# Revised Report on
Preliminary Geotechnical Investigation
Proposed Building – Area 'E'
4274 Dundas Street
Burlington, Ontario

## Prepared For:
Millcroft Greens Corporation

**Project No. 19-199-102 R3**
**December 14, 2020**

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**APPENDIX A** : CONCEPT SITE PLAN

# 1. INTRODUCTION

DS Consultants Ltd. (DS) was retained by Millcroft Greens Corporation to undertake a preliminary geotechnical investigation for the proposed development at Area 'E' of Millcroft Golf Club located at 4274 Dundas Street in Burlington, Ontario.

It is understood that the proposed development will consist of a 6-storey building with 1 level of basement. The finished floor elevation at the ground floor will be at Elevation 155.10m.

The purpose of this geotechnical investigation was to determine the subsurface conditions at three (3) borehole locations and from the findings at the boreholes make geotechnical recommendations for the following:

1) Foundations
2) Floor slabs and permanent drainage
3) Excavations and groundwater control
4) Earth pressures
5) Earthquake considerations
6) Temporary Shoring

This report is provided on the basis of the terms of reference presented above and, on the assumption, that the design will be in accordance with applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations can cater to the changed design.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Millcroft Greens Corporation, its architect and designers. Use of this report by third party without DS consent is prohibited.

# 2. FIELD AND LABORATORY WORK

Three (3) borehole (BH19-1 to BH19-3, see **Drawing 1** for borehole locations) were drilled at the subject site to depths ranging from 6.1 to 8m below the existing ground surface. Boreholes were drilled using solid stem continuous flight augers equipment by a drilling sub-contractor under the direction and

supervision of DS personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. The samples were logged in the field and returned to the DS laboratory for detailed examination by the project engineer and for laboratory testing.

As well as visual examination in the laboratory, all soil samples from the boreholes were tested for moisture contents. Grain size analyses of 3 selected soil samples were conducted and the results are presented on the individual logs and on **Drawing 6**. Atterberg Limits tests of one (1) sample were conducted and the results are shown on the respective borehole log.

Water level observations were made during and upon completion of drilling. Monitoring wells of 50mm diameter were installed in all boreholes for the long-term groundwater levels measurements.

The surface elevations at the borehole locations were surveyed by DS, using differential GPS system.

# 3. SITE AND SUBSURFACE CONDITIONS

The borehole location plan is shown on **Drawing 1**. General notes on sample description are provided on **Drawing 1A**. The subsurface conditions at borehole locations are presented in the individual borehole logs presented on **Drawings 2 to 4**. A generalized sub-surface profile is presented on **Drawing 5**.

## 3.1 Soil Conditions

**Topsoil/Fill Materials:**

A surficial topsoil layer, ranging in thickness from 100 to 125mm was encountered at BH19-1 and BH19-2. Fill materials were found in all boreholes, extending to depths ranging from 0.8 to 1.8m. The fill materials consisted of clayey silt to silty clay and sand & gravel with inclusions of trace to some topsoil. The SPT 'N' values measured in the fill generally ranged from 7 to 17 blows per 300 mm penetration, indicating its firm to very stiff consistency.

**Clayey Silt to Silty Clay Till:**

The native soils below the fill material consisted of clayey silt to silty clay till deposits, extending to depths of 2.3 to 4.6m below the existing grade, overlying sandy silt till deposits. The SPT 'N' values measured in the cohesive tills ranged from 17 to 32 blows per 300 mm penetration, indicating its very stiff to hard consistency.

Grain size analysis of one (1) silty clay till sample (BH19-3/SS3) was conducted and the results are presented on **Drawing 6**, with the following fractions:

Clay: 22 %
Silt: 52%
Sand: 22%
Gravel: 4%

Atterberg Limits test of the same silty clay till sample (BH19-3/SS3) was conducted and the results are shown on the borehole log, with following values:

Liquid Limit: 27%
Plastic Limit: 15%
Plasticity Index: 12%

**Sandy Silt Till:**

Sandy silt till deposits were encountered below the upper clayey silt to silty clay till, extending to the maximum explored depths of BH19-1 and BH19-3 and overlying silty clay deposit in BH19-2. The SPT 'N' values measured in the sandy tills ranged from 60 to over 100 blows per 300 mm penetration, indicating its very dense state. Occasional cobble/boulders were inferred in the boreholes during drilling.

Grain size analysis of 2 sandy silt till samples (BH19-1/SS6 and BH19-2/SS4) were conducted and the results are presented on **Drawing 6**, with the following fractions:

Clay: 4 to 5 %
Silt: 58 to 68%%
Sand: 22 to 35%
Gravel: 2 to 6%

**Silty Clay:**

A silty clay deposit was found in BH19-2 below the sandy silt till deposit, below a depth of 7.6m and extending to 8m. Silty clay contained trace shale fragments and was present in a hard state, with measured SPT 'N' of over 100 blows per 300 mm penetration

## 3.2 Groundwater Conditions

During drilling, groundwater was observed in the boreholes below depths ranging from 2.3 to 4.6m below the existing grade. Stabilized groundwater table measured in the monitoring wells was recorded at depths ranging from 0.6 to 2.6m, corresponding to Elevations 150.4 to 154.1 m, as summarized in **Table 1**.

**Table 1: Summary of Groundwater Level Measurements in Monitoring Wells**

| Borehole No. | Ground Surface Elev. (m) | Date of Observation | Depth of Groundwater (m) | Elevation of Groundwater (m) |
|---|---|---|---|---|
| BH19-1 | 152.9 | Dec. 4/2019 | 2.6 | 150.4 |
| BH19-2 | 153.7 | Dec. 4/2019 | 0.6 | 153.1 |
| BH19-3 | 154.7 | Dec. 4/2019 | 0.7 | 154.1 |

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events.

# 4. FOUNDATIONS

It is understood that the proposed development will consist of a 6-storey building with 1 level of basement. The finished floor elevation at the ground floor will be at Elevation 155.10m. Finished P1 basement floor is expected to at about Elevation 152m. Footings will be 1 to 2m below the P1 floor.

Based on the information from boreholes, the proposed building can be supported by footings founded on undisturbed native soils for bearing capacity values of 300 to 600 kPa at SLS (Serviceability Limit States), and for a factored geotechnical resistances of 450 to 900 kPa at ULS (Ultimate Limit States). The bearing values and corresponding founding levels of footings are provided on **Table 2**.

**Table 2: Bearing Values and Founding Levels of Footings**

| BH No. | Founding Soil | Bearing Capacity at SLS (kPa) | Factored Geotechnical Resistance at ULS (kPa) | Minimum Depth below Existing Ground (m) | Founding Level At or Below Elevation (m) |
|---|---|---|---|---|---|
| BH19-1 | Sandy Silt Till | 600 | 900 | 2.3 | 150.6 |
| BH19-2 | Sandy Silt Till | 600 | 900 | 2.3 | 151.4 |
| BH19-3 | Clayey Silt Till/ Sandy Silt Till | 300<br>400<br>600 | 450<br>600<br>900 | 1.2<br>3.0<br>4.6 | 153.5<br>151.7<br>150.1 |

Foundations designed to the specified bearing capacity values at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 19 mm differential.

All foundations exposed to seasonal freezing conditions must have at least 1.2 metres of soil cover for frost protection.

Where it is necessary to place foundations at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing.

All footing bases must be inspected by this office prior to pouring concrete. The excavated footing bases must be covered with 50 mm thick mud slab immediately after inspection and cleaning, in order to avoid disturbance of the founding soil due to weathering and construction activity.

It should be noted that the recommended bearing capacities have been calculated by DS Consultants Ltd. (DS) from the borehole information for the preliminary design stage only.

