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Geotechnical Investigation
Proposed Mid-Rise Development

198 to 206 Plains Road East
Burlington, Ontario
L8N 1E3

Prepared for:

Concept Lines Inc.
% Landwise
310 Limeridge Road West, Suite 6
Hamilton, Ontario
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Landtek File: 25004
April 2, 2025

EXECUTIVE SUMMARY

SCOPE OF SERVICES

Proposed Development	The proposed development is understood to comprise of an approximately six storey, mid-rise structure with a mechanical penthouse. The proposed development will include for two levels of basement parking across the full site area, with limited, at-grade deck parking also proposed to the rear of the site. No significant grade changes are anticipated.
Report Deliverables	The Geotechnical Investigation Report is required to provide an understanding of the subsurface conditions underlying the site and to provide preliminary design and construction recommendations for the proposed new mid-rise development.

SITE DETAILS AND SETTING

Coordinates	593600, 4796055	**Geodetic Elevation (approx.)**	101.0 m to 102.0 m
Site Description	The site is rectangular in shape and is situated on the southeast side of Plains Road East. The site is bound to the southwest by civic address 192 Plains Road East, to the southeast by residential properties, and to the northeast by civic address 212 Plains Road East. The topography of the site is generally flat-lying with several existing buildings that are understood to be removed prior to development.		
Geology	All boreholes except borehole BH/MW3 were drilled within an existing pavement area. Fill material was encountered in borehole BH4 and extends to depths of approximately 0.6 m below existing ground level. Interbedded deposits of sand and sand and gravel were encountered in all boreholes and extends to the maximum drill depth of approximately 12.1 m below existing ground level.		
Groundwater	Groundwater, water seepages or saturated soils were encountered during drilling in boreholes at depths of between approximately 6.0 m and 7.6 m during drilling. One return, groundwater monitoring well visit has been completed at the site to date, indicating groundwater measurements between 6.42 m and 7.75 m below the ground surface.		

ENGINEERING CONSIDERATIONS

Foundations	It is considered by Landtek that any elements of the anticipated moderately loaded, mid-mise structure may be supported by the native sands underlying the site using conventional, concrete strip or pads foundations where within shallow foundation depth ranges. It should be noted however, that alternative foundation solutions outside of conventional, concrete strip or pads foundations may be necessary should higher than anticipated loading of the proposed mid-rise structure be required.
Settlements	It is anticipated that the loads to be applied to the ground by any such structure will be generally low to moderate intensity. As such, associated settlements are not expected to be large. Therefore, the general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate.
Earthquake Considerations	Based on the soil conditions encountered, and in accordance with the Ontario Building Code Compendium, 2024, (herein "OBC") Table 4.1.8.4.-A "Site Classes, S, for Site Designation X_S", the site designation is considered 'X_D'.
At-grade Floor Slabs	It should be possible to construct the lowest (i.e., basement) floor slab level using slab-on-grade methods. The subgrade support condition is anticipated to be native sand soils, which should provide competent conditions for placing the vapour barrier material.

CONSTRUCTION CONSIDERATIONS

Excavations	The subsurface soils to be encountered during excavation at the site are expected to behave as "Type 2" materials according to the OHSA classification in Part III. Type 2 soils are characteristic of the generally compact to dense "*sand deposits*".
Subsurface Concrete	The native soils generally have a negligibly low sulphate environment and chloride concentration and are not aggressive to concrete (CSA criteria of less than 0.2 % water soluble sulphate in the soils). Therefore, normal General use (GU) hydraulic cement can be used for subsurface structures.
Construction Dewatering	It is expected that foundation elements for the proposed structure will be seated within the level at which groundwater was encountered. As such, temporary dewatering will be required during the construction process.

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1.0 INTRODUCTION

Landtek Limited (herein "*Landtek*") is pleased to submit this geotechnical investigation report for the proposed new residential mid-rise development at civic addresses 198 to 206 Plains Road East in Burlington, Ontario. Authorization to proceed with the work was received from Mr. Alaa Gaber of Concept Lines Inc. in December 2024.

Based on the drawing "*Plains Lake – dwg. No. A101*", project reference no. 0024, dated September 22, 2024, as provided to Landtek for review, and issued by Hatim Nassif Architects Inc., the proposed development is understood to comprise of an approximately six-storey, mid-rise structure with a mechanical penthouse. The proposed development will include for two levels of basement parking across the full site area, with limited, at-grade deck parking also proposed to the rear of the site. Access to the site will be from Plains Road East.

No significant grade changes are anticipated, and with a P2 basement floor slab level at approximately 7.0 m below ground level, foundations are anticipated to be seated at depths of approximately 9.0 m to 10.0 m below existing ground level. Elevator pits are expected to extend a further 1.5 m depth as a minimum.

The primary objectives of this investigation are:

- To confirm the subsurface soil and groundwater conditions for foundation design and construction;
- Provide design and construction recommendations with regards to building foundations, at-grade floor slabs, pavement structures, and subsurface drainage and utilities; and,
- Assess the characteristics of the soils to be excavated and their impact on excavatability, reuse and shoring systems.

This report has been prepared for the Client, the nominated engineers, designers, and project managers pertaining to the proposed mixed-use, mid-rise development at the site at civic addresses 198 to 206 Plains Road East in Burlington, Ontario. Reliance on this report is also extended to Municipalities and Regulatory Authorities but is limited to the intended purpose of the report only.

Any further dissemination of this report outside of those parties previously detailed is not permitted without Landtek's prior written approval. Further details of the limitations of this report are presented in Appendix A.

2.0 SITE SETTING

2.1 Site Location and Description

The site is located in Burlington, Ontario, and is centered at approximate grid reference 593600, 4796055 (UTM 17T coordinates). The Geodetic elevation of the ground surface at the site is approximately 102.0 m.

The site location is shown in Figure 2.1.1 below.

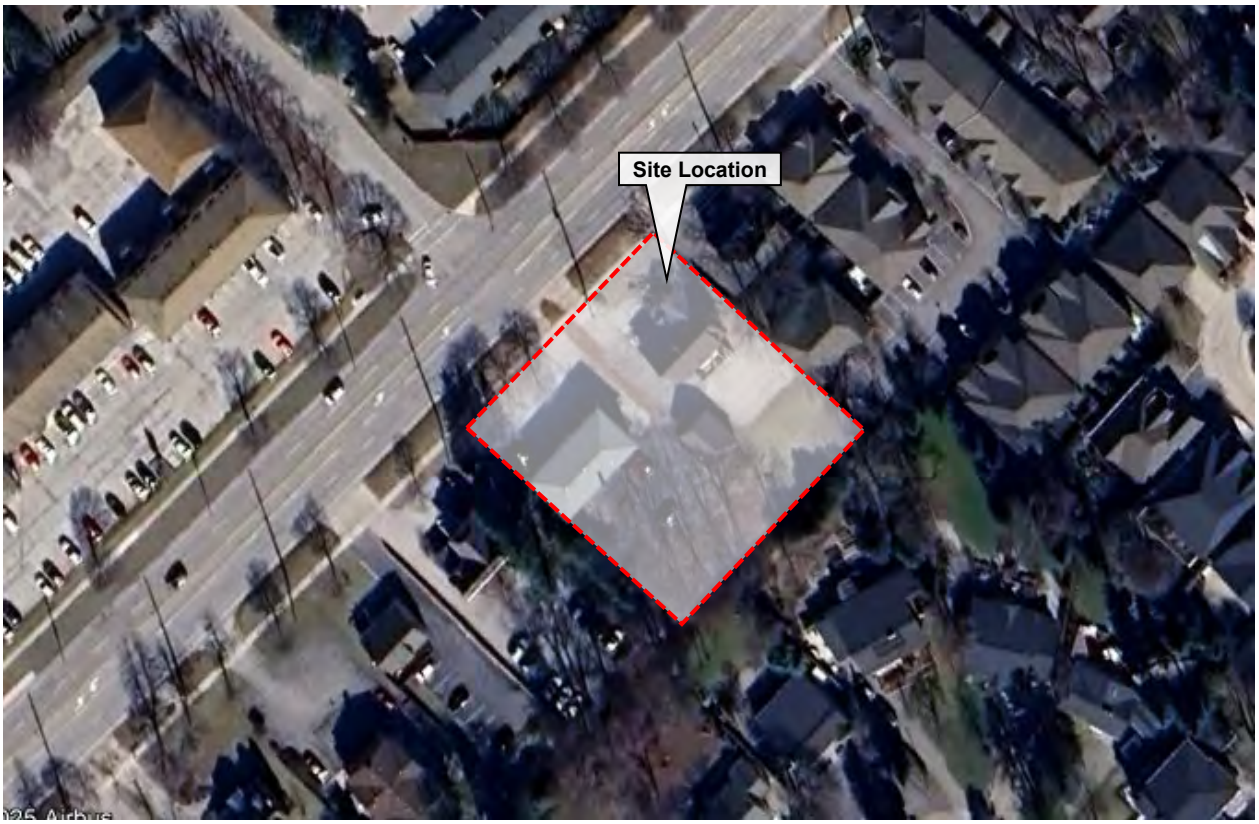


Figure 2.1.1: *Site Location and Surrounding Area*

The site is rectangular in shape and is situated on the southeast side of Plains Road East. The site is bound to the southwest by civic address 192 Plains Road East, to the southeast by residential properties, and to the northeast by civic address 212 Plains Road East.

The topography of the site is generally flat-lying with several existing buildings across the entire site. These structures are understood to be removed prior to development.

2.2 Published Geology

Based on previous geotechnical experience for the area and a review of the existing geological publications for the site area, Ontario Geological Survey (herein "*OGS*") Map P.2509 "*Quaternary Geology of the Hamilton Area*", the site is underlain by interbedded deposits of lacustrine outwash sand, and clay and silt till.

