovered soil samples were returned to our laboratory for detailed visual examination and classification, and routine moisture content determinations.

3. SUMMARIZED SUBSURFACE CONDITIONS

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions including soil classifications, inferred stratigraphy, standard penetration test N values, field vane test results, pocket penetrometer results, ground water observations, and the results of laboratory moisture content determinations.

Due to the soil sampling procedures and limited sample size, the depth demarcations on the borehole logs must be viewed as transitional zones between layers and cannot be construed as exact geologic boundaries between layers. PML would be pleased to assist in defining geologic boundaries during construction if required.

The subsurface stratigraphy in the boreholes typically comprised a surficial fill deposit, over silt over silty clay.

3.1 Pavement Structure

A pavement structure comprising 110 and 125mm of asphalt overlying 130 and 190 mm of granular base/subbase was encountered at the ground surface of Boreholes 1 and 2, respectively.

3.2 Topsoil

Borehole 3, in the area of the proposed parking expansion, encountered 40 mm of topsoil underlain by 30 mm of light brown silty sand fill and was judged to be damp at a moisture content of 3.1%.

3.3 Sand

Sand was contacted below pavement structure and topsoil in all boreholes and extended to depths of 6.5 and 6.6 m (elevation 90.8 and 90.7) in Boreholes 1 and 2, respectively, and to the termination depth of 3.7 m (elevation 93.8) in Borehole 3. The sand was very loose to compact with SPT “N” values of 1 to 21. The sand was moist with a moisture content determination of 3.1 to 11%. It is notable that the upper portion of the sand in Borehole 1, to a depth of 3 m, was observed to be very loose to loose and is a possible backfill zone or otherwise disturbed soil associated with past construction or underground service trenches.

Reference is given to Figure 1 for the results of the particle size distribution analyses conducted on sample of the sand (BH2 SS2). The results indicated 3% gravel, 84% sand, 10% silt and 3% clay.

Reference is given to Figure 2 for the results of the particle size distribution analyses conducted on sample of the sand (BH3 SS3). The results indicated 1% gravel, 80% sand, 16% silt and 3% clay.

3.4 Sand and Gravel

Below the sand, in Boreholes 1 and 2, a layer of Sand and Gravel was encountered and this extended to the borehole terminations depths of 6.7 m (elevation 90.6). The sand and gravel layer was compact to dense with SPT “N” values of 25 and 34. The sand and gravel was wet to saturated with moisture content of about 15%.

3.5 Ground Water Conditions

Upon completion of augering, Boreholes 1 and 2 had free water at 6.0 and 6.6 m (elevations 91.3 and 90.7), respectively. Borehole 3 was open and dry on completion. All boreholes were open through the full drilling depth upon extraction of the augers and no immediate caving was observed. It should be noted that the ground water levels at the site are subject to seasonal fluctuations and precipitation patterns.

4. ENGINEERING DISCUSSION AND RECOMMENDATIONS

It is understood that the existing school gym was recently demolished and a new gym is proposed, together with additional parking and asphalt pedestrian walkways.

The purpose of the geotechnical investigation was to determine and assess the subsurface soil and ground water conditions at the site and based on the findings, provide geotechnical comments and recommendations for the design and construction of the new gym and parking lot pavement structure with pedestrian walkways.

The subsurface stratigraphy in the boreholes typically comprised of a pavement structure and minor fill (Boreholes 1 and 2) or minor topsoil (Borehole 3), underlain by native very loose to compact sand and sand and gravel.

4.1 Site Preparation

Preparation of the site should consist of removal of the existing pavement structure, all remaining topsoil and all otherwise excessively loose/soft or deleterious material followed by proofrolling the exposed subgrade under geotechnical supervision to expose any remaining soft or unstable areas. Any soft or unstable material should be excavated, removed and replaced with well compacted, approved soil with a moisture content adjusted to within 3% of the optimum moisture content. Approved material should comprise of debris free, inorganic material.

The subgrade should be approved by geotechnical personnel prior to placement of bulk fill.

Bulk fill placed to raise the grades should be placed as an engineered fill in uniform 200 to 300 mm thick lifts within 3% of the optimum moisture content. Engineered fill in the building envelopes should be compacted to at least 98% standard Proctor maximum dry density (SPMDD). Compaction to 95% SPMDD should be suitable in other areas.

Based on the borehole information, the majority of excavated native sand is expected to be suitable for re-use bulk fill or general backfill subject to geotechnical review and approval during construction. However, depending on seasonal conditions at the time of construction, some moisture content adjustments may be necessary.

The native soils are considered to be frost susceptible, and should not be used where frost related movements or heave could present a concern.

Organic soil, topsoil, deleterious or excessively wet material should not be used as backfill.

Full time site observation should be carried out by PML to examine and approve backfill material, to review placement operations, and to verify the specified compaction is achieved.

4.2 Excavations

Excavation through the surficial pavement and topsoil into the sand is expected to be relatively straight forward using conventional equipment. The possibility of debris in the topsoil and/or cobbles and boulders in the sand and construction debris should not be overlooked.

Provided adequate ground water control is achieved, the in situ soil is classified as Type 3 soil according to the Occupational Health and Safety Act (OHSA). Therefore, trench sidewalls should be cut at a maximum inclination of 1H:1V from the base of the excavation. It may be necessary to further flatten the trench side slopes if excessively loose/soft conditions or concentrated seepage zones are encountered locally.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

4.3 Foundation Considerations

4.3.1 Footings on Native Sand

Details concerning the proposed founding level for the structure were not provided. It is understood that the gym addition will not include a basement level and it is assumed that conventional shallow spread and strip footings bearing on native undisturbed soil and at the minimum required depth for frost protection are contemplated. Based on Boreholes 1 and 2, the depth to competent native sand is 3.2 m at Borehole 1 and 1.5 m at Borehole 2, near elevations 94.3 and 95.8 m, respectively. The greater depth to competent soil at Borehole 1 is due to the presence of very loose to loose sand which is attributed to a possible fill zone associated with past construction.

Based on the findings at Boreholes 1 and 2, located within or near the proposed new gym footprint, the proposed building addition may be supported on conventional shallow spread and strip footings. The footings may be designed based on a geotechnical bearing resistance of 150 kPa at Serviceability Limit State (SLS), and a factored bearing resistance of 225 kPa at Ultimate Limit State (ULS), subject to geotechnical inspection during construction. All footings should be founded on competent native undisturbed sand found at elevations 94.3 and 95.8 at Boreholes 1 and 2, respectively. The depth to competent native undisturbed soil at locations between boreholes should be determined by geotechnical inspection by PML at the time of construction.

All footings exposed to freezing temperatures must be provided with a minimum depth of 1.2 m of soil cover or equivalent insulation.

4.3.2 Footings on Engineered Fill

Based on the loose to very loose soil conditions encountered in the upper 3 m at Borehole 1, footings in this area will need to extend below the normal minimum depth required for frost protection. In this case, consideration may be given to support the footings on low strength unshrinkable concrete fill or engineered fill.

For low strength concrete fill, the zone of concrete must extend a minimum of 200 mm horizontally beyond the edge of the structural footing and to the levels indicated in Section 4.3.1. Concrete fill should have a minimum compressive strength of 1 MPa.

Alternatively, footings may be supported on engineered structural fill placed and compacted to a minimum of 98% SPMDD in accordance with the recommendations in Appendix A. For engineered fill, the existing undocumented fill must be removed within the engineered fill pad area to reach native undisturbed soil at the levels indicated in Section 4.3.1. This excavation work should be carried out under fulltime supervision of a PML representative in order to determine the limits of the required removals. Approved engineered fill may then be placed and compacted under full-time geotechnical supervision and testing to the proposed underside of footings.

The minimum extent of engineered fill below footings should be as per the guideline provided in Appendix A.

Foundations supported on low strength concrete fill or approved engineered fill may be designed using a bearing pressure of 150 kPa at SLS and factored bearing resistance of 225 kPa at ULS.

4.3.3 General Foundation Recommendations

In general, where founding levels of adjacent footings vary, the relative founding elevations between adjacent footings should be such that a line drawn up from the edge of the lower footing at an inclination of 10 horizontal to 7 vertical (10H:7V) passes above the base of the higher footing.

Prior to placement of structural concrete, all foundation excavations should be examined by geotechnical personnel from PML to verify that the founding stratum is in accordance with the assumptions and recommendations of this report.

All footings subject to frost action should be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.

The native subgrade is prone to disturbance from exposure to weather and construction traffic. Accordingly, a 50 mm skim slab of lean concrete should be provided over the base of the approved subgrade if structural concrete cannot be provided within 24 hours of approval of the foundation base.

The total settlement of foundations designed in accordance with the above recommendations is not expected to exceed 25 mm. Differential settlement is expected to be less than 75% of this value.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

4.4 Earthquake Considerations

Design provisions for earthquake loading should also be applied. A Multichannel Analysis of Surface Waves (MASW) analysis was performed by Frontwave Geophysics to assist in site classification, the results of which are presented in Appendix B. Based on the characteristics of the subsoils encountered in the boreholes at this site and on the results of the MASW testing, the subject property should be classified as Site Class C per The Ontario Building Code Act, (2012) Section 4.1.8.4.

4.5 Floor Slab Construction

Construction of the floor slab as a conventional slab-on-grade on engineered fill or native sand is considered feasible.

Preparation of the floor slab subgrade should include stripping of the pavement structure, uncontrolled fill, and other deleterious material followed by proofrolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Excessively loose/soft or compressible materials revealed during the proofrolling operations should be subexcavated and replaced with well compacted approved material. Based on the borehole findings, and subject to the results of proofrolling, it is envisaged that a portion of the pre-existing in-place loose soil or fill as encountered in Borehole 1 will require subexcavation and replacement with well compacted material placed under geotechnical supervision in order to improve the relative density of the material for uniform support of slab-on-grade floors.

Fill placed under the floor slab to achieve finished subgrade levels or as foundation excavation backfill should comprise approved inorganic material having a moisture content within 3% of the optimum value, placed in maximum 200 mm thick lifts, and compacted to at least 95% of standard Proctor maximum dry density (SPMDD). It is envisaged that the excavated sand will be suitable for reuse as controlled fill below slab-on-grade floors.

A minimum 150 mm thick layer of well compacted free draining Granular A type material should be provided directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed under the slab if a moisture sensitive finish is to be placed on the floor.

Exterior grades should be maintained at least 150 mm below the ground floor level and sloped to promote drainage away from the building.

4.6 Ground Water Control

Ground water observations carried out during and upon completion of drilling are presented on the appended Log of Borehole Sheets. Upon completion of augering, Boreholes 1 and 2 had free water at 6.0 to 6.6 m (elevations 91.3 to 90.7), Borehole 3 was open and dry. It should be noted that the ground water levels at the site are subject to seasonal fluctuations and precipitation patterns.

Based on these short-term observations, significant ground water issues are not anticipated for excavations to the depths required for site services and foundations.

It is anticipated that seepage or surface water that enters the excavations will be minor and will be adequately handled by conventional sump pumping techniques. Water takings are not expected to exceed the thresholds which would require a permit to take water (PTTW) or environmental activity and sector registration (EASR) with the Ontario Ministry of Environment Conservation and Parks (MECP).

4.7 Re-Use of Site Material/Backfilling

It is anticipated that the excavated material will generally consist of the existing pavement structure and sand.

