Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED SIMCOE COUNTY HOUSING FACILITY
20 ROSE STREET
BARRIE, ONTARIO

for

THE CORPORATION OF THE COUNTY OF SIMCOE

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PML Ref.: 21BF014
Report: 1 Revised
May 2021

Peto MacCallum Ltd.
CONSULTING ENGINEERS

May 6, 2021

PML Ref.: 21BF014
Report: 1 Revised

Mr. Brad Spiewak, P.Eng.
The Corporation of The County of Simcoe
1110 Highway 26
Midhurst, Ontario
L9X 1N6

Dear Mr. Spiewak

Geotechnical Investigation
Proposed Simcoe County Housing Facility
20 Rose Street
Barrie, Ontario

Peto MacCallum Ltd. (PML) is pleased to present the results of the Geotechnical investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Mr. B. Spiewak, through provision of Purchase Order No. 4500086779.

Simcoe County is proposing to redevelop the former OPP facility at 20 Rose Street in Barrie. The existing buildings will be demolished and the new housing facilities constructed. The design has not been completed at this time. The current concept has an eight to ten storey slab-on-grade residential building planned, with a separate slab-on-grade two storey parking facility. Paved access and at-grade parking are also proposed. The site will have full municipal servicing. Infiltration facilities are also being considers in the design.

The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and Geotechnical engineering recommendations for earthworks, building foundations, site servicing, pavement design and preliminary infiltration parameters.

A Phae Two Environmental Site Assessment was carried out concurrently with the Geotechnical work and is provided under separate cover in Report 2.

A total of 26 boreholes were advanced across the site. Below topsoil or pavement, fill was encountered over a major till deposit. Ground water was encountered locally at depth only in some of the boreholes.

Typical construction methods should be applicable for the site with consideration for the thicker fill and associated with demolition to be carried out.

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

Sincerely

Peto MacCallum Ltd.

Geoffrey R. White, P.Eng.
Director
Manager, Geotechnical Services

GRW:tc

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1. INTRODUCTION

Peto MacCallum Ltd. (PML) is pleased to present the results of the Geotechnical investigation recently completed at the above noted project site. Authorization for the work described in this report was provided by Mr. B. Spiewak, through provision of Purchase Order No. 4500086779.

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The purpose of this investigation was to assess the subsurface conditions at the site, and based on this information, provide comments and Geotechnical engineering recommendations for earthworks, building foundations, site servicing, pavement design and preliminary infiltration parameters.

A Phase Two Environmental Site Assessment (ESA) was completed concurrently and will be reported under separate cover in Report 2.

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 works as addressed in the report. Any changes in the proposed plans will require review by PML to re-assess the validity of the report, and may require modified recommendations, additional investigation and/or analysis.

This report is subject to the Statement of Limitations that is included in Appendix A and must be read in conjunction with the report.

2. INVESTIGATION PROCEDURES

The field work for this investigation initially included a program of 30 boreholes. Boreholes 1 to 8, 10, 12, 13, 15 16 and 20 were drilled to 6.5 m depth for the main building. Boreholes 24 to 26, and 28 to 30 were drilled to 5.0 to 6.5 m depth for the parking structure. Boreholes 9, 14, 17, 18, 21 and 27 were drilled to 4.3 to 12.8 m depth in parking and infiltration areas. Boreholes 9, 17 and 18 were deepened from 4.3 to 12.8 m depth for Phase Two ESA purposes. Boreholes 11, 19, 22 and 23 were not drilled due to previous work at the site. Borehole locations are shown on Drawing 1, appended.

PML laid out the boreholes in the field. The ground surface elevation at the borehole locations was obtained with a Sokkia SHC5000 Global Navigation Satellite System (GNSS). Vertical and horizontal accuracy of this unit are 0.1 and 0.5 m, respectively. All elevations in this report are geodetic and expressed in metres.

Co-ordination for clearances of underground utilities was provided by PML with the aid of a private locating service. The boreholes were drilled cognizant of the underground utilities.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted D-50 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a member of PML's engineering staff.

Where topsoil was encountered at the surface, the thickness was measured in hand dug divots. Where pavement was encountered at the surface, the pavement component thicknesses were measured and samples of the granular materials were collected.

Representative samples of the overburden were recovered at frequent depth intervals for identification purposes using a conventional 51 mm OD split spoon sampler. The sampler excludes particles larger than 38 mm. Standard penetration tests were carried out simultaneously with the sampling operations to assess the strength characteristics of the subsoil. The ground water conditions in the boreholes were assessed during drilling by visual examination of the soil samples, the sampler, and drill rods as the samples were retrieved, and measurement of the water level in the open boreholes, if any.

A monitoring well, comprised of 50 mm diameter PVC pipe with a 1.5 m long screen at the bottom, filter sand, bentonite seal and stick-up protective casing, was installed in six boreholes to permit ground water level monitoring. The details of the monitoring well installation are shown on the applicable Log of Borehole sheets. It should be noted that the well becomes the property of the Owner and will have to be decommissioned by the Owner in accordance with O.Reg. 903. PML would be pleased to assist, if requested.

PML is currently carrying out a year long ground water level monitoring program. Results will be presented under separate cover when the program is completed.

All recovered samples were returned to our laboratory for detailed examination and moisture content determinations. Grain size analyses were carried out on eight samples of the major soil unit. The laboratory test results are provided on Figure 1, appended.

3. SITE SETTING

The site has an irregular triangle shape. The site is located on the north side of Rose Street between the Ramp to Highway 400 and the cul-de-sac on Ottaway Avenue. Highway 400 is to the north. The site is currently occupied by the former OPP facility with residential, properties surrounding most of the site.

The site is located within the physiographic region known as the Simcoe Uplands comprising drumlinzed till plans.

The borehole elevations indicate about 5.0 m of relief across the site, with elevations ranging from 271.65 to 266.55, being relatively flat in the west and central sections, gently sloping down in the eastern section.

4. GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Geology

Bedrock below the overburden is mapped as limestone, dolostone, shale, arkose, and sandstone of the Simcoe Group from the Middle Ordovian period of the Paleozoic era of the Phanerzoic eon. Bedrock is anticipated at depths greater than 60 m based on the Ministry of Environment, Conservation and Parks (MECP) Water Well Records in the area.

4.2 Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the subsurface conditions, including topsoil thicknesses, pavement component thicknesses, soil classifications, inferred stratigraphy and thicknesses, Standard Penetration test N Values (N Values, blows per 300 mm penetration of the split spoon sampler), well installation details, ground water level observations and the results of laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth/elevation demarcations on the borehole logs must be viewed as “transitional” zones, and cannot be construed as exact geologic boundaries between layers. PML should be retained to assist in defining the geological boundaries in the field during construction, if required.