# 5. FLOOR SLAB AND PERMANENT DRAINAGE

The basement floor can be supported on the native grade provided all fill and surficially loose/disturbed soils are removed and the base thoroughly proof rolled. Any backfill required to raise the grade can

consist of inorganic soil, placed in shallow lifts and compacted to 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

A moisture barrier consisting of at least 200mm of 19mm clear crushed stone should be installed under the floor slab.

A perimeter drainage system will be required around the exterior basement walls. The perimeter and underfloor drainages for open-cut and shored excavation are shown on **Drawings 7 to 9**.

## 6. EARTH PRESSURES

The lateral earth pressures acting on basement walls may be calculated from the following expression:

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

where p = Lateral earth pressure in kPa acting at depth h

K = Earth pressure coefficient equal to 0.40 for vertical walls and horizontal backfill used for permanent construction. Water pressure must be considered, if continuous wall drains are not used.

$\gamma$ = Unit weight of backfill, a value of 21 kN/m$^3$ may be assumed

h = Depth to point of interest in metres

q = Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the build-up of any hydrostatic pressure behind the wall.

## 7. EXCAVATION AND GROUNDWATER CONTROL

Excavations can be carried out with heavy hydraulic backhoe. Groundwater table in the monitoring wells was measured at depths ranging from 0.6 to 2.6m below the existing grade. Dewatering will be required prior to any excavation in sandy silt till deposits below the groundwater table. However, due to the low permeability of glacial till deposits, it is expected that seepage from till deposits can be removed by pumping from sumps for maximum excavation to 3 to 4m below the existing grade.

It is understood that RJ Burnside is carrying out a hydrogeology study at the site. RJ Burnside's hydrogeological report will provide detailed information regarding the type and extent of groundwater control required at this site.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill can be classified as Type 3 Soil above groundwater table and as Type 4 Soil below groundwater or in perched water. The very stiff to hard clayey silt till and silty clay can be classified as Type 2 Soil above the groundwater table and Type 3 Soil below groundwater table. Very dense sandy silt till can be classified as Type 2 Soil above the groundwater table and Type 3 to 4 Soil below the groundwater table.

The select inorganic fill and native soils free from topsoil and organics can be used as general construction backfill where it can be compacted with sheep's foot type compactors. Loose lifts of soil, which are to be compacted, should not exceed 200 mm.

Imported Granular 'B' fill is recommended in areas where free draining material is required, i.e. backfill behind foundation walls and in footing trenches. Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should therefore be compacted at the surface or be covered with tarpaulins to help minimize moisture uptake.

## 8. TEMPORARY SHORING

It is understood that the proposed excavations may be supported by a temporary shoring system consisting of timber lagging and soldier piles. A tightly braced caisson wall may be required to support adjacent structures. The requirement for caisson wall to support adjacent structure is given on **Drawing 10**.

The shoring system must be designed in accordance with the Fourth Edition of the Canadian Foundation Engineering Manual. The soil parameters estimated to be applicable for this design are as follows:

1) Earth Pressure Coefficients

   (a) where movement must be minimal K=0.45

   (b) where minor movement (0.2% shoring height H) can be tolerated K=0.28

   (c) passive earth pressure for soldier piles (unfactored) Kp=3.5 in very stiff to hard And compact to dense soils.

2) For stability check

   $\phi$= 31°
   c= 0
   $\gamma$ = 21 kN/m$^3$
   Surcharge is to be determined by shoring contractor.

3) For earth anchors

An allowable bond value of 50 kPa is suggested for anchors in very stiff to hard and compact to dense soils. However, this suggested bond value is arbitrary since the contractor's installation methods and grouting procedures will determine the actual soil to concrete bond value. Hence, the contractor must decide on a capacity and confirm its availability by field load testing. Gravity poured concrete can result in low bond values while pressure grouted anchors will give higher values and produce a more satisfactory anchor.

An allowable bearing value of 500 kPa can be used for soldier pile caissons in the very stiff to hard or dense soils, provided concrete is poured in clean dry caisson holes. If a slurry procedure and tremie concrete is used, an allowable bearing capacity of 250 kPa can be adopted.

Casing will be required during the construction of the tiebacks to prevent caving of soils. The soldier piles should be installed in pre-augered holes taken below the deepest excavation. The holes should be filled with concrete below the excavation level and half bag mix above the base of the excavation. The concrete strength must be specified by the shoring designer. Temporary liners may be required to help prevent the sand from caving during the installation period. Positive measures may be required to prevent the loss of soil through the spaces between the lagging boards. This could probably be achieved by placing well-graded sand and gravel behind the lagging boards or by installing a geotextile filter cloth.

Soil anchors or rakers will be required to support the shoring.

Soil anchors, if used, must be of a length that meets the Canadian Foundation Manual recommendations. It is important to note that the minimum length lies beyond the $(45 - \phi/2 + 0.15H)$ line drawn from the base of the soldier pile and the overall stability of the system must be checked at each anchor level, where $\phi$ is the soil friction angle and H is the shoring height.

The top anchor must not be placed lower than 3.0 metres below the top of level ground surface. Anchors will require casing when penetrating through wet sand and silt layers. The bond value of 50 kPa is suggested but this value is arbitrary since the contractors installation procedures will determine the actual soil to concrete bond value. Hence, the contractor must decide on a capacity and confirm its availability. All anchors must be tested as indicated in the Foundation Manual, 4th edition.

Adhesion on the buried caisson shaft or behind the shoring system must be neglected when designing this shoring system.

If rakers are used to support the shoring system, it is understood that the raker pads will be founded at or below Elevation 150.3m in very dense sandy silt till. For the purpose of raker pad design, bearing capacity values of 235kPa at SLS and 350kPa at ULS can be used for the inclined end bearing.

Movement of the shoring system is inevitable. Vertical movements will result from the vertical load on the soldier piles resulting from the inclined tiebacks and inward horizontal movement results from earth and water pressures. The magnitude of this movement can be controlled by sound construction practices, and it is anticipated that the horizontal movement will be in the range of 0.1 to 0.25% of the

shoring height (H). Vertical movements increase the horizontal movements because of the reduced stress in the inclined anchors and must be kept well below this value.

To ensure that movements of the shoring are within an acceptable range, monitoring must be carried out. Vertical and horizontal targets on the soldier piles must be located and surveyed before excavation begins. Weekly readings during excavation should show that the movements will be within those predicted; if not, the monitoring results will enable directions to be given to improve the shoring.

## 9. EARTHQUAKE CONSIDERATIONS

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2012, the subject site for the proposed building with 1 level of basement can be classified as “Class C” for seismic site response.

## 10. PRE-CONDITION SURVEY AND VIBRATION MONITORING

Due to the presence of existing structures in the area, pre-construction survey prior to the start of construction and vibration monitoring during the construction should be completed.

