GEMTEC
www.gemtec.ca

Geotechnical Site Investigation
Proposed Residential Development between 666 and 682 Liverpool Road
Pickering, Ontario

GEMTEC Project: 104161.001

GEMTEC
www.gemtec.ca

Submitted to:

Plaza 6 Inc.
23 Automatic Road
Brampton, Ontario
L6S 4K6

Geotechnical Site Investigation
Proposed Residential Development between 666 and 682 Liverpool Road
Pickering, Ontario

March 26, 2025
GEMTEC Project: 104161.001

experience • knowledge • integrity

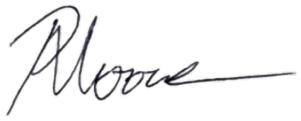
GEMTEC Consulting Engineers and Scientists Limited
850 Champlain Avenue, Unit 101
Oshawa, ON, Canada
L1J 8C3

March 26, 2025 Project: 104161.001 – Rev0

Plaza 6 Inc.
23 Automatic Road
Brampton, Ontario
L6S 4K6

Re: Geotechnical Site Investigation
Proposed Residential Development between 666 and 682 Liverpool Road
Pickering, Ontario

Enclosed is our geotechnical investigation report for the proposed residential development located between 666 and 682 Liverpool Road in the City of Pickering, Ontario. The report presented herein is based on the scope of work summarized in the proposal dated January 9, 2025. This report was prepared by Pricilla Moore, B.Sc. and reviewed by Timi Olumuyiwa, M.Sc., P.Eng., PMP.



Pricilla Moore, B.Sc.
Geotechnical E.I.T.

Timi Olumuyiwa, M.Sc., P.Eng., PMP
Senior Geotechnical Engineer

PM/TO/sv

N:\Projects\104100\104161.001\03_Submittals\Geotechnical\104161.001_RPT_Geotech Inv_666 to 682 Liverpool Rd_2025-03-26_Rev0.docx

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has been retained by Plaza 6 Inc. c/o Brian Moss and Associates Ltd., to carry out a preliminary geotechnical and hydrogeological investigations in support of the proposed residential development, located between 666 and 682 Liverpool Road in the City of Pickering, Ontario (herein referred to as the 'site'). The geotechnical site investigation is presented in this report, and the hydrogeological investigation is presented under a separate cover.

The purpose of the geotechnical site investigation was to characterize the general subsurface and groundwater conditions at the site by means of a limited number of boreholes and monitoring wells and, based on the information obtained, to provide geotechnical recommendations including trenching, engineered fill, excavation, foundation, and pavement design.

This report is subject to the Conditions and Limitations of This Report, which follows the text of the report, and are considered an integral part of the report (Appendix A).

2.0 PROJECT AND SITE DESCRIPTION

2.1 Project Location and Description

The site is roughly rectangularly shaped and located west of Liverpool Road and Broadview Street in the City of Pickering, Ontario. The site is located on a headland extending south towards Lake Ontario and is approximately 235 m east of Frenchman's Bay. The property currently consists of four units of one to two-storey residential buildings on Lots 666, 668, 672, 678 and 682, with one pool, and several frames shed, a garage, and driveways.

Based on a concept plan prepared by Cassidy + Company and dated May 27, 2024, the proposed development will consist of 21 units of four buildings each consisting of 3-storey slab-on-grade townhouses, parking lots, and internal roadways (fire route and light duty pavement areas). The existing slab-on-grade will be removed prior to construction of the new townhouses.

Based on available site topography, the site is relatively flat but gently sloping downward from west to east towards Liverpool Road.

2.2 Site Geology

According to published physiographic mapping (*L.J. Chapman and Putnam, 1984; The Physiography of Southern Ontario, Third Edition*) the site is within a physiographic region known as the Iroquois Plain. The Iroquois Plain refers to an area of lowland that borders the present-day Lake Ontario which was formed within the basin of Glacial Lake Iroquois which was a larger and more elevated version of Lake Ontario. Lake Iroquois sediments consist of both granular soils (silt and sand) and finer-grained silt and clay soils. The overburden within the Iroquois

Plain in the vicinity of the study area is underlain by shale bedrock of the Georgian Bay Formation which contains limestone interlayers.

3.0 SITE INVESTIGATION METHODOLOGY

The field work for the geotechnical site investigation was carried out on February 14, 2025. Three boreholes, noted as Boreholes BH25-1 to BH25-3, were advanced to an approximate depth of 6.5 m below ground surface.

The boreholes were advanced using a track mounted drill rig operated by ACE Environmental Drilling of Whitchurch-Stouffville, Ontario, who is a MECP-licensed Water Well Contractor. The boreholes were advanced using 152-mm diameter hollow stem augers. The field work was observed throughout by a member of our geotechnical engineering staff who directed the drilling operations and logged the samples and boreholes.

The boreholes were advanced to the sampling depths by means of continuous flight solid stem augers using conventional 50-millimetre (mm) external diameter split spoon sampling equipment driven by an automatic hammer in accordance with the SPT procedures outlined in ASTM International standard D1586: "*Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*". SPT "N"-values were recorded for the sampled intervals as the number of blows required to drive a split spoon sampler 305 mm into the soil, using a 63.5 kg drop hammer falling 750 mm, as per ASTM D1586 procedures. The split-spoon samplers used in the investigation limit the maximum particle size that can be sampled and tested to about 40 mm. Therefore, particles or objects that may exist within the soils that are larger than this dimension were not sampled and are not represented in the grain size distributions contained herein. The results of the field tests (i.e., SPT "N" -values) as presented on the Record of Borehole sheets and in subsequent sections of this report are the values measured directly in the field and are unfactored.

Monitoring wells were installed in Boreholes BH25-1 and BH25-3 and were constructed using nominal 50 mm diameter, Schedule 40 polyvinyl chloride (PVC) pipe with a No. 10 machine slotted screen (0.01-inch slot). The annular space between the monitoring well screen and surrounding soils was backfilled with a silica sand filter to a maximum of 0.3 m above the top of the screen, and the remainder of the annular space was sealed with bentonite. The monitoring wells were completed with flush mounted steel casing at ground surface. Stabilized groundwater levels were obtained on February 24 and March 4, 2025.

Following completion of the drilling, the soil samples were returned to our laboratory for examination by a geotechnical engineer. Samples were submitted for grain size distribution and moisture content testing.

Co-ordination for clearances of underground utilities was provided by GEMTEC. The borehole locations were selected by GEMTEC and positioned on site relative to existing features, and underground and above ground utility constraints.

Upon completion of drilling, the ground surface elevations at the borehole and monitoring well locations were extrapolated from a topographical survey drawing provided to GEMTEC, and should be considered approximate. The borehole elevations are geodetic and referenced to CGVD-1928:1978. The coordinates at the borehole and monitoring well locations were referenced to the Universal Transverse Mercator (UTM) Zone 17, NAD 1983.