As previously stated, select portions of the sand may be suitable for re-use as foundation and underfloor backfill, subject to evaluation at time of construction. Depending on seasonal conditions, some moisture content adjustments to the backfill materials may be required. The on-site soils are frost susceptible and are considered unsuitable for use where free draining backfill is required or at locations where frost related movement would present a concern.

In general, backfill should comprise inorganic, debris free material having a moisture content within 3% of the optimum value. Further, should construction extend into the winter season, particular attention must be given to ensure that frozen material is not used as backfill.

Organic soil, topsoil, deleterious or excessively wet material should not be used as backfill.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for re-use.

Should construction extend to the winter season, particular attention must be given to ensure that frozen material is not used as backfill.

In areas that underlie slabs, pavements and/or walkways, backfill should be compacted to at least 98% SPMDD. In landscaped areas, compaction to at least 90% SPMDD will be adequate.

Full time site observation should be carried out by PML to examine and approve backfill material, to carefully inspect placement operations, and to verify the compaction by in situ density testing using nuclear gauges.

4.8 Pavement Construction

The anticipated subgrade for pavement construction is anticipated to consist of native sand. Based on typical traffic patterns for asphalt play areas, parking lots, and access roads, the estimated strength and frost susceptibility of the anticipated subgrade and assuming adequate drainage, the following pavement structure are recommended:

Pavement Component	Light Duty Pavement Thickness (mm)	Medium Duty Pavement Thickness (mm)	Heavy Duty Pavement Thickness (mm)
Asphalt	50	80	120
Granular A Base Course	150	150	150
Granular B Subbase Course	-	250	300

Light duty pavement is for pavement without vehicle travel, such as walking paths, play areas, etc. Medium duty pavement is for car parking areas. Heavy duty pavement should be used for access roads and areas where buses, heavy service vehicles, delivery vehicles or garbage trucks will travel.

The pavement granular courses should conform to the OPS specifications for select granular materials. They should be placed in maximum 200 mm thick lifts and compacted to at least 100% of standard Proctor maximum dry density (SPMDD). The asphalt should be placed and compacted to a minimum of 92% of the material's maximum relative density (MRD). Reference is made to OPS Specification (OPSS.MUNI) 310, revised November 2017.

Preparation of the subgrade for pavement construction should involve stripping obvious deleterious materials followed by proofrolling of the subgrade with a heavy roller. Excessively soft, wet or deleterious material revealed by the proofrolling operations should be sub excavated and replaced. It is noted that fill was encountered in the boreholes and the proofrolling operations may be extensive. The subgrade surface should be compacted to at least 95% SPMDD.

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling operations. If the subgrade should become excessively wet or rutted during construction activities, additional subbase material may be required. The need for additional subbase is best determined during construction.

For the pavement to function properly, provision must be made for water to drain out of, and not collect in, the granular courses. The pavement subgrade should be sloped to promote drainage towards catch basins and manholes. The excavation around catch basins and manholes should be backfilled with free-draining granular material to minimize differential movements between the pavement and structures due to frost action. The manholes/catch basins should be provided with perforated stub drains to permit drainage of the backfill.

Site review should be carried out by PML personnel to examine and approve subgrade, backfill/granular materials, to observe placement operations and verify the compaction (granular and asphalt) by in situ testing using nuclear gauges.

5. GEOENVIRONMENTAL CONSIDERATIONS

PML understands that excess soil may be generated during construction; the volume of which is unknown at this time. A limited chemical testing program was carried out to check the geoenvironmental quality of the soil at selected sampling locations in order to provide comments regarding on-site and/or off-site re-use and/or off-site disposal options of excess soil.

A Phase One Environmental Site Assessment (ESA) or Assessment of Past Uses (APU) was not within the scope of work for this assignment. Accordingly, soil and ground water impairment that has not been identified by the limited chemical testing program may exist elsewhere at the site. The limited chemical testing program does not constitute an Environmental Site Assessment as defined under the Environmental Protection Act and O. Reg. 153/04, as amended.

Samples were reviewed and selected for chemical testing for typical contaminants of potential concern (COPCs) including metals; hydride forming metals; electrical conductivity (EC); sodium adsorption ratio (SAR); pH; petroleum hydrocarbons (PHCs); benzene, toluene, ethylbenzene and xylene (BTEX); and polycyclic aromatic hydrocarbons (PAHs).

5.1 Excess Soil Regulation

The Ministry of the Environment, Conservation and Parks (MECP) has introduced a new On-Site and Excess Soil Management Regulation (O. Reg. 406/19). This regulation changes the definition of soil as a waste unless it is being transported for beneficial re-use. Soil quality must meet the new Excess Soil Quality Standards (ESQSs) and the quantity of soil must be consistent with the beneficial reuse specified for the reuse site (Receiving Site).

It should be noted that the anticipated volume of excess soil to be generated during construction has not been provided or estimated. As such, the limited soil sampling and chemical testing program presented herein is for due diligence purpose and does not fulfill all planning and documentation components of O. Reg. 406/19. Depending on anticipated excess soil volumes additional review and excess soil management planning, including additional sampling, testing, and reporting may be required.

The rationale for sample selection was based on materials exhibiting visual and/or olfactory evidence of contamination, material most likely to be contaminated (i.e. fill materials), site coverage and materials most likely to be excavated during construction.

A list of all samples submitted for analysis is included as Table C1, appended.

5.2 Chemical Testing Protocol

Representative samples collected during the geotechnical investigation were returned to our laboratory for detailed visual examination. Selected soil samples were submitted for chemical analysis to SGS Canada Inc. (SGS), a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory in Lakefield, Ontario. The chemical analyses conducted by SGS were in accordance with the O. Reg. 153/04, as amended and Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004, amended as of July 1, 2011.

As part of the geoenvironmental procedural protocol, all recovered soil samples were examined for visual and olfactory evidence of potential contamination.

Since a Phase One ESA or APU were not completed to identify project specific Contaminants of Potential Concern (COPCs) samples were reviewed and selected for chemical testing in accordance with the proposal whereby six soil samples were selected and analyzed for common contaminant groups including general testing for metals and hydride forming metals; Other Regulated Parameters (ORPs) including electrical conductivity (EC) and sodium adsorption ratio (SAR); pH; petroleum hydrocarbons (PHCs) including benzene, toluene, ethylbenzene and xylene (BTEX); and polycyclic aromatic hydrocarbons (PAHs). It should be noted that additional sampling and testing for additional parameters may be required, depending on historical review (ESA/APU) and/or specific requirements of a potential re-use site. Additionally, one sample was submitted for toxicity characteristic leaching procedure as per O. Reg. 347 in order to classify the soi for land fill disposal if needed. This sample was placed on hold for testing only if required.

The general rationale for sample selection was based on general site coverage with consideration of any visual and/or olfactory evidence of contamination and/or material most likely to be contaminated (i.e., fill materials).

A list of all samples submitted for analysis is included as Table C1, appended.

5.3 Site Condition Standards: On-Site Re-Use

The Ontario Ministry of the Environment, Conservation and Parks (MECP) has developed a set of Soil, Ground water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) and O. Reg. 153/04, as amended. The standards consist of nine tables (Table 1 through Table 9) that provide criteria for maximum concentrations of various contaminants. In general, the applicable O. Reg. 153/04, as amended Site Condition Standards (SCSs) depend on the site location, land use, soil texture, bedrock depth, soil pH and source of potable water at the investigation site. In order to determine the Site Sensitivity, Sections 41 and 43.1 of O. Reg. 153/04, as amended were evaluated by PML as per the following table:

SITE CONDITION STANDARD
AND
SITE SENSITIVITY ANALYSIS

CRITERIA	RESULT
Proposed Property Use O. Reg. 153/04, as amended Part I Section 1	Institutional
Potable vs. Non-Potable Ground Water O. Reg. 153/04, as amended Part IX Section 35	Non-Potable
Proximity to Areas of Natural Significance O. Reg. 153/04, as amended Part IX Section 41 (1) (a)	> 30 m
Soil pH O. Reg. 15/04, as amended Section 41 (1) b	Surface Soil: 5 to 9 Subsurface Soil: 5 to 11
Soil Texture O. Reg. 153/04, as amended Part IX Section 42	Coarse
Proximity to a Water Body O. Reg. 153/04, as amended Part IX Section 43.1	> 30 m
Shallow Soil O. Reg. 153/04, as amended Part IX Section 43.1	No
Site Condition Standards for On-Site Re-Use	Table 3 (T3) Site Condition Standards (SCSs) for Residential/Parkland/ Institutional (RPI)

5.4 Excess Soil Quality Standards: Off-Site Reuse

For preliminary evaluation of potential off-Site beneficial reuse options for excess soil, if required, the generic Excess Soil Quality Standards (ESQS) of O. Reg. 406/19 were used. These standards consist of nine tables (Table 1 and Tables 2.1 through Table 9.1) that provide criteria for maximum concentrations of various contaminants. Similar to O. Reg. 153/04, as amended, the O. Reg. 406/19 ESQSs depend on the site location, land use, soil texture, bedrock depth, soil pH and source of potable water at the investigation site.

- For the option of re-using the excess soils with minimal environmental restrictions, the O. Reg. 406/19 Full Depth Background Table 1 (T1) SCSs for Residential/ Parkland/Institutional/Industrial/Commercial/Community (RPI/ICC) property uses was considered.
- For the option of re-using the excess soils at a property (or properties) with a potable ground water condition, results were compared to the O. Reg. 406/19 Table 2.1 (T2.1) ESQSs for both RPI and ICC land uses.
- For the option of re-using the excess soils at a property (or properties) with a non-potable ground water condition, results were compared to the O. Reg. 406/19 Table 3.1 (T3.1) ESQSs for both RPI and ICC land uses.

It is noted that a comparison to other ESQS Tables was not conducted as part of this assignment. If the potential receiving site for excess soil falls within one of these other categories, additional evaluation by PML will be required to confirm conformance.

5.5 Analytical Findings

Laboratory Certificates of Analysis compared to T1 RPI/ICC are included in Appendix C. The measured values and corresponding SCSs are shown on the certificates of analysis. In the event of an exceedance of the SCSs, the result is shown highlighted in orange, where applicable.

5.5.1 On-Site Re-Use

Based on the results of chemical testing, the measured concentration of the tested parameters complied with the applicable T3 RPI SCSs with the following exceptions:

Locations	Sample	Parameters Exceeding T3 RPI SCSs
Borehole 1	BH1 SS3	Sodium Adsorption Ratio (SAR) [1]
Borehole 2	BH2 SS2	Sodium Adsorption Ratio (SAR) [1]
Borehole 2	BH2 SS3	Sodium Adsorption Ratio (SAR) [1]

Note: [1] Refer to discussion below regarding elevated EC and SAR concentrations

The above exceedances for SAR are attributable to the use of de-icing salts at the site for control of snow and/or ice. Under O. Reg. 153/04, as amended, where a site condition standard is exceeded solely because a substance has been applied to surfaces for the safety of vehicular or pedestrian traffic under conditions of snow or ice or both, the applicable site condition standard is deemed not to be exceeded. In this regard, the tested soil samples would not be considered to exceed the applicable site condition standards under the Regulation if re-used on site.

5.5.2 Off-Site Beneficial Re-Use

A comparison of the results was carried out against the more common SCSs of T1, T2.1 and T3.1 for both residential/parkland/institutional and industrial/commercial/community property uses. The reported test results meet the T1 T2.1 and T3.1 RPI/ICC standards except for exceedances of electrical conductivity and/or sodium adsorption ratio in samples from Boreholes 1 and 2. These exceedances are attributable to the use of de-icing salts at the site for control of snow and/or ice.