## 11. GENERAL COMMENTS AND LIMITATIONS OF REPORT

DS Consultants Ltd. (DS) should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, DS will assume no responsibility for interpretation of the recommendations in the report.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to DS at the time of preparation. Unless otherwise agreed in writing by DS, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. DS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

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

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# Drawings



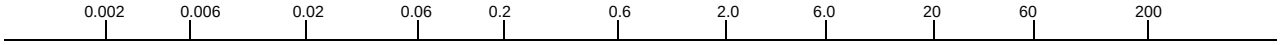

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|---|---|---|---|---|---|
| **DS CONSULTANTS LTD.**<br>6221 Highway 7, UNIT 16<br>Vaughan, Ontario L4H 0K8<br>Telephone: (905) 264-9393<br>www.dsconsultants.ca | Project: Geotechnical Investigation | | | | N |
| | Title: **Millcroft Golf Course, Burlington, ON** | | | | |
| Client: MILCROFT GREENS CORP. | Size: 8.5 x 11 | Approved By: | Drawn By: MM | Date: Dec 09, 2019 | |
| | Rev: 0 | Scale: As Shown | Project No.: 19-199-102 | Figure No.: **1** | |
| | | Image/Map Source: *Google Satellite Image* | | | |

# Drawing 1A: Notes On Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by DSCL also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

| CLAY | SILT | | | SAND | | | GRAVEL | | | COBBLES | BOULDERS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | FINE | MEDIUM | COARSE | | |




EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

| CLAY (PLASTIC) TO | FINE | MEDIUM | CRS. | FINE | COARSE |
|---|---|---|---|---|---|
| SILT (NONPLASTIC) | SAND | | | GRAVEL | |

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

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# LOG OF BOREHOLE BH19-01



PROJECT: Preliminary Geotechnical Investigation
CLIENT: Millcroft Greens Corporation
PROJECT LOCATION: 4274 Dundas Street, Burlington, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4805736.2 E 595924.1

**DRILLING DATA**
Method: Solid Stem Auger
Diameter: 150mm
Date: Nov/29/2019

REF. NO.: 19-199-102
ENCL NO.: 2

| (m) ELEV / DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | BLOWS 0.3 m "N" | GROUND WATER CONDITIONS | ELEVATION |
|---|---|---|---|---|---|---|---|
| 152.9 | | | | | | | |
| 152.8 | **TOPSOIL:** 125mm | | | | | | |
| 0.1 | **FILL:** sand and gravel, some asphalt, black, moist, compact | | 1 | SS | 15 | | |
| 152.1 | | | | | | | |
| 0.8 | **FILL:** silty clay, trace gravel, trace to some topsoil, greyish brown to reddish brown, moist, stiff to very stiff | | 2 | SS | 10 | | 152 |
| 151.1 | | | 3 | SS | 17 | | 151 |
| 1.8 | **CLAYEY SILT TILL:** sandy, trace gravel, occasional cobble, greyish brown, moist, very stiff | | | | | Bentonite | |
| 150.6 | | | | | | | |
| 2.3 | **SANDY SILT TILL:** trace clay, trace gravel, occasional cobble/boulder, brown, moist, very dense | | 4 | SS | 60 | W. L. 150.3 m Dec 04, 2019 | |
| | | | 5 | SS | 50/ 100mm | | 149 |
| | | | 6 | SS | 50/ 75mm | Filter Pack Slotted Pipe | 148 |
| | reddish brown below 6.1m | | 7 | SS | 50/ 75mm | | 147 |
| | | | | | | | 146 |
| 145.2 | Auger refusal at 7.7m on a possible boulder | | 8 | SS | 50/ 25mm | | |
| 7.7 | **END OF BOREHOLE:** | | | | | | |

Notes:
1) 50mm dia. monitoring well installed upon completion.
2) Water level Reading:

| Date: | Water Level (mbgl): |
|---|---|
| Dec 04, 2019 | 2.6 |

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

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

POCKET PEN. (Cu) (kPa): 225

NATURAL UNIT WT (kN/m³)

METHANE AND GRAIN SIZE DISTRIBUTION (%)

| GR | SA | SI | CL |
|---|---|---|---|
| 2 | 35 | 58 | 5 |

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 19-199-102_A (AREA 3)_MILLCROFT GREEN CORPORATION.GPJ DS.GDT 11/13/20

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Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

# LOG OF BOREHOLE BH19-02



PROJECT: Preliminary Geotechnical Investigation
CLIENT: Millcroft Greens Corporation
PROJECT LOCATION: 4274 Dundas Street, Burlington, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4805761 E 595873.5

**DRILLING DATA**
Method: Solid Stem Auger
Diameter: 150mm
Date: Nov/28/2019

REF. NO.: 19-199-102
ENCL NO.: 3

| (m) ELEV / DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | BLOWS "N" 0.3 m | GROUND WATER CONDITIONS | ELEVATION | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100) | PLASTIC LIMIT $w_P$ / NATURAL MOISTURE CONTENT $w$ / LIQUID LIMIT $w_L$ — WATER CONTENT (%) (10 20 30) | POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (kN/m³) | METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 153.7 | | | | | | | | | | | | |
| 153.6 | **TOPSOIL:** 100mm | | | | | | | | | | | |
| 0.1 | **FILL:** clayey silt, trace gravel, trace to some topsoil, greyish brown, moist, firm | | 1 | SS | 7 | | | | | | | |
| | | | | | | | W. L. 153.1 m Dec 04, 2019 | | | | | |
| 1 | trace organics below 1.0m | | 2 | SS | 7 | | | | | | | |
| 152.2 | | | | | | | | | | | | |
| 1.5 | **CLAYEY SILT TILL:** sandy, trace gravel, greyish brown, moist, very stiff | | 3 | SS | 17 | | 152 | | | 200 | | |
| 2 | | | | | | | Bentonite | | | | | |
| 151.4 | | | | | | | | | | | | |
| 2.3 | **SANDY SILT TILL:** trace clay, trace gravel, occasional cobble/boulder, brown, wet, very dense | | 4 | SS | 71 | | 151 | | | 225 | | 6 22 68 4 |
| 3 | | | 5 | SS | 50/ 100mm | | | | | 225 | | |
| | | | | | | | 150 | | | | | |
| 4 | | | | | | | | | | | | |
| | | | 6 | SS | 50/ 50mm | | 149 | | | | | |
| 5 | | | | | | | | | | | | |
| | | | | | | | 148 | | | | | |
| 6 | | | 7 | SS | 50/ 100mm | | Slotted Pipe Filter Pack | | | | | |
| | | | | | | | 147 | | | | | |
| 7 | | | | | | | | | | | | |
| 146.1 | | | | | | | | | | | | |
| 7.6 | **SILTY CLAY:** trace shale fragments, reddish brown, moist, hard | | 7 | SS | 50/ 125mm | | 146 | | | | | |
| 145.7 | | | | | | | | | | | | |
| 8.0 | **END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Water Level (mbgl): Dec 04, 2019 0.6 | | | | | | | | | | | |

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 19-199-102_A (AREA 3)_MILLCROFT GREEN CORPORATION.GPJ DS.GDT 11/13/20

DS CONSULTANTS LTD.
Geotechnical ◆ Environmental ◆ Materials ◆ Hydrogeology

# LOG OF BOREHOLE BH19-03



PROJECT: Preliminary Geotechnical Investigation
CLIENT: Millcroft Greens Corporation
PROJECT LOCATION: 4274 Dundas Street, Burlington, ON
DATUM: Geodetic
BOREHOLE LOCATION: See Drawing 1 N 4805834.5 E 595934.8