Topsoil and/or pavement was encountered at the surface, over fill, overlying a major native till deposit. Local sand or silty sand layers were noted in two boreholes. A description of the distribution of the subsurface conditions encountered is provided below.

4.2.1 Topsoil

Topsoil was present at the surface of Boreholes 1 to 3, 6 to 8, 16, 20, 24, 26 to 29 and was 150 to 250 mm thick.

4.2.2 Pavement

Pavement was at the surface in the following boreholes with component thicknesses noted.

BOREHOLE	ASPHALT	GRANULAR BASE	GRANULAR SUBBASE	TOTAL THICKNESS
4	50	140	210	400
5	50	100	200	350
9	80	150	300	530
10	40	120	140	300
12	100	120	180	400
13	40	100	110	250
14	110	200	150	460
15	30	100	140	270
17	100	150	210	460
18	100	120	200	420
21	100	120	230	450
25	130	150	200	480
30	90	180	150	420

4.2.3 Fill

Fill was encountered in all boreholes below the surficial topsoil or pavement, extending to 0.7 to 2.9 m depth (elevation 265.2 to 270.85). The material comprised silty sand to sandy silt with trace gravel. The material had N Values ranging from 2 to 26, indicating variable compaction when placed. The layer was moist, locally very moist or wet, with water contents of 7 to 21%.

4.2.4 Sand/Silty Sand

Below the fill in Borehole 5, a sand unit was noted to 4.0 m depth (elevation 267.6), and below the fill in Borehole 9 a silty sand layer was observed to 2.9 m depth (elevation 267.3). The sand was very

dense (N Value of 52) and the silty sand was compact (N Value of 25). Both materials were moist with moisture contents of 6 to 8 %.

Below the fill or local sand/silty sand layers, a major native silty sand till deposit was revealed to the 4.3 to 12.8 m depth of exploration. The matrix comprises silty sand with trace gravel and clay. Cobbles and boulders were noted during augering. Eight representative samples were submitted for gradation and the results are presented on Figure 1, appended. The material had N Values typically greater than 20 to greater than 50 (compact to very dense), locally 7, 10 or 15 at the top of the unit. The deposit was typically moist with moisture contents 10% or less, locally wet at depth.

4.2.5 Ground Water

The first water strike (ground water first encountered during drilling), the ground water/wet cave levels measured in the boreholes upon completion of augering, and ground water levels measured in the wells, are summarized in the table below, on a borehole by borehole basis.

BOREHOLE	FIRST STRIKE DURING DRILLING DEPTH (m) / ELEVATION	UPON COMPLETION OF AUGERING DEPTH (m) / ELEVATION	WATER LEVEL IN WELL APRIL 30, 2021 DEPTH (m) / ELEVATION
1	No Water	No Water	--
2	No Water	No Water	--
3	No Water	No Water	--
4	No Water	No Water	--
5	No Water	No Water	--
6	No Water	No Water	No Water
7	No Water	No Water	--
8	No Water	No Water	--
9	11.9 / 258.3	11.9 / 258.3	8.7 / 261.5
10	No Water	No Water	--
12	No Water	No Water	--
13	No Water	No Water	--
14	No Water	No Water	--

BOREHOLE	FIRST STRIKE DURING DRILLING DEPTH (m) / ELEVATION	UPON COMPLETION OF AUGERING DEPTH (m) / ELEVATION	WATER LEVEL IN WELL APRIL 30, 2021 DEPTH (m) / ELEVATION
15	No Water	No Water	--
16	No Water	No Water	--
17	10.7 / 259.1	11.6 / 258.2	8.1 / 261.7
18	11.0 / 259.2	11.6 / 258.6	8.4 / 261.8
20	No Water	No Water	--
21	No Water	No Water	--
24	No Water	No Water	--
25	No Water	No Water	--
26	No Water	No Water	No Water
27	No Water	No Water	3.2 / 263.4
28	No Water	No Water	--
29	No Water	No Water	--
30	No Water	No Water	--

The ground water table is believed to be about 8 to 11 m grade. Local perched water in the fill above the till or wet layers in the till, are also present.

Ground water levels will fluctuate seasonally, and in response to variations in precipitation.

5. GEOTECHNICAL ENGINEERING CONSIDERATIONS

5.1 General

Simcoe County is proposing to redevelop the former OPP facility at 20 Rose Street in Barrie. The existing buildings will be demolished and the new housing facilities constructed. The design has not been completed at this time. The current concept has an eight to ten storey slab-on-grade residential building planned, with a separate slab-on-grade two storey parking facility. Paved access and at-grade parking are also proposed. The site will have full municipal servicing. Infiltration facilities are also being considers in the design. The proposed site concept is shown on Drawing 1, appended.

It is understood that a basement in the main building is currently not part of the design. It is noted that the subsurface conditions are favourable for a basement, with the ground water at depth and a basement would help penetrate the fill and upper less dense soil to allow footings to be founded on soil with a higher bearing resistance. Basement recommendations can be provided if required.

5.2 Site Grading and Engineered Fill

The ground floor level of the main building and the parking structure have not been set at this time. For purposes of this report, the ground floor of the main building is assumes to be at elevation 271.8 and the main floor of the parking structure at elevation 270.5.

The existing topsoil, pavement and fill are not suitable to support footings or floor slabs due to concerns with settlement. Further, in the areas where the existing buildings and services will be to be demolished/removed, fill depths greater than those shown in the borehole logs are likely present. All fill associated with the existing buildings and infrastructure will need to be removed entirely (vertically and laterally) within the footprint of the proposed building and parking structure. In this regard, it is recommended that existing topsoil, pavement and fill be removed and replaced with engineered fill. Grades under the building can be raised as required, with engineered fill to required levels. Where grades are to be raised under structures (building, paved areas and site servicing) the fill needs to be constructed as engineered fill.

Reference is made to Appendix B for guidelines for engineered fill construction. The following general highlights are provided:

- Strip existing topsoil or pavement and fill, and other deleterious materials down to competent native soil, subject to geotechnical review during construction. The excavated native soil should be segregated and stockpiled separately for reuse or disposal, subject to geotechnical review;

- Proofroll exposed subgrade using a heavy vibrator roller to targeted 100% Standard Proctor maximum dry density (SPmdd) for the building areas and 95% SPmdd for parking areas, under geotechnical review.