For off-site beneficial reuse under O. Reg. 406/19, Excess Soil Quality Standards for chemicals (e.g., sodium adsorption ratio and electrical conductivity) in soil resulting solely from the use of a substance for the safety of vehicular or pedestrian traffic applied under conditions of snow or ice or both, are deemed to be met if the following criteria are met:

i. The excess soil is finally placed at one of the following locations:

   a. where it is reasonable to expect that the soil will be affected by the same chemicals as a result of continued application of a substance for the safety of vehicular or pedestrian traffic under conditions of snow or ice;

   b. at an industrial or commercial property use and to which non-potable standards would be applicable; or

   c. at least 1.5 metres below the surface of the soil.

ii. The excess soil is not finally placed at any of the following locations:

   a. within 30 metres of a waterbody;

   b. within 100 metres of a potable water well or area with an intended property use that may require a potable water well; or,

   c. a location that will be used for growing crops or pasturing livestock unless the excess soil is placed 1.5 metres or greater below the soil surface.

iii. The project leader or operator of the project area has informed the reuse site owner or operator that the excess soil is from a location that may be expected to contain the chemical and, if sampling and analysis has been conducted in accordance with the regulation, the project leader or operator of the project area has provided relevant sampling results to the reuse site owner or operator, including the soil characterization report if prepared, and identified and communicated any potential risks to surface water and ground water to the reuse site owner or operator.

All chemical testing must satisfy the specific requirements of the selected Receiving Site(s), which may be more or less than the limited testing included with this report. As such, additional sampling and chemical testing (including testing for additional parameters) may be required at the time of construction in order to verify that the chemical quality of the excess soil leaving the Site meets the minimum requirements of the Receiving Site(s).

It should be noted that the soil conditions between and beyond the sampled locations may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent during future development to further assess and appropriately handle the materials, if any, and evaluate whether modifications to the conclusions documented in this report are necessary.

6. CLOSURE

We trust the information presented in this report is sufficient for your present purposes. If you have any questions, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

Suman Liya Regi, B.Eng., EIT
Project Supervisor
Geotechnical Services

S. A. JEFFREY
Nov. 16/23

Scott Jeffrey, P.Eng., QP$_{ESA,}$ LEED$_{GA}$
Director
Regional Manager, Geotechnical and Geoenvironmental Services

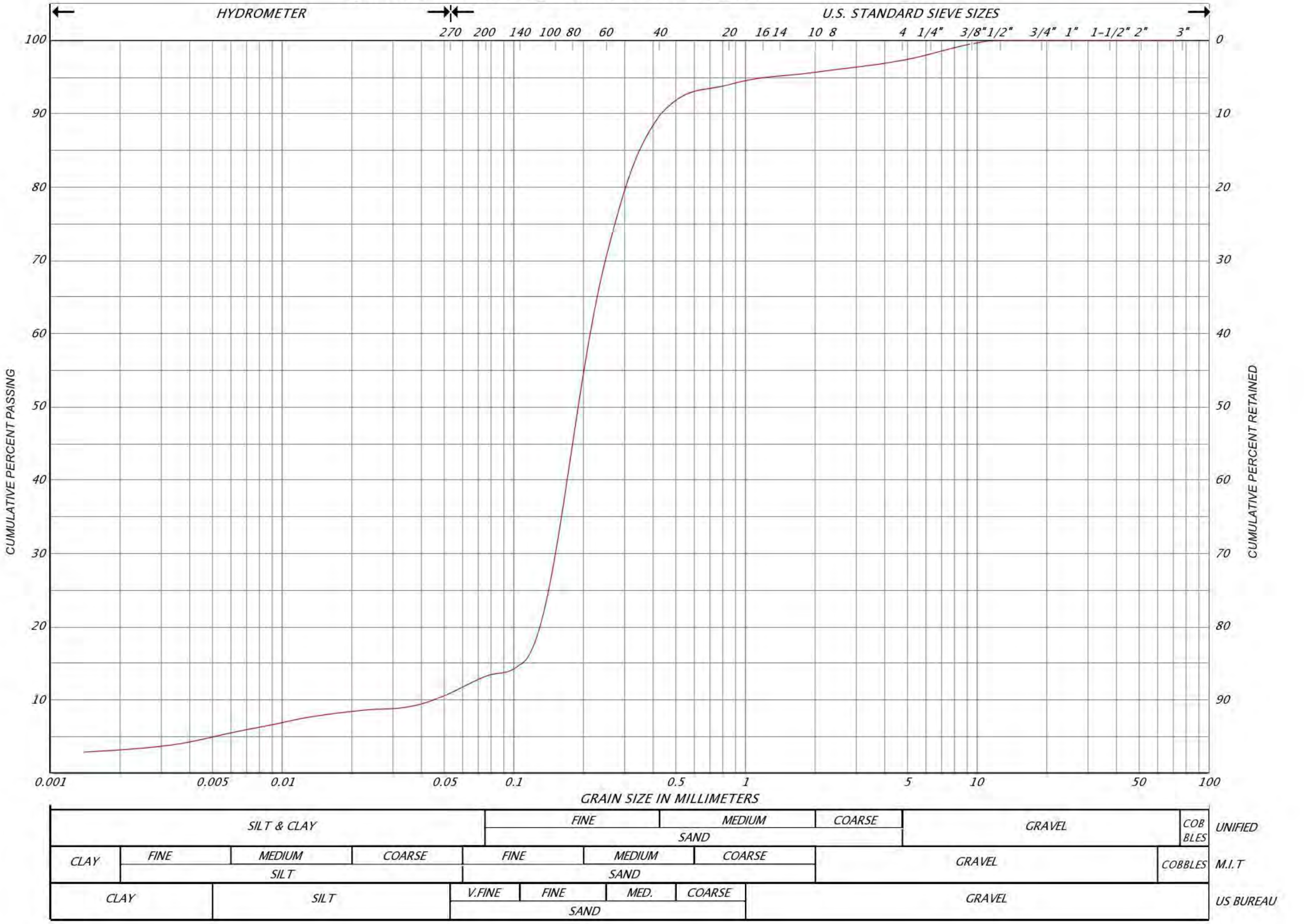
SR/SJ:ld

23HF019 SOIL: SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PROJECT NO.23HF019
FIGURE NO. 1