**DRILLING DATA**
Method: Solid Stem Auger
Diameter: 150mm
Date: Nov/29/2019

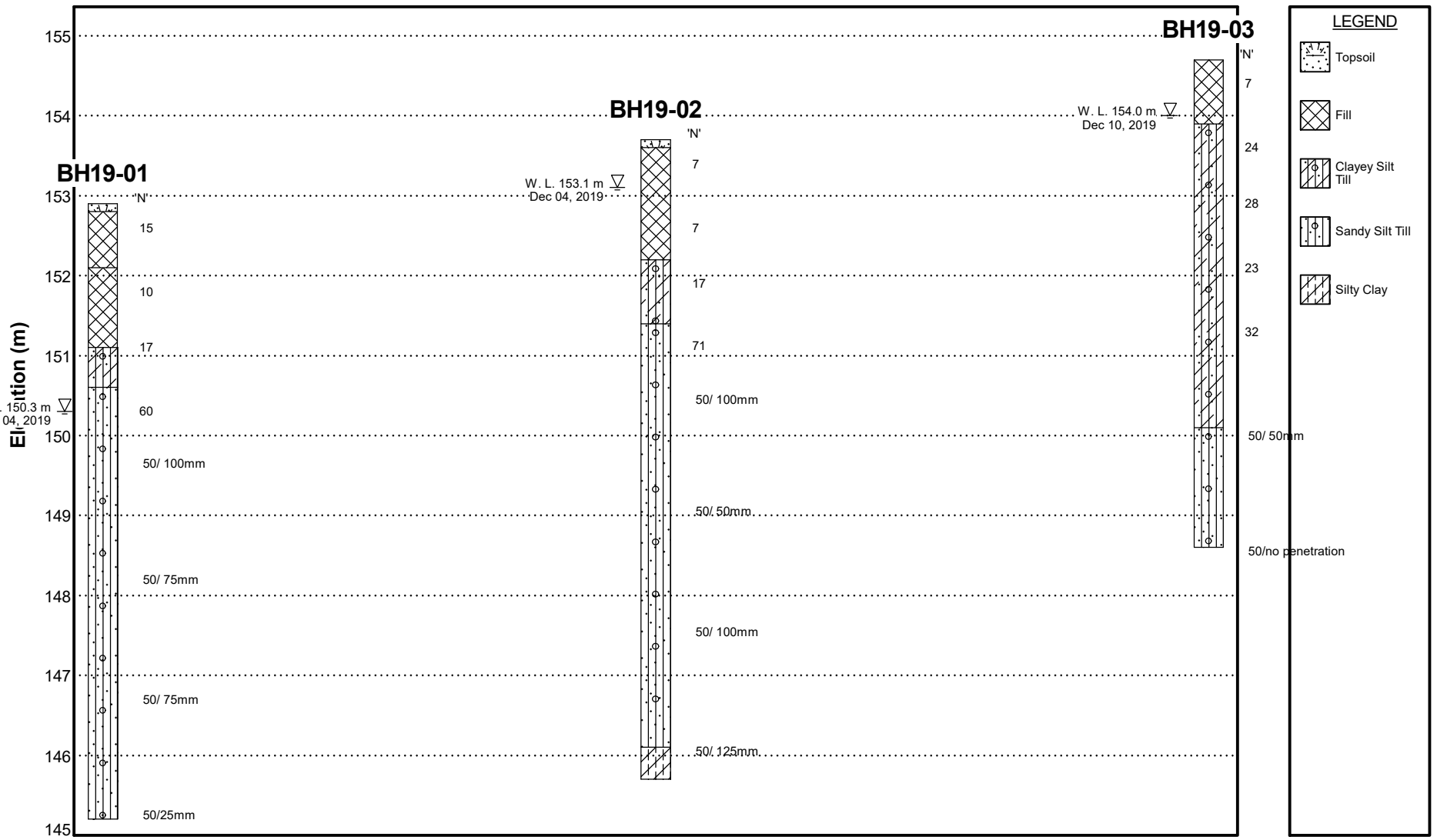
REF. NO.: 19-199-102
ENCL NO.: 4

| (m) ELEV / DEPTH | DESCRIPTION | STRATA PLOT | NUMBER | TYPE | BLOWS / 0.3 m "N" | GROUND WATER CONDITIONS | ELEVATION | DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100) | PLASTIC LIMIT $w_P$ / NATURAL MOISTURE CONTENT $w$ / LIQUID LIMIT $w_L$ — WATER CONTENT (%) (10 20 30) | POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (kN/m³) | METHANE AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 154.7 | | | | | | | | | | | | |
| 0.0 | **FILL:** clayey silt, trace gravel, trace rootlets, brown, moist, firm | | 1 | SS | 7 | | | | ○ | | | |
| 153.9 | | | | | | ▽ | 154 | | | | | |
| 0.8 | **CLAYEY SILT TO SILTY CLAY TILL:** sandy, trace gravel, occasional cobble/ boulder, brown, moist, very stiff to hard | | 2 | SS | 24 | | W. L. 154.0 m Dec 10, 2019 | | ○ | 225 | | |
| | | | 3 | SS | 28 | | 153 | | ○—○ | | | 4 22 52 22 |
| | | | | | | | Bentonite | | | | | |
| | greyish brown below 2.3m | | 4 | SS | 23 | | 152 | | ○ | | | |
| | | | 5 | SS | 32 | | 151 | | ○ | | | |
| 150.1 | | | | | | | | | | | | |
| 4.6 | **SANDY SILT TILL:** trace clay, trace gravel, cobble/boulder, greyish brown, moist, very dense | | 6 | SS | 50/ 50mm | | 150 | | ○ | | | |
| | | | | | | | Filter Pack | | | | | |
| | | | | | | | Slotted Pipe | | | | | |
| | Auger refusal at 6.1m on a possible boulder | | | | | | 149 | | | | | |
| 148.6 | | | | | | | | | | | | |
| 6.1 | **END OF BOREHOLE:** Notes: 1) 50mm dia. monitoring well installed upon completion. 2) Water level Reading: Date: Dec 10, 2019 Water Level (mbgl): 0.7 | | 7 | NR | 50/ no penetration | | | | | | | |

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

DS SOIL LOG 19-199-102_A (AREA 3)_MILLCROFT GREEN CORPORATION.GPJ DS.GDT 11/13/20




**Distance Along Baseline (Not to Scale)**

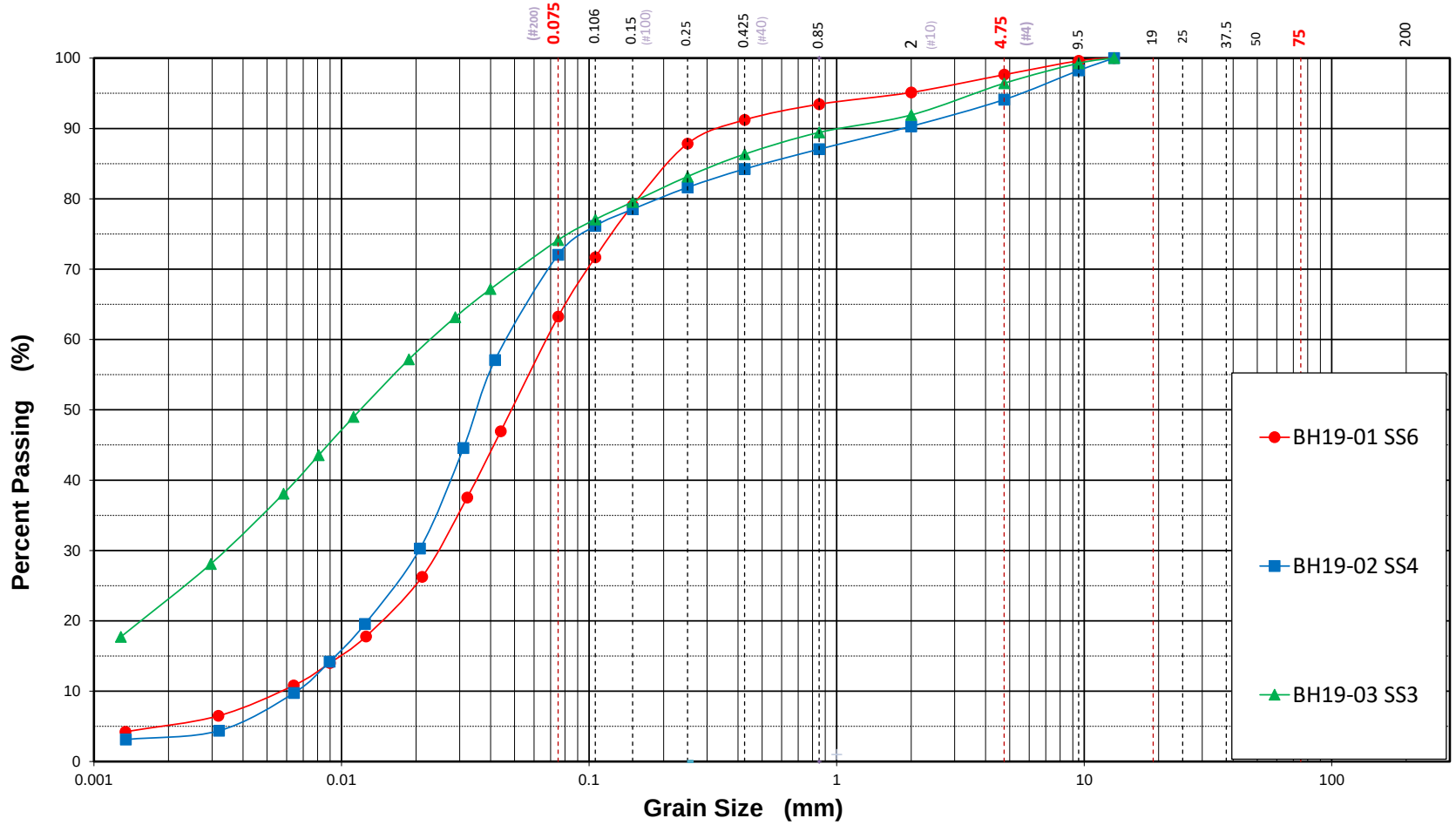
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# Generalized Sub-surface Profile