The borehole locations are shown on the Borehole Location Plan in Appendix C. Descriptions of the subsurface conditions observed in the boreholes during the investigation are provided on the Record of Borehole Sheets in Appendix D. The results of the geotechnical laboratory tests are provided on the Record of Boreholes and in Appendix E.

4.0 SUBSURFACE CONDITIONS

As previously indicated, the soil and groundwater conditions identified in the boreholes are shown on the Record of Borehole Sheets in Appendix D. The Record of Boreholes indicate the subsurface conditions at the specific borehole locations only. Boundaries between the different soils on the Records are often not distinct but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the method of drilling, the frequency and recovery of samples, the method of sampling, and the uniformity of the subsurface conditions. Subsurface conditions at locations other than the boreholes may vary from the conditions encountered in the boreholes, both laterally and with depth. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties.

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgement and GEMTEC does not guarantee descriptions as exact but infers accuracy to the extent that is common in current geotechnical practice.

In general, the subsurface conditions at the site consist of topsoil or asphalt, overlying cohesive fill and native cohesive and non-cohesive glacial till, and cohesive silty clay.

4.1 Asphalt and Topsoil

Asphalt was encountered at Boreholes BH25-1 and BH25-3 and was approximately 76 mm in thickness. A veneer of topsoil was encountered at Borehole BH25-2 and was approximately 610 mm in thickness.

4.2 Cohesive Fill Material

A cohesive fill consisting of silty clay with some sand and trace gravel and sandy silty clay with some gravel was encountered in Boreholes BH25-1 and BH25-3, underlying the asphalt. The fill extended to approximate depths of 1.4 m to 2.1 m below ground surface [i.e., Elevations (Elev.) 79.8 m to Elev. 79.9 m].

Standard penetration tests carried out in the cohesive fill material gave SPT N-values ranging from about 8 blows to 35 blows per 0.3 m of penetration, which indicates a firm to hard consistency, but generally of a firm to stiff condition. The hard consistency observed in the upper layer is likely due to the weathered crust underlying the asphalt pavement.

The water content measured on samples of the cohesive fill material ranged from about 7 percent to 17 percent.

4.3 Glacial Till

4.3.1 Cohesive Till

4.3.1.1 Upper Cohesive Till

An upper cohesive till deposit consisting of sandy silty clay with some gravel and oxidation staining was encountered in Boreholes BH25-2 and BH25-3 underlying the topsoil and fill material, respectively. The deposit ranged in thickness between 0.8 m and 1.5 m with bottom of layer extending to an approximate depth of 2.1 m below ground surface (i.e., Elev. 79.7 m to Elev. 79.1 m).

Three standard penetration tests carried out in the upper cohesive till deposit gave an SPT N-value of about 15 blows per 0.3 m of penetration, which indicates a very stiff consistency.

The water content measured on three samples of the upper cohesive till deposit ranged from about 10 percent to 13 percent.

4.3.1.2 Lower Cohesive Till

A lower cohesive till deposit consisting of gravelly sandy silty clay was encountered in Boreholes BH25-1 and BH25-2 underlying the non-cohesive till deposit. The lower cohesive till extended to an approximate depth of 5.6 m, (i.e., Elev. 75.6 m) in Borehole BH25-2. However, the bottom of the lower cohesive till could not be investigated due to the borehole terminating at a depth of 6.6 m below ground surface (Elev. 75.5 m).

Two standard penetration tests carried out in the lower cohesive till deposit gave an SPT N-value of about 22 and 35 blows per 0.3 m of penetration, which indicates a very stiff to hard consistency.

The water content measured on two samples of the lower cohesive till deposit was about 7 percent.

4.3.2 Non-Cohesive Till

A non-cohesive till deposit consisting of gravelly silty sand was encountered in all boreholes underlying fill material in Borehole BH25-1 and the upper cohesive till in Boreholes BH25-2 and BH25-3. The non-cohesive till deposit extended to depths ranging from about 4.0 m to 5.6 m below ground surface (i.e., Elev. 75.6 m to Elev. 77.8 m).

Standard penetration tests carried out in the non-cohesive till deposit gave SPT N-values ranging from about 17 to 68 blows per 0.3 m of penetration, which indicates a compact to very dense compactness condition, but generally of a dense compactness condition.

Grain size distribution testing was undertaken on one sample of the non-cohesive silty sand till deposit from Borehole BH25-2. The results are provided in Appendix E and are summarized in Table 4.1.

Table 4.1 – Summary of Grain Size Distribution Test (Silty Sand Till)

Location	Sample Number	Sample Depth (metres)	Gravel (%)	Sand (%)	Silt / Clay (%)
BH25-2	4	2.3 – 2.7	19.1	44.6	36.3

The water content measured on samples of the silty sand till deposit ranged from about 4 percent to 16 percent, but generally less than 10 percent.

4.3.3 Silty Clay

A cohesive silty clay deposit with some sand, and some gravel was encountered in Boreholes BH25-2 and BH25-3 underlying the glacial till. Sand and silt seams, shale fragments were observed within the cohesive deposit. Further, Boreholes BH25-2 and BH25-3 were terminated within this silty clay deposit.

Two standard penetration tests carried out in the silty clay deposit gave an SPT N-value of about 15 and 30 blows per 0.3 m of penetration, which indicates a very stiff to hard consistency.

The water content measured on two samples of the cohesive silty clay deposit was about 9 and 19 percent.

4.4 Groundwater Levels

Stabilized groundwater levels were measured in the monitoring wells installed in Boreholes BH25-1 and BH25-3, after completion of drilling, on February 24 and March 4, 2025. The groundwater levels and elevations have been provided in Table 4.2.

Table 4.2 – Approximate Groundwater Depth and Elevation

Monitoring Wells	Groundwater Below Existing Ground Surface (metres)		Groundwater Elevation (metres)	
	February 24, 2025	March 4, 2025	February 24, 2025	March 4, 2025
BH25-1	2.5	2.2	79.5	79.8
BH25-3	2.5	2.3	78.7	78.9

It should be noted that the groundwater levels may be higher during wet periods of the year such as the early spring or following periods of seasonal and annual precipitation.

5.0 GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

This section of the report provides guidance on the geotechnical engineering design aspects of the project based on our interpretation of the boreholes advanced as part of the site investigation. Hydrogeological comment on temporary construction dewatering needs and permitting are also provided (site specific Hydrogeological Report by GEMTEC provided under separate cover). It is stressed that the information in the following sections is provided for the guidance of the designers and is intended for this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety, and equipment capabilities.

The professional services retained for this project include only the geotechnical engineering and hydrogeological (provided under separate cover) aspects of the subsurface and groundwater conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site from materials from offsite sources are outside the terms of reference for this report and have not been investigated or addressed.

Based on the result of the investigations, the subsurface soil conditions encountered at the site are considered to be generally suitable for the proposed development, utilizing conventional shallow strip and spread footings, serviced underground utilities, and overall site development.

5.1 Site Preparation

5.1.1 Site Grading

Based on the existing site grades relative to the road elevations, minor grade raise (of up to a maximum of 0.5 m) should be anticipated. As such, majority of the site grading activities will be

centred on sub-excavation of the existing foundations and replacement with suitable fill materials.