The Ontario Department of Mines (herein "*ODM*") Map 2336 "*Paleozoic Geology of the Hamilton Area*" indicates that the superficial geology is underlain by red shale of the Queenston Formation.

Information provided by historical borehole records from within the vicinity of the site, and held by the OGS, generally confirms the anticipated geological conditions beneath the site. Based on the data from records for Borehole ID 622171, located approximately 200 m northeast of the site, the soil profile comprises of fill material from the ground surface to a depth of approximately 0.1 m, followed by sand deposits to approximately 6.2 m.

3.0 FIELDWORK AND INVESTIGATION METHODOLOGY

Fieldwork undertaken at the site by Landtek included clearance of underground services, borehole layout, borehole drilling and soil sampling, and field supervision. A total of four boreholes (boreholes BH1 to BH4) were drilled between February 12 to 14, 2025. All boreholes were logged using those standard symbols and terms defined in Appendix B. The Borehole Location Plan, Drawing 25004-01, and associated borehole logs are provided in Appendix C.

Full time supervision of drilling and soil sampling operations was carried out by a representative of Landtek. The boreholes were drilled using a Diedrich D-50 truck mounted drill rig equipped with continuous flight, hollow stem augers and were extended to a maximum depth of approximately 12.1 m below existing ground level. Standard Penetration Tests (SPT's) and split spoon samples were taken during drilling at selected depths.

Two boreholes were completed as a monitoring wells and re-identified as boreholes BH/MW1 and BH/MW3. The monitoring well consisted of new/sealed 50 mm polyvinyl chloride (PVC) screen with No.10 slots threaded onto a matching riser. The screens and risers were pre-threaded including o-ring seals such that no glues or solvents were used to connect the pipe sections. The annular space between the PVC well and the borehole was backfilled to approximately 0.3 m above the top of the screen section with sand pack, and then with bentonite to existing ground level. A J-Plug lockable air-tight cap was installed on the riser. The monitoring well installation details are presented on the respective borehole logs in Appendix C.

All soil samples were transported to the Landtek's in-house, Canadian Council of Independent Laboratories (CCIL) certified laboratory and visually examined to determine their textural classification. Moisture content testing was carried out on all samples. Two selected, composite samples were submitted to SGS Canada Inc. (herein *"SGS*") to be analyzed for soil corrosivity to assist with any protective requirements for buried concrete and metal infrastructure.

Borehole locations were established by Landtek using measurements and offsets relative to existing site structures. Elevations at the borehole locations were established by Landtek in reference to the existing ground surface at the time of borehole drilling investigation.

4.0 SUBSURFACE CONDITIONS

4.1 Overview

The borehole information is generally consistent with the geological data identified in Section 2.2, with the predominant soils comprising of sand deposits.

The detailed borehole logs are presented in Appendix C, with the ground conditions encountered by the boreholes discussed in the following sections.

4.2 Existing Pavement Structure

All boreholes except borehole BH/MW3 were drilled within an existing pavement area, with an asphalt thickness of approximately 100 mm. Gravel, consisting primarily of crushed limestone, underlies the pavement structure and is approximately 50 mm in thickness.

It should be noted that pavement structure thicknesses may vary across the site, and the thicknesses measured at the borehole locations may not be representative of the pavement structure depths throughout the site area.

4.3 Organic Materials

Organic material consisting of mainly sand was encountered at the ground surface in borehole BH/MW3 and is approximately 100 mm to 200 mm in thickness.

It should be noted that organic material thicknesses may vary across the site, and the thicknesses measured at the borehole locations may not be representative of the organic material depths throughout the site area.

4.4 Fill Materials

Fill material was encountered in borehole BH4 below the existing pavement structure and extends to depths of approximately 0.6 m below existing ground level. The fill comprises of silt, with varying portions of gravel and sand, and is primarily brown in colour.

An SPT ‘‘N’’ value of 83 was reported within the fill materials, indicating their compactness condition to be well and as expected for fill soils placed historically and in an uncontrolled manner.

4.5 Sand and Gravel

Sand and gravel deposits were encountered underlying the sand deposits in boreholes BH2 and BH4, and extends to drill depths of between approximately 3.0 m and 12.6 m below existing ground level. The sand and gravel deposits were observed to be primarily brown in colour and include variable fractions of pebbles.

SPT ‘‘N’’ values ranging from 8 to 50 blows for 125 mm of split-spoon sampler penetration were reported, indicating the sand and gravel deposits to be of a loose to very dense, but generally dense compactness condition. Moisture content testing results were recorded between 4 % and 11 %, which are generally representative of a moist to very moist soil with sand as the primary constituent.

The moisture content testing results are presented on the borehole logs in Appendix C.

4.6 Sand

Sand deposits were encountered underlying the existing pavement and fill materials in all boreholes and extends to the maximum drill depth of approximately 12.1 m below existing ground level. The sand deposits were observed to be primarily brown in colour and include variable fractions of gravel, pebbles and clay.

SPT ''N'' values ranging from 4 to 50 blows for 75 mm of split-spoon sampler penetration were reported, indicating the sand to be in a loose to very dense, but generally compact condition. Moisture content testing results were recorded between 4 % and 23 %, which are generally representative of a moist to wet soil with sand as the primary constituent.

The moisture content testing results are presented on the borehole logs in Appendix C.

4.7 Bedrock

Bedrock was not encountered during this investigation.

4.8 Groundwater

Groundwater, water seepages or saturated soils were encountered during drilling in boreholes at depths of between approximately 6.0 m and 7.6 m during drilling.

One return, groundwater monitoring well visit has been completed at the site to date, the most recent results of which are presented in Table 4.8.1 following.

Table 4.8.1: Summary of Water Level Measurements

MW ID	Well Details			Groundwater Monitoring Results	
	Depth	Screen	Water Strike	March 11, 2025	Cover Type
BH/MW1	12.1 m	9.1 m – 12.1 m	7.6 m	7.75 m	Flush Mount
BH/MW3	12.1 m	9.1 m – 12.1 m	6.0 m	6.42 m	Stick-Up

It is noted that the boreholes were generally very moist to wet at depth and that groundwater resting levels are much shallower. This is indicative of the groundwater responding to exposure by rising in the monitoring well through pressurization until it reaches a static equilibrium; what is referred to as the "*piezometric level*".

It should be noted that groundwater conditions and surface water flow conditions are expected to vary according to the time of the year and seasonal precipitation levels. Water seepage may be also anticipated from soil fissures and any fill material present at the site.

5.0 FOUNDATION DESIGN CONSIDERATIONS

5.1 Shallow Foundation Considerations

It is understood that the proposed structure is assumed to comprise of an approximately six-storey, mid-rise structure with a mechanical penthouse. The proposed development will include for two levels of basement parking across the full site area, with limited, at-grade deck parking also proposed to the rear of the site. On this basis, it is anticipated that the foundations will be seated at depths of approximately 9.0 m to 10.0 m below ground level.

Based on the ground conditions observed at the borehole locations, it is considered by Landtek that any elements of the anticipated moderately loaded, mid-mise structure may be supported by the native sands underlying the site using conventional, concrete strip or pads foundations where within shallow foundation depth ranges. It should be noted however, that alternative foundation solutions outside of conventional, concrete strip or pads foundations may be necessary should higher than anticipated loading of the proposed mid-rise structure be required.

Table 5.1.1 summarizes the preliminary, recommended geotechnical reactions at the Serviceability Limit State (herein "*SLS*") and factored geotechnical resistances at the Ultimate Limit State (herein "*ULS*") for the native soils. It should be noted that the design parameters have been determined by Landtek for the design stage only.

In accordance with the Ontario Building Code (herein "*OBC*"), 9.12.2.2 (5), and based on local experience, the shallowing of exterior and interior footings to 0.9 m and 0.6 m depth below the basement finished floor level respectively, may be adopted for the proposed development. Such shallowing of foundations is to be limited to only those areas where a minimum of one basement level is to be included.

Table 5.1.1: Limit State Foundation Design Values

Approximated Founding Ranges	Founding Stratum	Foundation Design Value	
Depth		SLS [1 2]	ULS [3 4]
±9.0 m to ±10.0 m	Sand	225 kPa	338 kPa

Notes:
1. The National Building Code general safety criterion for the serviceability limit states is: SLS resistance ≥ effect of service loads.
2. Recommended SLS bearing values conform to Estimated Values based on soil types given in Tables K-8 and K-9 of the National Building Codes User's Guide.
3. The ULS resistance factor for shallow foundations is 0.5, as given in Table K-1 of the National Building Code User's Guide.
4. The National Building Code general safety criterion for the ultimate limit states is: factored ULS resistance ≥ effect of factored loads.

Where the bearing levels of the footings are at different design elevations, the footing base levels should be stepped along a line of 7V:10H, drawn upwards from the lowest footing, to avoid overlapping stresses.

Subsurface conditions can vary over relatively short distances and the subsurface conditions revealed at the test locations may not be representative of subsurface conditions across the site. Therefore, a Geotechnical Engineer should be engaged during construction to examine the exposed sub-soil quality and condition, and confirm the subsurface conditions are consistent with design assumptions. This is in compliance with field review requirements in the National Building Code, Volume 1, Clause 4.2.2.3.

Design factors related to structural loads will determine the most cost-effective foundation system for the proposed development. The impact on foundation size and soil bearing pressure is illustrated in Figure 5.1.1 and emphasizes that foundation design sizes, bearing pressures, and

bearing levels must be taken into account to avoid excessive consolidation settlements.

