PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED CONVENTIONAL TOWNHOUSES
1489 HURONTARIO STREET
MISSISSAUGA, ONTARIO

Prepared for:

TWIN TOWNHOMES INC.

Prepared By:

SIRATI & PARTNERS CONSULTANTS LIMITED

SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Project: SP21-825-00-R1
August 01, 2024

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1. INTRODUCTION

Sirati & Partners Consultants Limited (SIRATI) was retained by Twin Townhomes Inc. (the Client) to undertake a preliminary geotechnical investigation at 1489 Hurontario Street in Mississauga, Ontario.

The concept development plan prepared by RN Design on July 14, 2021 **[Ref.1]** was provided by the Client on July 19, 2021.

As per [**Ref.1]**, It is understood that the proposed property will be developed to eight (8) 3-storey Townhouses and adjoining driveways. The property is currently occupied by a two-story dwelling unit.

The purpose of this geotechnical investigation was to obtain information about the subsurface conditions at two (2) borehole locations and from the findings in the boreholes provide preliminary recommendations for the following:

1. Foundations
2. Floor slab and permanent drainage
3. Excavations and backfill
4. Earthquake considerations
5. Earth pressures

This geotechnical report is preliminary. Additional deep boreholes will be required within the footprint of the proposed building to confirm and update the findings of this report once the project drawings and final design grades of foundations are provided by the client.

This report is provided based on the terms of reference presented above and, on the assumption, that the design will be in accordance with the 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 of this office can be relied upon.

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 and do not conform to generalized standards for services. 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 the Twin Townhomes Inc. and their architects and designers. Third party use of this report without Sirati & Partners Consultants Limited (SIRATI) consent is prohibited.

The limitations presented in Appendix B form an integral part of the report and they must be considered in conjunction with this report.

2. FIELD AND LABORATORY WORK

A total of two (2) boreholes (BH 1 and BH 2, See Drawing 1 for the location plan) were drilled by SIRATI on May 10th, 2021, extending to the depth of 6.6 m below existing ground surface (bgs).

The boreholes were drilled with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of SIRATI 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 field work was carried out in accordance with the ASTM D 1586-11 test method – "The Standard Method of Standard Penetration Testing (SPT)". All soil and rock core samples were logged in the field and returned to SIRATI's laboratory in King City for detailed examination by the project engineer and subsequent laboratory testing.

Two (2) representative soil samples were subjected to particle size analysis and hydrometer analysis as well as Atterberg limits test from borehole BH 2. The results of the laboratory tests are provided in respective borehole logs and in Figures 4 and 5**.**

Water level observations were made during drilling and in the open boreholes upon completion of drilling. The monitoring well was installed in borehole BH 1 for the long-term (stabilized) groundwater level monitoring.

The elevations at the borehole locations were surveyed by SIRATI personnel using differential GPS system and were found to be 94.04 m and 93.11 m for BH 1 and BH 2, respectively.

3. SUBSURFACE CONDITIONS

The borehole locations are shown on Drawing 1. Notes on sample descriptions and the general features of fill material and glacial till are presented on Drawing 1A.

The subsurface conditions in the boreholes are presented in the individual borehole logs (Encl. 2 and 3 inclusive). The subsurface conditions in the boreholes are summarized in the following paragraphs.

3.1 SOIL CONDITIONS

Asphalt: A layer of asphalt was encountered at surface at the location of borehole BH 1 with the thickness of approximately 75 mm.

Topsoil: A surficial layer of topsoil was encountered at the location of BH 2 with the thickness of approximately 80 mm.

It should be noted that the thickness of the topsoil explored at the borehole location may not be representative for the entire site and should not be relied on to calculate the amount of topsoil to be stripped at the site.

Fill Material: A layer of fill material was encountered in BH 1 and BH 2 below asphalt/topsoil, comprising sand or clayey silt, respectively. The fill material extended to 0.8 m below the existing surface and found to be in moderately compact state, with measured SPT 'N' values of 8 and 10 blows per 300 mm of penetration.

Cohesionless Soil Layer: Cohesionless soil layer consisting of silty sand or silt, trace to some sand was encountered blow the fill layer in both boreholes, extending to 4.6 m (BH 2) to 6.3 m (BH 1) below the existing surface.

The SPT 'N' values were recorded ranging between 15 and 43 blows per 300 mm penetration, indicating a compact to dense condition of the soil.

The moisture content in cohesionless soil deposit of boreholes BH 1 and BH 2 was found ranging from 14.0% to 29.0%, indicating a moist to wet condition.

Grain size analyses of one (1) representative soil sample (BH2/SS4) was conducted and the results are presented in **Figure 4**, with the following fractions:

Clay: 7%
Silt: 87%
Sand: 5%
Gravel: 1%

Glacial Till Deposit: Glacial till deposit was encountered underlaying the cohesionless soil deposit in both boreholes, comprising sandy silty clay to silty sand, some clay to clayey trace to some gravel and trace to some cobbles.

During the split spoon sampling, the SPT 'N' values were recorded in glacial till deposit ranging from 17 (in BH 1) to greater than 50 blows per 300 mm penetration (in BH 2), indicating very stiff consistency of soil BH 1 and compact to very dense condition in BH 2.

It should be noted that the stratum is believed to contain cobbles as well as boulders which should be taken into consideration by the contractor.

The moisture content in glacial till deposit of boreholes BH 1 and BH 2 was found ranging from 9.0% to 14.0%, indicating moist condition.

Grain size analyses of one (1) representative soil sample (BH2/SS6) was conducted and the results are presented in **Figure 4**, with the following fractions:

Clay: 16%
Silt: 32%
Sand: 37%
Gravel: 15%

3.2 GROUNDWATER CONDITIONS

During drilling and upon completion of drilling, no short-term groundwater (unstabilized) was observed in the boreholes. The groundwater level was observed on June 4, 2021, and the results are summarized in **Table 1**.

Table 1: Groundwater Levels Observed in Monitoring Wells

BH/MW No.	Date of Drilling	Date of Observation	Depth of Groundwater below existing ground (m)	Elevation of Groundwater (m)
BH 1	May 10, 2021	June 4, 2021	1.48	92.56

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

4. DISCUSSION AND RECOMMENDATIONS

As per **[Ref1.]** the proposed property will be developed to eight (8) 3-storey Townhouses with approximately 2800 sqft in GFA. and adjoining driveway. The property is currently occupied by a two-story dwelling unit.

The recommendations are based on the subsurface soil and groundwater conditions encountered during the investigation and interpretation of the factual data presented in this report. The soil conditions may vary between and beyond the borehole locations.

It should be noted that the development plan **[Ref1.]** does not provide information regarding the existence of basement(s) within the scope of the proposed development. As such, the following recommendations should be considered as preliminary and will need to be re-assessed by SIRATI once the final design grades of foundations have been finalized.

Where comments are made on construction, they are provided to highlight those aspects which could affect the design of the project, and for which special provision may be required during construction.

Those requiring information on aspects of construction should make their own interpretation of the factual information, provided such interpretation may affect selections, proposed construction methods, scheduling and the like.

The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by SIRATI to validate the information for use during the construction stage.

The following provides preliminary recommendations pertaining to foundation design, pavement, excavation and backfill, earthquake conditions, earth pressure, and temporary shoring.

4.1 ROADS AND PARKING LOT

The investigation has shown that the predominant subgrade soil at the site, after stripping the topsoil, fill material and any other organic and otherwise unsuitable material is capable tosupport the pavement structure.

Based on the above and assuming that traffic usage will be residential minor local or local, the following minimum pavement thickness is recommended for the roads and parking lot:

40 mm HL3 Asphaltic Concrete
50 mm HL8 Asphaltic Concrete
150 mm Granular ‘A’
300 mm Granular ‘B’

These values may need to be adjusted according to the municipality Standards. The pavement structure recommended above assumes that the subgrade has sufficient bearing capacity to accommodate the applied pavement structure and local traffic. The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly prepared road subgrade before the placement of asphalt and/or immediately thereafter, to avoid damaging the subgrade by heavy truck traffic.

4.1.1 Stripping, Sub-excavation and Grading

The site should be stripped of all topsoil, weathered/disturbed soils and any organic or otherwise unsuitable soils, both in cut and fill areas. The bottom of the excavations or subgrade should be clear of any disturbed soils, organic soil, residual materials (plastics, cardboards, etc.), and loose or soft soils prior to the installation of the pavement structure.

Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 10 tons. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be recompacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Proper cambering and allowing the water to escape towards the sides (where it can be removed by means of subdrains) is considered to be beneficial. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at ±2% of the optimum moisture content, imported granular material must be used.

Any fill required for re-grading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The fill should be placed in thin layers and compacted to at least 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade, as per City Standards. The compaction of the new fill should be checked by frequent field density tests.

4.1.2 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200 mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field density tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

4.1.3 Drainage

The City of Mississauga requires the installation of full-length subdrains on all roads. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards catch basins. As discussed in Section 4.1.1, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards subdrains or other interceptors.

4.2 SEWERS

As a part of the site development, a network of new storm and sanitary sewers is to be constructed.

4.2.1 Trenching

It is expected that the trenches will be dug through the native soil deposits. The groundwater was observed in the monitoring well of BH 1 at 92.56 m ASL. For any trenching below the groundwater

level, water table must be lowered to 1.0 m below the lowest excavation level. For any information regarding the long-term groundwater table and dewatering requirements, reference should be made to the hydrogeological report.

The excavation depth is expected to be proximately 1.5 m to 3.0 m. All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill layer above groundwater table could be categorized as Type 3 soil. The native soils could be categorized as Type 3 Soil above groundwater table and Type 4 Soil below groundwater table.

4.2.2 Bedding

The boreholes show that, in their undisturbed state, native soils will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter. The bedding material should consist of well-graded granular material such as Granular 'A' or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by the local Authority, should be placed.

To avoid the loss of soil fines from the subgrade, uniformly graded clear stone should not be used unless, below the granular bedding material, a suitable, approved filter fabric (geotextile) is placed. The geotextile should extend along the sides of the trench and should be wrapped all around the poorly graded bedding material.

4.2.3 Backfilling of Trenches

Based on visual and tactile examination, and the measured moisture contents of the soil samples, the onsite excavated soils from above the groundwater table will generally need to be brought to ±2% of the optimum moisture content whether by adding water or aerating. Soils excavated from below the groundwater table may require aeration prior to their use as backfill material.

The backfill should be placed in maximum 200 mm thick layers at or near (±2%) their optimum moisture content, and each layer should be compacted to at last 95% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling. Otherwise imported selected inorganic fill will be required for backfilling at this site.

The onsite excavated soils should not be used in confined areas (e.g. around catch basins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of imported granular fill would be preferable in confined areas and around structures, such as catch basins.

4.3 SITE GRADING AND ENGINEERED FILL

In the areas where earth fill is required for site grading purposes, an engineered fill may be constructed below house/building foundations, roads, boulevards, etc.

Prior to the construction of engineered fill, all topsoil, fill material, weak weathered / disturbed and any other unsuitable materials must be removed in this area. After the removal of all unsuitable materials, the excavation base consisting of native soil deposits must be inspected and approved by a qualified geotechnical engineer prior to any placement of engineered fill. The base of the excavation should be compacted, and proof rolled with heavy compactors (minimum 10,000 kg). During proof rolling, spongy, wet or soft/loose spots should be sub-excavated to stable subgrade and replaced with approved soil, compatible with subgrade conditions, as directed by the geotechnical engineer.

The material for engineered fill should consist of approved inorganic soil, compacted to 100 percent of Standard Proctor Maximum Dry Density (SPMDD). Recommendations regarding engineered fill placement are provided in Appendix C of this report.

To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor is essential by SIRATI to certify the engineered fill. Please note that SIRATI can only provide certification for material properly placed and compacted under direct supervision. Detailed Engineered fill and inspection requirements to be discussed at the pre-construction meeting with the contractor.

Depending upon the amount of grade raise, there will be consolidation settlement of the underlying soils. Additionally, there will be settlement of the engineered fill under its own weight, approximately 0.5% of the fill height. A waiting period of 3 to 6 months may be required prior to the construction of any structures on engineered fill. This should be confirmed during the detail design stage, once the grading plans for the proposed development are available.

4.4 FOUNDATION CONDITIONS

At the time of preparation of this report, no design loading requirements were made available. Based on our understanding, the footings for the townhouses with or without basement may be positioned at 1.5 m and 3.0 m below the existing grade.

The following sections outline our preliminary recommendations for the design of the proposed buildings. The following recommendations should be considered as preliminary and will need to be re-assessed by SIRATI once the final design grades of foundations have been finalized.

4.4.1 Frost Protection

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

4.4.2 Conventional Spread and Strip Footings

The boreholes show that, provided the native foundation soil is undisturbed during the construction, in general, allowable soil bearing values at or below the depths provided in **Table 2** are feasible at serviceability limit and ultimate limit states for strip and spread footings.

Table 2: Bearing Values and Founding Levels of Spread Footings for townhouses

BH No.	Depth Below Existing Ground (m)	Founding Level at Elevation (m)	Material	Bearing Capacity at SLS (kPa)	Factored Geotechnical Resistance at ULS (kPa)
BH 1	1.5	92.54	Silty Sand	100	150
	3.0	91.04	Silty Sand	150	225
BH 2	1.5	91.61	Silty Sand	100	150
	3.0	90.11	Silt, trace to some sand	150	225

The foundations designed to the specified allowable bearing capacity at the serviceability limit state (SLS) are expected to settle less than 30 mm total and 25 mm differential.

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

Where it is necessary to place footings 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.

Groundwater table should be lowered during construction to a depth of not less than 1 m below the foundation level.

It should be noted that the bearing capacities were provided based on the soil and groundwater condition at the borehole locations and as such, variability should be anticipated between the boreholes.

5. FLOOR SLAB AND PERMANENT DRAINAGE

Without basement or with one (1) level of basement, the basement floor slab can be supported on grade provided the base thoroughly proof rolled to detect any soft or unstable areas, which must be removed and replaced with suitably compacted soils, as defined in **Section 4** of this report. Once the required subgrade has been developed, SIRATI recommends that the exposed subgrade be inspected and approved by the Geotechnical Engineer prior to the placement of any granular fill or concrete. A granular layer consisting of at least 200 mm of 19 mm Crusher Run Limestone (CRL) or OPSS

Granular A should be installed under the floor slab as a bedding layer. The CRL or the OPSS Granular A should be compacted to 100% of its SPMDD.

Excavations for floor slabs should not be left open before pouring concrete for any period longer than 24 hours. Particularly, if the floor construction works are being completed during the winter months or wet weather periods. The base of any floor slab excavation that is left exposed longer than 24 hours should be suitably covered and protected from water ponding, and/or protected to prevent degradation of the exposed founding stratum with the construction of a mud mat.

The floor slab should be structurally independent of any load bearing structural elements and should tolerate expected foundation settlements as indicated above.

The perimeter drainage system shown on Drawings check the numbering are recommended for the basement walls with open cut and shored excavations. Weeping tile systems on the exterior and underfloor drainage systems, should be appropriately designed to effectively discharge water and eliminate hydrostatic pressure build-ups.

6. EARTH PRESSURES

The lateral earth and water pressure acting at any depth on the basement walls can be calculated by the following formula:

In soils above the groundwater table ($z < d_w$):

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

In soils below the groundwater table ($z \geq d_w$):

$$p = K \{\gamma d_w + \gamma_1 (z - d_w) + q\} + p_w$$

In which, $p_w = \gamma_w (z - d_w)$

where p = lateral earth and water pressure in kPa acting at a depth of z below ground surface

K = earth pressure coefficient = 0.5

γ = unit weight of soil above groundwater table, assuming $\gamma = 21.0$ kN/m^3

γ_1 = submerged unit weight of soil below groundwater table, assuming $\gamma_1 = 11.2$ kN/m^3

γ_w = unit weight of water, assuming $\gamma_w = 9.8$ kN/m^3

z = depth below ground surface to point of interest, in meters

d_w = depth of groundwater table below ground surface, in meters

q = value of surcharge in kPa

p_w = hydrostatic water pressure in kPa

When the basement wall is poured against the shoring caisson wall, the basement wall as well as the shoring caisson wall should be designed for hydrostatic pressure, even though a drainage board is provided between the basement wall and the caisson wall. 92.56

7. 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 two levels of basement can be classified as "Class D".