Topsoil, vegetation and trees, existing building foundations, buried services, pavement structures, existing pond, and any soil containing organics should be stripped from the site prior to placement of engineered fill. Outside of road allowances, utility corridors, building envelopes and the like, the topsoil may be reused for general grading in areas where the fill is not required to support settlement sensitive structures (e.g., as structural fill). Any oversize cobbles, boulders and other deleterious materials should be excluded from the reuse as site grading fill.

Where the (mineral) topsoil is used as general lot fill, its thickness should be limited to about 1.5 m. The topsoil fill should be placed in maximum 300 mm loose lifts and uniformly compacted to 95 percent of Standard Proctor Maximum Dry Density (SPMDD). To have any success in placing topsoil as lot grading fill, it must be placed at or close to its optimum water content to achieve workability and adequate compaction, to minimize post-construction settlements and/or lateral movements (e.g., of fences, etc.).

It should be noted that the existing pool located behind Lot 678 must be cleaned out and any concrete and/or tile elements should be completely removed to expose the underlying soils. The exposed soils will need to be inspected prior to backfilling. The sides of the exposed soils should be adequately sloped to ensure that engineered fill are adequately worked into the existing soils.

In areas where there is existing fill material, the fill should be removed, and the subgrade condition should be inspected prior to placement of engineered fill. Any areas where loose or soft soils are encountered should be sub-excavated and replaced with compacted engineered fill (see Section 5.1.2) under the direction of qualified geotechnical personnel. However, this should be carried out above the groundwater level and in dry weather conditions.

5.1.2 Engineered Fill

A grading plan was not available at the time of this report preparation; however, it is anticipated that engineered fill will be required to achieve the grade raise due to the need to sub-excavate and replace the existing fill materials.

Prior to placing engineered fill at the site, all topsoil, existing fill materials, buried foundations, and disturbed/reworked or deleterious materials within the limits of the engineered fill should first be removed. The limits of any engineered fill should extend laterally beyond the intended structure’s footprint in all directions by at least the thickness of the engineered fill plus one metre (i.e., up to 2.5 m).

The approved engineered fill should consist of the excavated glacial tills or import material consisting of OPSS.PROV 1010 Select Subgrade Material (SSM), Granular A or Granular B Type I, and placed in maximum 300 mm loose lifts and compacted to a minimum 98 percent

SPMDD or as noted otherwise. The sub-excavated silty clay fill may also be used as engineered fill but must be placed above the founding elevations (i.e., not deeper than 1.2 m from the finished grade). The water contents at the time of placement should be within +/- 2 percent of its optimum moisture content to achieve the required compaction. Cobbles and boulders exceeding 150 mm in diameter should be removed from the engineered fill prior to compaction.

After stripping and sub-excavating to the founding elevations (or sub-excavation depth where required), the prepared subgrade should be proof rolled (where possible) and inspected by qualified geotechnical personnel to confirm that the foundation soils are uniform and consistent with those encountered in the boreholes and are free of any softened / loosened or deleterious materials. Locations where less competent subgrade conditions (i.e., soft / loose soil, organic soils, or other deleterious materials) are identified during subgrade inspection should be sub-excavated and replaced with engineered fill.

It is strongly recommended that construction should be carried out under dry conditions. If construction is required during freezing temperatures, the subgrade should be protected immediately from freezing by placing additional soil cover above the final subgrade to provide temporary frost protection.

5.2 Foundations for Residential Buildings

The subsurface condition within the site consists of deposits of very stiff glacial till, dense to very dense non-cohesive till, and stiff to very stiff silty clay. The proposed foundations are anticipated to be founded on very stiff cohesive and dense to very dense non-cohesive glacial till. It has been assumed that shallow foundations will not be placed on the existing fill materials.

Spread and strip footings foundations are considered feasible foundation elements for the proposed residential structures within the very stiff cohesive till deposit and dense to very dense non-cohesive till deposit and may be designed with a factored geotechnical bearing resistance (based on a resistance factor of 0.5) at the Ultimate Limit State (ULS) of 300 kPa, and an unfactored bearing reaction at the Serviceability Limit State (SLS) of 200 kPa.

It should be noted that the site soils may be frost susceptible and the base of the footing could be subject to seasonal heave and settlement because of frost action. All exterior footings should be provided with at least 1.3 m of earth cover for frost protection purposes. Isolated (unheated) footings that are in areas that are to be cleared of snow should be provided with at least 1.3 m of earth cover for frost protection purposes. Alternatively, frost protection measures could be provided by means of a combination of earth cover and extruded polystyrene insulation. Further details regarding the insulation of foundations can be provided, if necessary.

5.2.1 Foundation Walls and Isolated Piers

To avoid ad-freeze and possible jacking (heaving) of the foundations, the interior and exterior of the foundation walls should be backfilled with free draining, non-frost susceptible material that meets OPSS requirements for Granular B Type I or II. The backfill should be compacted in maximum 300 mm thick lifts to at least 95 percent SPMDD using suitable vibratory compaction equipment. Alternatively, where the native soils (excluding the cohesive fill) are used as backfill at the building exterior, appropriate external insulation (e.g., a semi-rigid glass fibre/SM Styrofoam) should be installed to help absorb the adfreezing forces. The insulation should extend to the footing depth. Where the backfill will ultimately support areas of hard surfacing (pavement, sidewalks, or other similar surfaces), the backfill should be placed in maximum 200 mm thick lifts and compacted to 95 percent SPMDD using suitable compaction equipment.

Backfilling against isolated (unheated) walls or piers should consist of free draining, non-frost susceptible material meeting OPSS Granular B Type I or II requirements. Other measures to prevent frost jacking of foundation elements can be provided if required.

Where areas of hard surfacing (pavement etc.) abut the proposed structures, a gradual transition should be provided between those areas of hard surfacing underlain by non-frost susceptible granular wall backfill and those areas underlain by existing frost susceptible material to reduce the effects of differential frost heaving. It is suggested that granular frost tapers be constructed from 1.3 m below finished grade to the underside of the granular subbase material for the hard surfaced areas. The frost tapers should be sloped at 1H:1V or flatter.

5.2.2 Seismic Site Class

Based on the results of the investigation, it is anticipated that the proposed structures will be founded on the stiff to very stiff / dense to very dense glacial tills.

The seismic design provisions of Table 4.1.8.4-A of the 2012 Ontario Building Code depend, in part, on the shear wave velocity of the upper 30 m of soil and/or rock below founding level. Based on the subsurface conditions encountered and our experience with similar developments in the area, the foundations at the site may be designed using a Site Class D designation.

It is likely that the site class could be improved by in situ testing. If recommended by the structural engineer, in situ geophysical testing can be carried out at the site.