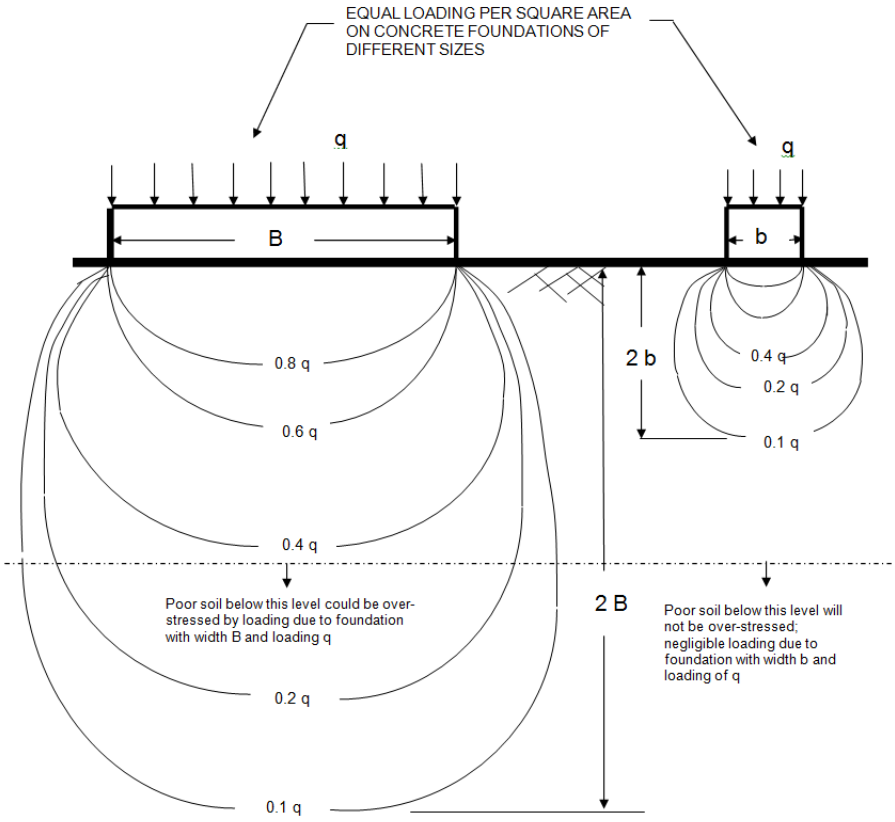


Figure 5.1.1: *Illustration of Load Distribution below Variable Size Foundations with the Same Applied Loading*

Footing foundations may be considered an appropriate option, though the acceptability of footings will depend upon design issues such as the elevation of the lowest floor level and the structural loading. If the footing design criteria provided in this report cannot be satisfied then an alternative solution may be considered, such as a piled solution, particularly if the proposed structures are of a generally high loading than anticipated.

5.2 Raft Foundation Considerations

As outlined in Section 5.1, for foundations of a higher loading a raft foundation may be considered an appropriate, shallow-seated alternative to strip or spread foundations.

The soil parameters to be used in the raft foundation design process include the modulus of subgrade reaction, corrected for the building footprint size, and the limiting average pressure at the underside of the raft foundation. The net average bearing pressure at the SLS acting on the underside of the raft should be taken as 200 kPa for the native soils underlying the site at depths of approximately 7.5 m to 8.5 m below existing ground level.

Design values for the modulus of subgrade reaction generally decrease when the size of the loaded plate (or footing) is larger than 0.3 m by 0.3 m. For granular soils, if the loaded area on the soil is a width of b, the modulus of subgrade reaction can be taken as:

$$K_{vb} = K_{v1}\left(\frac{b+0.3}{2b}\right)^2$$

where:

k_{v1}	=	modulus of subgrade reaction for a loaded plate of dimensions 0.3 m x 0.3 m;
	=	32 MPa/m, considered representative of the predominant soil bearing conditions at depth across the site;
b	=	raft foundation width in metres;
k_{vb}	=	modulus of subgrade reaction in MPa/m for actual foundation dimension b

The recommended limit state bearing capacities provided in this report are based on the available borehole data, knowledge of the geotechnical and geological history of the area, and the condition that construction quality assurance inspection will be carried out by Landtek.

Construction quality assurance is considered essential to confirm that the bearing stratum and bearing levels are consistent with the findings of this report, and the foundation installations are in accordance with accepted best practices.

5.3 Frost Susceptibility

The fill material and shallow soils encountered across the site are considered sensitive to water and frost, and their physical and mechanical properties are dependent on in-situ moisture content. As such, the founding soils at the site are considered to have a moderate to high frost susceptibility, being classified as Frost Group "*F4*" (Table 13.1 of the "*Canadian Foundation Engineering Manual*", 4th Edition). However, the identified depths for foundations, as given in Section 5.1 are considered to be below the maximum extents of influence from frost penetration in the Burlington area.

Should any re-grading be required as part of the proposed development and adjacent to the new structures, it will be important to ensure that the associated exterior footings will have a minimum of 1.2 m of soil cover, or equivalent suitable insulation, for frost protection.

5.4 Settlement Considerations

Based on the outline information provided for the nature of the proposed redevelopment of the site, it is anticipated that the loads to be applied to the ground by any such structure will be generally low to moderate intensity.

As such, associated settlements are not expected to be large. Therefore, the general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate.

5.5 Existing Building Demolition

It is understood that all structures, including pavements and services, will be removed prior to the proposed development. For the purposes of this report, it has been assumed that any existing structures and all associated substructures will be removed in full prior to construction.

Should there be a need to fill excavations created by the demolition of the existing structure with engineered fill or unshrinkable backfill prior to commencing the proposed development, Landtek should be contacted to determine the most appropriate placement requirements of the fill material.

5.6 Seismic Design Considerations

Based on the soil conditions encountered, and in accordance with the Ontario Building Code Compendium, 2024, (herein "*OBC*") Table 4.1.8.4.-A "*Site Classes, S, for Site Designation X_s*", the site designation is considered 'X_D'.

An improved seismic site classification may be achieved through the completion of a shear wave velocity test at the site using Multi-channel Analysis of Surface Waves (herein "*MASW*") methodologies.

5.7 Damp Proofing and Waterproofing Considerations

The subsurface areas should be damp proofed and comply with the OBC requirements. As a minimum it is recommended that the damp proofing system include a Delta Drainage Board or MiraDrain 2000 series product, or an approved alternative, along with an asphalt-based spray-on wall coating.

Based on the anticipated depths of foundations, it is recommended that all subsurface structures and areas (i.e., basement walls, floor slabs etc.) are appropriately waterproofed below the "*seasonally highest groundwater level*", which can be provided by a Hydrogeological Report. The required buffer zone (nominally 1.0 m to 1.5 m above the stabilized or highest recorded groundwater level) should be also taken into consideration).

6.0 FLOOR SLAB AND PERIMETER DRAINAGE CONSIDERATIONS

Based on the borehole soil conditions and preliminary design information provided to Landtek, it should be possible to construct the lowest (i.e., basement) floor slab level using slab-on-grade methods. The subgrade support condition is anticipated to be native sand soils, which should provide competent conditions for placing the vapour barrier material.

After the subgrade has been prepared to the underfloor design elevation it is recommended that the area be proof-rolled with a loaded tandem axle dump truck to delineate if there are soft or unstable ground conditions that require repair. This operation should be completed before the underfloor vapour barrier granular material is placed.

It is recommended that a minimum 200 mm layer of clear, 19 mm crushed quarried stone be used as the vapour barrier under the floor slab. The vapour barrier stone should meet the requirements of Ontario Provincial Standard Specifications (herein "*OPSS*") 1004 for 19 mm Type II clear stone. If a graded crushed stone is substituted for clear stone, the material should be limited to a maximum of 5 % fines (passing the 0.075 mm sieve). The floor slab thickness should meet the specifications of the project based on anticipated floor loadings.

The finished exterior ground surface should be sloped away from the buildings at a grade in the order of 2 %.

The concrete properties should meet the requirements of OPSS 1350. Contraction and isolation jointing practices should be in accordance with current Portland Cement Association recommendations, as given in the engineering bulletin "*Concrete Floors on Ground*", second edition, by R. E. Spears, and W. C. Panarese.

The design of concrete slabs may be made on the basis of a value of modulus of subgrade reaction of 20 MPa/m for the native sand materials.

Unless the proposed structure is to be waterproofed as prescribed in Section 5.7, perimeter drainage should be provided around all subsurface floor areas where water may accumulate. This, however, is subject to the Municipal approval allowing for the discharge of groundwater into the Municipal storm system where the perimeter drainage is going to be installed at a depth below the established groundwater level.

Underfloor drains may be also required depending on the provision of waterproofing, or excavation and groundwater seepage conditions, particularly if below the groundwater level. Based on the anticipated foundation elevations for the at-grade floor slab, and when considering the groundwater monitoring data, groundwater is to be expected within the excavation profile for the proposed structure.

The drainage system should comply with the OBC and associated amendments. Further details pertaining to perimeter and underfloor drainage systems are provided in Drawings 25004-02 and 25004-03 respectively, in Appendix F.

7.0 EARTH PRESSURE CONSIDERATIONS FOR SUBSURFACE WALLS

The earth pressure, p, acting on subsurface walls at any depth, h, in metres below the ground surface assumes an equivalent triangular fluid pressure distribution and may be calculated using the expression below. It is assumed that granular material is used as backfill. Allowances for pressure due to compaction operations should be included in the earth pressure determinations and a value of 12 kPa is applicable for a vibratory compactor and granular material.