- Following geotechnical review and approval of the subgrade, spread approved material in maximum 200 mm thick lifts and uniformly compacted to 100% SPmdd in building areas and 95% SPmdd in parking areas. If wet subgrade conditions are present the use of Granular B Type II may be required for the first lift or two of engineered fill;

- Organics, topsoil, oversized material (over 150 mm in diameter) or otherwise deleterious materials are not suitable for reuse as engineered fill. The excavated site soil is selectively considered suitable for reuse as engineered fill, subject to moisture content and geotechnical review during construction. In the regard, it is recommended to utilize imported material under the building and on-site soil elsewhere on the site. Imported material should comprise OPSS Granular B or OPSS Select Subgrade Material (SSM). Other sources of imported material should be reviewed by our office to ensure suitability;

- The engineered fill pad must extend at least 1 m beyond the structure to be supported, then outwards and downwards at no steeper than 45° to the horizontal to meet the underlying approved native subgrade. In this regard, strict survey control and detailed documentation of the lateral and vertical extent of the engineered fill limits should be carried out to ensure that the engineered fill pad fully incorporates the structure to be supported;

- Engineered fill construction must be carried out under full-time field review by PML, to approve sub-excavation and subgrade preparation, backfill materials, placement and compaction procedures, and to verify that the specified compaction standards are achieved throughout.

5.3 Foundations

As noted above, for purposes of this report the ground floor of the main building is assumes to be at elevation 271.8 and the main floor of the parking structure at elevation 270.5. Exterior footings would be placed at about elevation 270.3 for the main building and about elevation 269.0 for the parking structure. Interior footings for the main building are assumed at about elevation 271.1. As noted earlier, in-situ fill is not suitable to support footings. Existing fill will have to be removed and replaced with engineered fill. In general, it is anticipated footings would be supported on a combination of native soil and engineered fill.

The available bearing capacity on native soils, on a borehole by borehole basis (boreholes in building areas only) is provided below:

BOREHOLE	DEPTH (m) / ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
Main Building				
1	1.5 / 270.2	Till	200	300
	2.2 / 269.5		350	525
2	0.8 / 270.7	Till	200	300
	1.5 / 270.0		350	525
3	2.2 / 269.4	Till	300	450
4	1.5 / 270.1	Till	250	375
	2.2 / 269.4		350	525
5	3.0 / 268.6	Sand / Till	350	525
6	0.8 / 270.7	Till	200	300
	1.5 / 270.0		350	525
7	1.5 / 270.1	Till	250	375
	2.2 / 269.4		350	525
8	0.8 / 270.7	Till	350	525

BOREHOLE	DEPTH (m) / ELEVATION	ANTICIPATED SUBGRADE SOIL TYPE	GEOTECHNICAL BEARING RESISTANCE AT SLS (kPa)	FACTORED BEARING RESISTANCE AT ULS (kPa)
10	2.2 / 269.3	Till	350	525
12	1.5 / 269.7	Till	350	525
13	1.5 / 269.8	Till	350	525
15	2.2 / 268.7	Till	350	525
16	2.2 / 269.1	Till	350	525
20	0.8 / 269.8	Till	250	375
	1.5 / 269.1		350	525
Parking Structure				
24	1.5 / 267.6	Till	200	300
	2.2 / 266.9		350	525
25	2.2 / 268.0	Till	300	450
	2.9 / 267.3		350	525
26	2.2 / 268.1	Till	350	525
28	1.5 / 266.0	Till	350	525
29	2.2 / 266.0	Till	350	525
30	2.2 / 267.7	Till	150	225
	2.9 / 267.0	Till	350	525

Higher capacities are possible, however the footing/foundation details will need to be confirmed.

As discussed earlier, any upfilling under building to remove existing fill will need to be constructed as engineered fill. Footings founded on engineered fill, constructed with Granular B, can be designed for a net Geotechnical bearing resistance at SLS of 200 kPa and a factored bearing resistance at ULS of 300 kPa.

The bearing resistance at SLS is based on total settlement of 25 mm in the bearing stratum with differential settlement of 75% of this value.

Footings subject to frost action should be provided with a minimum 1.2 m of earth cover or equivalent insulation.

Prior to placement of structural concrete, all founding surfaces should be reviewed by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions revealed in the excavation.

Based on the soil profile revealed in the boreholes, Site Classification D is applicable for Seismic Site Response as set out in Table 4.1.8.4.A of the Ontario Building Code (2012). Based on the type and relative density of the soil cover at the site, there is a low potential for liquefaction of soils to occur.

5.4 Site Servicing

Design details were not finalized at the time of this report. For purposes of this report, inverts are assumed to be as much as 3.0 m below existing grade.

5.4.1 Trench Excavation and Ground Water Control

Trench excavation and ground water control are described later in the report under Excavation and Ground Water Control.

5.4.2 Pipe Support, Pipe Bedding and Cover

Native soil is generally expected at invert levels, which is considered satisfactory for pipe support. Where existing fill or other deleterious material is encountered at the design invert level, such material should be sub-excavated and replaced with an increased thickness of bedding material, subject to geotechnical field review and approval.

OPSS bedding and cover thickness and compaction standards are recommended. Bedding and cover material should comprise OPSS Granular A.

5.4.3 Trench Backfill

Backfill in trenches should comprise select inorganic soil and be placed in maximum 200 mm thick loose lifts compacted to at least 95% SPmdd to minimize post construction settlement in the backfill. Topsoil, organic, excessively wet, frozen, oversized (greater than 150 mm in diameter), or otherwise deleterious material should not be incorporated as trench backfill. The moisture content of the trench backfill should be within 2% of the optimum moisture content in order to achieve the specified compaction and be close to optimum moisture content in the upper 1 m to prevent subgrade instability issues. Ideally the backfill should comprise excavated site soil, in order to minimize differential frost heave.

The excavated soil will comprise the topsoil, fill and native soil. Excavated inorganic site soil should generally be acceptable for reuse, subject to moisture content control (wet material will need to be dried out or mixed with drier soil in order to be suitable for reuse), removal of organics/deleterious material and geotechnical review during construction.

Earthworks operations should be inspected by PML to verify subgrade preparation, backfill materials, placement and compaction efforts and ensure the specified degree of compaction is achieved throughout.

5.5 Excavation and Ground Water Control

It is anticipated that excavation for the buildings and site serving will extend about 3.0 m below existing grade. Excavation will encounter topsoil, pavement, fill, and native sand/silty sand and the till deposit. Th native soils were typically very dense and harder digging and the occurrence of cobbles and boulders should be expected.

Subject to the ground water control as discussed below, the site soils encountered at the site should be considered as Type 3 soil requiring excavation sidewalls to be constructed at no steeper than one horizontal to one vertical (1H:1V) from the base of the excavation in accordance with the Occupational Health and Safety Act.

Excavation side slopes will need to be continuously examined and reviewed for evidence of instability, particularly following periods of heavy rain or thawing. When required, remedial action must be taken to ensure the continued stability of the excavation slope and the safety of the workers.

Within the depth of excavation as discussed above, only local perched water is expected. Based on the soil conditions observed on-site, conventional sump pumping techniques should be sufficient for ground water control. Local sandy areas may yield greater seepage volumes where more concentrated pumping may be required.