PARTICLE SIZE DISTRIBUTION CHART



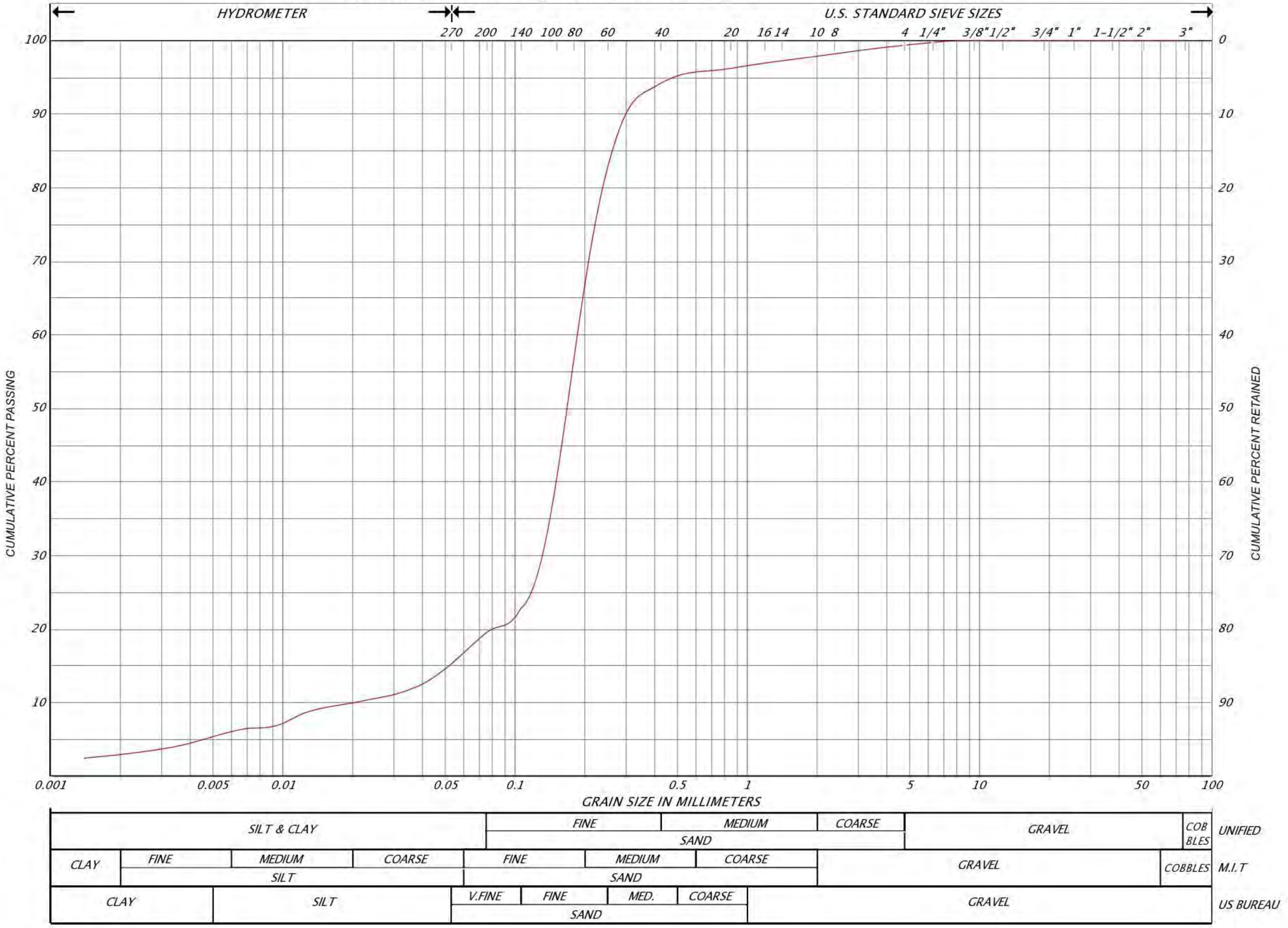
BH2 SS2 – 0.76 m to 1.4 m

23HF019 SOIL: FILL

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

PROJECT NO.23HF019
FIGURE NO. 2

PARTICLE SIZE DISTRIBUTION CHART



BH3 SS3 – 1.5 m to 2.1 m

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample		

PH	Sample Advanced Hydraulically
PM	Sample Advanced Manually

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

17T 593577.6E 4795733N

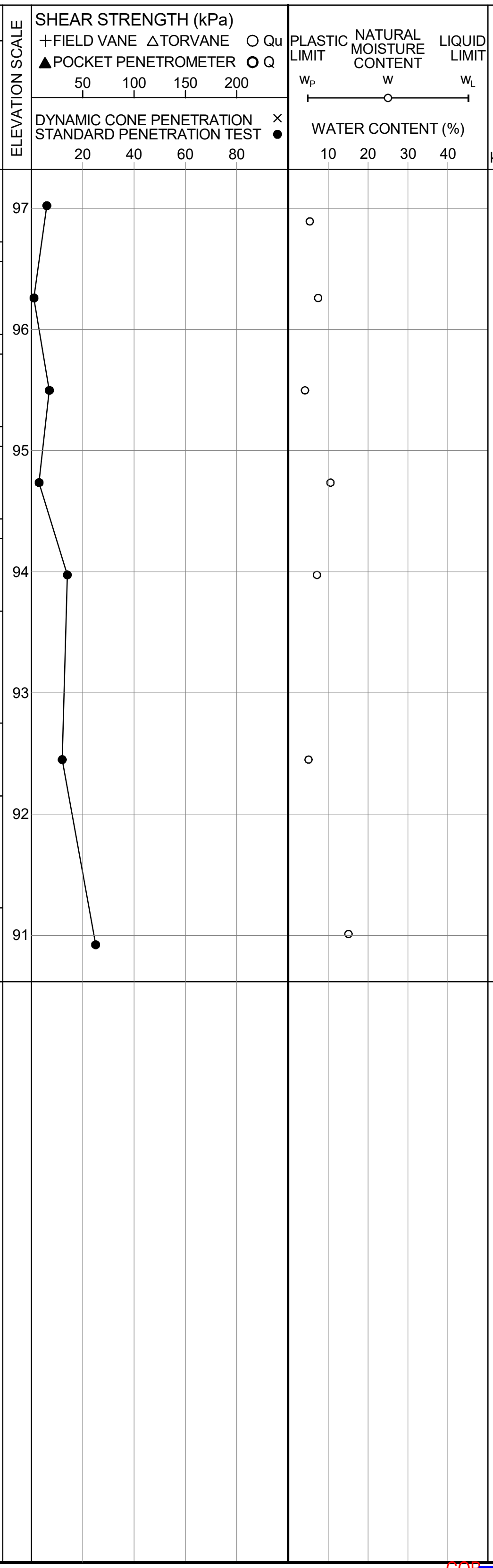
PROJECT Glenview Public School Gym Replacement
LOCATION 143 Townsend Ave, Burlington
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2023-10-19
PML REF. 23HF019
ENGINEER SJ
TECHNICIAN SR

SOIL PROFILE

DEPTH ELEV (metres)	DESCRIPTION
	SURFACE ELEVATION 97.3
0.0	PAVEMENT STRUCTURE: 125 mm asphalt over 135 mm granular base
0.26 97.06	SAND: Loose to very loose reddish brown fine sand, some silt, trace gravel, moist
1.4 95.9	becoming light brown to greyish brown, moist to wet
2.2 95.1	becoming very loose; occasional black staining
3.0 94.3	becoming compact, some gravel
4.1 93.2	occasional reddish brown silt lenses, broken rock fragments
6.5 6.7 90.6	SAND AND GRAVEL: Compact greyish brown sand and gravel, some silt, wet to saturated
	BOREHOLE TERMINATED AT 6.7 m.

SAMPLES

NUMBER	TYPE	"N" VALUES
1A	SS	6
1B		
2[1]	SS	1
3[1]	SS	7
4	SS	3
5	SS	14
6	SS	12
7A	SS	25
7B		



GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering, cave at 6.4 m and free water at 6.0 m.

NOTES [1]Sample submitted for chemical analysis.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

ALL CONSTRUCTION TO MEET ONTARIO BUILDING CODE REQUIREMENTS

LOG OF BOREHOLE NO. 2

17T 593563.6E 4795717N

PROJECT	Glenview Public School Gym Replacement	**PML REF.**	23HF019
LOCATION	143 Townsend Ave, Burlington	**BORING DATE** 2023-10-19	
		ENGINEER	SJ
BORING METHOD	Continuous Flight Solid Stem Augers	**TECHNICIAN**	SR

SOIL PROFILE

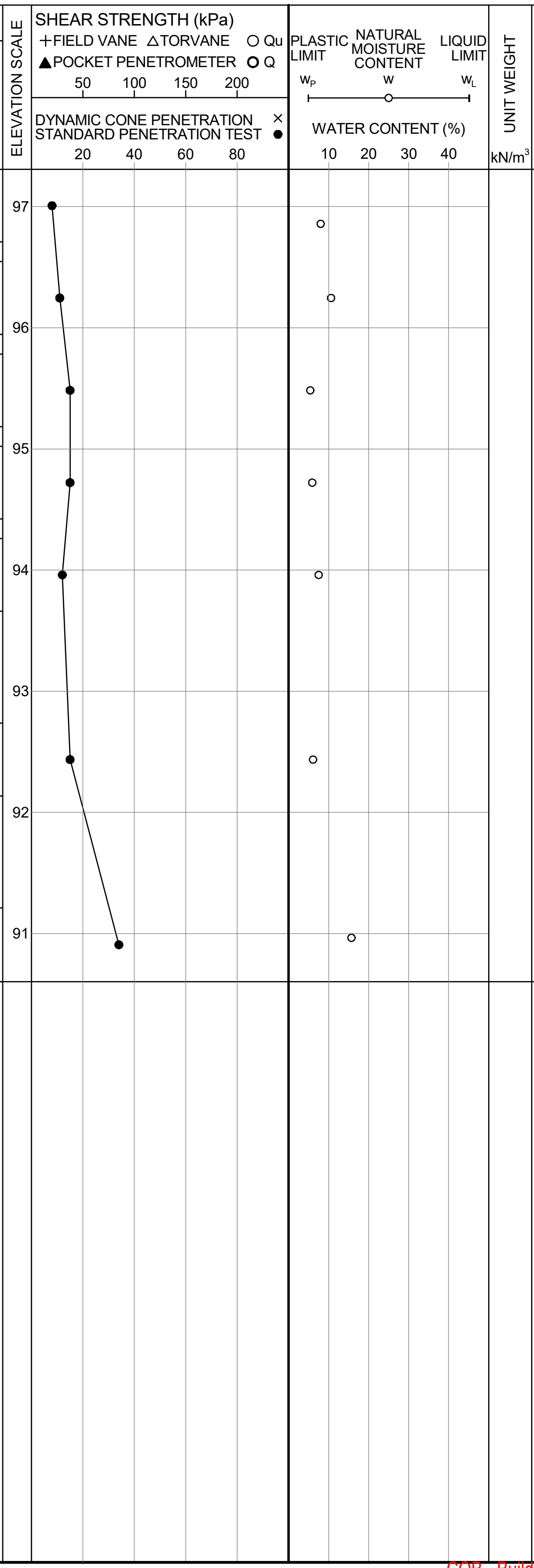
DEPTH / ELEV (metres)	DESCRIPTION
0.0 / 97.3	SURFACE ELEVATION 97.3
	PAVEMENT STRUCTURE: 110 mm asphalt over 190 mm granular base
0.30 / 97.01	SAND: Loose reddish brown fine sand, some silt, trace gravel and clay, moist
0.69 / 96.62	becoming compact light brown to greyish brown
2.2 / 95.1	becoming wet; occasional reddish brown silt layers, clay inclusions
4.1 / 93.2	some gravel
5.6 / 91.7	SAND AND GRAVEL: Dense greyish brown fine sand and gravel, saturated
6.6	occasional broken grey rock fragments with black spots
90.6	BOREHOLE TERMINATED AT 6.7 m.

SAMPLES

NUMBER	TYPE	"N" VALUES	GRAIN SIZE DISTRIBUTION (%) GR SA SI & CL
1A 1B	SS	8	
2[1]	SS	11	3 84 10 3
3[1]	SS	15	
4	SS	15	
5	SS	12	
6	SS	15	
7A 7B	SS	34	

GROUND WATER OBSERVATIONS AND REMARKS

Upon completion of augering, open and free water at 6.6 m.



NOTES [1]Sample submitted for chemical analysis.

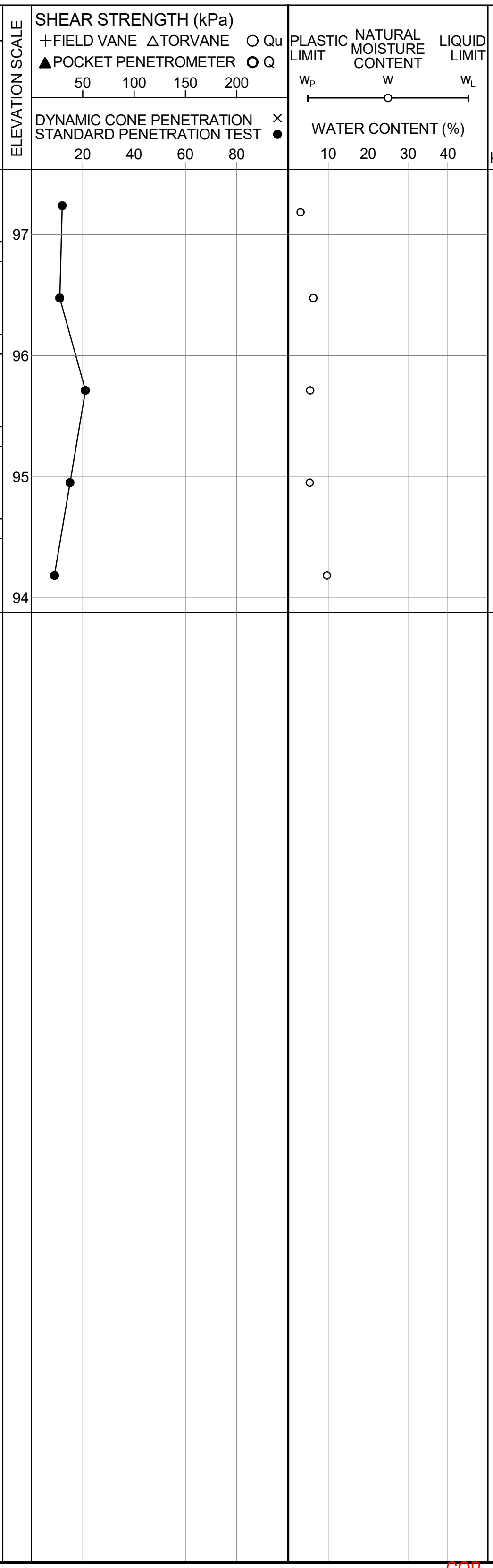
Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

17T 593511.1E 4795756N

PROJECT Glenview Public School Gym Replacement
LOCATION 143 Townsend Ave, Burlington
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE 2023-10-19
PML REF. 23HF019
ENGINEER SJ
TECHNICIAN SR

DEPTH / ELEV (metres)	SOIL PROFILE DESCRIPTION	SAMPLES NUMBER	TYPE	"N" VALUES	GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL	GROUND WATER OBSERVATIONS AND REMARKS
0.0	SURFACE ELEVATION 97.5					
97.43	TOPSOIL: Compact, dark brown silt topsoil, some sand and gravel, moist; occasional rootlets	1A				
		1B[1]	SS	12		
	FILL: Light brown silty sand fill, some gravel, moist					
	SAND: Compact reddish brown fine sand, some silt, trace gravel, moist	2[1]	SS	11		
		3	SS	21	1 80 16 3	
2.2 95.3	becoming greyish brown to light brown; occasional black staining, coarse sand and gravel lenses	4	SS	15		
3.0 94.5	becoming loose	5	SS	9		
3.7 93.8	BOREHOLE TERMINATED AT 3.6 m.					Upon completion of augering, no free water and no cave.