5.3 Slabs on Grade (Heated Areas Only)

For slab-on-grade founded on a prepared subgrade, a modulus of subgrade reaction, k_{vb}, is typically used to represent the soil stiffness. The modulus of vertical subgrade reaction (k_{vb}) is not a fundamental soil property, and the value changes with footing size and/or the size of the loaded area(s). The current state of practise uses a standard reference vertical subgrade reaction, k_{v1}, associated with a 0.3 m x 0.3 m (i.e., 1 ft x 1 ft) plate. The modulus of vertical subgrade reaction can be estimated from the equations given below for foundations and / or

slabs on non-cohesive or cohesive soils (CFEM, 2023). However, it should be noted that these methods are approximate only and it is generally considered that carrying out a detailed settlement analysis is the more rational approach (once design details are known) to obtaining more realistic values of k_{vb}.

For slab-on-grade foundations, the modulus of subgrade reaction is defined as:

$$k = \frac{q}{\delta}$$

Where:

k is the modulus of vertical subgrade reaction for actual foundation width, b (MPa/m);

q is the applied bearing or contact pressure on the foundation; and,

δ is the settlement of the foundation under the applied pressure q.

For cohesive soils:

$$k_{vb} = \frac{0.3\ k_{v1}}{b}\left[\frac{m + 0.5}{1.5m}\right]$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m);

b is the foundation width (m); and,

m is the ratio of foundation length to width (i.e., m = *L* / b).

For non-cohesive soils:

$$k_{vb} = k_{v1}\left[\frac{3.3b + 1}{6.6b}\right]^2$$

Where:

k_{vb} is the modulus of vertical subgrade reaction for actual foundation dimension, b (MPa/m);

k_{v1} is the modulus of vertical subgrade reaction for a 1 ft x 1 ft plate (MPa/m);

b is the foundation width (m)

The base for all floor slabs should consist of at least 200 mm of Ontario Provincial Standard Specification (OPSS) Granular A compacted to at least 100 percent SPMDD in suitable lift thicknesses (typically maximum 200 mm).

For the design of interior floor slabs using a spring constant, a modulus of vertical subgrade reaction, k_{v1}, of 30 MPa/m may be used for the design of slabs placed directly on granular fill.

The design modulus of vertical subgrade reaction is derived based on the assumption that the subgrade is not disturbed during construction.

It should be noted that the modulus of subgrade reaction is not a fundamental nor intrinsic soil property and will vary depending on the rigidity of the slab and the thickness of the granular bedding. Additional analysis and input may be required for the structural design to refine the range of k_{vb} values. Where designs are sensitive to the specific modulus value(s), a more rigorous method of analysis (i.e., settlement analysis) should be undertaken to obtain modulus value(s) that are more representative of the site conditions.

To assist in preventing potential long-term settlement of the floor slab, any soft / loose / disturbed, wet, or otherwise deleterious materials should be removed from below the floor slab. An underfloor drainage system is not considered necessary provided that the floor slab level is above the finished exterior ground surface.

A polyethylene vapour barrier / retarder is recommended below the floor slabs where the floor will be covered by moisture sensitive flooring material or where moisture sensitive equipment, products or environments will exist. The ACI 302.1R-04 "*Guide for Concrete Floor and Slab Construction*" should be referenced for design purposes.

The floor slabs should be structurally separate from the foundation walls and columns and sawcut control joints should be provided at regular intervals and along column lines to reduce shrinkage cracking and allow for any differential settlement of the floor slabs.

If any areas of the building are to remain unheated during the winter period, thermal protection of the slab on grade may be required. Further details on the insulation requirements could be provided, if necessary.

5.4 Site Servicing

It should be noted that site servicing drawings (indicating pipe diameter, inverts, depths etc.) were not available at the time of writing this report. As such, we have assumed that underground infrastructure will be located within 3 m below the ground surface.

Depending on final grades, underground infrastructure is anticipated to be founded on the engineered fill, native very stiff / dense to very dense glacial tills, which is anticipated to be below the groundwater level (or above the groundwater level where underground services are within 2 m of the existing grades). In general, engineered fill and these native soils are considered suitable for supporting sewers and watermains, provided that the integrity of the base can be maintained during construction. However, if softened/loose, organic, or deleterious materials are encountered at the proposed invert level, these materials must be removed and replaced with approved engineered (or unshrinkable) fill to provide a suitable founding stratum.

5.4.1 Pipe Bedding and Cover

The bedding for watermains and sewers should be compatible with the size, type, and class of pipe, surrounding soil and loading conditions and should be designed in accordance with provincial and municipal standards.

The pipe bedding material should consist of well graded crushed stone meeting OPSS gradation requirements for Granular A or 19 mm crusher run limestone, in accordance with the City of Pickering's Drawing Nos. P-400 and P-401. The minimum bedding thickness should be 150 mm for pipes within the competent native soils. The use of clear crushed stone or 'high-performance bedding' as bedding material should not be permitted.

Cover material, from pipe spring line to at least 300 mm above the top of the pipe, should consist of granular material, such as OPSS SSM (i.e., coarse sand). The use of clear crushed stone or 'high-performance bedding' as the cover material should not be permitted.

The bedding and cover materials should be compacted in maximum 150 mm loose lift thickness to at least 98 percent SPMDD.

5.4.2 Trench Backfill

Most of the excavated materials will consist of engineered fill, native cohesive and non-cohesive glacial tills. The soils within the anticipated excavated depths will likely be below or at their estimated optimum water contents for compaction. Based on this, the excavated glacial tills at water contents of +/- 2 percent of their optimum water contents may be re-used as trench backfill, provided they are free of topsoil, organic or other deleterious materials. Some moisture conditioning may be required prior to placement as backfill. Oversized cobbles and boulders (i.e., greater than 150 mm in size) should be removed from the backfill.

Where the cohesive fill material is used as trench backfill, the soils must be broken down into smaller sizes and placed in a maximum of 200 mm thick lifts prior to compaction. Alternatively, the cohesive soils can be blended with the glacial tills prior to placement in trenches.

Alternatively, the trench may be backfilled with imported free draining, non-frost susceptible granular or sandy material. The material should meet OPSS gradation requirements for SSM or Granular B Type II. To minimize future settlement of the backfill and achieve an acceptable subgrade for the roadways, curbs, driveways, etc., the backfill material should be compacted in maximum 300 mm loose lift thickness to a minimum 95 percent SPMDD from the top of the cover material to 1.0 m below the subgrade elevation. The upper 1 m of the backfill should consist of granular material and be compacted to at least 98 percent SPMDD to support the pavement structure.

Normal post-construction settlement of the compacted trench backfill should be expected. As such, consideration could be given to implementing one or a combination of the following

measures to reduce post construction settlement above the trenches, depending on the weather conditions encountered during the construction:

- Allow the overburden materials to dry prior to compaction; and / or,
- Make provision to defer final paving of the surface course asphalt in the roadway for 3 months, or longer, to allow the trench backfill settlement to occur and thereby improve the final roadway appearance.

5.5 Temporary Excavation

Excavations for the proposed structures and underground utilities are anticipated to be through the engineered fill, and native very stiff / dense to very dense glacial tills.