Water taking in Ontario is governed by the Ontario Water Resources Act (OWRA) and the Water Takings and Transfer Regulation O. Reg. 387/04. Section 34 of the OWRA requires anyone taking more than 50,000 L/d to notify the MECP. This requirement applies to all withdrawals, whether for consumption, temporary construction dewatering, or permanent drainage improvements. Where it is assessed than more than 50,000 L/d but less than 400,000 L/d of ground water taking is required, the Owner can register online via the Environmental Activity and Sector Registry (EASR) system. Where it is assessed that more than 400,000 L/d of ground water taking is required then a Category 3 Permit-To-Take-Water (PTTW) is required.

Based on the conditions revealed in the boreholes and anticipated excavation depths discussed above, registry on the EASR system or a PTTW are not anticipated. Once details of the site have been established, they should be reviewed by PML to re-establish any dewatering requirements.

It is recommended that a test dig be conducted to permit prospective contractors an opportunity to observe and examine the conditions likely to be encountered, in order that they may assess for themselves the excavation and ground water control requirements.

5.6 Pavement Design and Construction

Grading was not finalized at the time of this report. It is anticipated that the pavement subgrade will predominantly comprise near surface soils which typically consist of moderately to highly frost susceptible silty sand and sandy silt fill or silty sand till. Based on the subgrade conditions, the following pavement structure thicknesses are recommended and should be reviewed when grading/subgrade soils are determined:

	LIGHT DUTY	HEAVY DUTY
Asphalt (mm) (Two Lifts)	90	120
Granular A Base Course (mm)	150	150
Granular B Subbase Course (mm)	350	500
Total Thickness (mm)	590	760

It is recommended that following rough grading to the subgrade level, subgrade preparation should include proofrolling and compacting the exposed subgrade with a heavy compactor to minimum 95% SPmdd under geotechnical review. Any unstable zones identified during this process should be sub-excavated and replaced with compacted select site material, subject to geotechnical field review. Any upfilling or soil replacement should be carried out as engineered fill.

Imported material for the granular base and subbase should conform to OPSS gradation specifications for Granular A and Granular B, and should be compacted to 100% SPmdd. Asphalt should be compacted in accordance with OPSS 310.

If wet or unstable subgrade is encountered, additional excavation, additional granular subbase, the use of Granular B Type II and/or geotextile may be provided, subject to geotechnical review during construction.

For the pavement to function properly, it is essential that provisions be made for water to drain out of and not collect in the base material. The incorporation of subdrains is recommended along pavement edges in conjunction with crowning of the final subgrade to promote drainage towards the pavement edge. Subdrains should be installed at least 300 mm below the subgrade level. Refer to OPSD 216 Series for details regarding pipe, filter fabric or filter sock, bedding and cover material.

Maintenance hole/catchbasins should be backfilled with free draining Granular B and have stub drains extend out from the structure. The above measures will help drain the pavement structure as well as alleviate the problems of differential frost movement between the catchbasins and pavement.

5.7 Preliminary Infiltration Assessment

The grain size analyses of the major till deposit presented on Figure 1 and are quite uniform. Based on the very dense state of the soil and the grain size distribution, the K value is estimated to be on the order of $1x10^{-5}$ to $1x10^{-6}$ cm /sec, not very favourable for infiltration.

5.8 Geotechnical Review and Construction Inspection and Testing

It is recommended that the final design drawings be submitted to PML for geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures and check the specified degree of compaction is achieved throughout.

Prior to placement of structural concrete, all founding surfaces must be inspected by PML to verify the design bearing capacity is available, or to reassess the design parameters based on the actual conditions.

The comments and recommendations provided in the report are based on information revealed in the boreholes. Conditions away from and between boreholes may vary. Geotechnical review during construction should be ongoing to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

6. CLOSURE

We trust this report is complete within our terms of reference, and the information presented is sufficient for your present purposes. If you have any questions, or when we may be of further assistance, please do not hesitate to call our office.

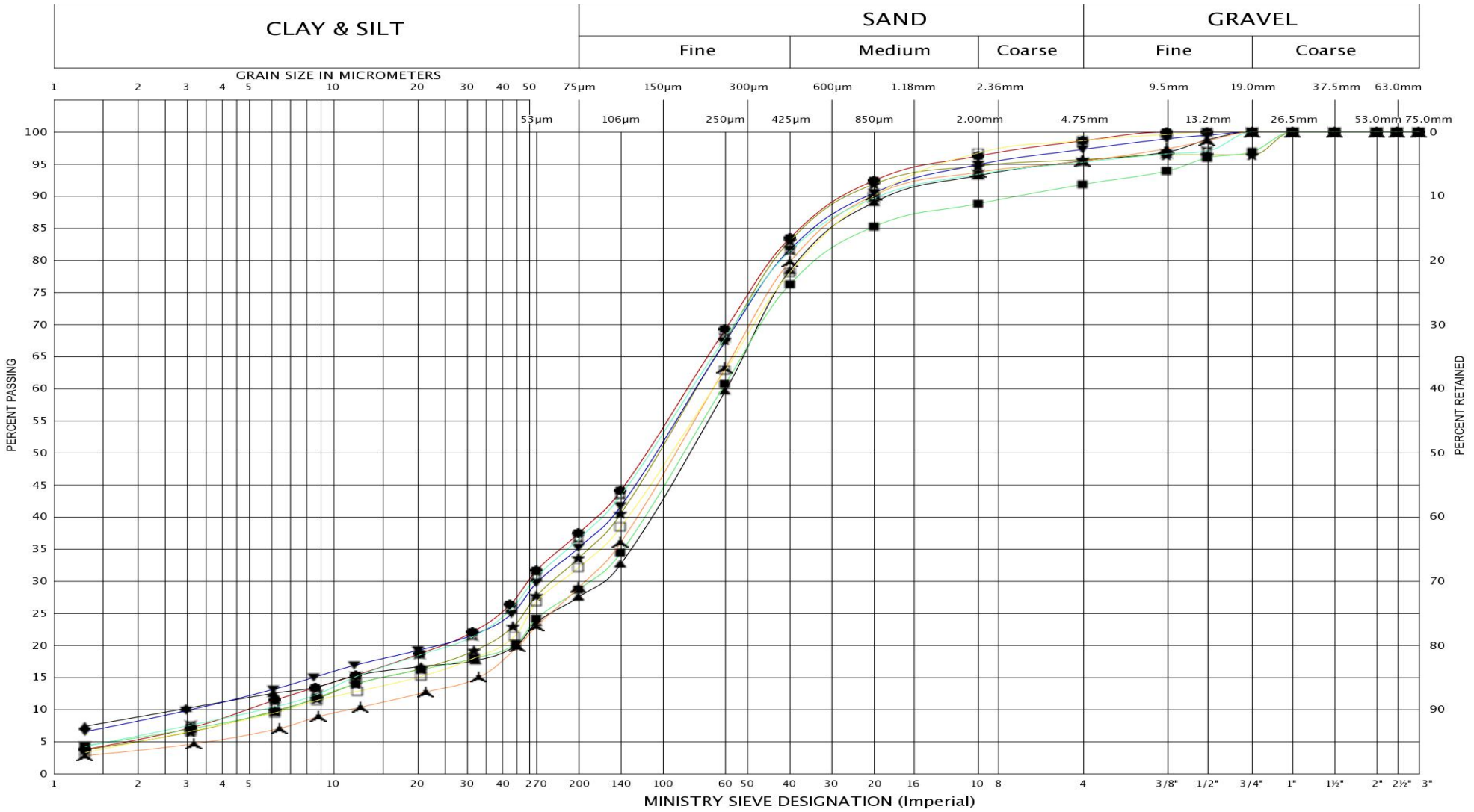
Sincerely

Peto MacCallum Ltd.