If the structure retaining soil can move slightly, the active earth pressure case can be used in determining the lateral earth pressure. For restrained structures and no yielding an "at rest" earth pressure condition should be used. The determination of the earth pressures should be based on the following expression:

$$P_1 = K (\delta h + q)$$

where:

P_1 = the pressure in kPa acting against any subsurface wall at depth, h, in metres (feet) below the ground surface;

K = the at rest earth pressure coefficient considered appropriate for subsurface walls; OPSS 1010 Granular B Type 1 (pit-run sand and gravel) material has an effective angle of friction estimated to be 32° with a corresponding at rest earth pressure coefficient, K_o, of 0.45; and,

δ = the moist bulk unit weight of the retained backfill; 21.5 kN/m^3.

and,

q = the value for any adjacent surcharge in kPa, which may be acting close to the wall; and,

h = the depth, in m, at which the pressure is calculated

For any subsurface walls below the established, "*seasonally highest groundwater level*", the pressure distribution on the wall should include the hydrostatic pressure. The determination of hydrostatic pressure should be based on the following expression:

$$P_2 = \delta_w h_w$$

where:

P_2 = hydrostatic pressure;

δ_w = unit weight of water; 9.8 kN/m^3; and,

h_w = depth of wall, below reported water level.

Backfill materials required for behind the retaining structure is assumed to meet an OPSS 1010 Granular B Type 1 pit-run sand and gravel material or OPSS 1010 Granular A. The granular fill should be compacted to a minimum of 98 % of the material's SPMDD, or to the levels and backfilling procedures specified.

Table 7.1 below provides those lateral earth pressure parameters for the predominant soils anticipated at the site.

Table 7.1: Recommended Lateral Earth Pressure Parameters

Parameter	Site Soils (Generalized)	OPSS 1010 Granular A	OPSS 1010 Granular B Type I
Angle of Internal Friction, ϕ	35°	35°	32°
Unit Weight (KN/m^3)	16	23	22
Passive Earth Pressure Coefficient, K_p	4.20	3.70	3.25
At-Rest Earth Pressure Coefficient, K_o	0.38	0.43	0.47
Active Earth Pressure Coefficient, K_a	0.24	0.27	0.31

8.0 SOIL CORROSIVITY AND SUBSURFACE CONCRETE

8.1 Soil Corrosivity

Two composite soil samples were obtained from the boreholes associated with the proposed industrial development and submitted to SGS for analysis of pH, soil conductivity, resistivity and concentrations of sulphates, and chlorides (Soil Corrosivity).

The American Water Works Association (AWWA) document, "*Polyethylene Encasement for Ductile-Iron Pipe Systems*" *ANSI/AWWA C105/A21.5-18,* dated December 1, 2018, uses a 10-point scoring method to determine the soil corrosivity potential. For each given soil sample, points were assigned to the different parameters to evaluate their contribution towards the corrosivity of soil.

The test results are provided in Appendix D and are summarized in Table 8.1.1.

Table 8.1.1: Results of Soil Corrosivity Testing

Borehole and Sample ID	Chloride (µg/g)	Sulphate (µg/g)	pH (pH units)	Resistivity (ohm.cm)	Moisture (%)	Total ANSI/AWWA Points
BH1 SS1	31	12	8.83	7350	9.3	4
BH2 SS1	13	3.8	8.17	6540	8.8	2

Corrosion protection for buried ductile-iron pipes is recommended, when a score of 10 points or greater is reported. Based on the total ANSI/AWWA values above of between 2 and 4, ductile-iron pipes and other such buried metal elements used at the site will not require corrosion protective measures such as cathodic protection. It should be noted that the analytical results only provide an indication of the potential for corrosion.

The contribution of chloride ions to soil corrosivity towards buried metallic improvements or steel structures is very significant. According to the Corrosion Guidelines (Caltrans, May 2021, version 3.2), a site is considered corrosive if, "*chloride concentration is 500 ppm or greater, sulphate concentration is 1,500 ppm or greater, or the pH is 5.5 or less.* "

In addition, the Canadian Standards Association (CSA) A23.1-14 "*Concrete materials and methods of concrete construction*", Table 3, "*Additional requirements for concrete subjected to sulphate attack*", states that design requirements for sulphate resistant concrete are only necessary when the water-soluble sulphate content of the soil in which the concrete is to be embedded is greater than 0.1 % (1,000 µg/g).

The representative soil samples at the site are reported to contain chloride ion concentrations between 13 µg/g (0.0013 %) and 31 µg/g (0.0031 %), and sulphate concentrations between 3.8 µg/g (0.0004 %) and 12 µg/g (0.0012 %). These equate to an average of 22 µg/g and 8 µg/g, respectively, and indicate a very limited, local potential (i.e., "*negligible risk*") of sulphate attack on buried reinforced concrete structures.

8.2 Concrete Class Considerations

The requirements for subsurface concrete subject to a sulphate and chloride environment are presented in Canadian Standards Association specification, CSA A23.1-14 *"Concrete Materials and Methods of Concrete Construction, Tables 1-4"*. Experience in the area indicates that the

native soils generally have a negligibly low sulphate environment and chloride concentration. It is recommended that subsurface concrete mix designs utilize general use (GU), normal Portland cement:

For the parking garage decks and ramps it is recommended that the concrete exposure class be C-1 and the concrete have the following minimum properties:

- minimum 56-day compressive strength: 35 MPa;
- maximum water to cement ratio: 0.40;
- chloride ion penetrability requirement: < 1500 coulombs (within 91 days)
- cementing materials: GU (general use hydraulic cement) or GUb (blended general use)
- air content: as per CSA A23.1-14 Table 4, air content category 1 (freeze-thaw environment)

The concrete should be placed without segregation and should be consolidated to achieve a uniform dense mass.

8.3 Methods for Specifying Concrete

Alternative methods of specifying concrete for a project are outlined in CSA A23.1-14 and allow for "*Performance*" or "*Prescription*" based methods. Each method attaches different levels of responsibility to the owner, the contractor, and the concrete supplier. The pros and cons of each method should be examined prior to completion of the specifications for the project.

9.0 EXCAVATION AND BACKFILL CONSIDERATIONS

9.1 Excavation Considerations for Soils

All temporary excavations and unbraced side slopes in the soils should conform to standards set out in the Occupational Health and Safety Act, Ontario Regulation 213/91 "*Construction Projects*" (herein "*OHSA*"). The subsurface soils to be encountered during excavation at the site are expected to behave as "*Type 2*" materials according to the OHSA classification in Part III. Type 2 soils are characteristic of the generally compact to dense "*sand deposits"*.

Excavations for new foundations should satisfy the criteria given in the example shown in Figure 9.1.1 to avoid overlapping stresses and minimize the risk of undermining existing adjacent structures, including utilities, and/or triggering additional settlements of the existing structures due to soil disturbance.

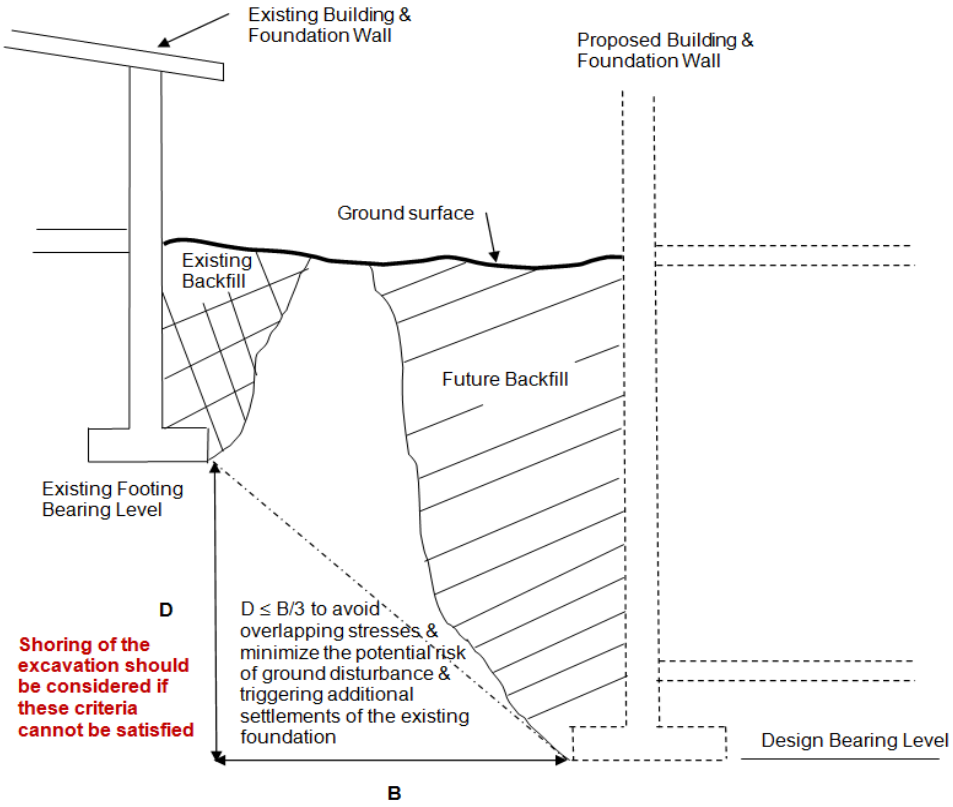


Figure 9.1.1: *Criteria for Assessing Excavation Shoring Requirements (Not to Scale)*

It should be possible to excavate the overburden soils with a hydraulic backhoe. Moist Type 2 soils are expected to be stable for short construction periods at slopes of approximately 45° to the horizontal (i.e., 1V:1H).

Consideration should be given to any existing trench excavations and associated backfill that may be present directly behind cut slopes within the native soils that may appear to be stable on first excavation. In these circumstances, slopes can suddenly slough or collapse due to the effects of the adjacent backfill.

Consequently, for excavation conditions that cannot satisfy the OHSA requirements for unbraced 1H:1V side slopes, a trench box system should be used, or temporary shoring should be installed to maintain safe working conditions. This may be more applicable to basement excavations, though may also apply to service trench excavations etc., particularly when in close proximity to new road pavements or associated infrastructure. Temporary shoring considerations are provided in more detail in Section 10.0 of this report.

9.2 Short-Term (Construction) Dewatering Considerations

Based on the anticipated depths of excavation required for the two proposed basement parking level and associated elevator pits, it is expected that foundation elements for the proposed structure will be seated within the level at which groundwater was encountered. As such, temporary dewatering will be required during the construction process.