The sides of the excavations should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act (OHSA). The native soils and engineered fill can be classified as Type 3, with excavation side slope of 1H:1V sloped from the base of the excavation.

Flattening and / or blanketing of the side slopes may be required in the non-cohesive deposits (if encountered) depending on the weather conditions and construction procedure adopted by the contractor. Further, excavations should be left open for as short a duration as possible and completely backfilled at the end of each working day. All excavated material should be stockpiled well away (i.e., minimum 2 m) from the sides / crest of the excavation.

Where side slopes of excavations are required to be steepened to limit the extent of the excavation, then some form of trench support system or engineered temporary support system may be required. It is emphasized that ‘trench box’ support systems provide protection for construction personnel, but do not provide any lateral support for the adjacent excavation walls, underground services, or existing structures. Any voids between the excavation walls and the exterior of the trench box should be filled immediately to restore lateral support.

If there is insufficient space to excavate temporary open cuts, it is recommended that a shoring system consisting of braced steel sheet piles or potentially a slide rail system designed by a Professional Engineer, including assessment of the potential for basal heave be utilized. If shoring is implemented at the site, the requirements of OPSS.PROV 539 should be followed. The design of temporary works is (entirely) the responsibility of the contractor.

5.6 Temporary Groundwater Control

The groundwater levels measured in the monitoring wells ranged from about 2.2 m to 2.5 m below existing ground surface, and between approximately Elev. 78.7 m and Elev. 79.8 m at the time of this investigation.

Based on the anticipated grade raise, and frost depth for foundations, it is expected that excavations for shallow foundations will be carried out above the groundwater level. and any seepage may be controlled by properly filtered sumps and pumps. For underground services below the groundwater level, excavation will likely be carried out within the glacial tills which have low hydraulic conductivity. As such, groundwater can likely be controlled by pumping from properly constructed and filtered sumps located within the excavations, assuming the excavation will be open for a short period of time.

The rate and volume required for dewatering will be dependent on the depth of the required excavations, the groundwater levels at the time of construction and the construction methods and staging chosen by the Contractor. An application under the Environmental Activity Section Registry (EASR) of the Ontario Ministry of the Environment, Conservation and Parks (MECP) should be submitted if the pumping volumes exceed 50,000 L/day. Under the EASR, a Permit to Take Water (PTTW) is not required for water taking for construction site dewatering for volumes less than 400,000 L/day. The Hydrogeological Assessment carried out by GEMTEC will provide more details regarding groundwater control and volumes.

5.7 Asphalt Pavement Construction

5.7.1 Pavement Structure

Based on the results of the geotechnical investigation, it is our understanding that the roads within the development will be used for residential use and are classified as a Local Road in accordance with the City of Pickering Standard Drawing Series 700, dated November 2019 (City Standards). The following minimum pavement design may be considered for the internal roads:

Table 5.1 – Flexible Pavement Design Recommendations

Material	Thickness and Type of Pavement Elements	
	Light Duty Pavement	Heavy Duty Pavement (Fire Route)
Surface Course	40 mm HL 3	40 mm HL 3
Base Course	50 mm HL 8	70 mm HL 8
Granular Base	150 mm Granular A	150 mm Granular A
Granular Subbase	300 mm Granular B, Type I or II	450 mm Granular B, Type I or II

5.7.2 Effects of Subgrade Disturbance

If the road subgrade surface becomes disturbed or wetted due to construction operations or precipitation, or the granular pavement materials are to be used by construction traffic, the Granular B thicknesses provided above may not be adequate and it may be necessary to increase the thickness of the Granular B subbase or exclusively use Granular B, Type II

subbase. The contractor should be responsible for providing suitable access for construction equipment.

The required thickness of the subbase materials will depend on several factors, including contractor workmanship and schedule, contractor methodology, soil types, and weather conditions, and should be assessed by geotechnical personnel at the time of construction. In our opinion, the recommended approach for subgrade preparation from a geotechnical point of view is to:

- Proofroll the subgrade conditions at the time of construction under the supervision of experienced geotechnical personnel; and,
- Adjust the thickness or type of the subbase material and include a woven geotextile separator, as required. Unit rate allowances should be made in the contract for sub-excavation and replacement with OPSS Granular B, Type II (as required).

5.7.3 Granular Material Placement

The pavement granular materials should be compacted in maximum 300 mm thick lifts to at least 98 percent SPMDD using suitable vibratory compaction equipment.

5.7.4 Asphaltic Cement

Performance graded PG 58-28 asphaltic cement is recommended for the road construction.

5.7.5 Transition Treatments

In areas where the new pavement structure will abut existing pavements, the depths of the granular materials should taper up or down at 5H:1V, or flatter, to match the depths of the granular material(s) exposed in the existing pavement. Any undermining or broken edges resulting from the construction activities should be removed by saw cut. All milled surfaces and butt joints should be properly tack coated prior to asphalt placement.

5.7.6 Pavement Drainage

To provide drainage of the granular base and subbase, the granular material should extend to ditches or drainage outlets. The bottom of the granular subbase layer should be at least 0.3 m above the bottom of the ditch or drainage outlet and should have positive drainage away from the site.

If storm sewers and catch basins are installed, it is suggested that continuous subdrains connected to catch basins be provided along the perimeter of both sides of all roadways to assist with drainage of the pavement structure. These drains should be installed at the bottom of the subbase layer.

6.0 ADDITIONAL CONSIDERATIONS

6.1 Monitoring Well Abandonment

All monitoring wells installed as part of the previous and current investigations should be decommissioned when no longer required by a licensed Water Well Contractor in accordance with applicable legislation. The well abandonment could be carried out in advance of or during construction.

6.2 Environmental and Management of Excess Soil Considerations

It is noted that the professional services retained for this project include only the geotechnical and hydrogeological aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination, including naturally occurring sources of contamination, are outside the terms of reference for this report. This report does not constitute a Phase II Environmental Site Assessment (ESA), nor does it constitute a contaminated material management plan.

It is recommended that soil samples be collected prior to and/or during construction to support the disposal or re-use of excess soil generated from the site.

6.3 Corrosion Considerations

The potential for the subsurface soil and groundwater conditions to corrode concrete and steel elements, or the like, should be considered in the final design. Additional sampling and / or testing may be required, or suitable protection measures (i.e., sulphate resistance concrete, sacrificial thickness, cathodic protection, etc.) should be considered by the designer.

6.4 Design Review and Construction Observation

The engagement of the services of the geotechnical consultant during construction is recommended to confirm that the subsurface conditions throughout the proposed site development and excavations do not materially differ from those given in the report, and that the construction activities do not adversely affect the intent of the design. The subgrade surfaces for the services and pavement construction should be inspected by experienced geotechnical personnel to ensure that suitable materials have been reached and properly prepared. The placing and compaction of earth fill and imported granular materials should be inspected to ensure that the materials used conform to the grading and compaction specifications.

7.0 CLOSURE

We trust that this report meets your immediate requirements. If conditions that differ from those assumed in this geotechnical investigation report are encountered during construction, GEMTEC should be given the opportunity to review the recommendations presented herein.