Geoffrey R. White, P.Eng.
Director
Manager, Geotechnical Services

GRW:tc

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND	BH	3	6	10	17	20	24	27	27
	SAMPLE	4	3	5	12	2	4	3	5
	SYMBOL	□	⊠	●	▲	★	▼	⅄	■

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GRAIN SIZE DISTRIBUTION

TILL: Silty Sand, Trace Gravel, Trace Clay

FIG No.: 1

Project No.: 21BF014

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		

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

TYPE OF SAMPLE

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

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 603851E 4917184N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 271.65							
0.20 / 271.45	TOPSOIL: Dark brown, silty sand, very moist FILL: Brown, silty sand to sandy silt, trace gravel, very moist to wet		1	SS	7	271	15	
			2	SS	3		20	
1.4 / 270.3	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	22	270	20	
			4	SS	45	269	20	
			5	SS	57		15	
						268		
			6	SS	57	267	25	
						266		
6.5 / 265.2	BOREHOLE TERMINATED AT 6.5 m		7	SS	50		25	Upon completion of augering No water No cave

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

17T 603841E 4917198N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 271.55								
0.0	271.33	TOPSOIL: Brown, silty sand, trace wood pieces, moist		1	SS	11	271		15	
0.70	270.85	FILL: Brown, silty sand to sandy silt, trace gravel, very moist								
1.0		SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		2	SS	25			10	
				3	SS	33	270		20	
2.0				4	SS	43	269		15	
3.0				5	SS	44			20	
							268			
4.0										
							267			
5.0				6	SS	48			30	
							266			
6.0	265.1			7	SS	50			25	
6.5		BOREHOLE TERMINATED AT 6.5 m								Upon completion of augering No water No cave
7.0										
8.0										
9.0										
10.0										
11.0										
12.0										
13.0										
14.0										
15.0										

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

17T 603868E 4917193N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 271.55									
0.18	271.37	TOPSOIL: Dark brown, sandy silt, trace gravel, very moist		1	SS	11	271			35	
		FILL: Brown, silty sand to sandy silt, trace gravel, moist to very moist		2	SS	6				20	
				3	SS	10	270			15	
2.1	269.5	SILTY SAND TILL: Dense to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4[1]	SS	41	269			20	
				5	SS	49				15	
							268				
				6	SS	69	267			20	
							266				
6.5	265.1	BOREHOLE TERMINATED AT 6.5 m		7	SS	54				25	Upon completion of augering No water No cave

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 603857E 4917202N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS (ppm)	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 271.55									
0.0		PAVEMENT: 50 mm of asphalt, over 140 mm granular base, over 210 mm granular subbase, moist		1A 1B	GS	-				20 20	
0.40	271.15	FILL: Brown, silty sand to sandy silt, trace gravel, moist		2	SS	9	271			20	
1.0											
1.4	270.2	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	25	270			10	
2.0				4	SS	39	269			15	
3.0				5	SS	46	268			10	
4.0											
5.0				6	SS	51	267			20	
6.0							266				
6.5	265.1	BOREHOLE TERMINATED AT 6.5 m		7	SS	45				15	Upon completion of augering No water No cave
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%); 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 603850E 4917218N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
		SURFACE ELEVATION 271.55				
0.0	271.55	PAVEMENT: 50 mm of asphalt, over 100 mm granular base, over 200 mm granular subbase, moist		1A 1B	GS	-
0.35	271.20	FILL: Brown, silty sand to sandy silt, trace gravel, moist		2	SS	12
1.0				3	SS	14
2.0				4	SS	15
2.9	268.7	SAND: Very dense, brown, sand, trace silt, trace gravel, moist		5	SS	52
3.0						
4.0	267.6	SILTY SAND TILL: Very dense to dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		6	SS	59
5.0						
6.0				7	SS	44
6.5	265.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 271, 270, 269, 268, 267, 266

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 6

17T 603840E 4917233N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 24, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 271.50				
0.0	271.30	TOPSOIL: Dark brown, silty sand, trace gravel, very moist (0.20)		1	SS	18
0.70	270.80	FILL: Brown, silty sand to sandy silt, trace gravel, very moist				
1.0		SILTY SAND TILL: Compact to dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		2	SS	21
2.0				3	SS	34
3.0				4	SS	43
4.0				5	SS	27
5.0				6	SS	41
6.0						
6.5	265.0	BOREHOLE TERMINATED AT 6.5 m		7	SS	46
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

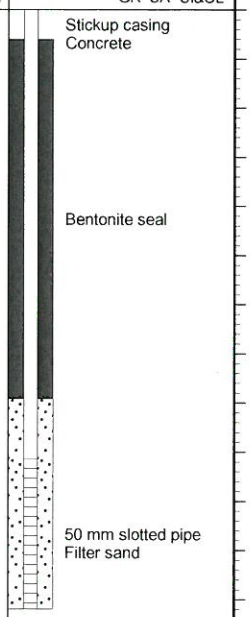
ELEVATION SCALE: 271, 270, 269, 268, 267, 266, 265

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS (ppm): 5, 10, 20, 20, 15, 10

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-01	Dry	----
2021-04-30	Dry	----

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 7

17T 603854E 4917237N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 23, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 271.60				
0.15 / 271.45	TOPSOIL: Dark brown, silty sand, trace gravel, moist		1	SS	5
	FILL: Brown, silty sand to sandy silt, trace gravel, moist		2	SS	7
1.4 / 270.2	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	25
			4	SS	37
			5	SS	63/250 mm
			6	SS	63
6.5 / 265.1	BOREHOLE TERMINATED AT 6.5 m		7	SS	46

ELEVATION SCALE: 271, 270, 269, 268, 267, 266

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 8

17T 603837E 4917251N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 24, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 271.50					
0.20 / 271.30	TOPSOIL: Dark brown, silty sand, trace gravel, moist		1	SS	7	271
0.70 / 270.80	FILL: Brown, sandy silt, trace gravel, very moist					
	SILTY SAND TILL: Dense to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		2	SS	35	
			3	SS	48	270
			4	SS	35	269
			5	SS	39	268
			6	SS	49	267
						266
6.5 / 265.0	BOREHOLE TERMINATED AT 6.5 m		7	SS	50	265