| | |
|---|---|
| DRAWING NO. | 5 |
| JOB NO. | 19-199-102 |
| DATE | Jan 10, 2020 |

DS FENCE (M) 19-199-102 A-BOREHOLE LOGS.GPJ DS.GDT 1/10/20

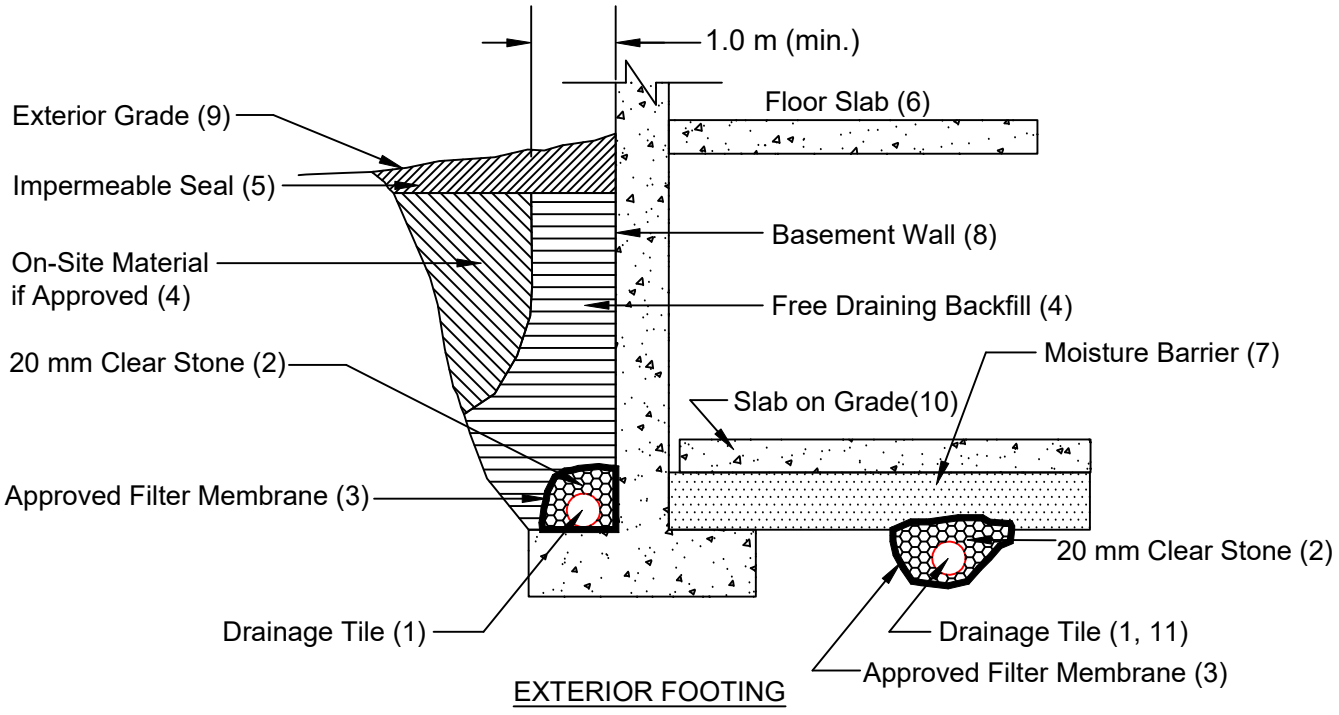
# Particle Size Distribution (ASTM-D421/D422)




| Silt and Clay | | Sand | | | Gravel | | Cobble + |
|---|---|---|---|---|---|---|---|
| Clay | Silt | Fine | Medium | Coarse | Fine | Coarse | |


DS CONSULTANTS LTD.
6221 Highway 7, Unit 16
Vaughan, Ontario, L4H 0K8
Telephone: (905) 264-9393
www.dsconsultants.ca


| | | | |
|---|---|---|---|
| Project | **Preliminary Geotechnical Investigation** | Project No | **19-199-102** |
| Location | **4252 Dundas Street, Burlington, ON** | Date | **Dec-09-2019** |
| Client | **Millcroft Greens Corporation** | Figure No | 6 |



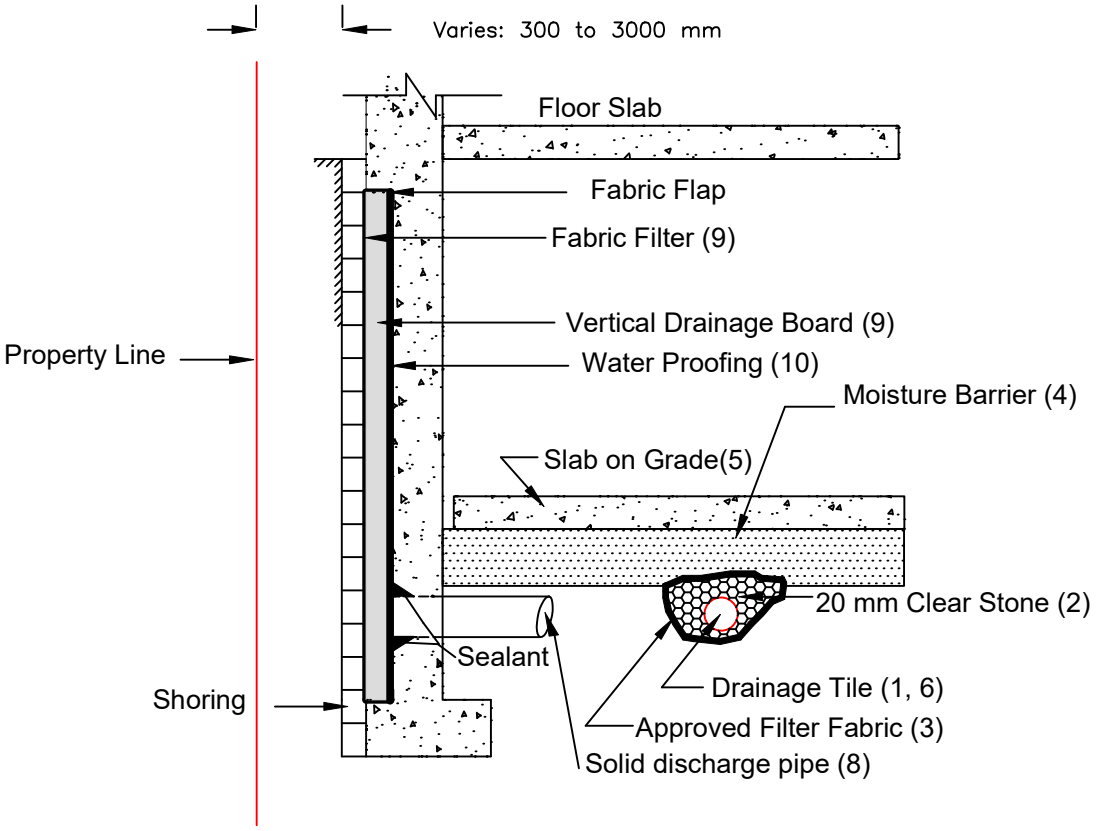

EXTERIOR FOOTING

**Notes**

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Impermeable backfill seal - compacted clay, clayey silt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be damp proofed /water proofed.
9. Exterior grade to slope away from building.
10. Slab on grade should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 270R or equivalent) if non-cohesive (sandy) soils below ground water table encountered.
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details.