8. GENERAL COMMENTS ON REPORT

Sirati & Partners Consultants Limited 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, Sirati & Partners will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

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

Yours truly,

SIRATI & PARTNERS CONSULTANTS LIMITED

LICENSED PROFESSIONAL ENGINEER
A. SIRATI
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01/08/2024
PROVINCE OF ONTARIO

Hamid Sarabadani, M.A.Sc., P.Eng.
Geotechnical Engineer

Archie Sirati, Ph.D., P.Eng.
Senior Geotechnical Designer

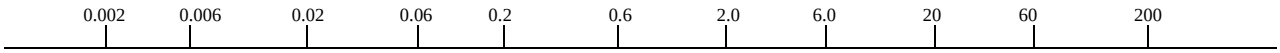
Drawings

Drawing 1A: Notes on Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Sirati & Partners Consultants Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has 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 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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North:

Legend:

Approximate Property Boundry

BH Location

Source:- Google Earth Map

0 10 m

Project Title:
Geotechnical Investigations

Site Location:
1489 Hurontario Street, Mississauga, ON, Canada

Drawing Title:
Borehole Location Plan

Scale:	Project Number:
As Shown	SP21-825-00
Date:	**Drawing Number:**
August, 2024	1

SIRATI & PARTNERS

LOG OF BOREHOLE BH 1

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Twin Townhomes Inc.
PROJECT LOCATION: 1489 Hurontario Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4824503.577 E 613505.92

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: May-10-2021
Drilling Contractor:

REF. NO.: SP21-825-00
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES 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)	CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
94.0												
93.9 0.1	**ASPHALT:** 75 mm thick			AUGRE								
93.2 0.8	**FILL:** sand, trace gravel, trace silt, brown, moist, compact		1	SS	10							
	SILTY SAND: trace oxidation, brown, moist, compact		2	SS	16		93					
	becoming wet		3	SS	16	W. L. 92.6 m Jun 04, 2021	92					spoon wet
			4	SS	27							
	becoming dense		5	SS	43		91					
	becoming compact and grey		6	SS	15		90					
87.7							89					
87.3 6.6	**SANDY SILTY CLAY TILL:** trace to some gravel, grey, moist, very stiff		7	SS	17		88					
	END OF BOREHOLE:											

Note:
1. Borehole was open and dry upon completion of drilling.
2. Monitoring well installed in the BH 1 from 1.5 m to 4.6 m bgs.
3. Groundwater level observations:

Date	Depth (mbgs)
2021-06-09	1.48

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

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

SPCL SOIL LOG SP21-825-00.GPJ SPCL.GDT 21-8-10

SIRATI & PARTNERS

LOG OF BOREHOLE BH 2

PROJECT: Preliminary Geotechnical Investigation
CLIENT: Twin Townhomes Inc.
PROJECT LOCATION: 1489 Hurontario Street, Mississauga, Ontario
DATUM: Geodetic
BH LOCATION: N 4824533.67 E 613522.444

DRILLING DATA
Method: Solid Stem Auger
Diameter: 150 mm
Date: May-10-2021
Drilling Contractor:

REF. NO.: SP21-825-00
ENCL NO.: 3

(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)	CHEMICAL ANALYSIS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
93.1												
93.0	**TOPSOIL:** 80 mm						93					
92.9	**FILL:** clayey silt, trace contamination, trace gravel, trace rootlets, dark brown, moist, stiff		1	SS	8							
92.3												
0.8	**SILTY SAND:** trace oxidation, brown, very moist, compact		2	SS	15		92					
	becoming greyish brown		3	SS	16							
90.8							91					
2.3	**SILT:** tarce to some sand, greyish brown, moist, compact		4	SS	25							1 5 87 7
	becoming very moist and grey		5	SS	22		90					
88.5							89					
4.6	**SILTY SAND TILL:** some clay to clayey, some gravel, grey, moist, dense to very dense		6	SS	36		88					15 37 32 16
	trace cobbles		7	SS	87		87					
86.6												
6.6	**END OF BOREHOLE:**											

Note:
1. Borehole was open and dry upon completion of drilling.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

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

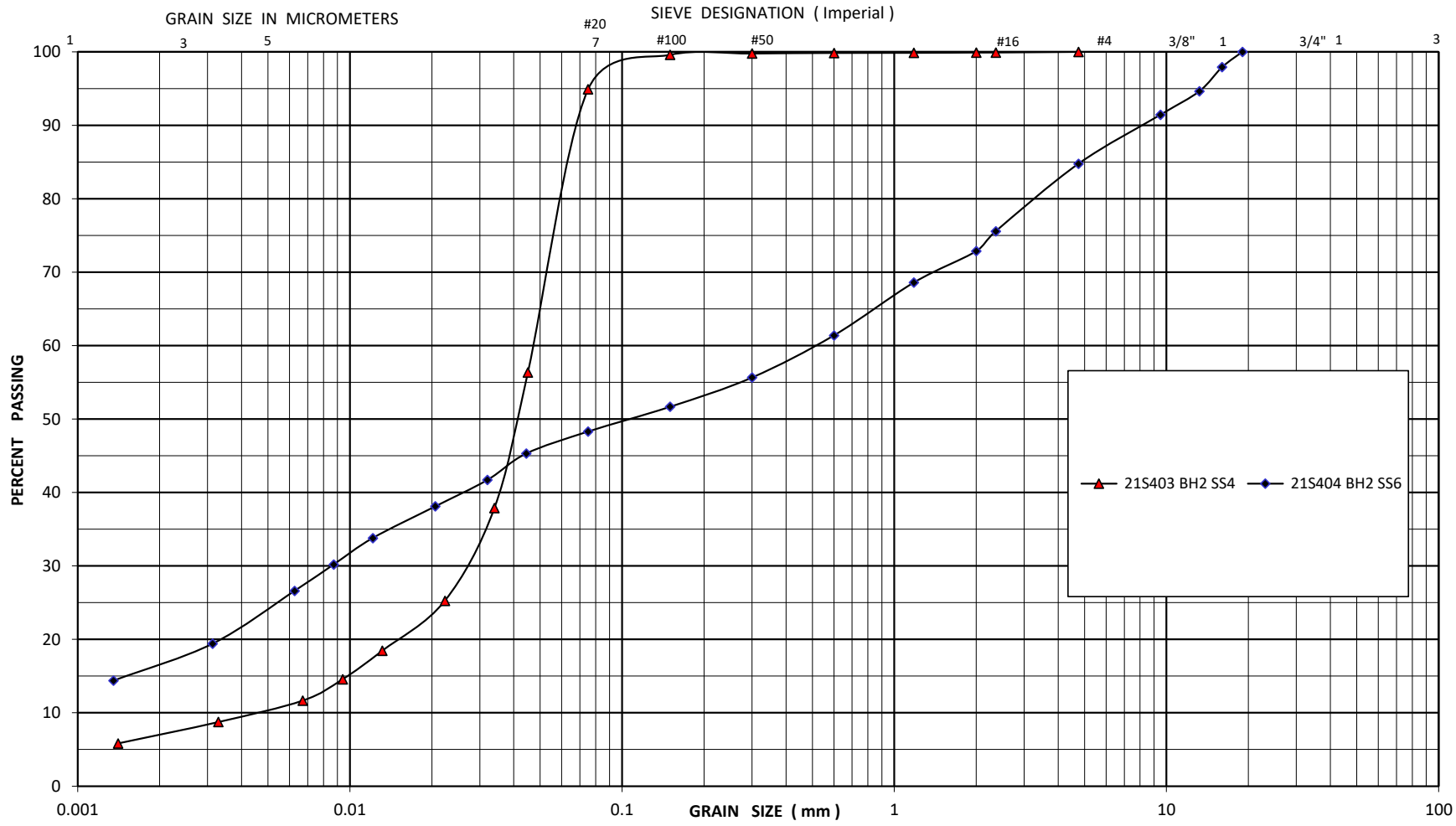
SPCL SOIL LOG SP21-825-00.GPJ SPCL.GDT 21-8-10

SIRATI & PARTNERS

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

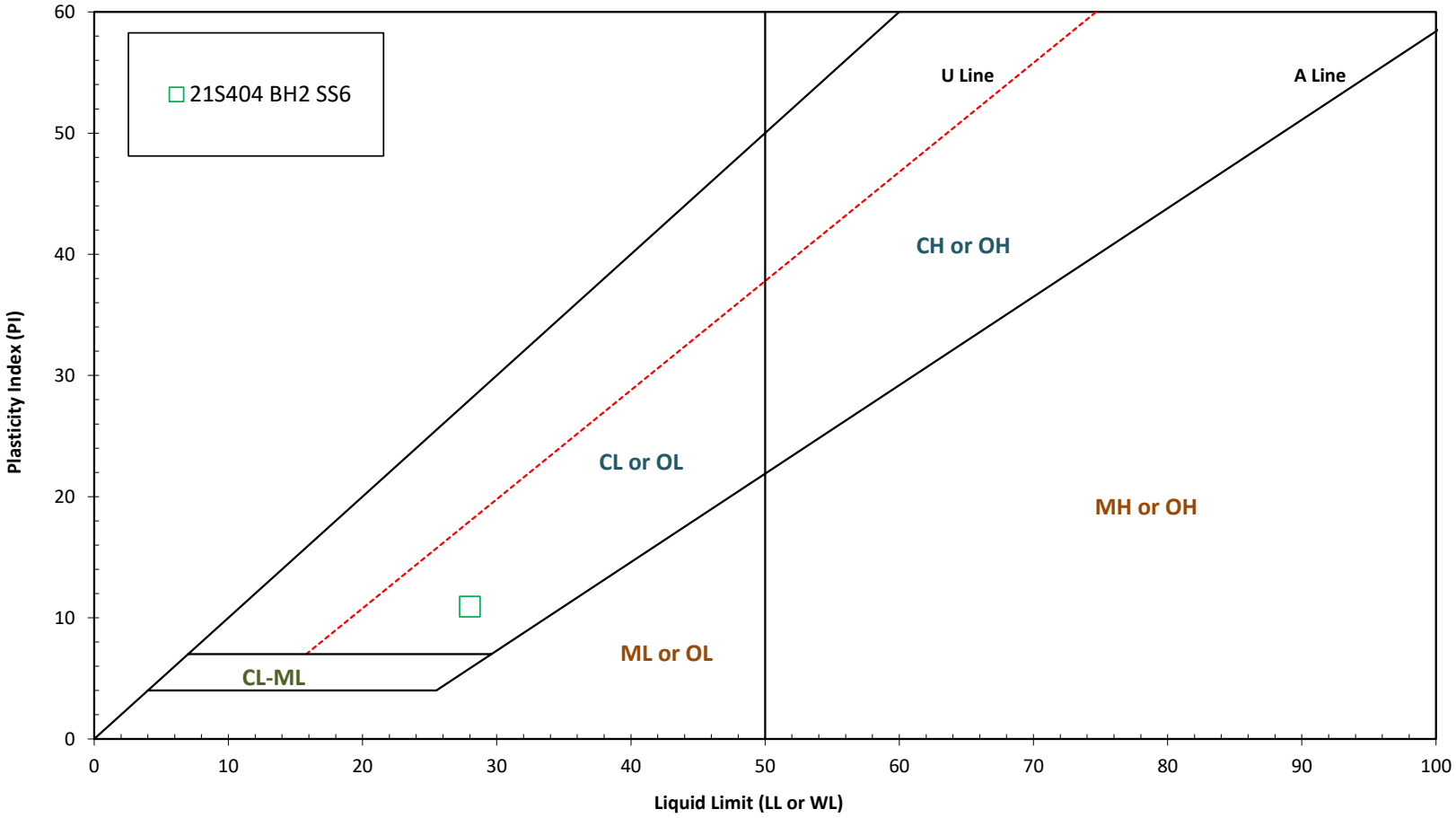
CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Project No.	:	SP21-825-00
Date	:	01 June 2021
Figure No.	:	4

Atterberg's Limits Test Report

ASTM D4318-10



SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Date	:	01 June 2021
Project No.	:	SP21-825-00
Figure No.	:	5

APPENDIX A:
GUIDELINES FOR ENGINEERED FILL

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and Sirati & Partners Consultants Limited. Without this confirmation, no responsibility for the performance of the structure can be accepted by Sirati & Partners Consultants Limited (SIRATI). Survey drawing of the pre-and post-fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a SIRA -TI engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by SIRATI during placement of engineered fill is required. Workcannot commence or continue without the presence of the SIRATI representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

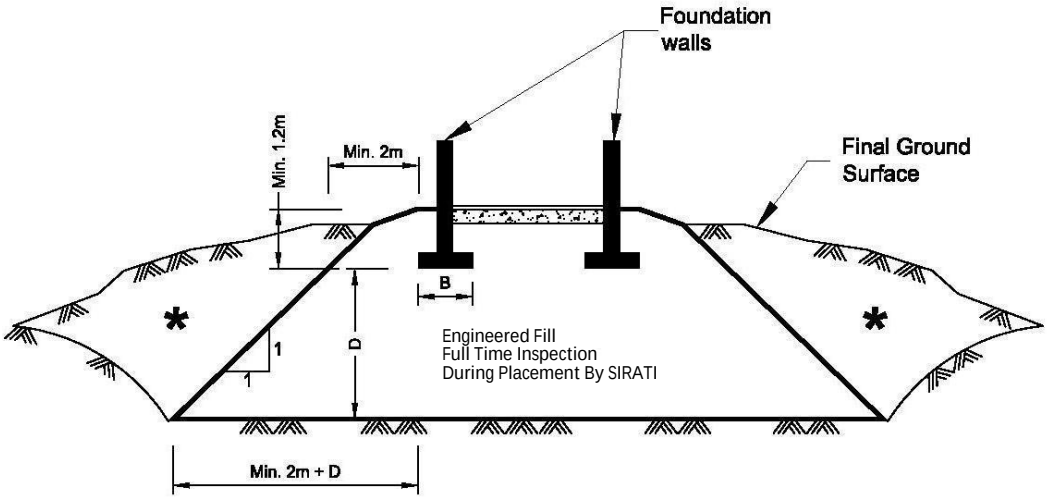
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from SIRATI prior tofooting concrete placements. All excavations must be backfilled under full time supervision bySIRATI to the same degree as the engineered fill pad. Surface water cannot be allowed to pond inexcavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with theapproval of SIRATI.

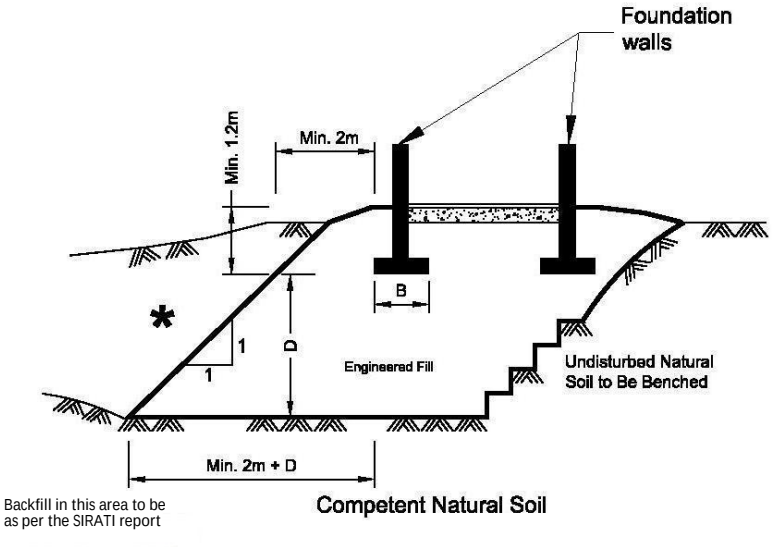
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with Sirati & Partners Consultants Limited (SIRA TI) report attached.


Foundation walls
Min. 1.2m
Min. 2m
Final Ground Surface
B
D
1
1
Engineered Fill
Full Time Inspection
During Placement By SIRATI
Min. 2m + D
Competent Natural Soil To Be Confirmed By SIRATI


Foundation walls
Min. 1.2m
Min. 2m
B
D
1
1
Engineered Fill
Undisturbed Natural Soil to Be Benched
Min. 2m + D
Backfill in this area to be as per the SIRATI report
Competent Natural Soil

Appendix B: Limitations of 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 Sirati & Partners Consultants Limited (SIRATI) at the time of preparation. Unless otherwise agreed in writing by SIRATI, 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 borehole 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 boreholes may differ from those encountered at the borehole 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 borehole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc. Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

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 boreholes 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. SIRATI 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. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services.

SIRATI engagement hereunder is subject to and condition upon, that SIRATI not being required by the Client, or any other third party to provide evidence or testimony in any legal proceedings pertaining to this finding of this report or providing litigations support services which may arise to be required in respect of the work produced herein by SIRATI. It is prohibited to publish, release or disclose to any third party the report produced by SIRATI pursuant to this engagement and such report is produced solely for the Client own internal purposes and which shall remain the confidential proprietary property of SIRATI for use by the Client, within the context of the work agreement. The Client will and does hereby remise and forever absolutely release SIRATI, its directors, officers, agents and shareholders of and from any and all claims, obligations, liabilities, expenses, costs, charges or other demands or requirements of any nature pertaining to the report produced by SIRATI hereunder. The Client will not commence any claims against any Person who may make a claim against SIRATI in respect of work produced under this engagement.