If you have any questions or require additional information, please contact the undersigned.

Regards,

GEMTEC Consulting Engineers and Scientists Limited

Pricilla Moore, B.Sc.
Geotechnical E.I.T.

Timi Olumuyiwa, M.Sc., P.Eng., PMP
Senior Geotechnical Engineer

APPENDIX A

Conditions and Limitations of This Report

CONDITIONS AND LIMITATIONS OF THIS REPORT

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
2. **Copyright:** The contents of this report are subject to copyright owned by GEMTEC, save to the extent that copyright has been legally assigned by us to another party or is used by GEMTEC under license. To the extent that GEMTEC owns the copyright in this report, it may not be copied without our prior written agreement for any purpose other than the purpose indicated in this report. The methodology (if any) contained in this report is provided to the Client in confidence and must not be disclosed or copied to third parties without the prior written agreement of GEMTEC. Disclosure of that information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests.
3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC cannot be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in Property Value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions,

misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of of the subsurface descriptions.

    Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

    During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Concept Plan

KEY PLAN N.T.S

THE INFORMATION IN THIS SITE PLAN IS FROM
PLAN OF SURVEY OF
PART OF LOTS 9, 10 & 13
AND
LOTS 11 & 12
BLOCK D
REGISTERED PLAN 65
TOWN OF PICKERING
(REGIONAL MUNICIPALITY OF DURHAM)

SCALE 1:200

4 2 0 4 8 12
METRES

RICHMOND SURVEYING INC.
© COPYRIGHT 2023

LOT AREA = 3962.187 SQ M (0.39 HEC)(0.97 ACRES)
NET LOT AREA = 3808.95 SQ M (0.38 HEC)(0.94 ACRES) (without the road widening block area)
BUILDING COVERAGE = 1482.68 SQ M (38.93%)
PAVED AREA = 911.0 SQ M (23.92%)
LANDSCAPE AREA = 1,415.27 SQ M (37.15%)
DENSITY (21 UNITS) = 53.84 UNIT PER NET HECTARES
BUILDINGS (GFA):
BUILDING–A (4 UNITS)
BUILDING–B (6 UNITS)
BUILDING–C (6 UNITS)
BUILDING–D (5 UNITS)
TOTAL:(21 UNITS)

TOTAL # PARKING =2 PARKING SPACES/UNIT PARKING
TOTAL # VISITOR PARKING =6 PARKING SPACES

No.	Description	Date	Rev.
8	ISSUED FOR CLIENT REVIEW	NOV 18, 2024	SA
7	ISSUED FOR CLIENT REVIEW	NOV 14, 2024	SA
6	ISSUED FOR CLIENT REVIEW	SEP 30, 2024	SA
5	ISSUED FOR CLIENT REVIEW	SEP 04, 2024	SA
4	ISSUED FOR CLIENT REVIEW	AUG 06, 2024	SA
3	ISSUED FOR CLIENT REVIEW	JULY 02, 2024	SA
2	ISSUED FOR CLIENT REVIEW	JUNE27, 2024	SA
1	ISSUED FOR CLIENT REVIEW	JUNE 21, 2024	SA

CLIENT: PLAZA 6 INC.

666,668,672,678,682 LIVERPOOL ROAD

ELEVATION:

Drawing No. A-101

CONCEPT PLAN
3 STOREY CONDO TOWNHOUSES

DATE ISSUED: MAY 27, 2024

PROJECT #: 2024-19

MARKETING NAME: -

SCALE: 1:200

MUNICIPALITY: CITY OF PICKERING

Cassidy + Company
Residential Design Consultants
60 RANDALL DRIVE, SUITE 11, AJAX, ONTARIO L1S 6L3
T:905-619-1270 F:905-619-1269

APPENDIX C

Borehole Location Plan

Legend

BH # BOREHOLE ID

XX.X GROUND SURFACE ELEVATIONS, (m amsl)

BOREHOLE LOCATION

MONITORING WELL LOCATION

SITE BOUNDARY

NOTES:

1. All locations approximate
2. Coordinate system: NAD 1983 UTM Zone 17N
3. Geographic dataset source: Ontario GeoHub.
4. Contains information licensed under the Open Government Licence – Ontario.
5. Ground surface elevations for Borehole locations extrapolated from LIVERPOOL SIGNED.dwg, & considered approximate.
6. m amsl = metres above mean sea level.
7. "Site Boundary" provided by RICHMOND SURVEYING INC., October 24, 2023.
8. Service Layer Credits: World Street Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Imagery: Maxar, Microsoft

Scale:

1:400

0 5 10 20 30 Meters

Drawing: BOREHOLE LOCATION PLAN

Client: PLAZA 6 INC.

Project: PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
BETWEEN 666 AND 682 LIVERPOOL ROAD,
PICKERING, ONTARIO

Drwn By:	S.J.	Chkd By:	P.M.
Project No.	104161.001	Revision No.	0
Date	MARCH 2025	**FIGURE 1**	

GEMTEC
Consulting Engineers and Scientists
850 Champlain Ave Suite 101,
Oshawa, ON L1J 8R2
T: (289) 274-8476
www.gemtec.ca

Folder: N:\Projects\104100\104161.001\06_Civil Drafting\Design\GeoTech\

APPENDIX D

Abbreviations and Terminology Used on Records of Boreholes
Boreholes BH25-1 to BH25-3

ABBREVIATIONS AND TERMINOLOGY USED ON RECORDS OF BOREHOLES AND TEST PITS

SAMPLE TYPES	
AS	Auger sample
CA	Casing sample
CS	Chunk sample
BS	Borros piston sample
GS	Grab sample
MS	Manual sample
RC	Rock core
SS	Split spoon sampler
ST	Slotted tube
TO	Thin-walled open shelby tube
TP	Thin-walled piston shelby tube
WS	Wash sample

SOIL TESTS	
w	Water content
PL, w_p	Plastic limit
LL, w_L	Liquid limit
C	Consolidation (oedometer) test
D_R	Relative density
DS	Direct shear test
G_S	Specific gravity
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	Organic content test
UC	Unconfined compression test
γ	Unit weight

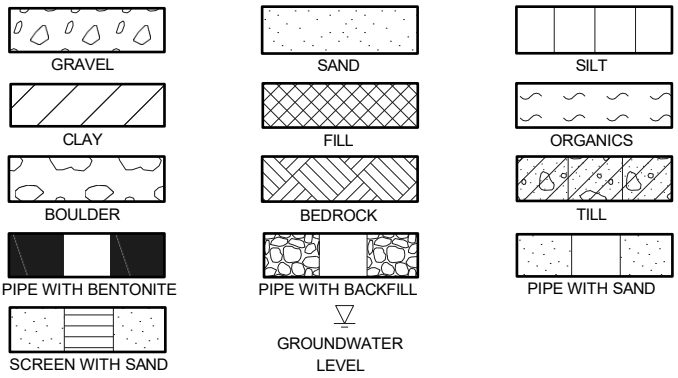
PENETRATION RESISTANCE

Standard Penetration Resistance, N
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 millimetres (30 in.) required to drive a 50 mm split spoon sampler for a distance of 300 mm (12 in.). For split spoon samples where less than 300 mm of penetration was achieved, the number of blows is reported over the sampler penetration in mm.