## DRAINAGE AND BACKFILL RECOMMENDATIONS
## Basement with Underfloor Drainage

(not to scale)

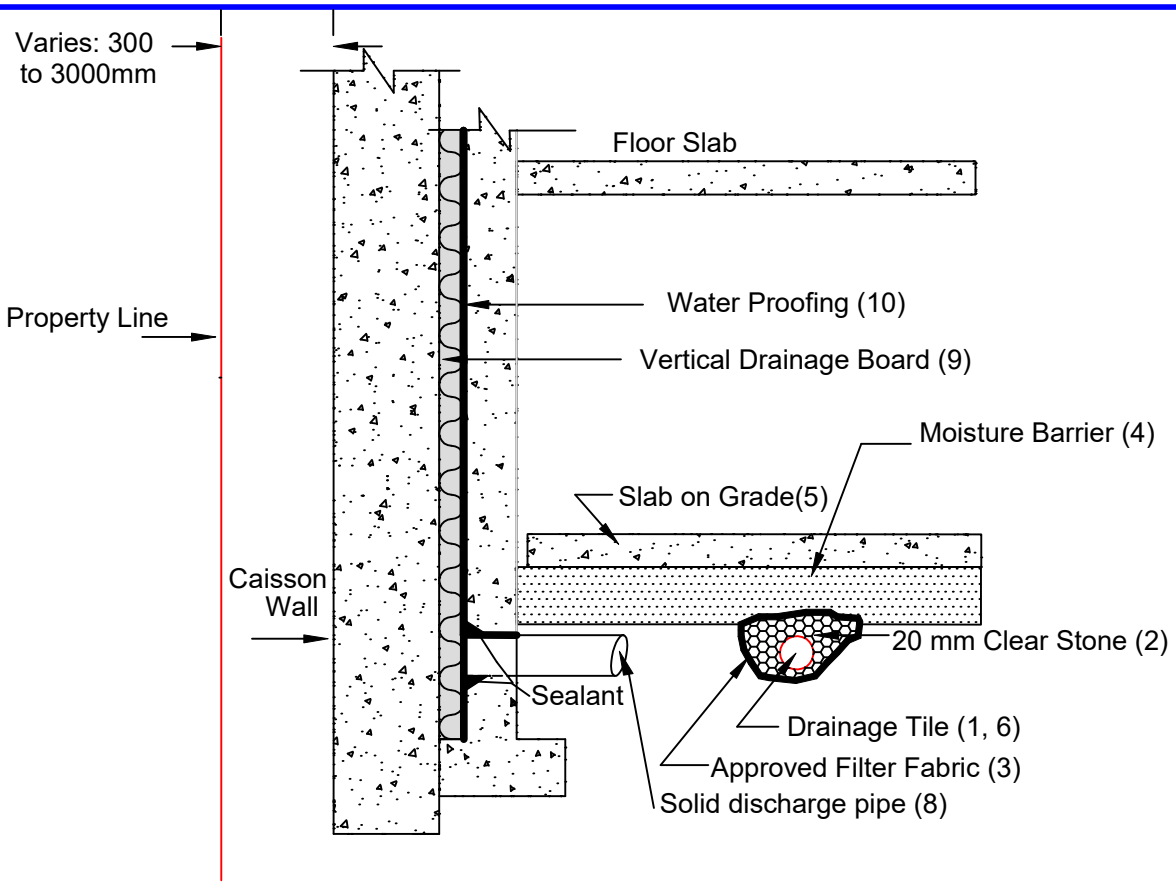



EXTERIOR FOOTING

**Notes**

1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board with filter cloth should be kept a minium of 1.2 m below exterior finished grade.
10. The basement walls should be water proofed using bentonite or equivalent water-proofing system.
11. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

## DRAINAGE RECOMMENDATIONS
## Shored Basement wall with Underfloor Drainage System
(not to scale)




EXTERIOR FOOTING

**Notes**

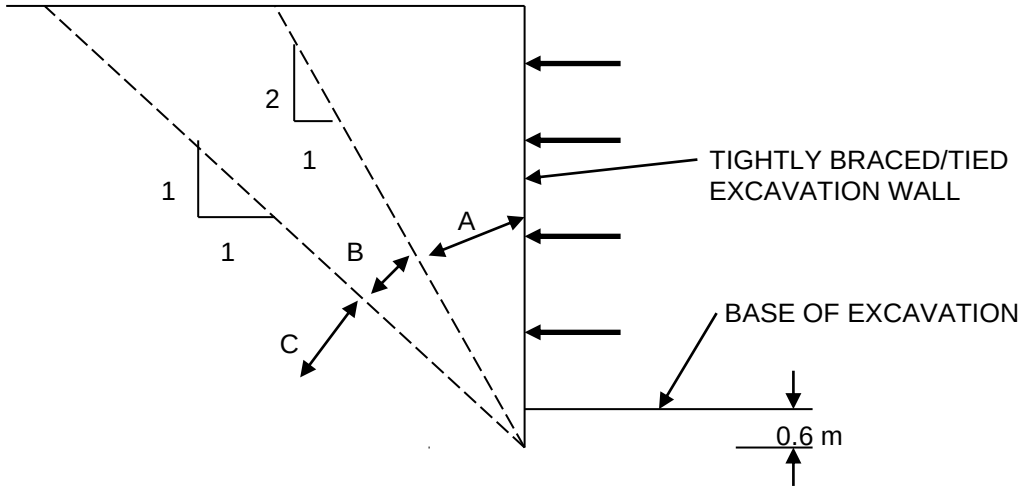
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter membrane (Terrafix 270R or equivalent).
4. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
5. Slab on grade should not be structurally connected to the wall or footing.
6. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab. Drainage tile placed in parallel rows 6 to 8 m (20 to 25') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
7. Do not connect the underfloor drains to perimeter drains.
8. Solid discharge pipe located at the middle of each bay between the solider piles, approximate spacing 2.5 m, outletting into a solid pipe leading to a sump.
9. Vertical drainage board mira-drain 6000 or eqivalent with filter cloth should be continous from bottom to 1.2 m below exterior finished grade.
10. The basement walls must be water proofed using bentonite or equivalent water-proofing system.
11. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

## DRAINAGE RECOMMENDATIONS
## Shored Basement wall with Underfloor Drainage System
(not to scale)

**Project: 19-199-102** **Drawing 10**

## Guidelines for Underpinning in Soil and Excavation Support

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




Zone A Foundations located within this zone normally require underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered

Zone B Foundations located within this zone normally do not require underpinning. Horizontal and vertical pressures on the excavation wall of non underpinned foundations must be considered

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

(Reference: Figure 26.27 from Canadian Foundation Engineering Manual, 4th Edition)

# Appendix A - Concept Site Plan

**GENERAL INFORMATION:**

-FOR SURVEY INFORMATION, PLEASE REFER TO R-PE SURVEYING LTD.