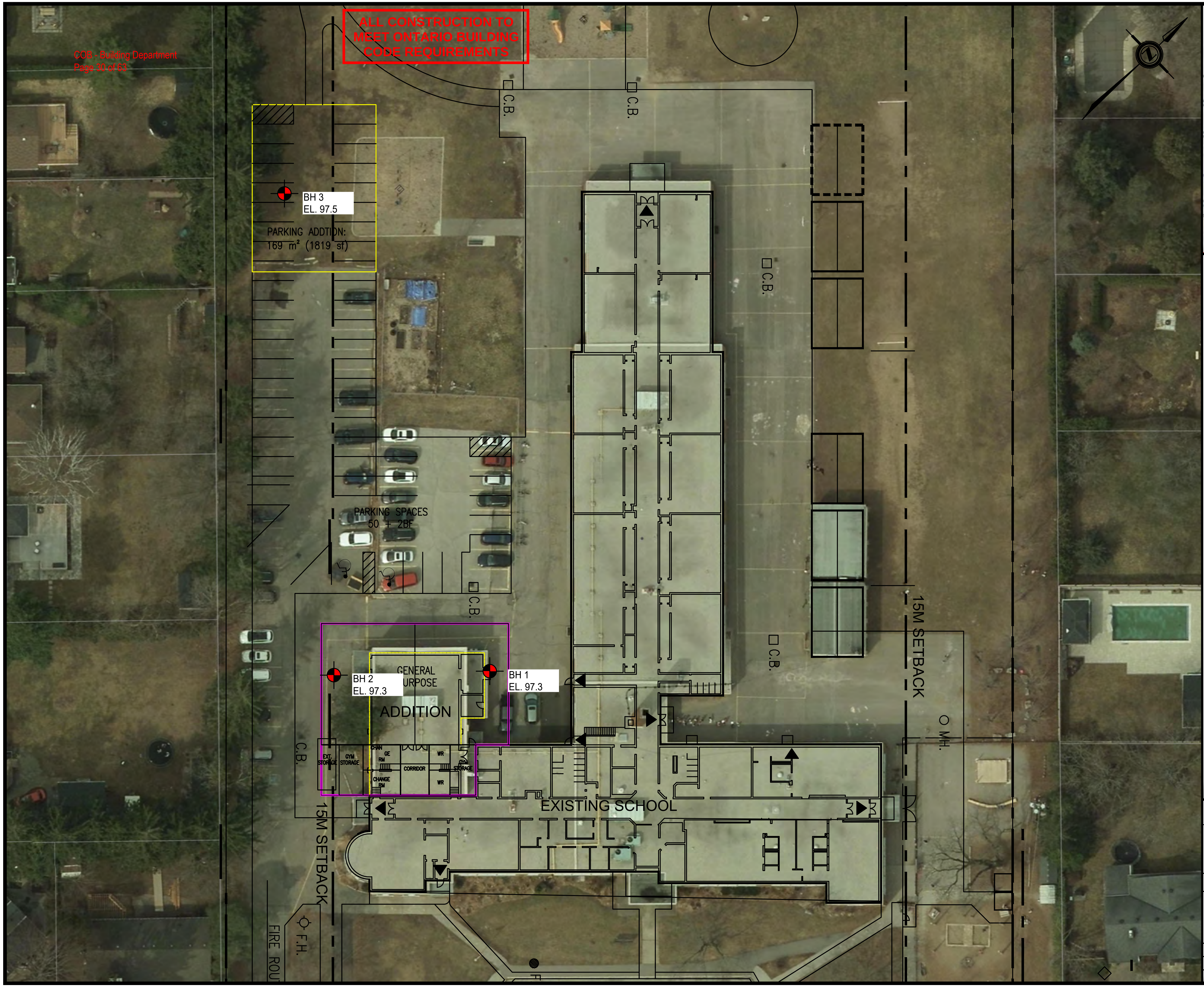


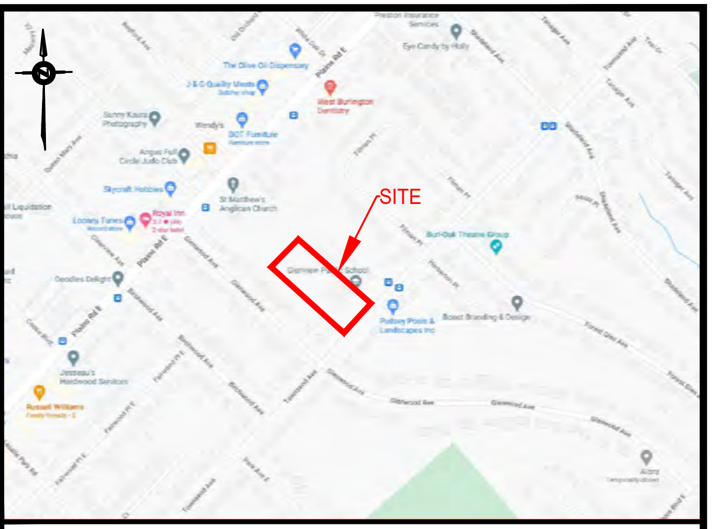
Depth scale: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0

NOTES [1] Sample submitted for chemical analysis.

COB - Building Department
Page 29 of 63

ALL CONSTRUCTION TO MEET ONTARIO BUILDING CODE REQUIREMENTS





KEY PLAN
BURLINGTON, ONTARIO

LEGEND:

BH 3 EL. 199.99	PETO MACCALLUM LTD. (PML) BOREHOLE (BH) LOCATION ELEVATION (METRIC, GEODETIC)

RECEIVED
JUL 3 2024
CITY OF BURLINGTON
BUILDING DEPARTMENT

REFERENCE:
PLAN PRODUCED FROM CONCEPT SITE PLAN & FLOOR PLAN DRAWING LABELED "2314", DATED SEPTEMBER 19, 2023 AND FROM GIS INFORMATION FROM THE CITY OF BURLINGTON ONLINE INTERACTIVE MAPPING SERVICE.

NOTE:
1. THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.
2. GEODETIC GROUND SURFACE ELEVATIONS AND UTM CO-ORDINATES AT THE BOREHOLE LOCATIONS WERE DETERMINED BY PML USING A GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS). THE SURVEY EQUIPMENT COMPRISED A SOKKIA CANADA GCX-3 NETWORK REAL TIME KINEMATIC (RTK) ROVER SYSTEM.

0m 5 10 15 20 25 30
SCALE
(1:500)

HALTON DISTRICT SCHOOL BOARD

GEOTECHNICAL INVESTIGATION
GLENVIEW PUBLIC SCHOOL GYM REPLACEMENT
143 TOWNSEND AVENUE EAST, BURLINGTON, ONTARIO

PROPOSED BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

		DATE	SCALE	PML REF.	DRAWING NO.
DRAWN	SR	NOV 2023	AS SHOWN	23HF019	1
CHECKED	SJ				
APPROVED	SJ				

Appendix A

Engineered Fill

ALL CONSTRUCTION TO MEET ONTARIO BUILDING CODE REQUIREMENTS

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.

Appendix B

MASW Report by Frontwave Geophysics

FRONTWAVE
GEOPHYSICS

SHEAR WAVE VELOCITY TESTING FOR SEISMIC SITE CLASSIFICATION

GLENVIEW PUBLIC SCHOOL
143 TOWNSEND AVENUE, BURLINGTON, ONTARIO

Submitted to:

Peto MacCallum Ltd.
45 Burford Road
Hamilton, Ontario L8E 3C6

Attention:

Ms. Suman Liya Regi, B.Eng., EIT

Email: sregi@petomaccallum.com

File No. F-23139

October 23, 2023

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

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

Frontwave Geophysics Inc. was retained by Peto MacCallum Ltd. to carry out a geophysical investigation for the proposed addition to Glenview Public School at 143 Townsend Avenue in Burlington, Ontario. The objective of the survey was to determine site class 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 determine the depth to bedrock and obtain shear wave velocity values in the rock.

The fieldwork was conducted on October 18, 2023. The location of seismic survey lines 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

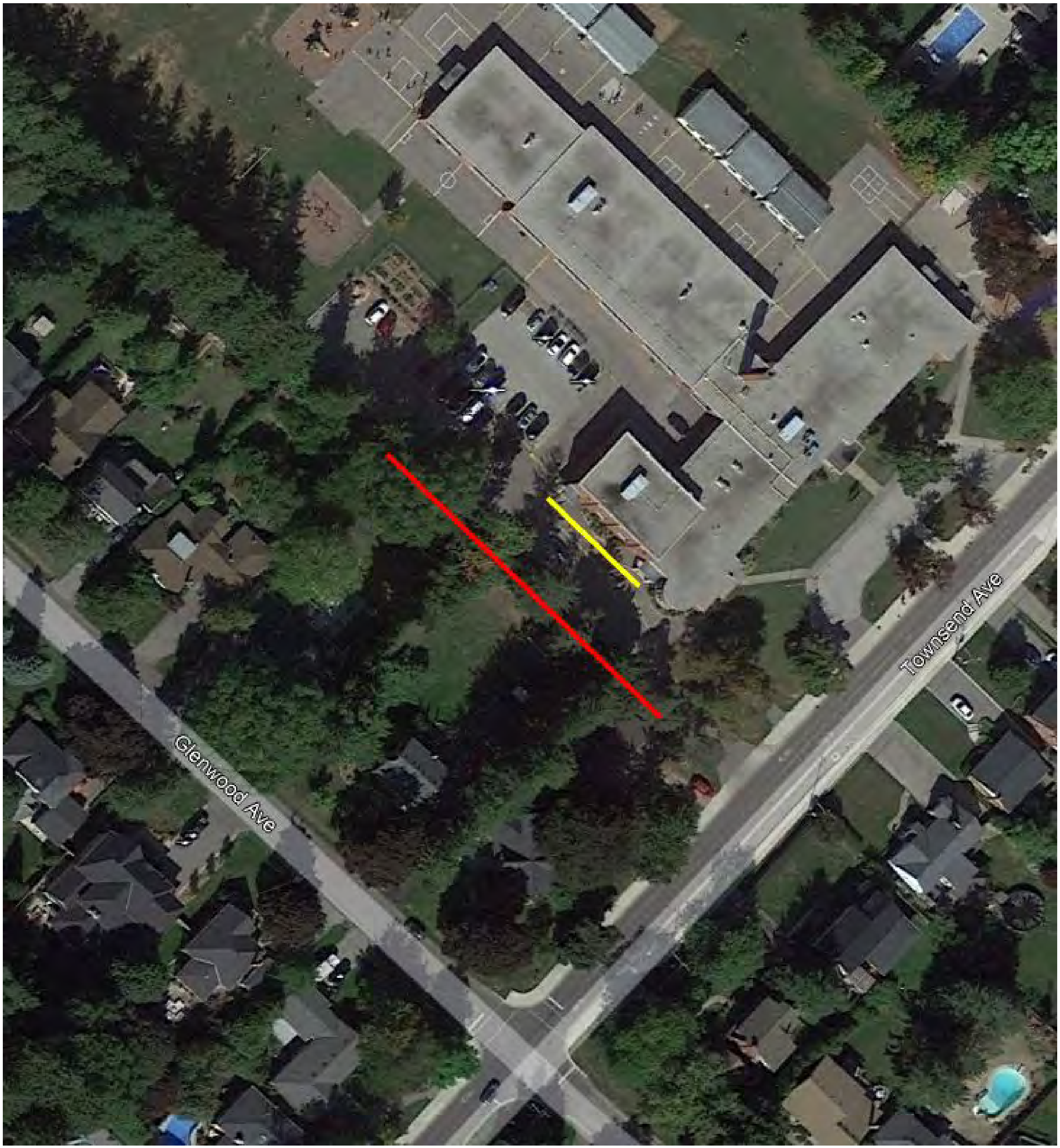
2.1 Multichannel Analysis of Surface Waves (MASW)

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.