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 9

17T 603911E 4917221N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 22, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES
		SURFACE ELEVATION 270.20				
0.0	270.2	PAVEMENT: 80 mm of asphalt, over 150 mm granular base, over 300 mm granular subbase, moist		1A / 1B	GS	-
0.53	269.67	FILL: Brown, silty sand, trace gravel, moist		2	SS	6
1.0				3[1]	SS	10
2.1	268.1	SILTY SAND: Compact, brown, silty sand, trace gravel, moist		4	SS	25
2.9	267.3	SILTY SAND TILL: Compact to very dense, brown to grey, silty sand, trace gravel, trace clay, cobbles & boulders, moist to wet		5	SS	48
3.0				6	SS	50/140 mm
4.0				7	SS	89/250 mm
5.0						
6.0				8	SS	37
7.0						
8.0				9	SS	45
9.0						
10.0				10	SS	29
11.0				11	SS	55
12.0						
12.8	257.4	BOREHOLE TERMINATED AT 12.8 m		12	SS	56
13.0						
14.0						
15.0						

ELEVATION SCALE: 270, 269, 268, 267, 266, 265, 264, 263, 262, 261, 260, 259, 258

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200

DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS (ppm): 20, 5, 15, 5, 10, 15, 20, 10, 25, 20, 20, 15, 15

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Flushmount casing
Concrete
Bentonite seal
50 mm slotted pipe
Filter sand
First water strike at 11.9 m

Upon completion of augering
Water at 11.9 m
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-30	8.7	261.5

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 10

17T 603855E 4917267N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 24, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 271.50					
0.30 / 271.20	PAVEMENT: 40 mm of asphalt, over 120 mm granular base, over 140 mm granular subbase, moist		1A / 1B	GS	-	
	FILL: Brown, sandy silt, trace gravel, moist		2	SS	5	
1.9 / 269.6	SILTY SAND TILL: Dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	17	
			4	SS	41	
			5	SS	43	
			6	SS	49	
6.5 / 265.0	BOREHOLE TERMINATED AT 6.5 m		7	SS	33	

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

17T 603873E 4917268N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 24, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 271.15					271
0.40 / 270.75	PAVEMENT: 100 mm of asphalt, over 120 mm granular base, over 180 mm granualr subbase, moist		1A / 1B	GS	-	
1.4	FILL: Brown, sandy silt to silty sand, trace gravel, moist		2	SS	8	270
269.8	SILTY SAND TILL: Dense to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	41	269
			4	SS	50	
			5	SS	74	268
			6	SS	47	267
6.5			7	SS	46	266
264.7	BOREHOLE TERMINATED AT 6.5 m					265

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 13

17T 603866E 4917281N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 24, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 271.30				
0.25	271.05	PAVEMENT: 40 mm of asphalt, over 100 mm granualar base, over 110 mm granular subbase, moist		1A	GS	-
				1B		
1.4		FILL: Brown, sandy silt, trace gravel, moist		2	SS	8
	269.9	SILTY SAND TILL: Very dense to dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	67
				4	SS	94/250mm
				5	SS	79
				6	SS	49
6.5				7	SS	38
	264.8	BOREHOLE TERMINATED AT 6.5 m				

ELEVATION SCALE: 271, 270, 269, 268, 267, 266, 265

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 14

17T 603896E 4917265N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 26, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN DP

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) / DYNAMIC CONE PENETRATION / STANDARD PENETRATION TEST	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 270.50									
0.46 / 270.04	PAVEMENT: 110 mm of asphalt, over 200 mm granular base, over 150 mm granular subbase, moist		1A / 1B	GS	-	270				
1.4 / 269.1	FILL: Brown, sandy silt, trace gravel, moist		2	SS	6					
	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	10	269				
			4	SS	41	268				
			5	SS	88	267				
4.3 / 266.2	BOREHOLE TERMINATED AT 4.3 m		6	SS	69/250 mm					Upon completion of augering No water No cave

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 15

17T 603879E 4917288N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 24, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 270.90					
0.27 / 270.63	PAVEMENT: 30 mm of asphalt, over 100 mm granular base, over 140 mm granular subbase, moist		1A	GS	-	
	FILL: Brown, sandy silt, trace gravel, moist		1B			
			2	SS	6	270
			3	SS	10	269
2.1 / 268.8	SILTY SAND TILL: Very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	52	
			5	SS	53	268
			6	SS	66	267
			7	SS	36	266
6.5 / 264.4	BOREHOLE TERMINATED AT 6.5 m					265

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 16

17T 603870E 4917309N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Solid Stem Augers
BORING DATE March 25, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 271.25					
0.22 / 271.03	TOPSOIL: Dark brown to black, silty sand, moist		1	SS	4	271
	FILL: Brown, silty sand, trace gravel, moist		2	SS	5	
			3	SS	9	270
2.1 / 269.2	SILTY SAND TILL: Dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	45	269
			5	SS	44	268
			6	SS	37	267
			7	SS	40	266
6.5 / 264.8	BOREHOLE TERMINATED AT 6.5 m					265

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 17

17T 603923E 4917222N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 22, 2021
ENGINEER GW
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES	GAS READINGS (ppm)
		SURFACE ELEVATION 269.80				
0.0	269.80	PAVEMENT: 100 mm of asphalt, over 150 mm granular base, over 210 mm granular subbase, moist	1A 1B	GS	-	5 5
0.46	269.34	FILL: Brown, sand, trace silt, trace gravel, moist	2[1]	SS	11	10
1.0			3	SS	3	10
2.0	267.7	SILTY SAND TILL: Compact to dense, brown to grey, silty sand, trace gravel, trace clay, cobbles & boulders, moist to wet	4	SS	15	15
2.1			5	SS	32	20
3.0			6	SS	42	20
4.0			7	SS	33	20
5.0			8	SS	43	25
6.0			9	SS	35	20
7.0			10	SS	19	15
8.0			11	SS	21	15
9.0			12	SS	30	
10.0			13	SS	47	15
11.0						
12.0	257.0	BOREHOLE TERMINATED AT 12.8 m				
12.8						
13.0						
14.0						
15.0						

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
Water at 11.6 m
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-01	8.3	261.5
2021-04-30	8.1	261.7