-FOR CIVIL AND SITE SERVICING INFORMATION, PLEASE REFER TO URBANTECH CONSULTING

-FOR LANDSCAPE INFORMATION, PLEASE REFER TO NAK DESIGN

-FOR TRAFFIC AND TRUCK TURNING INFORMATION, PLEASE REFER TO CROZIER CONSULTING ENGINEERS

-SNOW WILL BE REMOVED FROM SITE

**LOT INFORMATION:**

LOT INFORMATION

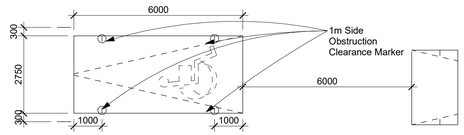
**FFE:**

FFE AT GROUND FLOOR = 155.10

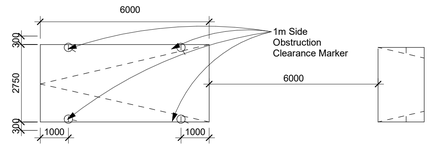
## General Notes 4

NTS dA1.2

HANDICAP PARKING SPACE (Type A):



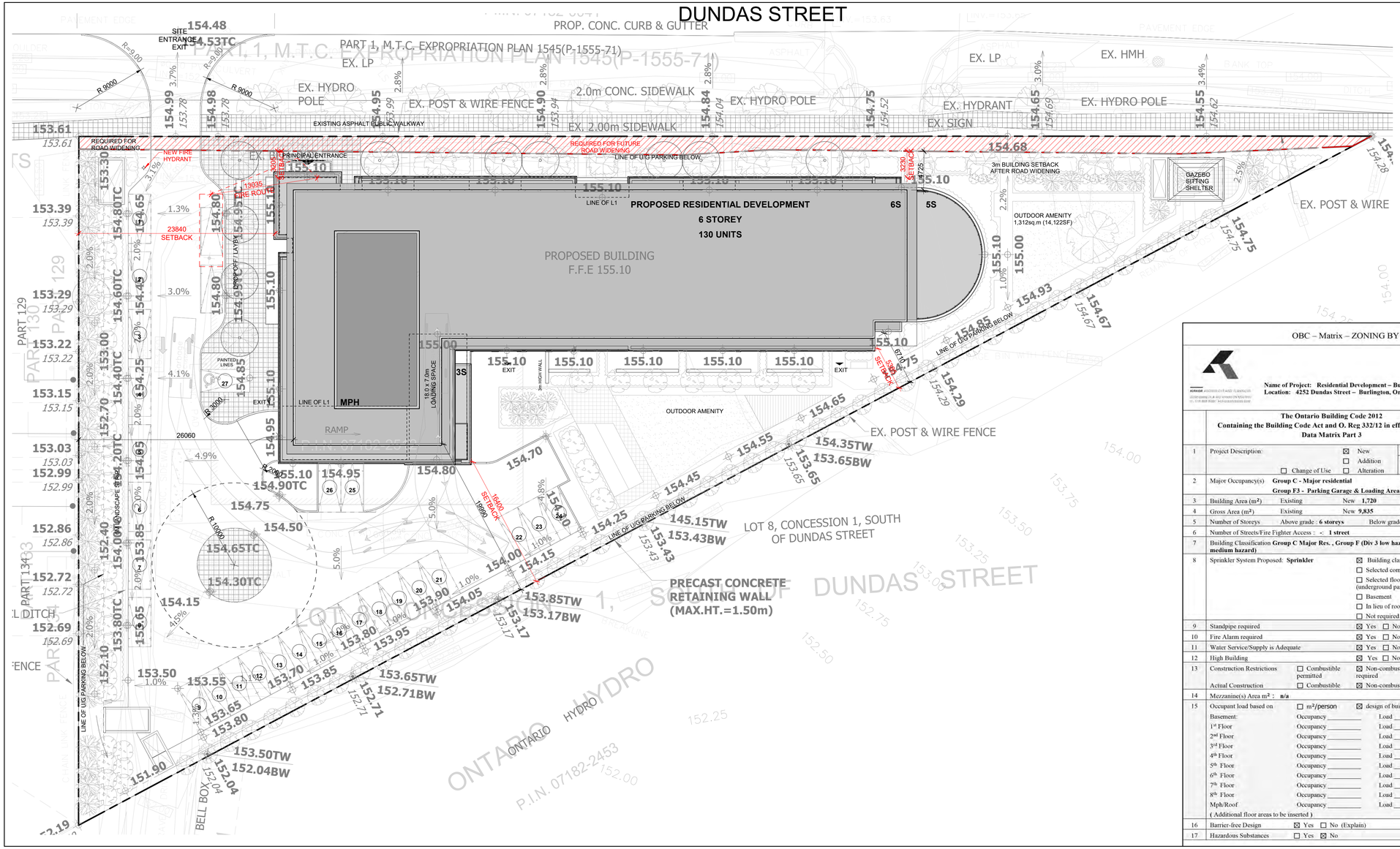

TYPICAL PARKING SPACE:




## Typical Parking Space Legend 3

NTS dA1.2

# DUNDAS STREET




Site Plan 2

1 : 250 dA1.2

## OBC Classification 1

NTS dA1.2

OBC – Matrix – ZONING BY LAW AMENDMENT

**Name of Project: Residential Development – Building with U/G parking**
**Location: 4252 Dundas Street – Burlington, Ontario**

Seal must be signed to be valid

| | The Ontario Building Code 2012 Containing the Building Code Act and O. Reg 332/12 in effect Jan 1, 2014 Data Matrix Part 3 | | OBC Reference References are to Division B unless noted [A] for Division A or [C] for Division C. | |
|---|---|---|---|---|
| 1 | Project Description: | ☒ New ☐ Addition ☐ Change of Use ☐ Alteration ☐ Part 11 11.1 to 11.4 | ☒ Part 3 1.1.2. [A] | ☐ Part 9 1.1.2. [A] & 9.10.1.3. |
| 2 | Major Occupancy(s) | **Group C - Major residential** **Group F3 - Parking Garage & Loading Area** | 3.1.2.1.(1) | 9.10.2. |
| 3 | Building Area (m²) | Existing New **1,720** Total **1,720** | 1.4.1.2. [A] | 1.4.1.2. [A] |
| 4 | Gross Area (m²) | Existing New **9,835** Total **9,835** | 1.4.1.2. [A] | 1.4.1.2. [A] |
| 5 | Number of Storeys | Above grade : **6 storeys** Below grade : **1** | 1.4.1.2. [A]&3.2.1.1. | 1.4.1.2[A] & 9.10.4 |
| 6 | Number of Streets/Fire Fighter Access : | **1 street** | 3.2.2.10. & 3.2.5. | 9.10.20. |
| 7 | Building Classification | **Group C Major Res. , Group F (Div 3 low hazard, Div.2 medium hazard)** | 3.2.2.20.-.83 | 9.10.2. |
| 8 | Sprinkler System Proposed: **Sprinkler** | ☒ Building classification ☐ Selected compartments ☐ Selected floor areas (underground parking garage only) ☐ Basement ☐ In lieu of roof rating ☐ Not required | 3.2.2.20.-.83 3.2.1.5. 3.2.2.17. | 9.10.8. |
| 9 | Standpipe required | ☒ Yes ☐ No | 3.2.9. | N/A |
| 10 | Fire Alarm required | ☒ Yes ☐ No | 3.2.4. | 9.10.18. |
| 11 | Water Service/Supply is Adequate | ☒ Yes ☐ No | 3.2.5.7. | N/A |
| 12 | High Building | ☒ Yes ☐ No | 3.2.6. | N/A |
| 13 | Construction Restrictions: ☐ Combustible permitted ☒ Non-combustible required ☐ Both<br>Actual Construction: ☐ Combustible ☒ Non-combustible ☐ Both | | 3.2.2.20.-.83 | 9.10.6. |
| 14 | Mezzanine(s) Area m² : **n/a** | | 3.2.1.1.(3)-(8) | 9.10.4.1. |
| 15 | Occupant load based on ☐ m²/person ☒ design of building<br>Basement Occupancy _____ Load _____ persons<br>1st Floor Occupancy _____ Load _____ persons<br>2nd Floor Occupancy _____ Load _____ persons<br>3rd Floor Occupancy _____ Load _____ persons<br>4th Floor Occupancy _____ Load _____ persons<br>5th Floor Occupancy _____ Load _____ persons<br>6th Floor Occupancy _____ Load _____ persons<br>7th Floor Occupancy _____ Load _____ persons<br>8th Floor Occupancy _____ Load _____ persons<br>Mph/Roof Occupancy _____ Load _____ persons<br>( Additional floor areas to be inserted ) | | 3.1.17. | 9.9.1.3. |
| 16 | Barrier-free Design | ☒ Yes ☐ No (Explain) | 3.8. | 9.5.2. |
| 17 | Hazardous Substances | ☐ Yes ☒ No | 3.3.1.2. & 3.3.1.19. | 9.10.1.3.(4) |