9.3 General Backfill Considerations

Backfill next to foundation walls and in service trenches should be selected to be compactable in narrow trench conditions. The native soils at the site are expected to be reusable as trench backfill and backfill around the proposed structures on the site. Any variation in the moisture contents of the soils encountered may require selective separation of material to avoid the use of wet soil.

Site servicing trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlements. It is recommended that the target compaction specification for trench backfill be 97 % SPMDD with no individual test below 95 % SPMDD.

During inclement weather the native soils may become too wet to achieve satisfactory compaction. If construction is proposed for late in the year, a reduced level of trench compaction with a higher risk of future settlements is to be anticipated, and it is recommended that provisional contract quantities be established for the supply and placement of imported granular fill under such circumstances. The imported granular should meet the requirements of OPSS 1010 for Granular B Type I material as a minimum requirement.

10.0 TEMPORARY SHORING CONSIDERATIONS

The installation of temporary shoring is also recommended to maintain safe working conditions and eliminate the possibility of loss of ground and damage to nearby structures and buried utilities on the adjacent road allowances during excavation for the basement construction.

The requirement and application of shoring to support excavation side slopes will be dependent on the required excavation depth and the proximity of existing or newly constructed infrastructure adjacent to the excavation.

The preferred method of shoring will consist of a concrete caisson wall. This type of system is expected to provide the additional benefit of sealing the excavation from water penetration and loss of soil fines into the open excavation. Soldier piles and timber lagging may be considered as an option for a shoring system, though this type of system may require measures to prevent groundwater inflow into the excavation and any subsequent loss of soil between the spaces of lagging boards. Consideration may be also given to the application of shotcrete where groundwater is encountered in the excavation faces.

The shoring methods may provide lateral restraining force through the use of rakers or tieback anchors. Tieback anchors provide additional advantage since they do not protrude into the excavations as rakers would. However, the use of tieback anchors is also dependent upon whether permission is needed or whether it is physically possible to extend the anchors to the required distance into neighbouring properties.

It should be noted that the design of any temporary shoring system is the responsibility of the Contractor. Therefore, a specialist shoring contractor should be consulted to provide the most appropriate shoring type method and associated installation procedures. In any event, the shoring design should be based on the procedures outlined in the latest edition of the Canadian Foundation Engineering Manual. It is also recommended that lateral and vertical movement of the shoring system be monitored during construction to ensure that movements are within the acceptable range.

11.0 SITE SERVICING CONSIDERATIONS

There is no indication that special pipe bedding materials or procedures are required for the installation of services. All bedding cover and backfill materials should be selected in accordance with OPSS 1010 Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

The pipes should be placed with a minimum bedding thickness in conformance of Ontario Provincial Standard Drawing (herein "*OPSD*") 802.010, 802.013 and 802.014 for flexible pipe and OPSD 802.030, 031, 032, 033 and 034 for rigid pipes. The type of bedding shall be selected to suit the applicable pipe strength and site conditions.

Bedding material shall be placed in layers not exceeding 300 mm in thickness, loose measurement, and compacted to 95 % of the SPMDD before a subsequent layer is placed. Site servicing trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlements. Bedding on each side of the pipe shall be completed simultaneously. At no time shall the levels on each side differ by more than the 300 mm uncompacted layer. The remainder of the trench should be backfilled as per the requirements defined in Sections 9.0 of this report.

It is assumed all services will have a minimum of 1.2 m of soil cover for frost protection. For services installed at shallower depths, suitable insulation for frost protection is recommended.

12.0 SOIL MANAGEMENT CONSIDERATIONS

From a geotechnical perspective, and in order to optimize the use of the on-site soils, a Soil Management Plan should be established in accordance with the requirements of Ontario Regulation (herein "*O. Reg.*") 406/19 for excess soils and O. Reg. 153/04 for soil stockpiles.

The plan objective should be to achieve a self-sustainable development with respect to excavated materials and control the placement of organic soils so that there is negligible impact on the settlement performance of the compacted fill material. The soil management criteria should be per the following sections, as a minimum:

12.1 Organic and Deleterious Materials

Surface vegetation, topsoil and organic soils should not be placed within the proposed roadways, below finished subgrade level for pavement construction or building limits. These materials should be placed in landscaped areas where settlements are not critical.

12.2 Materials Reuse Management

12.2.1 Fill Compaction Requirements

Excavated soils for structural fill in pavement areas and building floor slab areas, which do not have topsoil or organic matter and are compactable with moisture contents within 2 % to 3 % of the optimum value, should be placed and compacted to a target density of 97 % of the SPMDD with no individual test result below 95 % SPMDD.

If engineered fill is required to support building foundations:

- the engineered fill should be placed and compacted in lifts to a target density of 100 % SPMDD with no individual tests below 98 % SPMDD; and,
- the soil should be placed in a loose lift thickness not exceeding 250 mm and should be compacted using a large (10 ton or larger) pad-foot type roller with vibratory capability.

If engineered fill to support building foundations is being considered it is recommended that a pre-construction meeting be scheduled to review the proposed fill materials, fill placement and compaction procedures, and the testing and inspection requirements.

Soils to be placed in landscaped areas where settlements are not critical should receive nominal compaction effort in order to achieve at least 90 % of the SPMDD.

12.2.2 Structural Fill Subgrades

Prior to the placement of any structural fill materials, the exposed subgrade soil should be inspected and proof-rolled using a loaded tandem axle truck and traversing the exposed subgrade for full coverage. The proof-rolling should be monitored by a geotechnical representative of this office to delineate any soft areas which may require repair.

13.0 PAVEMENT CONSIDERATIONS

13.1 Deck Pavement Design Considerations

It is understood that the footprint of the proposed basement will cover the site area in full. As such, any pavement structures are anticipated to be deck structures rather than standalone, at-grade pavement structures.

Such deck pavements should comprise a minimum 50 mm cover of OPSS HL 3 asphalt or minimum 80 mm cover of interlocking concrete pavers. The bedding or grading material to be placed between the concrete deck and the asphalt pavement surface or interlocking concrete pavers should comprise either blinding sand or a material, depending on the thickness of the layer required.

Any tie-ins of the deck pavements to the road pavement structure of Barton Street should match existing as a minimum, in accordance with OPSS 310.

13.2 Pavement Materials

13.2.1 Granular Bedding Course

If granular material is used, the material should meet OPSS Granular “A” specifications. Quarried 20 mm limestone crushed to Granular "A" gradation specifications is recommended.

13.2.2 Hot Mix Asphalt

The surface course asphalt should meet current specifications for HL 3, as prescribed by the City of Burlington or, alternatively, OPSS 1150.

13.2.3 Compaction

Granular base course and subbase course fill material should be compacted to 100 % SPMDD. Hot mix asphalt should be compacted to the criteria set out by the City of Burlington.

13.3 Sidewalk Considerations

The construction of the concrete sidewalks at the site should be completed to the satisfaction of the City of Burlington’s Engineering Standards, and as detailed in Table 13.3.1. The concrete and aggregates should be produced and placed to meet those standards also stipulated by the City of Burlington’s Engineering Standards.

Table 13.3.1: Recommended Minimum Concrete Sidewalk Specifications

Materials	Compaction Requirements	Layer Thickness
Normal Portland GU (32 MPa) (CAN3-CSA A23.1) - Class C-2	N/A	125 mm
Granular “A” Base	95 % SPMDD*	150 mm

* Standard Proctor Maximum Dry Density

Where finished sidewalks are on level ground, and to ensure that they remain free of ponding water, a final slope/gradient of the concrete sidewalk surface of at least 2 % should be maintained. In addition, construction joints in the sidewalk concrete should be properly sealed (e.g., bitumen filler) to minimize the water migration.

14.0 CLOSURE

The Limitations of Report, as stated in Appendix A, are an integral part of this report.

Soil samples will be retained and stored by Landtek for a period of three months after the report is issued. The samples will be disposed of at the end of the three-month period unless a written request from the client to extend the storage period is received.

We trust this report will be of assistance with the design and construction of the proposed development. Should you have any questions, please do not hesitate to contact our office.

Yours sincerely,

LANDTEK LIMITED

LICENSED PROFESSIONAL ENGINEER
R. DI CIENZO
Apr. 2/25
PROVINCE OF ONTARIO

James Dann, B.Eng. (Hons) ACSM
Manager, Geotechnical Projects

Ralph Di Cienzo, P. Eng.
Consulting Engineer

APPENDIX A
LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the borehole locations. Subsurface and ground water conditions between and beyond the Boreholes may be different from those encountered at the borehole locations, and conditions may become apparent during construction that could not be detected or anticipated at the time of the geotechnical investigation. It is recommended practice that Landtek be retained during construction to confirm that the subsurface conditions throughout the site are consistent with the conditions encountered in the Boreholes.

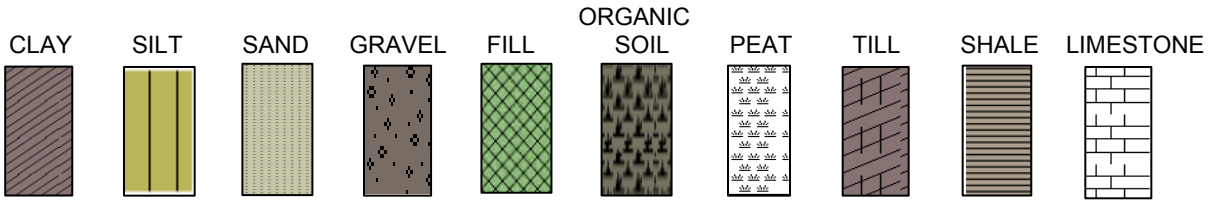
The comments made in this report on potential construction problems and possible remedial methods are intended only for the guidance of the designer. The number of Boreholes may not be sufficient to determine all the factors that may influence construction methods and costs. For example, the thickness and quality of surficial topsoil or fill layers may vary markedly and unpredictably. Additionally, bedrock contact depths throughout the site may vary significantly from what was encountered at the exact borehole locations. Contractors bidding on the project, or undertaking construction on the site should make their own interpretation of the factual borehole information, and establish their own conclusions as to how the subsurface conditions may affect their work.