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 18

17T 603916E 4917245N

PROJECT Proposed Simcoe County Housing Facility
LOCATION 20 Rose Street, Barrie, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE March 23, 2021
PML REF. 21BF014
ENGINEER GW
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	270.20	SURFACE ELEVATION 270.20			
0.0	270.20	PAVEMENT: 100 mm of asphalt, over 120 mm granular base, over 200 mm granular subbase, moist	1A, 1B	GS	-
0.42	269.78	FILL: Brown, silty sand, trace gravel, moist	2[1]	SS	8
1.0			3[1]	SS	12
2.1	268.1	SILTY SAND TILL: Dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist to very moist	4	SS	36
3.0			5	SS	34
4.0			6	SS	42
5.0			7	SS	45
6.0			8	SS	44
7.0					
8.0			9	SS	36
9.0					
10.0			10	SS	24
11.0			11	SS	37
12.0					
12.8	257.4	BOREHOLE TERMINATED AT 12.8 m	12	SS	48
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm: 10, 10, 15, 10, 20, 15, 20, 20, 20, 20, 15, 20, 15, 10

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Flushmount casing
Concrete
Bentonite seal
First water strike at 11.0 m
50 mm slotted pipe
Filter sand

Upon completion of augering
Water at 11.6 m
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-01	8.4	261.8
2021-04-30	8.4	261.8

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 20

17T 603887E 4917304N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 270.60				
0.23 / 270.37	TOPSOIL: Dark brown, silty sand, trace gravel, moist		1	SS	6
0.70 / 269.90	FILL: Brown, silty sand to sandy silt, trace gravel, moist				
	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		2	SS	25
			3	SS	42
			4	SS	55
			5	SS	58
			6	SS	61
6.5 / 264.1	BOREHOLE TERMINATED AT 6.5 m		7	SS	44

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
ELEVATION SCALE: 270 269 268 267 266 265
PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40
GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 21

17T 603927E 4917267N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q / DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	SURFACE ELEVATION 269.80						50 100 150 200 / 20 40 60 80	10 20 30 40		
0.45 / 269.35	PAVEMENT: 100 mm of asphalt, over 120 mm granular base, over 230 mm granular subbase, moist		1A 1B	GS	-					
	FILL: Brown, silty sand, trace gravel, moist		2	SS	20	269				
			3	SS	20	268				
2.1 / 267.7	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	22	267				
			5	SS	55					
4.3 / 265.5	BOREHOLE TERMINATED AT 4.3 m		6	SS	57	266				Upon completion of augering No water No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 24

17T 603923E 4917295N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 22, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 269.05					
0.18	268.87	TOPSOIL: Dark brown, sandy silt, trace gravel, moist		1	SS	5	
		FILL: Brown, sandy silt, trace gravel, very moist		2'	SS	4	268
1.4	267.7	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	20	267
				4	SS	50	
				5	SS	62	266
				6	SS	41	265
							264
6.5	262.6	BOREHOLE TERMINATED AT 6.5 m		7	SS	26	263

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 25

17T 603904E 4917323N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 26, 2021
ENGINEER GW
BORING METHOD Continuous Flight Hollow Stem Augers
TECHNICIAN DP

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE	SHEAR STRENGTH (kPa) + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q / DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	GAS READINGS ppm	GROUND WATER OBSERVATIONS AND REMARKS / GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
		SURFACE ELEVATION 270.15						50 100 150 200 / 20 40 60 80	10 20 30 40		
0.0		PAVEMENT: 130 mm of asphalt, over 150 mm granular base, over 200 mm granular subbase, moist		1A 1B	GS	-	270				
0.48	269.67	FILL: Brown, sandy silt, trace gravel, moist		2	SS	6	269				
1.0				3	SS	8					
2.0	2.1						268				
	268.1	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	29					
3.0				5	SS	57	267				
4.0							266				
				6	SS	70					
5.0							265				
6.0	6.5			7	SS	44	264				
	263.7	BOREHOLE TERMINATED AT 6.5 m									Upon completion of augering No water No cave
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 26

17T 603895E 4917335N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 270.25				
0.20 / 270.05	TOPSOIL: Brown, silty sand, trace gravel, moist		1	SS	2
	FILL: Brown, silty sand to sandy silt, trace gravel, moist to very moist		2	SS	3
			3	SS	5
2.1 / 268.2	SILTY SAND TILL: Dense to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	42
			5	SS	81
			6	SS	66
6.5 / 263.8	BOREHOLE TERMINATED AT 6.5 m		7	SS	55

ELEVATION SCALE: 270, 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS (ppm)

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete
Bentonite seal
50 mm slotted pipe
Filter sand

Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-01	Dry	----
2021-04-30	Dry	----

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 27

17T 603965E 4917268N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 266.55					
0.0	266.55						266
0.20	266.35	TOPSOIL: Brown, silty sand/sandy silt, trace gravel, moist		1	SS	5	
1.0		FILL: Brown, silty sand, trace gravel, moist		2'	SS	8	
1.4	265.2	SILTY SAND TILL: Compact to dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	26	265
2.0				4	SS	25	264
3.0				5	SS	31	263
4.0				6	SS	20	262
5.0				7	SS	60/250 mm	
5.0	261.6	BOREHOLE TERMINATED AT 5.0 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stick-up casing
Concrete
Bentonite seal
50 mm slotted pipe
Filter sand

Upon completion of augering
No water
No cave
Water Level Readings:

Date	Depth(m)	Elev.
2021-04-01	2.7	263.9
2021-04-30	3.2	263.4

NOTES 1. Sample submitted for chemical testing

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 28

17T 603947E 4917292N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 267.45					
0.0	267.45						267
0.25	267.20	TOPSOIL: Brown to dark brown, sandy silt, trace gravel, moist		1	SS	3	
		FILL: Brown, sand, trace silt, trace gravel, moist		2	SS	10	
1.4	266.1	SILTY SAND TILL: Compact to very dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	37	266
2.0				4	SS	45	265
3.0				5	SS	50	264
4.0							263
5.0				6	SS	36	262
6.0							
6.5	261.0	BOREHOLE TERMINATED AT 6.5 m		7	SS	27	261
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 29

17T 603937E 4917306N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 25, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN AT

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 268.15					
0.0	268.15						268
0.24	267.91	TOPSOIL: Brown to black, sandy silt to silty sand, trace gravel, moist		1	SS	4	
		FILL: Brown, silty sand, trace gravel, moist		2	SS	20	267
1.0							
				3	SS	26	
2.0	2.1						
	266.1	SILTY SAND TILL: Very dense to dense, brown, silty sand, trace gravel, trace clay, cobbles & boulders, moist		4	SS	52	266
3.0				5	SS	44	265
4.0							264
				6	SS	53	
5.0							263
6.0							262
	6.5			7	SS	37	
	261.7	BOREHOLE TERMINATED AT 6.5 m					
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER O Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

GAS READINGS ppm

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 30

17T 603918E 4917331N

PROJECT Proposed Simcoe County Housing Facility
PML REF. 21BF014
LOCATION 20 Rose Street, Barrie, Ontario
BORING DATE March 26, 2021
ENGINEER GW
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN DP

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 269.90				
0.0	269.90	PAVEMENT: 90 mm of asphalt, over 180 mm granular base, over 150 mm granular subbase, moist		1A 1B	GS	-
0.42	269.48	FILL: Brown, silty sand, trace gravel, moist		2	SS	14
1.0						
1.4	268.5	SILTY SAND TILL: Loose to very dense, brown to grey, silty sand, trace gravel, trace clay, cobbles & boulders, moist		3	SS	7
2.0				4	SS	13
3.0				5	SS	59
4.0						
5.0				6	SS	36
6.0						
6.5	263.4	BOREHOLE TERMINATED AT 6.5 m		7	SS	65/200 mm
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 269, 268, 267, 266, 265, 264

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

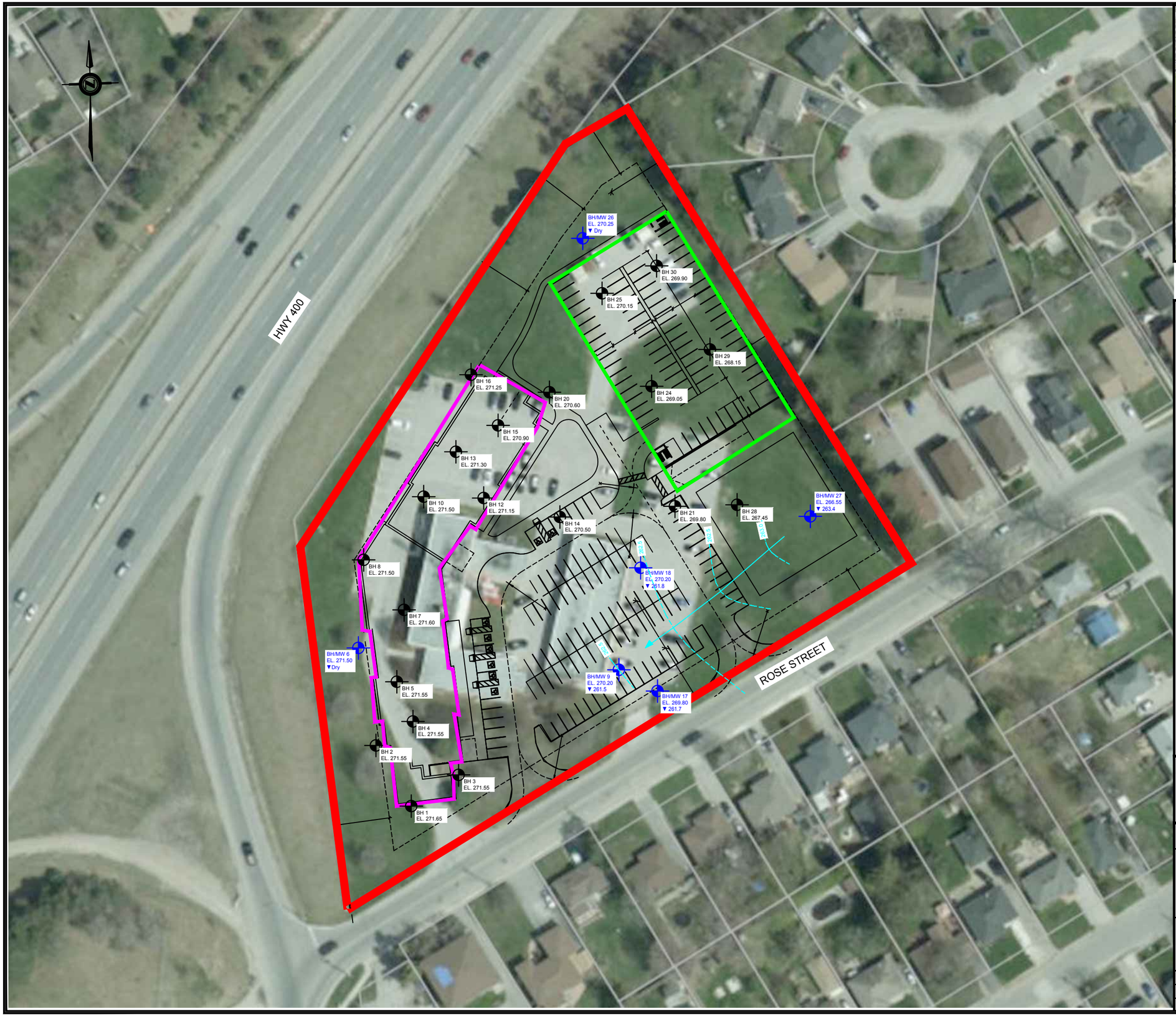
GAS READINGS ppm

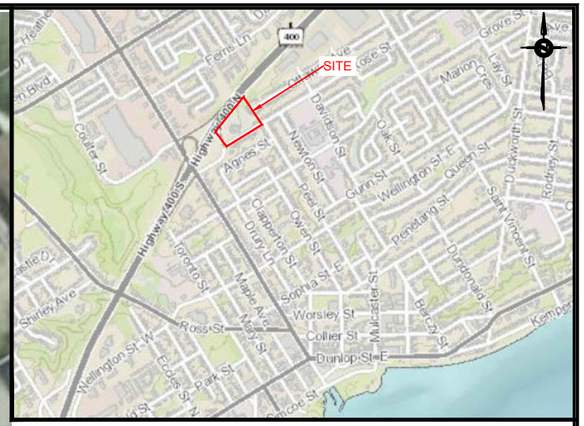
GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
No water
No cave

NOTES





KEY PLAN
BARRIE, ONTARIO

LEGEND:

- SITE LIMITS
- PROPOSED MAIN BUILDING
- PROPOSED PARKING STRUCTURE
- PROPOSED PAVED PARKING AND ACCESS AREA
- BH 1 EL.271.65 — BOREHOLE LOCATION SURFACE ELEVATION
- BH/MW 6 EL. 271.50 ▼DRY — BOREHOLE/MONITORING WELL LOCATION SURFACE ELEVATION GROUND WATER ELEVATION (APRIL 30, 2021)
- INTERPRETTED GROUND WATER CONTOURS
- INFERRED GROUND WATER FLOW DIRECTION

REFERENCE:
BASE PLAN PRODUCED USING GOOGLE EARTH AUG.2020

0m 15 30 45 60 75
SCALE

BOREHOLE/MONITORING WELL LOCATION PLAN

PROPOSED SIMCOE COUNTY HOUSING FACILITY
20 ROSE STREET
BARRIE, ONTARIO

Peto MacCallum Ltd.
CONSULTING ENGINEERS

		DATE	SCALE	PML REF.	DRAWING NO.
DRAWN	AK	MAY. 2021	AS SHOWN	21BF014	1
CHECKED	AK				
APPROVED	GRW				

APPENDIX A

Statement of Limitations

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

STATEMENT OF LIMITATIONS
(continued)

The findings and comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence an action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

APPENDIX B

Engineered Fill

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.