Two approaches different in data acquisition and processing can be implemented. The active method involves using artificial sources (e.g., sledgehammer, drop weight) to generate seismic energy, whereas the passive method utilizes energy generated by natural sources (wind, waves, microseismicity) and human activities (mostly vehicle traffic). The energy that can be generated with easily accessible active sources such as sledgehammers is typically concentrated within a relatively high frequency range, and the maximum depth of penetration for active surveys is limited to approximately 15-30 m, depending on the mass of the source and geology of the site. Ambient vibrations registered with the passive acquisition are usually of lower frequency and provide better resolution at greater depths. When survey logistics allow, the active and passive source methods are combined for obtaining well-resolved dispersion images over a wide frequency range, thus increasing the depth of investigation while retaining high resolution at shallow depths.

ALL CONSTRUCTION TO MEET ONTARIO BUILDING CODE REQUIREMENTS



Legend

🟨 Location of 23 m, 24-geophone seismic spread

🟥 Location of 69 m, 24-geophone seismic spread

Image: Google Earth 2022

Date: 2023-10-23

File No: F-23139

FRONTWAVE GEOPHYSICS

Title: Survey location plan

Location: 143 Townsend Ave,
Burlington, ON

Figure: **1**

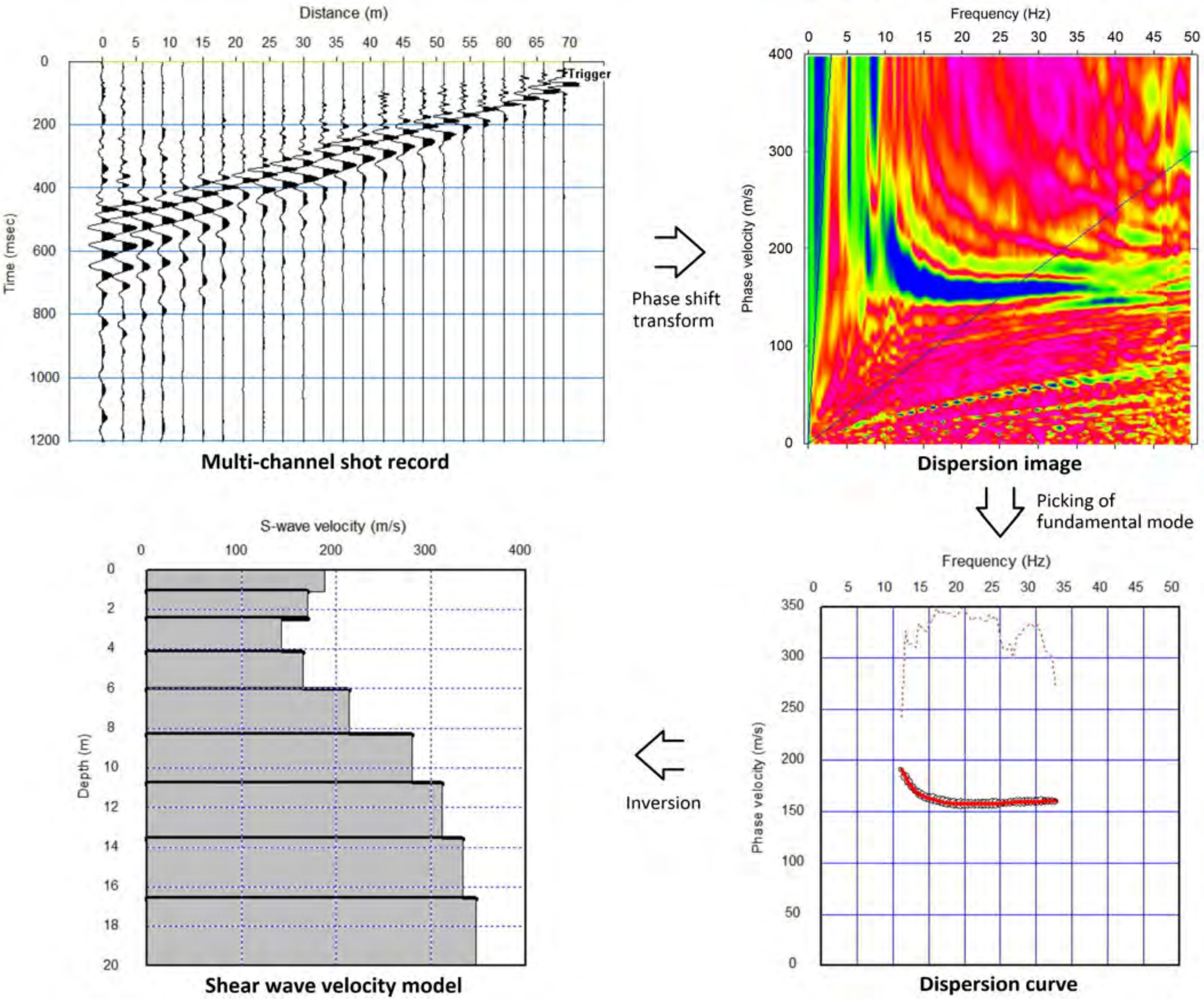


Figure 2 *The procedure of MASW data processing using the SeisImager SW software package.*

Survey Design

The acquisition layout consisted of 24 receivers in a linear array (spread), connected with two 12-channel cables to P.A.S.I. Gea-24 seismograph. To optimize sampling of different wavelengths, two sets of measurements were conducted with spread lengths of 23 m and 69 m (1 m and 3 m spacing between geophones, respectively). Data collected with longer spreads provide a greater depth of investigation, whereas data collected with shorter geophone spacings ensure better resolution in the uppermost few meters of the subsurface. The 69 m long array was also used to obtain shear (S) wave refraction data.

4.5 Hz natural frequency vertical geophones and vertical energy excitation were used for the 23 m long array; 10 Hz natural frequency horizontal geophones and horizontal energy excitation were used for the 69 m long array. An 8-kg sledgehammer was used as an energy source. Shots were executed at five locations per spread: two shots close to the ends of the spread, one shot within the spread, and two shots with an offset of 15 to 45 m from the ends of the spread. For horizontal shots, 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 and Love wave arrivals of opposite polarity. The record length was set to 1500 ms with a 0.05 ms sampling interval.

For passive acquisition, the 69 m long array was used. Ambient wavefield was recorded for 10 minutes with a sampling interval of 2 ms.

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.

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

Some variability among the dispersion curves and resulting models obtained from different shot records is always observed due to lateral velocity variations, near and far field effects, different signal-to-noise ratio, etc. Combining independent inversion results from multiple shot records improves the estimation of the actual shear wave velocity and provides an assessment of uncertainty. The results of the interpretation are presented in the form of the average shear wave velocity profile; the observed variability of the MASW data is reported as upper and lower bound velocity profiles.

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-priory information to optimize model parameters for more accurate results. Hence, if the a-priory information is not available (e.g., when the data are overly noisy to carry out refraction analysis), the accuracy decreases.

The uncertainty of the resulting S-wave velocity depth profile is evaluated using the upper and lower bound velocity profiles. In practice, it means that the MASW data can be used to provide reliable site classification if the calculated upper and lower bound V_S30 values fall into the same site class range.

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.

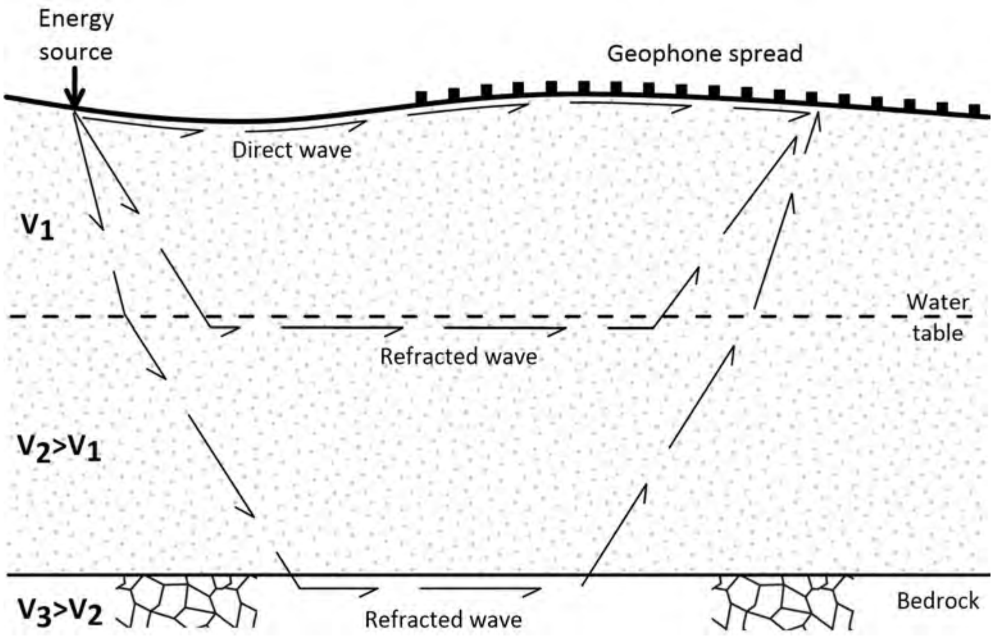


Figure 3 *Seismic model showing the basic principle of refraction method.*

Survey Design

The data set collected using the 69 m long array was used for S-wave refraction analysis.

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 records was good; first arrivals of refracted waves and MASW dispersion curves were well defined. The dispersion images covered a frequency range of approximately 4 to 70 Hz. Example S-wave refraction shot record and MASW dispersion images obtained at this site are presented in Figure 4.

Seismic refraction analysis indicated that the depth to bedrock at this site was approximately 23 m. The shear wave velocity in the bedrock measured using the S-wave refraction method was 2201 ± 10% m/s. The measured velocity for the bedrock is representative of the top of competent rock.

Refraction and borehole data were used for parameterization of the initial MASW inversion model. The resulting shear wave velocity depth profile is presented in Figure 5. 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.

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	0.8	173
0.8	1.7	206
1.7	2.7	295
2.7	3.8	347
3.8	5.1	351
5.1	6.5	337
6.5	8.1	332
8.1	9.8	356
9.8	11.8	398
11.8	14.0	423
14.0	16.5	405
16.5	19.3	361
19.3	22.5	327
22.5	25.9	1326
25.9	30.0	2201

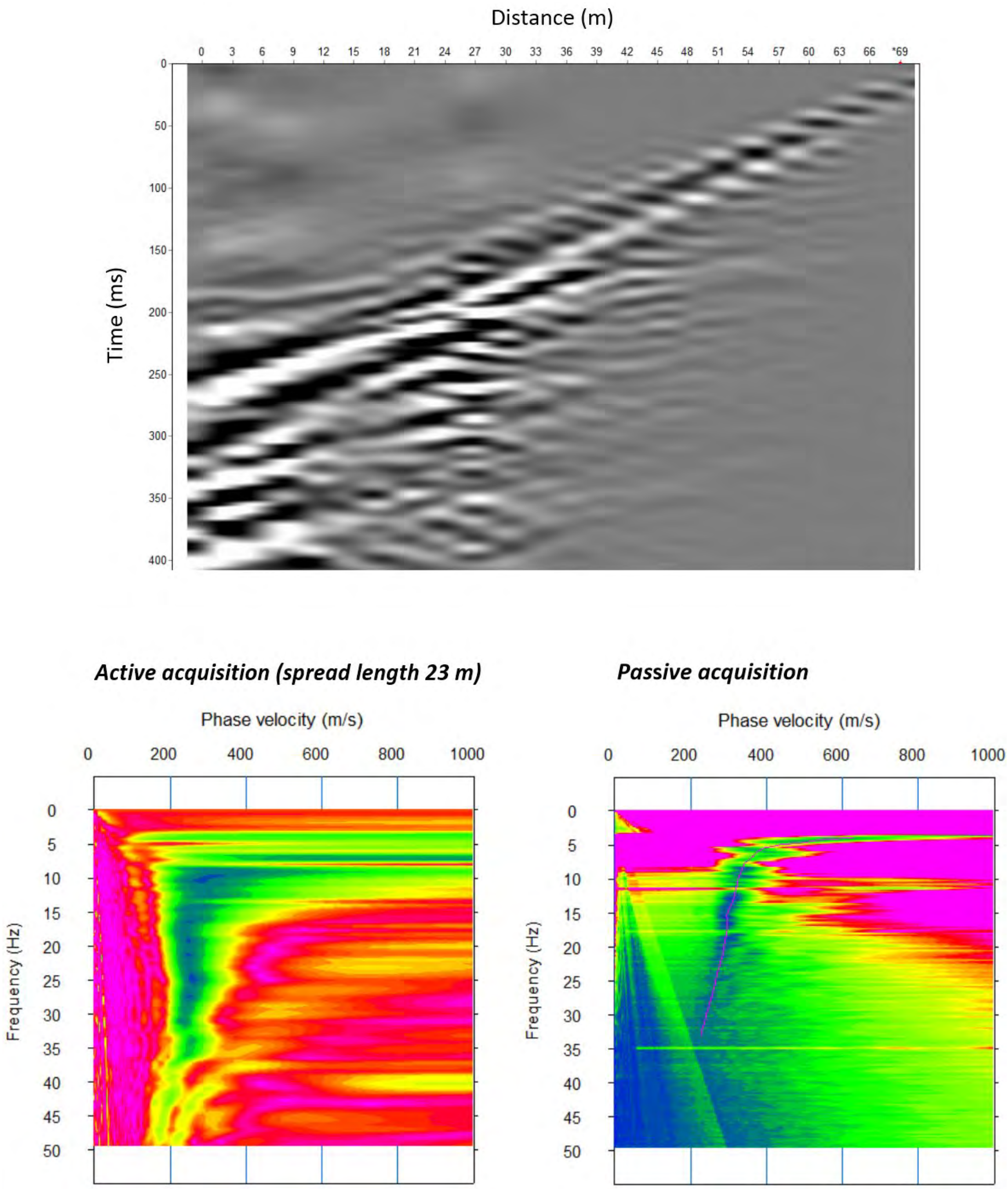


Figure 4 *Data examples displaying a stacked S-wave refraction shot record (top) and MASW dispersion images (bottom).*

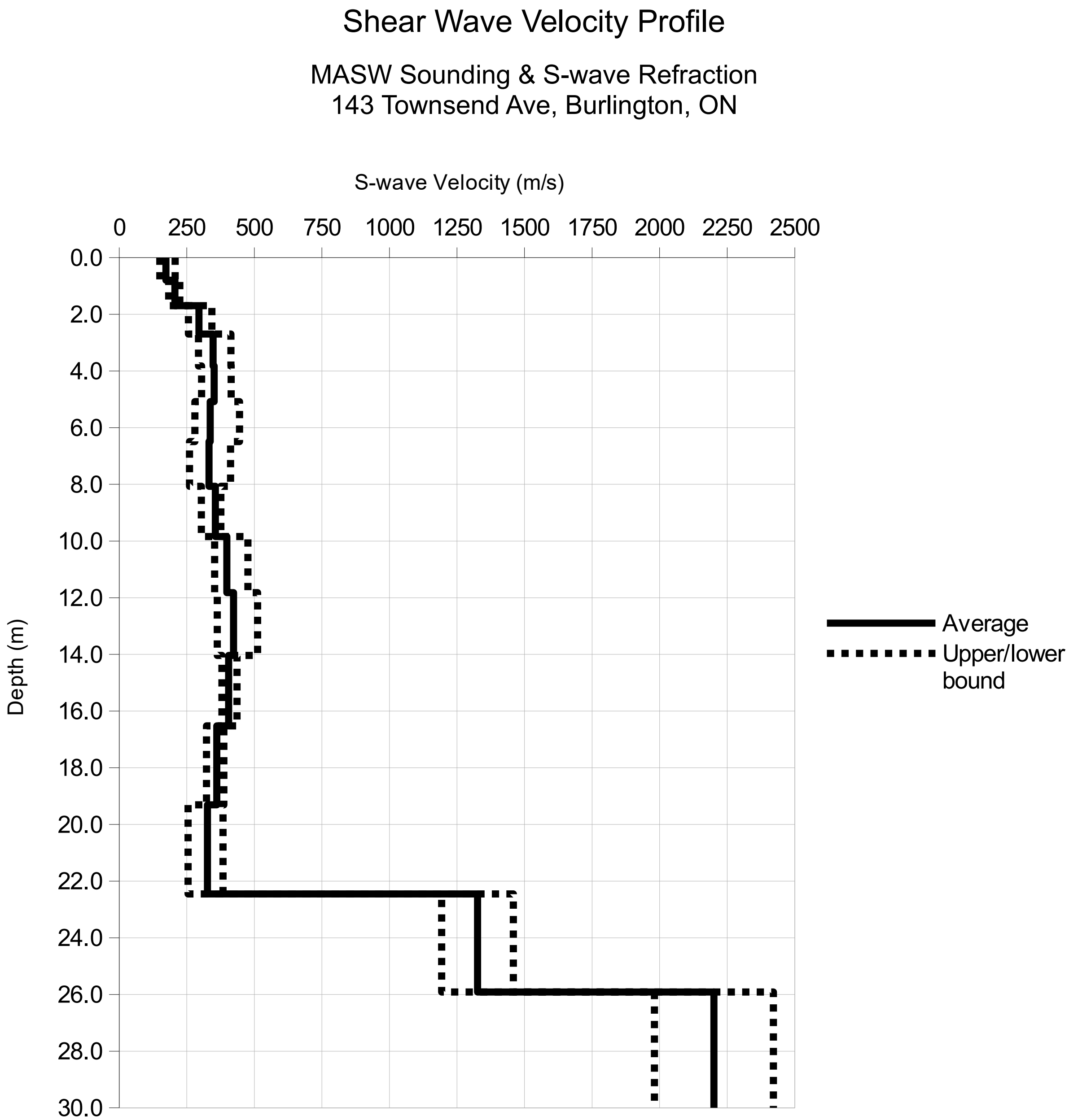


Figure 5 *Shear wave velocity profile from MASW sounding and S-wave refraction.*

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 and S-wave refraction.*

Depth Range (m)	Minimum V_S30 (m/s)	Average V_S30 (m/s)	Maximum V_S30 (m/s)	NBC 2015 Seismic Site Class
0 to 30	361	**421**	485	**C**

The V_S30 values obtained from the S-wave sounding varied from 361 m/s to 485 m/s with an average of 421 m/s.

Based on the Site Classification for Seismic Site Response (Table 4.1.8.4.-A) of the National Building Code of Canada 2015 (NBC), the investigated area is in **Site Class C** ($360 < V_S30 \leq 760$ m/s).

4 CLOSURE

Shear wave velocity testing involving the MASW and seismic refraction methodologies was carried out at the site of the proposed addition to Glenview Public School in Burlington, Ontario.

Based on the average shear wave velocity (V_S30) value calculated from in situ shear wave velocity measurements, **Site Class C** is applicable to the design of the proposed addition.

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

PROFESSIONAL GEOSCIENTIST
ILIA GUSAKOV
PRACTISING MEMBER
3161
ONTARIO

Appendix C

Limited Chemical Testing Program

Table C1 – Soil Samples Submitted for Geoenvironmental Testing

SGS Canada Inc., Certificates of Analysis

TABLE C1

Summary of Samples Submitted for Geoenvironmental Chemical Testing

Location	Sample ID	Approx. Depth (m)	Description
Borehole 1	BH1 SS2	0.76 – 1.37	Sand
Borehole 1	BH1 SS3	1.52 – 2.13	Sand
Borehole 2	BH2 SS2	0.76 – 1.37	Sand
Borehole 2	BH2 SS3	1.52 – 2.13	Sand
Borehole 3	BH3 SS1B	0.15 – 0.61	Sand
Borehole 3	BH3 SS2	0.76 – 1.37	Sand

Note:

All samples submitted for O. Reg 153/04 and O. Reg. 406/19 metals, hydride forming metals, PHC, BTEX, EC, SAR and pH

FINAL REPORT

CA40181-OCT23 R

23HF019

Prepared for

Peto MacCallum Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	Peto MacCallum Ltd
Address	45 Burford Road Hamilton, ON L8E 3C6, Canada
Contact	Suman Regi
Telephone	
Facsimile	
Email	sregi@petomaccallum.com; sjeffrey@petomaccallum.com
Project	23HF019
Order Number	
Samples	Soil (6)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA40181-OCT23
Received	10/20/2023
Approved	10/26/2023
Report Number	CA40181-OCT23 R
Date Reported	10/26/2023

COMMENTS

CCME Method Compliance: Analyses were conducted using analytical procedures that comply with the Reference Method for the CWS for Petroleum Hydrocarbons in Soil and have been validated for use at the SGS laboratory, Lakefield, ON site.

Quality Compliance: Instrument performance / calibration quality criteria were met and extraction and analysis limits for holding times were met.

nC6 and nC10 response factors within 30% of response factor for toluene: YES
nC10, nC16 and nC34 response factors within 10% of the average response for the three compounds: YES
C50 response factors within 70% of nC10 + nC16 + nC34 average: YES
Linearity is within 15%: YES

F4G - gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
The results for F4 and F4G are both reported and the greater of the two values is to be used in application to the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: No
Custody Seal Present: yes

Chain of Custody Number: 029752

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

FINAL REPORT

Client: Peto MacCallum Ltd
Project: 23HF019
Project Manager: Suman Regi
Samplers: Suman Regi

MATRIX: SOIL

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	10	11	12	13	14	15
			Sample Name	BH1 SS2	BH1 SS3	BH2 SS2	BH2 SS3	BH3 SS1B	BH3 SS2
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Date	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
BTEX									
Benzene	µg/g	0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Ethylbenzene	µg/g	0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Toluene	µg/g	0.05	0.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Xylene (total)	µg/g	0.05	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
m/p-xylene	µg/g	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
o-xylene	µg/g	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hydrides									
Antimony	µg/g	0.8	1.3	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Arsenic	µg/g	0.5	18	2.7	2.3	2.9	2.5	2.7	2.5
Selenium	µg/g	0.1	1.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Metals and Inorganics									
Moisture Content	%	no		7.5	5.8	4.6	10.7	3.1	4.0
Barium	µg/g	0.1	220	15	8.4	11	10	10	10
Beryllium	µg/g	0.02	2.5	0.29	0.13	0.20	0.17	0.15	0.16
Boron	µg/g	1	36	3	2	3	3	2	3
Cadmium	µg/g	0.05	1.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chromium	µg/g	0.5	70	6.5	3.5	6.1	4.5	4.3	3.7
Cobalt	µg/g	0.01	21	3.4	2.1	3.5	2.6	2.9	2.4
Copper	µg/g	0.1	92	15	9.3	13	10	12	10
Lead	µg/g	0.1	120	4.9	3.0	4.3	3.7	3.7	3.4
Molybdenum	µg/g	0.1	2	0.2	0.1	0.2	0.1	0.2	0.1

FINAL REPORT

Client: Peto MacCallum Ltd
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Project Manager: Suman Regi
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MATRIX: SOIL

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	10	11	12	13	14	15
			Sample Name	BH1 SS2	BH1 SS3	BH2 SS2	BH2 SS3	BH3 SS1B	BH3 SS2
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Date	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)									
Nickel	µg/g	0.5	82	8.7	4.5	7.1	5.7	5.6	5.1
Silver	µg/g	0.05	0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Thallium	µg/g	0.02	1	0.05	0.03	0.04	0.03	0.03	0.03
Uranium	µg/g	0.002	2.5	0.28	0.24	0.37	0.24	0.29	0.24
Vanadium	µg/g	3	86	11	7	14	9	9	7
Zinc	µg/g	0.7	290	17	11	17	15	13	12
Other (ORP)									
Sodium Adsorption Ratio	No unit	0.2	2.4	**3.6**	**8.1**	**23.0**	**15.4**	< 0.2	< 0.2
SAR Calcium	mg/L	0.2		7.1	1.9	3.0	3.1	12.7	12.7
SAR Magnesium	mg/L	0.3		9.8	0.5	< 0.3	< 0.3	1.3	1.3
SAR Sodium	mg/L	0.1		63.8	47.4	154	104	1.5	2.8
Conductivity	mS/cm	0.002	0.57	0.32	0.23	**0.67**	0.56	0.09	0.09
pH	pH Units	0.05		7.88	8.09	8.12	8.13	8.19	8.16

FINAL REPORT

Client: Peto MacCallum Ltd
Project: 23HF019
Project Manager: Suman Regi
Samplers: Suman Regi

MATRIX: SOIL

L1 = REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED

			Sample Number	10	11	12	13	14	15
			Sample Name	BH1 SS2	BH1 SS3	BH2 SS2	BH2 SS3	BH3 SS1B	BH3 SS2
			Sample Matrix	Soil	Soil	Soil	Soil	Soil	Soil
			Sample Date	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023	19/10/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
PHCs									
F1 (C6-C10)	µg/g	10	25	< 10	< 10	< 10	< 10	< 10	< 10
F1-BTEX (C6-C10)	µg/g	10	25	< 10	< 10	< 10	< 10	< 10	< 10
F2 (C10-C16)	µg/g	10	10	< 10	< 10	< 10	< 10	< 10	< 10
F3 (C16-C34)	µg/g	50	240	< 50	< 50	< 50	< 50	< 50	< 50
F4 (C34-C50)	µg/g	50	120	< 50	< 50	< 50	< 50	< 50	< 50
Chromatogram returned to baseline at nC50	Yes / No	no		YES	YES	YES	YES	YES	YES

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	REG153 / SOIL / COARSE - TABLE 1 - Residential/Parkland/Industrial - UNDEFINED L1
BH1 SS2				
Sodium Adsorption Ratio	MOE 4696e01/EPA 6010	No unit	3.6	2.4
BH1 SS3				
Sodium Adsorption Ratio	MOE 4696e01/EPA 6010	No unit	8.1	2.4
BH2 SS2				
Conductivity	EPA 6010/SM 2510	mS/cm	0.67	0.57
Sodium Adsorption Ratio	MOE 4696e01/EPA 6010	No unit	23.0	2.4
BH2 SS3				
Sodium Adsorption Ratio	MOE 4696e01/EPA 6010	No unit	15.4	2.4

FINAL REPORT

QC SUMMARY

Conductivity

Method: EPA 6010/SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0597-OCT23	mS/cm	0.002	<0.002	1	10	101	90	110	NA		

Metals in aqueous samples - ICP-OES

Method: MOE 4696e01/EPA 6010 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
SAR Calcium	ESG0049-OCT23	mg/L	0.2	<0.2	1	20	106	80	120	104	70	130
SAR Magnesium	ESG0049-OCT23	mg/L	0.3	<0.3	1	20	102	80	120	102	70	130
SAR Sodium	ESG0049-OCT23	mg/L	0.1	<0.1	2	20	96	80	120	101	70	130

QC SUMMARY

Metals in Soil - Aqua-regia/ICP-MS

Method: EPA 3050/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Silver	EMS0213-OCT23	ug/g	0.05	<0.05	ND	20	103	70	130	96	70	130
Arsenic	EMS0213-OCT23	µg/g	0.5	<0.5	1	20	108	70	130	99	70	130
Barium	EMS0213-OCT23	ug/g	0.1	<0.1	2	20	105	70	130	96	70	130
Beryllium	EMS0213-OCT23	µg/g	0.02	<0.02	3	20	104	70	130	105	70	130
Boron	EMS0213-OCT23	µg/g	1	<1	5	20	97	70	130	88	70	130
Cadmium	EMS0213-OCT23	ug/g	0.05	<0.05	4	20	103	70	130	109	70	130
Cobalt	EMS0213-OCT23	µg/g	0.01	<0.01	2	20	107	70	130	104	70	130
Chromium	EMS0213-OCT23	µg/g	0.5	<0.5	1	20	105	70	130	101	70	130
Copper	EMS0213-OCT23	µg/g	0.1	<0.1	9	20	106	70	130	108	70	130
Molybdenum	EMS0213-OCT23	µg/g	0.1	<0.1	0	20	107	70	130	101	70	130
Nickel	EMS0213-OCT23	ug/g	0.5	<0.5	2	20	109	70	130	105	70	130
Lead	EMS0213-OCT23	ug/g	0.1	<0.1	3	20	107	70	130	107	70	130
Antimony	EMS0213-OCT23	µg/g	0.8	<0.8	ND	20	99	70	130	74	70	130
Selenium	EMS0213-OCT23	ug/g	0.1	<0.1	2	20	109	70	130	100	70	130
Thallium	EMS0213-OCT23	µg/g	0.02	<0.02	2	20	102	70	130	109	70	130
Uranium	EMS0213-OCT23	µg/g	0.002	<0.002	1	20	101	70	130	NV	70	130
Vanadium	EMS0213-OCT23	µg/g	3	<3	2	20	104	70	130	95	70	130
Zinc	EMS0213-OCT23	µg/g	0.7	<0.7	3	20	109	70	130	97	70	130

QC SUMMARY

Petroleum Hydrocarbons (F1)

Method: CCME Tier 1 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-010

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
F1 (C6-C10)	GCM0394-OCT23	µg/g	10	<10	ND	30	107	80	120	91	60	140

Petroleum Hydrocarbons (F2-F4)

Method: CCME Tier 1 | Internal ref.: ME-CA-[ENV]GC-LAK-AN-010

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
F2 (C10-C16)	GCM0386-OCT23	µg/g	10	<10	ND	30	104	80	120	91	60	140
F3 (C16-C34)	GCM0386-OCT23	µg/g	50	<50	ND	30	104	80	120	91	60	140
F4 (C34-C50)	GCM0386-OCT23	µg/g	50	<50	ND	30	104	80	120	91	60	140

QC SUMMARY

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	ARD0110-OCT23	pH Units	0.05		0	20	100	80	120			

Volatile Organics

Method: EPA 5035A/5030B/8260C | Internal ref.: ME-CA-[ENV]GC-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Benzene	GCM0394-OCT23	µg/g	0.02	<0.02	ND	50	96	60	130	79	50	140
Ethylbenzene	GCM0394-OCT23	µg/g	0.05	<0.05	ND	50	92	60	130	80	50	140
m/p-xylene	GCM0394-OCT23	µg/g	0.05	0.06	13	50	93	60	130	81	50	140
o-xylene	GCM0394-OCT23	µg/g	0.05	<0.05	ND	50	95	60	130	83	50	140
Toluene	GCM0394-OCT23	µg/g	0.05	<0.05	ND	50	96	60	130	83	50	140

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.
This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm.
The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Reproduction of this analytical report in full or in part is prohibited.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

RECEIVED
JUL 3 2024
CITY OF BURLINGTON
BUILDING DEPARTMENT

No: 029752
Page 1 of 1

COB - Building Department
Page 63 of 63

Laboratory Information Section - Lab use only

Received By: ED
Received Date: 10 / 20 / 23 (mm/dd/yy)
Received Time: 11 : 00 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☐ No ☐
Cooling Agent Present: Yes ☐ No ☑ Type:
Temperature Upon Receipt (°C) 9.X3.
LAB LIMS #: CA40181-OCT23

REPORT INFORMATION

Company: PML
Contact: Suman Regi
Address: 41 Burford Rd
Hamilton
Phone: 343-889-2306
Fax: sjeffrey@petomaccallum.com
Email: sregi@petomaccallum.com

INVOICE INFORMATION

☒ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 23HF019
Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☑ O.Reg 153/04
☑ O.Reg 406/19
☒ Table 1 ☒ Res/Park Soil Texture:
☐ Table 2 ☒ Ind/Com ☒ Coarse
☒ Table 3 RPI ☐ Agri/Other ☐ Medium/Fine
☐ Table ____ Appx.
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

M & I: Field Filtered (Y/N); Metals & Inorganics incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water); Full Metals Suite ICP metals plus B(HWS-soil only) Hg, CrVI; ICP Metals only Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn
SVOC: PAHs only; SVOCs all incl PAHs, ABNs, CPs
PCB: PCBs ☐ Total ☐ Aroclor
PHC: F1-F4 + BTEX; F1-F4 only no BTEX
VOC: VOCs all incl BTEX *; BTEX only *
Pest: Pesticides Organochlorine or specify other
Other (please specify): Metals, Hydride Forming metals; EC, SAR, PH, PHC; Sewer Use: Specify pkg:; Water Characterization Pkg ☐ General ☐ Extended
SPLP Specify tests: ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN
TCLP Specify tests: ☑ M&I ☑ VOC ☑ PCB ☑ B(a)P ☐ ABN ☑ Ignit.

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	Metals & Inorganics	Full Metals Suite	ICP Metals only	PAHs only	SVOCs	PCBs	F1-F4 + BTEX	F1-F4 only	VOCs	BTEX only	Pesticides	Metals, Hydride Forming metals	EC, SAR, PH, PHC			Sewer Use	Water Characterization Pkg	SPLP	TCLP	COMMENTS:
1	BH1 SS2	OCT 19/23	12:20PM	4	SOIL											X		X	X							
2	BH1 SS3	"	12:09PM	4	"											X		X	X							
3	BH2 SS2	"	10:00AM	4	"											X		X	X							
4	BH2 SS3	"	11:04AM	4	"											X		X	X							
5	BH3 SS1B	"	1:12PM	4	"											X		X	X							
6	BH3 SS2	"	1:17PM	4	"											X		X	X							
7	TCLP-1	"	1:30PM	1	"																				X	HOLD
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): Suman Regi Signature: Date: 10 / 19 / 23 (mm/dd/yy)
Relinquished by (NAME): Suman Regi Signature: Date: 10 / 20 / 23 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

COB - Building Department
Page 63 of 63

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Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. (2) Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). (3) Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.