The survey elevations in the report were obtained by Landtek Limited or others, and are strictly for use by Landtek in the preparation of the geotechnical report. The elevations should not be used by any other parties for any other purpose.

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. Landtek Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

This report does not reflect environmental issues or concerns related to the property unless otherwise stated in the report. The design recommendations given in the 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. Since all details of the design may not be known, it is recommended that Landtek Limited be retained during the final design stage to verify that the design is consistent with the report recommendations, and that the assumptions made in the report are still valid.

APPENDIX B
SYMBOLS AND TERMS USED IN THE REPORT



RELATIVE PROPORTIONS

Term	Range
Trace	0 - 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

CLASSIFICATION BY PARTICLE SIZE

Boulder ---------- > 200 mm
Cobble ---------- 80 mm – 200 mm
Gravel -
Coarse ---------- 19 mm – 80 mm
Fine ---------- 4.75 mm – 19 mm
Sand -
Coarse ---------- 4.75 mm – 2 mm
Medium -------- 2 mm – 0.425 mm
Fine ---------- 0.425 mm – 0.75 mm
Silt ---------- 0.075 mm – 0.002 mm
Clay ---------- < 0.002 mm

DENSITY OF NON-COHESIVE SOILS

Descriptive Term	Relative Density	Standard Penetration Test
Very Loose	0 – 15%	0 – 4 Blows Per 300 mm Penetration
Loose	15 – 35%	4 – 10 Blows Per 300 mm Penetration
Compact	35 – 65%	10 – 30 Blows Per 300 mm Penetration
Dense	65 – 85%	30 – 50 Blows Per 300 mm Penetration
Very Dense	85 – 100%	Over 50 Blows Per 300 mm Penetration

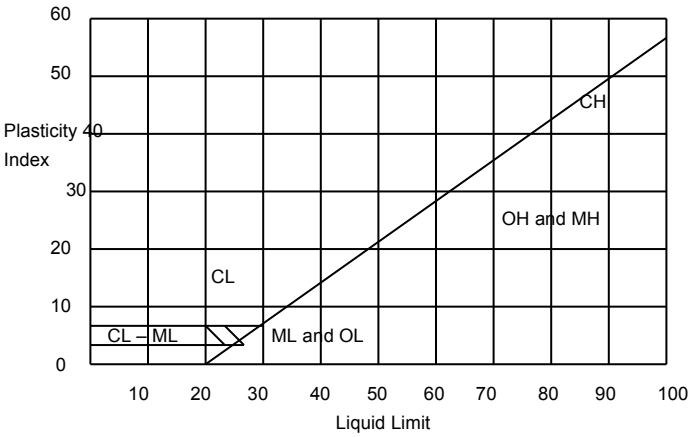
CONSISTENCY OF COHESIVE SOILS

Descriptive Term	Undrained Shear Strength kPa (psf)	N Value Standard Penetration Test	Remarks
Very Soft	< 12 (< 250)	< 2	Can penetrate with fist
Soft	12 – 25 (250 – 500)	2 – 4	Can indent with fist
Firm	25 – 50 (500 –1000)	4 – 8	Can penetrate with thumb
Stiff	50 – 100 (1000 – 2000)	8 – 15	Can indent with thumb
Very Stiff	100 – 200 (2000 – 4000)	15 – 30	Can indent with thumb-nail
Hard	> 200 (> 4000)	> 30	Can indent with thumb-nail

Notes: 1. Relative density determined by standard laboratory tests.
2. N value – blows/300 mm penetration of a 623 N (140 Lb.) hammer falling 760 mm (30 in.) on a 50 mm O.D. split spoon soil sampler. The split spoon sampler is driven 450 mm (18 in.) or 610 mm (24 in.). The “N” value is the Standard Penetration Test (SPT) value and is normally taken as the number of blows to advance the sampler the last 300 mm.

APPENDIX B CONTINUED
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES
ASTM Designation: D 2487 - 69 AND D 2488 – 69
(Unified Soil Classification System)

Major Divisions			Group Symbols	Typical Names	Classification Criteria		
Coarse-grained soils More than 50% retained on No. 4 sieve *	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve . . . . . GW, GP, SW, SP More than 12% pass No. 200 sieve . . . . . GM, GC, SM, SC 5 to 12% pass No.200 sieve . . . . . Borderline classifications requiring use of dual symbols	C_u=D60/D10 greater than 4; C_z = $(D30)^2$/(D10xD60) between 1 and 3	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines		C_u=D60/D10 greater than 6; C_z = $(D30)^2$/ (D10xD60) between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		Sands with fines	SM	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils 50% or more passes No. 200 sieve *	Silts and clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Plasticity Chart For classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols. Equation of A-line: PI=0.73 (LL-20)		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silts			
			OL	Organic silts and organic silts of low plasticity			
	Silts and clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity			
	Highly organic soils		Pt	Peat, much and other highly organic soils	* Based on the material passing the 3 in. (76mm) sieve.		



APPENDIX C

DRAWING 25004-01 – BOREHOLE AND MONITORING WELL LOCATION PLAN
BOREHOLE LOGS



LANDTEK LIMITED

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e: engineering@landtek.ca
w: www.landtek.ca

project location



Key plan an extract from burlington.maps.arcgis.com©

Key:

- Approximate location of borehole drilled by Landtek Limited between February 12th and 14th, 2025.
- Approximate location of monitoring wells drilled by Landtek Limited between February 12th and 14th, 2025.

Notes:

Base plan and extract from the drawing "Site Plan", reference Project No.: 0024, Drawing No.: A101, Dated: 2024-09-22 as issued by Hatem Nassif Architects Inc.

revisions/ submissions

#	date	description

client
Concept Lines Inc.

municipality
The City of Burlington

project
Geotechnical Investigation
198 to 206 Plains Road East

sheet
Borehole and Monitoring well Location Plan

date: february, 2025
drawn: mdc
checked: jdc
project #: 25004
scale: 2:1 - 1:500 m

25004-01

LOG OF BOREHOLE BH/MW1

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-14
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311477
Easting: -79.846087
Ground Surface Elevation: 0

Depth Scale (m)	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Undrained Shear Strength (kPa)	Moisture / Plasticity (%)	Comments
		Asphalt ~100 mm. Bituminous, black.							
		Silty Clay some gravel. Red, dry.	1	SS	25 33 23 10	56		9.3	
		Sand Very dense, brown, moist.							
1	-1.0	...trace gravel, trace clay. Compact, reddish brown.	2	SS	4 4 8	12		10.7	
		...with clay (~150 mm). Loose.	3	SS	3 3 5	8		6.2	
2	-2.0		4	SS	1 4 4	8		5.9	
3	-3.0	...compact, reddish brown. With clay in the last ~125 mm of sample.	5	SS	5 5 12	17		18.4	
4	-4.0								
		...brown.	6	SS	2 8 11	19		7.6	
5	-5.0								
6	-6.0	...dense.	7	SS	6 50-5"	50		7.3	
7	-7.0								
		...trace gravel, trace pebbles. Compact, wet.	8	SS	20 10 12	22		19.1	
8	-8.0								
9	-9.0	...no pebbles.	9	SS	10 11 11	22		15.2	
10	-10.0								

Penetration Test Values (Blows / 0.3m): 20 40 60 80
Moisture / Plasticity: PL MC LL; 10 20 30 40

Well Details: 8" Drop-in Flushmount; 3/8" Bentonite Pellets; #10 Well Slot Sand; 2" PVC Screen

Groundwater Levels

Headspace Concentrations / PID (ppm) [LEL(%)] / ppm

Additional Notes:
1. Borehole open, with cave, to approximately 11.6 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.6 m depth below the ground surface.
3.
4.

LANDTEK LIMITED
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Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

LOG OF BOREHOLE BH/MW1

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-14
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311477
Easting: -79.846087
Ground Surface Elevation: 0

Depth Scale (m)	Stratigraphic Symbol	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Comments
11		-11.0						
12		-12.0		10	SS	6 16 12	28	
			End of Log					
13		-13.0						
14		-14.0						
15		-15.0						
16		-16.0						
17		-17.0						
18		-18.0						
19		-19.0						
20		-20.0						

Penetration / Strength Results

Undrained Shear Strength Values (kPa)
40 80 120 160

Penetration Test Values (Blows / 0.3m)
20 40 60 80

Moisture / Plasticity

PL MC LL

Moisture / Plasticity
10 20 30 40

14.5

Well Details

2" PVC Screen

Groundwater Levels

Headspace Concentrations / PID (ppm) [LEL(%)] / ppm

Additional Notes:
1. Borehole open, with cave, to approximately 11.6 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.6 m depth below the ground surface.
3.
4.