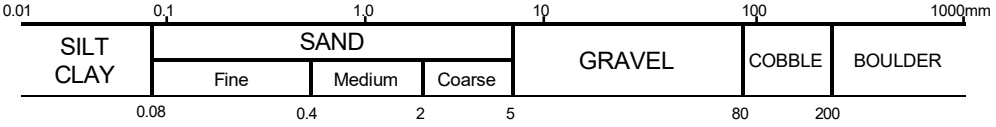
Dynamic Penetration Resistance
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive a 50 mm (2 in.) diameter 60° cone attached to 'A' size drill rods for a distance of 300 mm (12 in.).

WH	Sampler advanced by static weight of hammer and drill rods
WR	Sampler advanced by static weight of drill rods
PH	Sampler advanced by hydraulic pressure from drill rig
PM	Sampler advanced by manual pressure

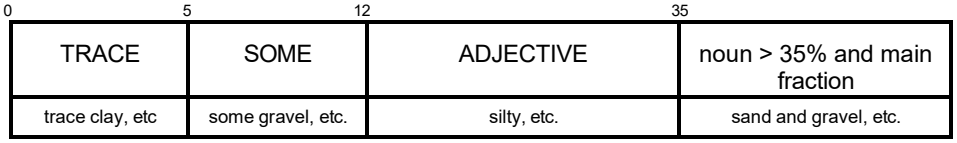
COHESIONLESS SOIL Compactness		COHESIVE SOIL Consistency	
SPT N-Values	Description	Cu, kPa	Description
0-4	Very Loose	0-12	Very Soft
4-10	Loose	12-25	Soft
10-30	Compact	25-50	Firm
30-50	Dense	50-100	Stiff
>50	Very Dense	100-200	Very Stiff
		>200	Hard



GRAIN SIZE



DESCRIPTIVE TERMINOLOGY



RECORD OF BOREHOLE : BH25-1

CLIENT: Plaza 6 Inc.
PROJECT: Proposed Residential Development Between 666 and 682 Liverpool Road, Pickering, Ontario
JOB#: 104161.001
LOCATION: See Borehole Location Plan

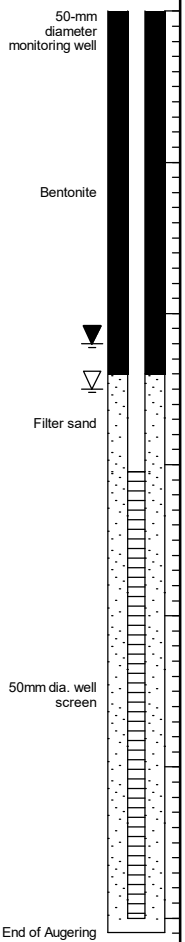
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		82.00				
0		ASPHALT (~76.2 mm thick)		81.92 / 0.08				
		FILL - (CL) SILTY CLAY, some sand, trace gravel; brown and grey; cohesive, w>PL, hard to firm			1	SS	607	35
1					2	SS	457	8
					3	SS	305	10
2				79.87				
	Power Auger / Solid Stem Auger (152mm OD)	(SM) gravelly SILTY SAND; grey (TILL); non-cohesive, moist, compact to very dense		2.13	4	SS	457	17
3		- auger grinding between 3.0 m to 3.8 m			5	SS	254	50 /0.1
4		- grey at 4.6 m			6	SS	457	44
5				76.44				
		(CL) gravelly sandy SILTY CLAY; grey (TILL); cohesive, w~PL, hard		5.56				
6					7	SS	457	35
				75.45				
		End of Borehole		6.55				
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Due to auger refusal at 3.0 m, borehole location was shifted approximately 0.7 m south of original location.

2. Unstabilized groundwater level was measured in open borehole at approximately 4.7 m below ground surface upon completion of drilling.

3. Monitoring well installed as shown upon completion of drilling.

4. Stabilized groundwater levels measured in the monitoring well are as follows:

Date	Depth (m bgs)	Elev. (m)
02/24/2025	2.5	79.5
03/04/2025	2.2	79.8

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
25/02/24	2.5 ▽	79.5
25/03/04	2.2 ▼	79.8

GEMTEC
Consulting Engineers and Scientists

LOGGED: PB
CHECKED: TO

GEO - BOREHOLE LOG 104161.001.GPJ GEMTEC 2018.GDT 3/5/25

RECORD OF BOREHOLE : BH25-2

CLIENT: Plaza 6 Inc.
PROJECT: Proposed Residential Development Between 666 and 682 Liverpool Road, Pickering, Ontario
JOB#: 104161.001
LOCATION: See Borehole Location Plan

SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2025

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		Ground Surface		81.80						
0	Power Auger / Solid Stem Auger (152mm OD)	TOPSOIL		81.19	1	SS	607	5		
		(CL) sandy SILTY CLAY, some gravel; brown; oxidation stains (TILL); cohesive, w~PL, very stiff		0.61	2	SS	457	15		
1										
					3	SS	457	15		
2										
		(SM) gravelly SILTY SAND; brown (TILL); non-cohesive, moist, dense		79.67 2.13	4	SS	457	35	MH	
										Backfilled with Bentonite
3					5	SS	457	43		
4		(CL) gravelly sandy SILTY CLAY; grey (TILL); cohesive, w<PL, very stiff		77.76 4.04	6	SS	457	22		
5										
		(CL) SILTY CLAY, some sand, silt and sand seams; grey; cohesive, w~PL, very stiff		76.24 5.56	7	SS	457	15		
6										
		End of Borehole		75.25 6.55						
7		Notes: 1. Borehole was dry upon completion of drilling. 2. Borehole was backfilled with bentonite upon completion of drilling.								
8										
9										
10										

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: NATURAL, REMOULDED
WATER CONTENT, %: W_P, W, W_L
10 20 30 40 50 60 70 80 90

GEMTEC
Consulting Engineers and Scientists

LOGGED: PB
CHECKED: TO

GEO - BOREHOLE LOG 104161.001.GPJ GEMTEC 2018.GDT 3/5/25

RECORD OF BOREHOLE : BH25-3

CLIENT: Plaza 6 Inc.
PROJECT: Proposed Residential Development Between 666 and 682 Liverpool Road, Pickering, Ontario
JOB#: 104161.001
LOCATION: See Borehole Location Plan

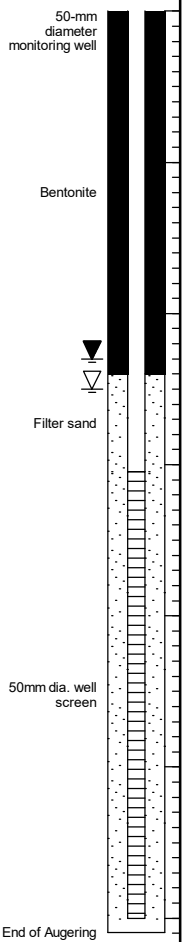
SHEET: 1 OF 1
DATUM: CGVD28
BORING DATE: Feb 14 2025