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Date:


**KIRKOR** ARCHITECTS AND PLANNERS
20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com


Revisions:

| No.: | Revision: | Date: |
|---|---|---|
| | | |
| | | |
| 1 | ZBA Submission #1 | Oct. 2nd, 2020 |
| No.: | Issued For: | Date: |

Drawing Title:

Site Plan

Client:

MILLCROFT - BLOCK E

Project:

PROPOSED RESIDENTIAL DEVELOPMENT

4252 Dundas Street, Burlington Ontario L7R 3X4

Scale: As indicated

Drawn by: Author

Checked by: Checker

Project No.: 19-111

Date: 02/10/20

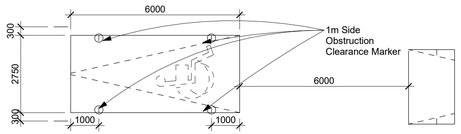
Drawing No.:

dA1.2

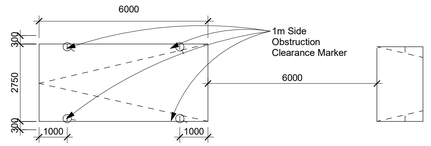

2020.02.04

Plot Date: 10/2/2020 10:50:54 AM File Path: C:\Revit\2019\19-111\Proj_Arch_dwg\19-111_Arch_Central_R19_dA1.rvt

HANDICAP PARKING SPACE (Type A):



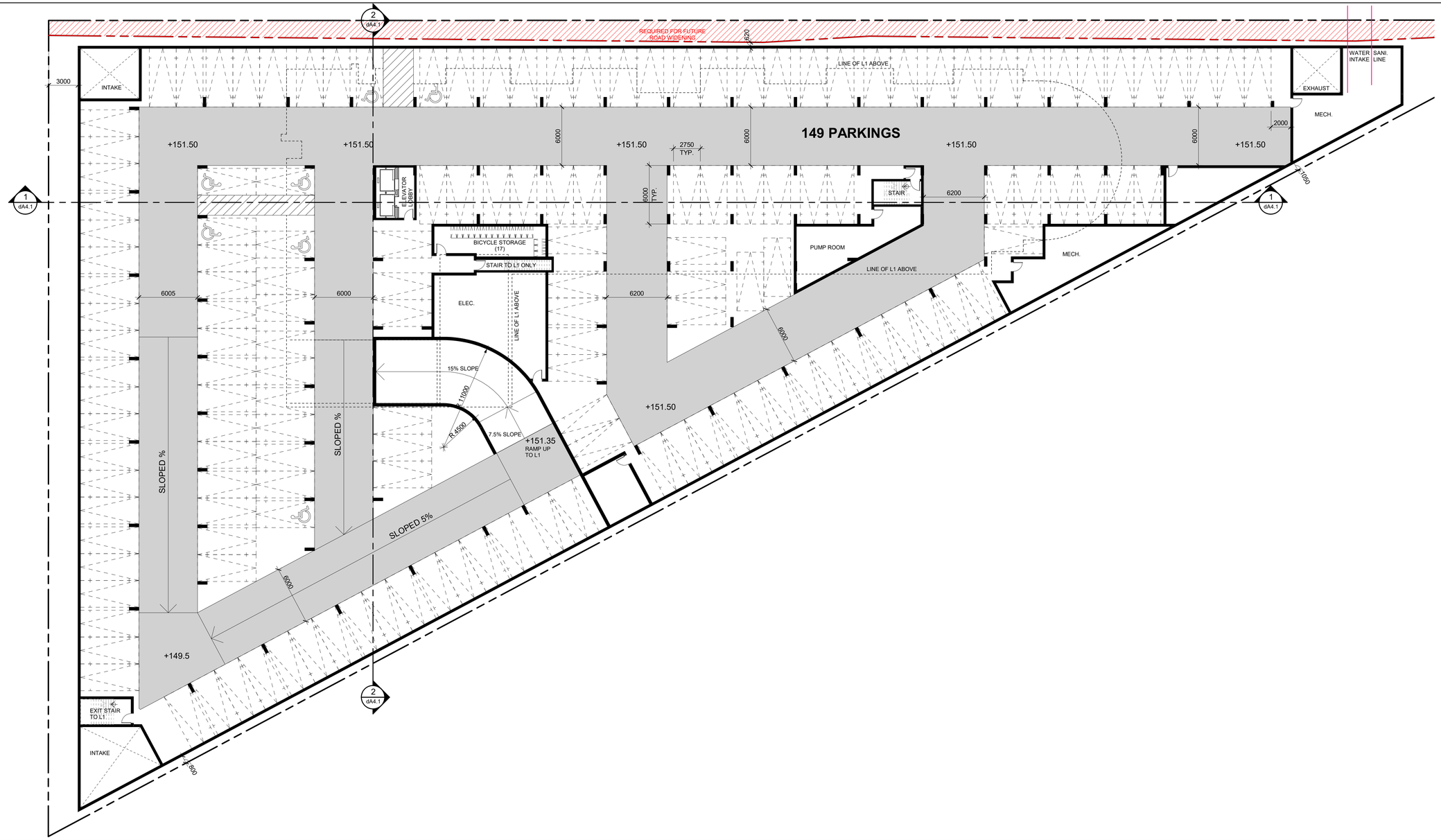

TYPICAL PARKING SPACE:




## Typical Parking Space Legend

NTS

2 dA1.3




## U/G Parking Level - P1

1 : 200

1 dA1.3

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20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

Revisions:

| No.: | Revision: | Date: |
|---|---|---|
| | | |
| | | |
| 1 | ZBA Submission #1 | Oct. 2nd, 2020 |

No.: Issued For: Date:

Drawing Title:

Underground Parking Plan

Client:

MILLCROFT - BLOCK E

Project:

PROPOSED RESIDENTIAL DEVELOPMENT

4252 Dundas Street, Burlington Ontario L7R 3X4

Scale: As indicated

Drawn by: Author

Checked by: Checker

Project No.: 19-111

Date: 02/10/20

Drawing No.:

dA1.3

Plot Date: 10/2/2020 10:35:54 AM File Path: C:\Revit\2019\19-111\Final_Model_Angle_dbarnett.rvt

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