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LOG OF BOREHOLE BH2

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Road East, Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311644
Easting: -79.845901
Ground Surface Elevation: 0

Depth Scale (m)	Stratigraphic Symbol	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Undrained Shear Strength (kPa) 40 80 120 160 / Penetration Test Values (Blows / 0.3m) 20 40 60 80	Moisture / Plasticity PL MC LL / 10 20 30 40	Well Details	Groundwater Levels	Headspace Concentrations / PID (ppm) [LEL(%)] / ppm	Comments
0			**Asphalt** ~100 mm. Bituminous, black.										
			Sand trace gravel. Compact, brown, moist.	1	SS	13 16 4 5	20		8.8				
1		-1.0	...loose.	2	SS	4 5 3	8		11.5				
				3	SS	2 2 2	4		16.4				
2		-2.0	...loose to compact.	4	SS	3 3 7	10		8.7				
3		-3.0	...compact.	5	SS	5 8 21	29		5.7				
4		-4.0											
				6	SS	3 9 14	23		6.4				
5		-5.0											
6		-6.0	**Sand and Gravel** some pebbles. Dense, brown, moist to very moist.	7	SS	15 45 50-5"	50		4.0				
7		-7.0											
8		-8.0	**Sand** Compact, brown, wet.	8	SS	7 9 10	19		21.6				
9		-9.0	...very dense.	9	SS	50-4"	50		22.7				
10		-10.0											

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.6 m depth below the ground surface.
3.
4.

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205 Nebo Road, Unit 4B
Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

LOG OF BOREHOLE BH2

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Road East, Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311644
Easting: -79.845901
Ground Surface Elevation: 0

Depth Scale (m)	Stratigraphic Symbol	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Comments
11		-11.0	...dense.	10	SS	7 17 15	32	
12		-12.0	**Sand and Gravel** Very dense, brown, very moist.	11	SS	15 39 21	60	
13		-13.0	End of Log					
14		-14.0						
15		-15.0						
16		-16.0						
17		-17.0						
18		-18.0						
19		-19.0						
20		-20.0						

Penetration / Strength Results

Undrained Shear Strength Values
(kPa)
40 80 120 160

Penetration Test Values
(Blows / 0.3m)
20 40 60 80

Moisture / Plasticity

PL MC LL

Moisture / Plasticity
10 20 30 40

17.4
11.2

Well Details

Groundwater Levels

Headspace Concentrations / PID (ppm) [LEL(%)] / ppm

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.6 m depth below the ground surface.
3.
4.

LANDTEK LIMITED
205 Nebo Road, Unit 4B
Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

LOG OF BOREHOLE BH/MW3

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311504
Easting: -79.845455
Ground Surface Elevation: 0

Depth Scale (m)	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Undrained Shear Strength (kPa)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity (PL MC LL)	Well Details	Groundwater Levels	Headspace Concentrations / PID (ppm) [LEL(%)] / ppm	Comments
0		**Organic Material** ~75 mm. Sand, some organics. Brown, moist.	1	SS	5 2 2 2	4			12.4				
		Sand Loose, brown, moist.											
1	-1.0	...compact.	2	SS	6 5 6	11			18.1				
		...loose.	3	SS	4 4 5	9			7.1				
2	-2.0												
		...compact.	4	SS	6 8 10	18			5.6				
3	-3.0		5	SS	5 7 9	16			7.5	3/8" Bentonite Pellets			
4	-4.0												
			6	SS	3 8 11	19			7.5				
5	-5.0												
6	-6.0	...dense, some gravel, some pebbles.	7	SS	12 35 18	53			13.3				
7	-7.0												
		...compact, wet.	8	SS	8 10 14	24			16.2				
8	-8.0												
9	-9.0	...loose to compact.	9	SS	4 4 6	10			16.3	#10 Well Slot Sand	8" Flushmount / 2" PVC Screen		
10	-10.0												

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 6.0 m depth below the ground surface.
3.
4.

LANDTEK LIMITED
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Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

LOG OF BOREHOLE BH/MW3

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311504
Easting: -79.845455
Ground Surface Elevation: 0

Depth Scale (m)	Stratigraphic Symbol	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Penetration / Strength Results	Moisture / Plasticity	Well Details	Groundwater Levels	Headspace Concentrations / PID (ppm) [LEL(%)] / ppm	Comments
			Subsurface Conditions	**Samples**				**Undrained Shear Strength Values** (kPa) ▲ 40 80 120 160 ▲ / **Penetration Test Values** (Blows / 0.3m) × 20 40 60 80 ×	PL MC LL / **Moisture / Plasticity** ○ 10 20 30 40 ○				
11		-11.0											
12		-12.0	...compact, wet.	10	SS	8 9 14	23		18.4				
			End of Log										
13		-13.0											
14		-14.0											
15		-15.0											
16		-16.0											
17		-17.0											
18		-18.0											
19		-19.0											
20		-20.0											

2" PVC Screen

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 6.0 m depth below the ground surface.
3.
4.

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LOG OF BOREHOLE BH4

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311273
Easting: -79.845743
Ground Surface Elevation: 0

Depth Scale (m)	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Undrained Shear Strength (kPa)	Penetration Test Values (Blows / 0.3m)	Moisture / Plasticity (%)	Well Details	Groundwater Levels	Headspace Concentrations / PID (ppm) [LEL(%)] / ppm	Comments
		Asphalt ~100 mm. Bituminous, black.	1	SS	448 48 35 18	83			11.1				
		Fill Silt, some gravel, trace sand. Brown, dry to moist.											
1	-1.0	**Sand** Loose, reddish brown, moist.	2	SS	7 4 5	9			9.4				
		...trace gravel.	3	SS	3 5 3	8			11.6				
2	-2.0												
		Sand and Gravel Loose, brown, moist.	4	SS	3 3 5	8			7.1				
3	-3.0	**Sand** Loose, brown, moist.	5	SS	2 2 4	6			5.0				
4	-4.0												
		...compact.	6	SS	4 7 10	17			4.4				
5	-5.0												
6	-6.0	...some pebble fragments. Very dense, moist to very moist.	7	SS	3 50-3"	50			4.6				
7	-7.0												
		...no pebbel fragments. Wet.	8	SS	17 18 19	37							
8	-8.0												
9	-9.0	...compact.	9	SS	7 9 15	24			20.8				
10	-10.0												

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.3 m depth below the ground surface.
3.
4.

LANDTEK LIMITED
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Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

LOG OF BOREHOLE BH4

Project No.: 25004
Project Name: 198-206 Plains Road East, Burlington
Location: 198-206 Plains Rd. E., Burlington

Drill Date: 2025-02-12
Drilling Method: Hollow Stem
Datum: Ground Surface

Northing: 43.311273
Easting: -79.845743
Ground Surface Elevation: 0

Depth Scale (m)	Stratigraphic Symbol	Depth / Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Comments
11		-11.0	...trace gravel. Dense.	10	SS	5 14 19	33	
12		-12.0	...compact.	11	SS	2 4 11	15	
			End of Log					
13		-13.0						
14		-14.0						
15		-15.0						
16		-16.0						
17		-17.0						
18		-18.0						
19		-19.0						
20		-20.0						

Penetration / Strength Results

Undrained Shear Strength Values (kPa)
40 80 120 160

Penetration Test Values (Blows / 0.3m)
20 40 60 80

Moisture / Plasticity

PL MC LL

Moisture / Plasticity
10 20 30 40

15.8
22.1

Well Details

Groundwater Levels

Headspace Concentrations / PID (ppm) [LEL(%)] / ppm

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage encountered during drilling at approximately 7.3 m depth below the ground surface.
3.
4.

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APPENDIX D

CHEMICAL LABORATORY TESTING RESULTS





FINAL REPORT

CA40157-FEB25 R1

25004, 198-206 Plains Road East, Burlington

Prepared for

Landtek Limited

FINAL REPORT

First Page

CLIENT DETAILS

Client	Landtek Limited
Address	205 Nebo Road, Unit 3 Hamilton, Ontario L8W 2E1. Canada
Contact	Marco Di Cienzo
Telephone	905-383-3733 ext 2213
Facsimile	905-383-8433
Email	Marco@landtek.ca; James@landtek.ca
Project	25004, 198-206 Plains Road East, Burlington
Order Number	
Samples	Soil (2)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA40157-FEB25
Received	02/27/2025
Approved	03/06/2025
Report Number	CA40157-FEB25 R1
Date Reported	03/06/2025

COMMENTS

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: N/A

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

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Annexes..... 7

Client: Landtek Limited
Project: 25004, 198-206 Plains Road East, Burlington
Project Manager: Marco Di Cienzo
Samplers: Marco Di Cienzo

MATRIX: SOIL

Sample Number	5	6
Sample Name	BH1-SS1	BH2-SS1
Sample Matrix	Soil	Soil
Sample Date	26/02/2025	26/02/2025

Parameter	Units	RL		Result	Result
Corrosivity Index					
Corrosivity Index	none	1		4	2
pH	pH Units	0.05		8.83	8.17
Soil Redox Potential	mV	no		198	232
Sulphide (Na2CO3)	%	0.01		< 0.01	< 0.01
Resistivity (calculated)	ohms.cm	-9999		7350	6540
General Chemistry					
Conductivity	uS/cm	2		136	153
Metals and Inorganics					
Sulphate	µg/g	0.4		12	3.8
Other (ORP)					
Chloride	µg/g	0.4		31	13

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0030-MAR25	µg/g	0.4	<0.4	4	35	109	80	120	118	75	125
Sulphate	DIO0030-MAR25	µg/g	0.4	<0.4	6	35	107	80	120	100	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide (Na2CO3)	ECS0097-FEB25	%	0.01	< 0.01								

Conductivity

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0032-MAR25	uS/cm	2	< 2	0	20	99	90	110	NA		

QC SUMMARY

pH

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

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0032-MAR25	pH Units	0.05	NA	0		100			NA		

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

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

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

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

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

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

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

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

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

LEGEND

FOOTNOTES

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

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

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

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.
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This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

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

No: Page 1 of 1

Laboratory Information Section - Lab use only

Received By: BD
Received Date: 2/27/25 (mm/dd/yy)
Received Time: 11:50 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Pack
Temperature Upon Receipt (°C): 9x3
LAB LIMS #: CA40157Feb25

REPORT INFORMATION	INVOICE INFORMATION
Company: Landtek Limited	☑ (same as Report Information)
Contact: Marco Di Cienzo	Company: Landtek Limited
Address: 205 Nebo Road, Unit 4B	Contact: Kathy Cristoi
Hamilton, Ontario, L8W 2E1	Address: 205 Nebo Road, Unit 4B
Phone: 905-383-3733 ext. 2213	Hamilton, Ontario, L8W 2E1
Fax:	Phone: 905-383-3733
Email: marco@landtek.ca	Email: kathy@landtek.ca

Quotation #: 2024 876 SGS Fee Schedule
P.O. #:
Project #: 25004
Site Location/ID: 198 - 206 Plains Road East, Burlington

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

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

REGULATIONS

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

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

Sewer By-Law: ☐ Sanitary ☐ Storm Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☑ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX
1	BH1-SS1	2025-02-26	PM	1	Soil
2	BH2-SS1	2025-02-26	PM	1	Soil
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

	Field Filtered (Y/N)	M & I: Metals & Inorganics (incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M & I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M & I: ICP Metals only (Sb,As,Ba,Be,B,Cd,Cr,Co,Cu,Pb,Mo,Ni, Se,Ag,Ti,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs (Aroclor ☐ Total ☐)	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify): Soil Corrosivity				Sewer Use: Specify pkg:	Water Characterization Pkg: General ☐ Extended ☐	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Limited Volume
2		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	☐	☐	Limited Volume
3		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
4		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
5		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
6		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
7		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
8		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
9		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
10		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
11		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
12		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Observations/Comments/Special Instructions

also cc the report to: james@landtek.ca

Sampled By (NAME): Marco Di Cienzo **Signature:** Date: 02/26/25 (mm/dd/yy)
Relinquished by (NAME): Marco Di Cienzo **Signature:** Date: 02/26/25 (mm/dd/yy)

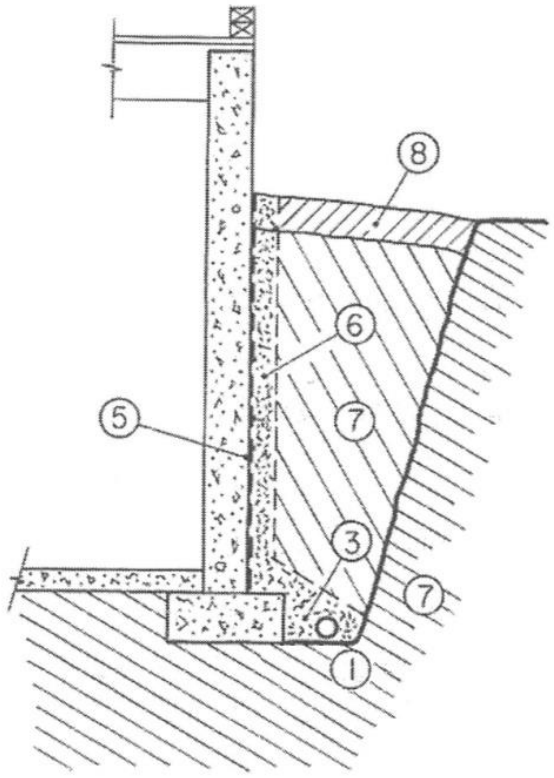
Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 11 June 2021

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

APPENDIX E

DRAWING 25004-02 – ENGINEERING COMMENTARIES – GENERAL REQUIREMENTS FOR DRAINAGE TO BASEMENT STRUCTURES
DRAWING 25004-03 – ENGINEERING COMMENTARIES – GENERAL REQUIREMENTS FOR UNDERFLOOR DRAINAGE SYSTEMS



① 100 mm, perforated or slotted pipe placed below the upper level of the floor slab.;
③ Filter material that is compatible with the grain size characteristics of the fine grained foundation and backfill soils, as well as with the perforations of the pipe;
④ Filter material continuously or intermittently placed next to the foundation wall to intercept water draining from window wells, down exterior walls and from low areas near the building;
⑤ Damp-proofing on wall – optional depending on the quality of the concrete wall;
⑥ Optional use of sheet drain, or synthetic fire blanket, next to the foundation wall to replace the soil filter according to ④;
⑦ Foundation and backfill soils, which may contain fine grained and erosion-susceptible materials;
⑧ "*Topping off*" material is to be graded such that it slopes outwards to lead surface water away from the building. It is usually desirable to use low permeability topsoil to reduce the risk of overloading the drainage pipe.

Based on Figure 12.1, Canadian Foundation Engineers Manual, Fourth Edition, 2006.

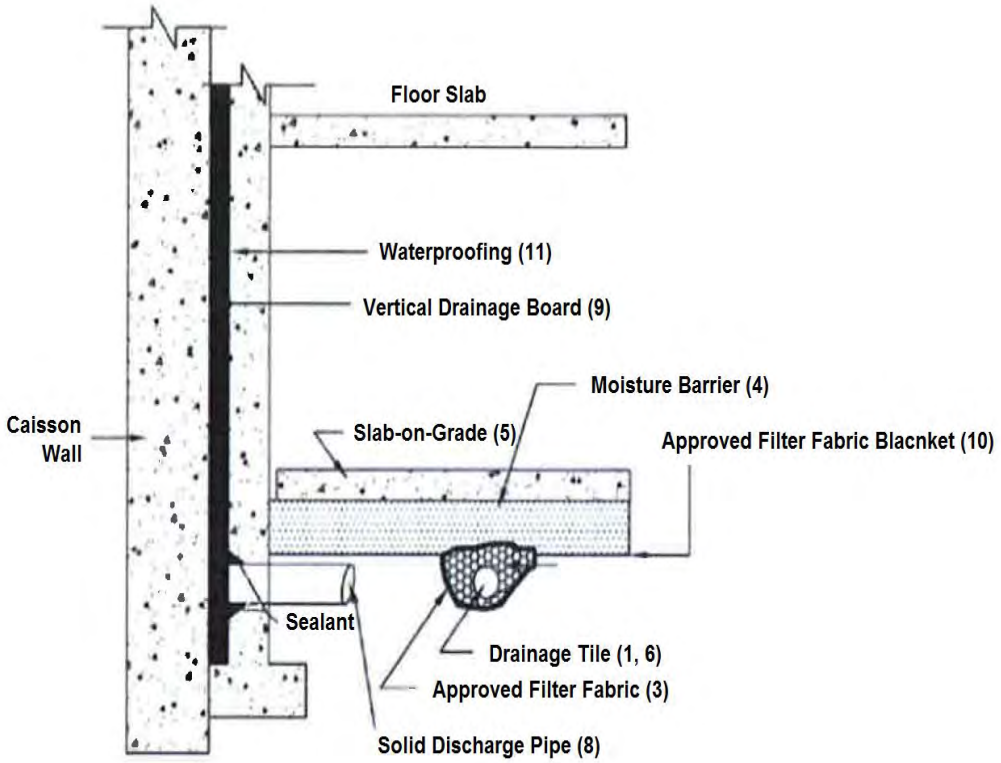
Additional Notes:

1. The perforated or slotted drainage pipe is to lead to a positive drainage sump or outlet. The invert of the pipe is to be a minimum of 150 mm below the underside of the proposed floor slab.
2. Backfill materials to the interior of the foundation walls may be clean, organic-free soils that can be compacted to the specified density within in a confined space.
3. Heavy, vibratory compaction equipment should not be used within 450 mm of the foundation wall. Fill is not to be placed or compacted within 1.8 m of the wall unless fill is being placed simultaneously on both sides of the wall.
4. The moisture barrier beneath the floor slab is to comprise at least 200 mm of compacted19mm clear stone or an equivalent free-draining material.
5. Should the 19 mm clear stone require surface blinding then 6mm stone chips are to be used.
6. The slab on grade should not be structurally connected to the foundation wall or footing.

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General Requirements for Drainage to Basement Structures

client	Concept Lines Inc. c/o Landwise		
project	198 to 206 Plains Road East, Burlington, Ontario		
project #	25004	drawing #	25004-02



Notes:

1. Drainage tile, if required for permanent dewatering, to consist of 100 mm diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns;
2. 19 mm clear stone – 150 mm top and side of drain. If the drain is not on the footing then place 100 mm of 19 mm clear stone below the drain;
3. Wrap the clear stone with an approved filter fabric (e.g., Terrafix 270R or equivalent);
4. Moisture barrier to be at least 200 mm of compacted, 19 mm clear stone or equivalent (and approved), free-draining material. A vapour barrier may be required for specialty floor coverings;
5. Typically, the slab-on-grade is not structurally connected to the wall or footing. However, if it is connected to the walls it should be designed accordingly;
6. Underfloor drain invert, where to be installed, to be at least 300 mm below underside of floor slab. Drainage tile should be placed in parallel rows 6 m to 8 m centres one way. Place drains on 100 mm of 19 mm clear stone and 150 mm of 19 mm clear stone on top and sides. Enclose clear stone with filter fabric as prescribed in Note (3);
7. Do not connect any underfloor drainage to perimeter drainage. The two systems are to remain separate.
8. Locate solid discharge at the middle of each bay between soldier piles;
9. Vertical drainage board (e.g., MiraDrain 6000 or equivalent) with filter cloth should be continuous from bottom to 1.2 m below exterior finished grade;
10. The entire subgrade is to be sealed with an approved filter fabric as in Note (3) where non-cohesive (silty/sandy/granular) soils are encountered below the groundwater table;
11. Where no permanent dewatering is proposed, the basement walls must be waterproofed below the seasonally highest groundwater level (plus 1.0 m to 1.5 m buffer) using bentonite or an equivalent waterproofing system;
12. The Geotechnical Report should be reviewed for site-specific details. Final detail must be approved before system is considered acceptable.

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General Requirements for Underfloor Drainage Systems

client	Concept Lines Inc. c/o Landwise		
project	198 to 206 Plains Road East, Burlington, Ontario		
project #	25004	drawing #	25004-03