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		81.20				
0	Power Auger	ASPHALT (~76.2 mm thick)		81.12 0.08				
	Solid Stem Auger (152mm OD)	FILL - (CL) sandy SILTY CLAY, some gravel; brown; cohesive, w<PL, very stiff to stiff			1	SS	607	27
1					2	SS	102	11
		(CL) sandy SILTY CLAY, some gravel; brown (TILL); cohesive, w<PL, very stiff		79.83 1.37	3	SS	457	15
2		(SM) gravelly SILTY SAND; brown to grey (TILL); non-cohesive, moist, very dense to dense		79.07 2.13	4a	SS	457	
					4b	SS	457	52
		- grey at 2.67 m			5	SS	457	68
3								
4								
					6	SS	457	40
5		(CL) SILTY CLAY, some sand, some gravel; grey, shale fragments; cohesive, w<PL, hard		75.64 5.56				
6					7	SS	457	30
		End of Borehole		74.65 6.55				
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



Notes:

1. Unstabilized groundwater level was measured in open borehole at approximately 5.9 m below ground surface upon completion of drilling.

2. Monitoring well installed as shown upon completion of drilling.

3. Stabilized groundwater levels measured in the monitoring well are as follows:

Date	Depth (m bgs)	Elev. (m)
02/24/2025	2.5	78.7
03/04/2025	2.3	78.9

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
25/02/24	2.5 ▽	78.7
25/03/04	2.3 ▼	78.9

GEMTEC
Consulting Engineers and Scientists

LOGGED: PB
CHECKED: TO

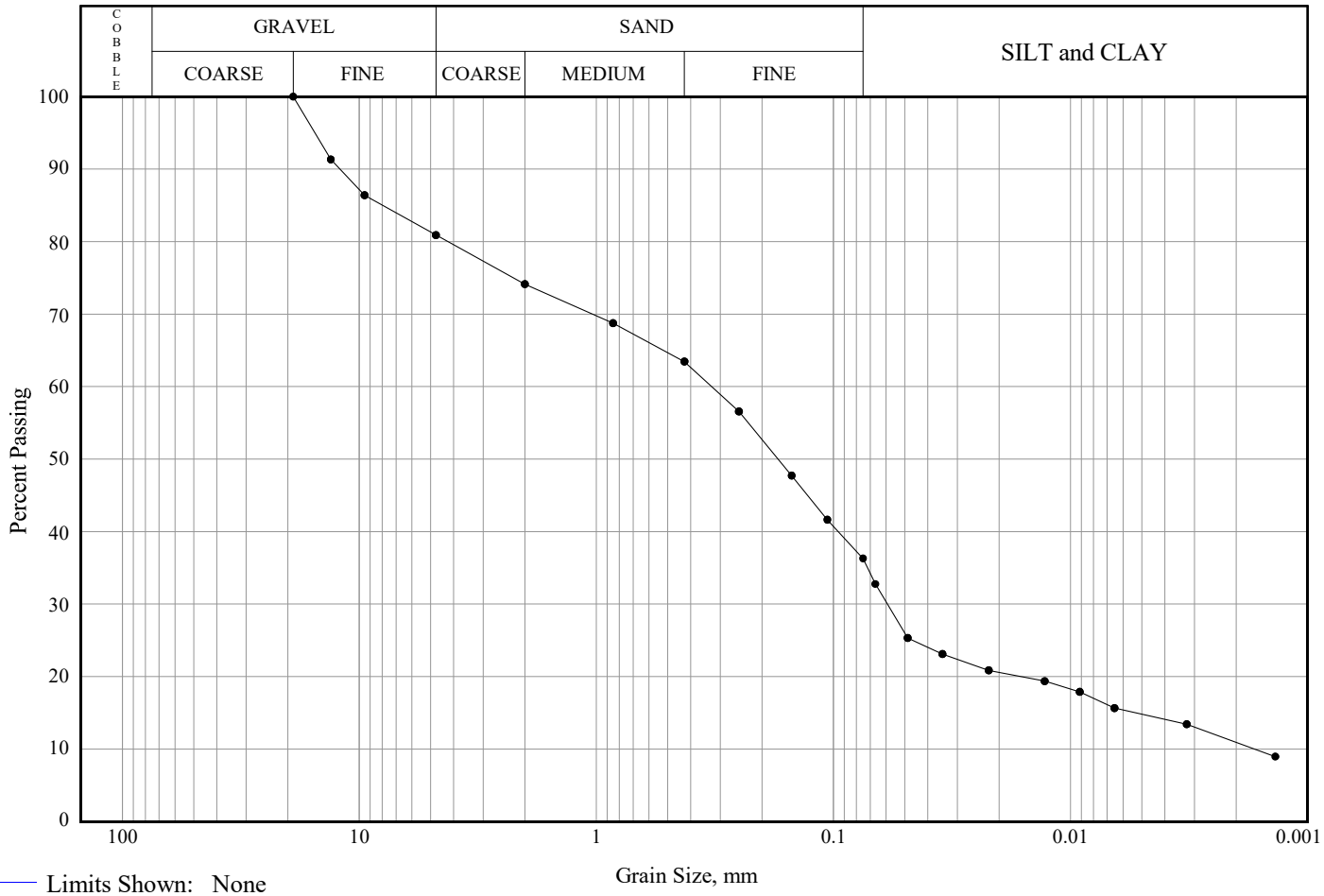
GEO - BOREHOLE LOG 104161.001.GPJ GEMTEC 2018.GDT 3/5/25

APPENDIX E

Geotechnical Test Results

GEMTEC Consulting Engineers and Scientists	Client: Plaza 6 Inc. Project: Proposed Residential Development Between 666 and 682 Liverpool Road, Pickering, Ontario Project #: 104161.001	Soils Grading LS-702/ASTM D-422

Note: More information available upon request

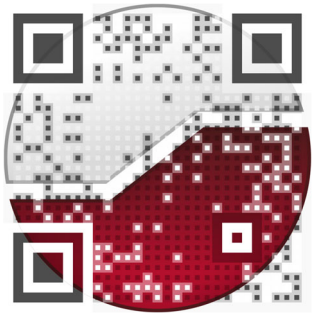


Limits Shown: None

Line Symbol	Sample	Borehole/ Test Pit	Sample Number	Depth	% Cob.+ Gravel	% Sand	% Silt and Clay
—●—	(SM) gravelly SILTY SAND	BH25-2	SA-4	2.3-2.7	19.1	44.6	36.3

Line Symbol	USCS Classification	USCS Symbol	D_{10}	D_{15}	D_{30}	D_{50}	D_{60}	D_{85}	% 5-75µm
—●—	Gravelly Silty Sand	SM	0.002	0.005	0.06	0.17	0.33	7.98	25.4

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité