

Geotechnical Investigation

Proposed River's Edge Subdivision
Scott Street
Town of Grand Valley, Ontario

Client:

Thomasfield Homes Ltd.

Attention: Thomas McLaughlin
Controller, Vice President, Finance

Type of Document:

Geotechnical Report

Project Number:

G4524-22-1

JLP Services Inc.
Geotechnical and Environmental Consultants
405 York Road
Guelph, ON
N1E 3H3

Date Submitted:
April 20, 2022

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1. Introduction

JLP Services Inc. (JLP), formerly V.A. Wood (Guelph) Inc., was retained by Thomasfield Homes Ltd. to carry out a preliminary geotechnical investigation for the proposed residential development, Rivers Edge Subdivision, located in the vicinity of Scott Street in the Town of Grand Valley, Ontario.

Although final details concerning the proposed development are unavailable at the time of this report, it is understood that the proposed residential development will consist of single family dwellings with basement and associated municipal site services, roads and storm water management facility.

The purpose of this investigation was to reveal the subsurface soil and groundwater conditions and to determine the relevant soil properties for preliminary recommendations for the design and construction of building foundations, floor slab-on-grade, site services, roads and storm water management facility.

The conclusions and recommendations given in this report are based on the assumption that the design concept mentioned above will proceed into construction. If changes are made in the design phase and/or during construction, JLP must be retained to review these changes. The outcome of this review may lead to modifications to our recommendations or may require additional field and/or laboratory analyses to determine if the proposed changes are acceptable from a geotechnical standpoint.

2. Site Description

The site is located primarily on north side of Scott Street between Crozier Street and the Grand River with a small separate piece of property located on south side of Scott Street and east of Bielby Street. The site is in a residential neighbourhood with single detached dwellings as well as multiple unit townhomes. It is surrounded by existing residential dwellings on west and south sides and by open space on north and east sides towards the channel of Grand River. The

ground surface is sloping gently to the northeast towards the channel of Grand River with a difference in elevations of about 3.8m between borehole locations.

3. Field Work

The fieldwork was carried out on March 7 and 29, 2022 and consisted of four (4) boreholes at the locations shown on the Borehole Location Plan, Enclosure 1.

Prior to the commencement of drilling and sampling operations at the site, the borehole locations were cleared of underground utilities by Ontario One Call contractors.

The boreholes were advanced to the sampling depths by means of a track-mounted, power auger machine, equipped with hollow stem augers and split spoon samplers for soil sampling. Standard Penetration tests were carried out at frequent intervals of depth and the results are shown on the Borehole Logs as N-values. The subsurface soils were visually examined, logged and sampled at the borehole locations.

Ground water conditions were observed in the open boreholes during the drilling and sampling operations. Monitoring well was installed in each of the boreholes for groundwater monitoring.

JLP engineering staff supervised and directed the fieldwork operations. The location of and the ground surface elevation at each borehole was provided by GM BluePlan Engineering Limited.

4. Subsurface Conditions

Full details of the soil conditions encountered in each borehole are given on the Borehole Logs, Enclosures 2 to 5, inclusive and the following notes are intended to summarize this data.

A layer of **topsoil**, about 50 to 900mm thick, was encountered at the surface of Boreholes 1, 2 and 3. In Boreholes 3 and 4, a lower layer of **topsoil** was encountered at about 2.4 and 0.3 metres below grade, respectively. The topsoil consisted of silty sand to sandy silt, mixed with organics, and scattered roots and plant fibres. It was dark brown to black in colour. Standard

Penetration tests in the topsoil gave N-values ranging between 4 and 6 blows/300mm. The natural moisture content was found to range between 16 and 18%.

Based on the test results, the topsoil is considered to be in a generally loose state of compactness and in moist condition.

It should be noted that the thickness of topsoil may vary significantly between borehole locations and should not be relied upon to estimate the quantity of topsoil for removal.

A layer of **fill**, about 300mm thick, was encountered at the surface of Borehole 4. The fill consisted of greyish brown silty sand and was in wet condition. Boreholes 1 and 3 encountered a deposit of **fill** below the topsoil to depths ranging between 4.5 and 2.4 metres below grade, respectively. In Boreholes 3 and 4, a lower deposit of **fill** was encountered below the lower topsoil deposit to depths of about 4.5 and 2.8 metres below grade, respectively. In Borehole 1, the fill consisted of dark brown to brown sandy silt to silty sand, some gravel, trace to some clay and scattered organic inclusions. In Boreholes 3 and 4, the fill contained silty sand, trace to some gravel. In the lower deposit of fill in Borehole 4, the fill contained silty sand, some gravel and occasional metal pieces.

Standard Penetration tests in the fill gave N-values ranging between 7 and over 100 blows/300mm, with typical values between 7 and 23 blows/300mm. The natural moisture content was found to range between 3 and 19%.

A typical grain size distribution curve and the results of plasticity limits for the fill material can be found on Enclosure 6. The grain size analysis results indicate 19% of gravel, 44% of sand, 30% of silt and 7% of clay size particles by weight. The liquid limit (LL), Plastic Limit (PL) and plasticity index (PI) of the sample of fill material are 25%, 11% and 14%, respectively.

Based on the test results and visual and tactile examination of the soil samples, the deposit of fill is considered to be in a generally loose to compact state of compactness and in moist to wet condition. It is noted the presence of gravel, cobbles and/or debris, such as metal pieces in Borehole 4, may have resulted in high N-values and these may not accurately represent the relative density of the fill material.

The fill in Borehole 1, the topsoil in Borehole 2 and the lower fill in Borehole 3 were underlain by a deposit of brown **sand and gravel** to the full depth of investigation at about 6.5 metres below grade in Boreholes 1 and 2, and to depth of about 6.0 metres below grade in Borehole 3. Standard Penetration tests in this material gave N-values ranging between 5 and over 100 blows/300mm. The natural moisture content was found to range between 5 and 16%.

A typical grain size distribution curve for the sand and gravel can be found on Enclosure 7. The grain size analysis results indicate 53% of gravel, 38% of sand and 9% of silt size particles by weight.

Based on the test results and visual and tactile examination of the soil samples, the deposit of sand and gravel is considered to be in a loose to very dense state of compactness and in moist to wet condition. It is noted the presence of coarse gravel and cobbles may have resulted in high N-values and these may not accurately represent the relative density of the sand and gravel material.

The sand and gravel deposit in Borehole 3 was underlain by a deposit of brown **sand** to the full depth of investigation at about 6.5 metres below grade. The sand contained some gravel and was brown in colour. Standard Penetration test in this material gave N-value of 37 blows/300mm. The natural moisture content was found to be 15%.

Based on visual and tactile examination of the soil sample, the deposit of sand is in a dense state of compactness and in wet condition.

Probable limestone bedrock was encountered in Borehole 4 below the lower fill deposit at about 2.8 metres below grade. The borehole was terminated by refusal to sampling and/or augering. The limestone appeared to be highly weathered, frequently jointed and was white in colour.

5.0 Groundwater Conditions

Borehole 4 was dry and open on completion of the fieldwork. Free water was encountered in Boreholes 1, 2 and 3 at about 6.0, 3.0 and 6.0 metres below grade on completion of the fieldwork.

A monitoring well was installed in each of the boreholes, sealed with bentonite between 0.3 and 4.2 metres below grade, for groundwater level monitoring. Free water surfaces were measured at depths and elevations noted in Table 1 below.

Table 1: Observed Groundwater Levels

Location	Ground Elevation (m)	March 7 or 29, 2022		April 8, 2022	
		Depth Below Existing Grade (m±)	Water Level Elevation (m±)	Depth Below Existing Grade (m±)	Water Level Elevation (m±)
BH/MW 1	458.7	6.0	452.7	5.2	453.5
BH/MW 2	454.9	3.0	451.9	1.3	453.6
BH/MW 3	457.5	6.0	451.5	3.9	453.6
BH/MW 4	457.5	dry	--	dry	--

An examination of the soil samples indicated that the materials were generally moist to wet.

It is noted that no sub-artesian water pressure was encountered in any of the boreholes.

Based on the foregoing and the moisture content profiles of the soil samples, the groundwater table at the site is considered to be located at about 1.3 to 5.1 metres below grade, approximately Elevation 453.6m. The groundwater is believed to be originated within the pervious sand and gravel deposit.

Seasonal fluctuation of the groundwater level should be anticipated.

6.0 Discussion and Recommendations

6.1 General

The boreholes generally encountered a surficial deposit of topsoil or fill, followed by deposits of fill and/or buried topsoil, overlying a deposit of sand and gravel and underlain by a deposit of sand or probable limestone bedrock. Borehole 4 was terminated by refusal to augering or sampling on probable bedrock at about 3.1 metres below grade, approximate Elevation 454.4m.

The groundwater table at the site appears to be located at about Elevation 453.6m, which is about 1.3 to 5.1 metres below grade. The groundwater is believed to be originated from the sand and gravel deposit. Seasonal fluctuation of the groundwater level should be anticipated.

Although final details concerning the proposed development are unavailable at the time of this report, it is understood that the proposed residential development will consist of single family dwellings with basement and associated municipal site services, roads and storm water management facility. Based on the foregoing, the following discussion is therefore considered preliminary. It should be reviewed when more details are available

6.2 Site Grading

It is assumed some re-grading will be required at the site depending on the final design of the proposed subdivision development.

It appears that the lower deposit of fill in Boreholes 1, 3 and 4 on site may have been placed and compacted previously. However, the upper deposit of fill is variable in compactness and is in loose to compact condition. A buried topsoil layer is also encountered in Boreholes 3 and 4 between the upper and lower fill deposits.

It is recommended to remove the surficial topsoil and the buried topsoil layers and replace with "engineered fill" to support the proposed building lots, site services and pavement areas.

The procedure for “engineered fill” construction would consist of the following:

1. All vegetation, surficial topsoil, buried topsoil and unsuitable fill should be removed from the proposed building lots, site services and pavement areas. Any organic, excessively wet or otherwise deleterious materials should not be used for “engineered fill” material.
2. Existing groundwater monitoring wells and/or potable water wells, if any, should be properly decommissioned in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario (O.Reg.) 903 – amended to O.Reg. 128/03.
3. The exposed subgrade should be proofrolled with a heavy duty equipment, such as a loaded dump truck, and examined by geotechnical personnel from JLP. Any loose or soft areas encountered during the proofrolling process should be further subexcavated and replaced with approved on-site or imported soil material compacted to a minimum of 98% of the Standard Proctor Maximum Dry Density (SPMDD).
4. Low areas can then be brought up to the design pre-grade level with approved on-site or imported soil material placed in maximum 200mm thick lifts and compacted to a minimum of 98% of the SPMDD.
5. Moisture conditioning should be applied to the approved on-site and/or imported soil materials for effective compaction. Some of the on-site soil materials may require air drying before they can be properly compacted.
6. The “engineered fill” under all structures to be supported should extend to at least 0.6 metres laterally beyond the edge of their perimeter at the founding level and at least a distance equal to the depths of the fill pad, at the level of the approved subgrade.
7. Temporary fill slopes should be no steeper than 1 vertical to 2 horizontal and should be protected from surface erosion.
8. All imported fill materials should be assessed by JLP prior to transport to the site in accordance with the “On-Site and Excess Soil Management Regulation”, O.Reg. 406/19 and supporting amendments.
9. All imported fill materials should be free from organics and debris and should be tested geotechnically by JLP prior to transport to the site.
10. All topsoil and unsuitable material removal, subgrade preparation, fill placement and compaction should be monitored on a full-time basis by geotechnical staff from JLP to approve materials and to verify that the specified degree of compaction have been achieved.

11. The “engineered fill” should be in place at least three months prior to the construction of buildings over it to minimize potential settlement.

6.3 Site Services

The inverts of the proposed site services are not available at the time of this report. However, it is expected that the storm sewer and watermain inverts will be located at depths ranging between 2 and 4 metres below the finished grades. All sewers and watermains should be protected from frost actions by at least 1.6m of soil cover or equivalent thermal insulation.

Reference to the Borehole Logs indicates that the subgrade will consist of existing fill in compact state, native dense to very dense sand and gravel or “engineered fill” constructed during site grading. The subgrade will generally provide adequate support for the pipes and allow the use of OPSD 802.010 and/or OPSD 802.031 Class ‘B’ bedding using OPSS.MUNI 1010 Granular ‘A’ material.

Clear crushed stone should not be used as bedding as fine-grained particles may migrate into the voids of the stone and cause undesirable settlements. Where the exposed subgrade is less competent than the materials identified in the Borehole Logs, the bedding thickness may have to be increased.

Assuming that the final site grades will be at about Elevations 459m to 455m following the existing ground levels, the trench excavation may be above or below the observed groundwater level of Elevation 453.6m.

If the trench excavation is above the observed groundwater level, the sides of the open cut excavation should either be cut back at a side slope of 1 vertical to 1 horizontal or supported with trench box or temporary shoring system.

If the trench excavation is below the observed groundwater level, construction dewatering by means of pumping from sump within the excavation or by pumping from well-points may be required to lower the groundwater level to at least 600 mm below the bottom of the trench to

facilitate construction. The sides of the open cut excavation should either be cut back at a side slope of 1 vertical to 2 horizontal or supported with trench box or temporary shoring system.

The excavated materials will be generally suitable for re-use as trench backfill provided that they are free of topsoil and cobbles/boulders. If the on-site materials become wet, they should be air dried prior to re-use as trench backfill. The trench backfill should be placed in 150 to 200mm thick layers and uniformly compacted to at least 95% of its Standard Proctor Maximum Dry Density (SPMDD).

The backfill around maintenance manholes, catchbasins, valve chambers, thrust blocks and/or service connections should consist of free-draining granular material, such as the Modified Granular 'B' material conforming to the Town of Grand Valley Engineering Standards, compacted to a minimum of 95% of its SPMDD.

To minimize potential problems and wetting of the subgrade material, backfilling operations should follow closely after excavations, so that only a minimal length of trench is exposed at a time. Should construction be carried out in the winter season, particular attention should be given to make sure no frozen material is used for backfill.

Cobbles and/or boulders may be present in the existing fill and native sand and gravel deposits, and some difficulty or delays may be anticipated during excavation. Probable bedrock may be encountered as high as Elevation 454.7m in the vicinity of Borehole 4. Cobbles and/or boulders with nominal diameter larger than 150mm should not be re-used as trench backfill.

6.4 Storm Water Management Facility

Grain size distribution curves were prepared for representative samples of the subsoils obtained at the boreholes. These grain size distribution analyses were performed following applicable ASTM laboratory procedures and are found on Enclosures 6 to 7, inclusive.

The grain size distribution curves were compared to the family of curves presented in the Supplementary Standard SB-6 of the 2012 Building Code Compendium. According to the Unified Soils Classification System and taking into consideration the specific physical nature of

the soils, the samples in question are considered to have the properties noted in the following Table 2.

Table 2: Soil Permeability and T-time Estimation

Sample Number	Material					Unified Soils Classification Group	Estimated Co-efficient of Permeability (k) (cm/sec)	Estimated T-time (min/cm)
	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)			
BH1 SS4	Silty Sand Fill	19	44	30	7	(CL)	$10^{-3} - 10^{-5}$	8 - 20
BH2 SS2	Sand and Gravel	53	38	9	0	(GP)	$10^{-2} - 10^{-4}$	4 - 12

If a storm water management pond is to be constructed for the proposed subdivision, a low permeability liner may be required to maintain a permanent wet pond. The low permeability liner may be constructed with a minimum 1m thick layer of clayey soils conforming to OPSS.MUNI 1205 requirements. Alternatively, a geosynthetic clay liner, such as Bentofix CNSL, or a synthetic liner, such as Nilex Geomembrane PVC 40 mil or similar products, may be used.

If a geosynthetic or synthetic liner is used, a minimum 300mm thick marker layer should be placed above the liner as an indicator/protective soil cover. The liner should be installed as per manufacturer's guidelines and up to a minimum of 0.6m above the design flood level in the pond. An underdrainage system may be required to relieve the hydrostatic uplift against the liner if the bottom of pond is lower than the highest observed groundwater level in the vicinity of the pond.

6.5 Pavement Design and Construction

All topsoil and any deleterious materials encountered should be stripped from the proposed road pavement areas. The exposed subgrade should be re-compacted from the surface to at

least 98% of its SPMDD prior to construction of the road pavement. Any loose areas which are detected should be sub-excavated and backfilled with approved imported granular fill. All granular fill materials should be placed in 150 to 200mm thick lifts and compacted to at least 98% of the SPMDD.

Considering the probable traffic requirements, subgrade conditions and a functional design life of about 15 years, the following pavement designs according to Town of Grand Valley Engineering Standards 2016 are recommended:

Table 3: Recommended Pavement Structures

Pavement Components	Local Roads (mm)	Collector Roads (mm)
Asphaltic Concrete – HL3	40	50
Asphaltic Concrete – HL8	50	60
Granular 'A' Base Course	150	150
Modified Granular 'B' Subbase Course	450	600

The granular base and sub-base materials should meet Ontario Provincial Standard Specification OPSS.MUNI.1010 and Town of Grand Valley Engineering Standards requirements and should be compacted to 100% of the Standard Proctor Maximum Dry Density (SPMDD) as per OPSS.MUNI.501 requirements. The asphaltic concrete should conform to OPSS.MUNI.1150 and should be compacted to a minimum of 92.0% of the Maximum Relative Density (MRD) as per OPSS.MUNI.310 requirements.

Frequent inspections by geotechnical personnel from JLP Services Inc. should be carried out during construction to verify the compaction of the subgrade, base courses and asphaltic concrete by in-situ density testing using nuclear gauges.

6.6 Building Foundations

The proposed buildings to be constructed at the site are assumed to be primarily single detached or linked townhome residential dwellings with basements. The proposed buildings can be supported on spread footings founded a minimum of 0.2m into the native undisturbed sand and gravel in dense to very dense compactness or the properly constructed "engineered fill" and designed to a geotechnical reaction of 150 kPa at Serviceability Limit States (S.L.S.) and a factored geotechnical resistance of 225 kPa at Ultimate Limit States (U.L.S.).

All exterior footings or footings in unheated areas should be located at least 1.6 metres below finished grade or provided with equivalent thermal insulation for adequate frost protection.

Elevation differences between adjacent footings should not be more than a half of the horizontal distance between them.

It is estimated that the total and differential settlements of spread footings designed to these bearing pressures will be less than 25mm and 20mm respectively, which are normally considered acceptable for the proposed structure.

It is recommended that all foundation excavations be inspected by geotechnical personnel from JLP to ensure the founding soils are similar to those identified in the boreholes or are competent "engineered fill" and that they are capable of supporting the design bearing pressures.

Based on the 2012 Building Code Compendium, the classification of soils for seismic design should be based on the average properties of the top 30 metres of the soil profile. The deepest boreholes were only 6.5 metres below grade and were terminated in compact to very dense sand and gravel, dense sand or probable limestone bedrock. Assuming these deposits extend to depth, the soils at the site may be classified as Site Class 'D' under the site classification for seismic site response of 2012 Building Code Compendium.

6.7 Basement Walls

The basement walls of the proposed buildings may be designed to resist lateral earth pressures and the magnitude of which can be determined from the equation below:

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

where;

p	=	lateral earth pressure, kN/m ²
K	=	active earth pressure coefficient, $K = K_a = 0.33$, if retaining structure is permitted to move, otherwise, $K = K_o = 0.50$
γ	=	bulk unit weight of backfill, use 21 kN/m ³
d	=	depth below finished grade, metres
q	=	adjacent surcharge acting close to the wall, kN/m ²

The above equation assumes that there is no hydrostatic pressure build up against the basement walls. As such, the basement walls should be dampproofed and protected with a synthetic vertical drainage layer. A perimeter subdrain system should be installed at footing level outside the building envelope to facilitate drainage. The perimeter subdrain system should consist of 150mm diameter perforated pipe surrounded with a minimum of 300mm of 19mm clear stone all wrapped with a filter fabric, such as Texel 100C or other products with equivalent apparent opening size (AOS).

Water collected in the perimeter drainage system should be directed to the local storm drainage system either by gravity or by a permanent sump pump. Surface runoff around the proposed buildings should be directed away from the building.

Alternatively, the basement walls and floors can be sealed tight using waterproofing systems and designed to resist full hydrostatic pressures.

6.8 Floor Slabs

All topsoil and any deleterious materials encountered should be stripped from the proposed building areas. Any loose material encountered should be sub-excavated and replaced with

approved fill. The exposed subgrade should be re-compacted from the surface to a minimum of 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the footings and basement walls should be compacted to a minimum of 98% of the SPMDD. The backfill may consist of approved on-site sand and gravel or imported granular materials, such as Town of Grand Valley Modified Granular 'B' or OPSS Granular 'B' Type I (natural sand, some gravel). All fills should be placed in 150 to 200mm thick lifts and compacted to a minimum of 95% of the SPMDD.

A layer of free-draining material, such as OPSS.MUNI 1004 19mm Clear Stone, at least 150mm thick and nominally compacted, should be placed under the floor slabs to provide a uniform bearing surface and act as a moisture barrier.

The basement floors should be located at least 0.5 metres above the highest observed groundwater level, otherwise sub-floor drainage systems together with continual pumping from the drainage systems will be required. Consideration may also be given to locate the basement floors above the 100-year flood level of the nearby Grand River depending on local conservation authority requirements.

Around the perimeter of the proposed building, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and reduce groundwater infiltration adjacent to the foundations.

Frequent field review and testing by geotechnical personnel from JLP should be carried out during construction to verify the competency of the subgrade and compaction of granular base and/or backfill by in-situ density testing using nuclear gauges.

6.9 Excavation and Groundwater Control

Excavation to reach the footing founding levels will extend to about 1.2 metres below design pre-grades. Excavations must be carried out in accordance with the current Occupation Health and Safety Act (OHSA) and local regulations. For guidance, the side slopes should be cut back

to 1 vertical to 1 horizontal as the existing fill, "engineered fill" and native sand and gravel are considered to be Type 3 soils within the meaning of the OHSA.

Minor seepage from perched water in the existing fill, "engineered fill" or native sand and gravel should be anticipated during construction. However, it should be possible to control and remove seepage water from these sources or surface water from precipitation by pumping on as and where required basis.

7.0 Statement of Limitation

The Statement of Limitation including the Terms and Conditions of this report is presented on Appendix 'A' is an integral part of this report.

8.0 Closure

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Sincerely,

JLP Services Inc.



A circular professional engineer seal for the Province of Ontario. The seal contains the text "LICENSED PROFESSIONAL ENGINEER" at the top and "PROVINCE OF ONTARIO" at the bottom. In the center, the name "A. H-M. LEE" is printed. A handwritten signature in blue ink is written over the seal, and the date "April 20, 2022" is handwritten in blue ink above the name.

Alexander Lee, M.Sc. (Eng.), P.Eng.
Senior Geotechnical Engineer



A handwritten signature in blue ink, appearing to read "J. Board".

J. Board, B.A.
General Manager

Enclosures



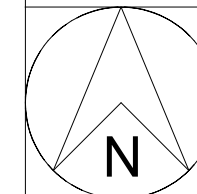
Legends

 Borehole (JLP, 2022)

 Property Line

NOTE: Monitoring Well's Layout and Ground Elevation provided by GM Blueplan Engineering Ltd.

- Notes:
1. The soil types and boundaries are applicable only at the location of the boreholes. Between boreholes, they are assumed and may change substantially. The topsoil thicknesses quoted in the report are used for discussion purposes only and should not be used for estimating purposes.
 2. The Ground Surface elevations at the borehole locations were derived from the Temporary Benchmark (TBM) as shown.
 3. The soil samples will be retained for three months from the date of issue of the final report and then discarded, unless the client has requested to extend the storage period with fees.



Borehole Location Plan
 Rivers Edge Subdivision
 Part of Lot 31, Concession 3
 Scott Street
 Town of Grand Valley, Ontario

Source: Google Map

Date: April 20, 2022

Ref. No. G4524-22-1

Scale: N.T.S.

Prepared By: GB

Checked By: JB

REFERENCE No: G4524-22-1

MONITORING WELL No: 1

CLIENT: Thomasfield Homes Ltd.

PROJECT: Rivers Edge Subdivision

ENCLOSURE No: 2

LOCATION: Scott Street, Grand Valley, ON

SUPERVISOR: AK

JLP Services Inc.
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
 PH. (519) 763-3101

SUBSURFACE PROFILE					SAMPLE			PENETRATION RESISTANCE				WATER CONTENT %					UNIT WEIGHT
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE	N-VALUE	20	40	60	80	5	10	15	20	25	
0.0	Ground Surface	458.7															
	<p>TOPSOIL: about 100mm thick, silty sand, organics, grass on surface; dark brown, moist, no odour, no staining</p> <p>FILL: sandy silt to silty sand, some gravel, trace to some clay, scattered organic inclusions; dark brown to brown, moist to wet, no odour, no staining</p>				1	SS	71										
					2	SS	8	○									
					3	SS	12	○									
					4	SS	14	○									
4.5		454.2			5	SS	13	○									
					6	SS	21	○									
	<p>SAND AND GRAVEL: coarse grained, scattered rock fragments; grey, wet, compact to dense, no odour, no staining</p>				7	SS	49	○									
6.5		452.2															
	End of Borehole																

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 200mm

DRILL METHOD: Hollow Stem Auger

DATUM: Geodetic

DRILL DATE: March 7, 2022

SHEET: 1 of 1

REFERENCE No: G4524-22-1

MONITORING WELL No: 2

CLIENT: Thomasfield Homes Ltd.

PROJECT: Rivers Edge Subdivision

ENCLOSURE No: 3

LOCATION: Scott Street, Grand Valley, ON

SUPERVISOR: AK

JLP Services Inc.
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
 PH. (519) 763-3101

SUBSURFACE PROFILE					SAMPLE			PENETRATION RESISTANCE				WATER CONTENT %					UNIT WEIGHT
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE	N-VALUE	20	40	60	80	5	10	15	20	25	
0.0	Ground Surface	454.9															
0.9	TOPSOIL: silty sand, some gravel, mixed with organics, scattered roots; black to dark brown, moist, no odour, no staining	454.0															
	SAND AND GRAVEL: coarse grained, scattered rock fragments; grey, wet, dense to very dense, no odour, no staining			Well Casing Concrete Bentonite PVC Riser W.L. @ 453.6m± (8-APRIL-2022) Silica Sand PVC Screen	1	SS	57										
					2	SS	77										
					3	SS	44										
					4	SS	50				50/125m						
					5	SS	62										
6.5	End of Borehole	448.3			6	SS	87				87/200mm						

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 200mm

DRILL METHOD: Hollow Stem Auger

DATUM: Geodetic

DRILL DATE: March 7, 2022

SHEET: 1 of 1

REFERENCE No: G4524-22-1

MONITORING WELL No: 3

CLIENT: Thomasfield Homes Ltd.

PROJECT: Rivers Edge Subdivision

ENCLOSURE No: 4

LOCATION: Scott Street, Grand Valley, ON

SUPERVISOR: AK

JLP Services Inc.
GEOTECHNICAL & ENVIRONMENTAL
CONSULTANTS

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3
 PH. (519) 763-3101

SUBSURFACE PROFILE				SAMPLE			PENETRATION RESISTANCE				WATER CONTENT %					UNIT WEIGHT			
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE	N-VALUE	20	40	60	80	5	10	15	20		25		
0.0	Ground Surface	457.5																	
	TOPSOIL: about 50mm thick, silty sand, organics, grass on surface; dark brown, moist, no odour, no staining FILL: silty sand, trace to some gravel; brown, moist, no odour, no staining				1	SS	16												
2.4		455.1			2	SS	7												
2.8	TOPSOIL: sandy silt, trace gravel, mixed with organics; dark brown, moist, no odour, no staining FILL: silty sand, some gravel; brown, moist, compact, no odour, no staining	454.7			3	SS	4												
4.5		453.0			4	SS	12												
6.0	SAND AND GRAVEL: coarse grained; brown, moist, loose, no odour, no staining	451.5			5	SS	5												
6.5	SAND: some gravel; brown, wet, dense, no odour, no staining	451.0			6	SS	37												
	End of Borehole																		

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 200mm

DRILL METHOD: Hollow Stem Auger

DATUM: Geodetic

DRILL DATE: March 7, 2022

SHEET: 1 of 1

REFERENCE No: G4524-22-1

MONITORING WELL No: 4

CLIENT: Thomasfield Homes Ltd.

PROJECT: Rivers Edge Subdivision

ENCLOSURE No: 4

LOCATION: Scott Street, Grand Valley, ON

SUPERVISOR: AK

JLP Services Inc.
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SUBSURFACE PROFILE					SAMPLE			PENETRATION RESISTANCE	WATER CONTENT %	UNIT WEIGHT
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE	N-VALUE			
0.0	Ground Surface	457.5								
0.3	FILL: silty sand; greyish brown, moist, no odour, no staining	457.2			1	SS	6			
1.6	TOPSOIL: sandy silt, some gravel, mixed with organics, scattered roots and plant fibres; dark brown, moist, no odour, no staining	455.9			2	SS	6			
2.8	FILL: silty sand, some gravel, occasional metal pieces; brown moist, no odour, no staining	454.7			3	SS	23			
3.1	LIMESTONE: highly weathered, frequently jointed; white, no odour, no staining	454.4			4	SS	50			
	Refusal on Probable Bedrock				5	SS	50			

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 200mm

DRILL METHOD: Hollow Stem Auger

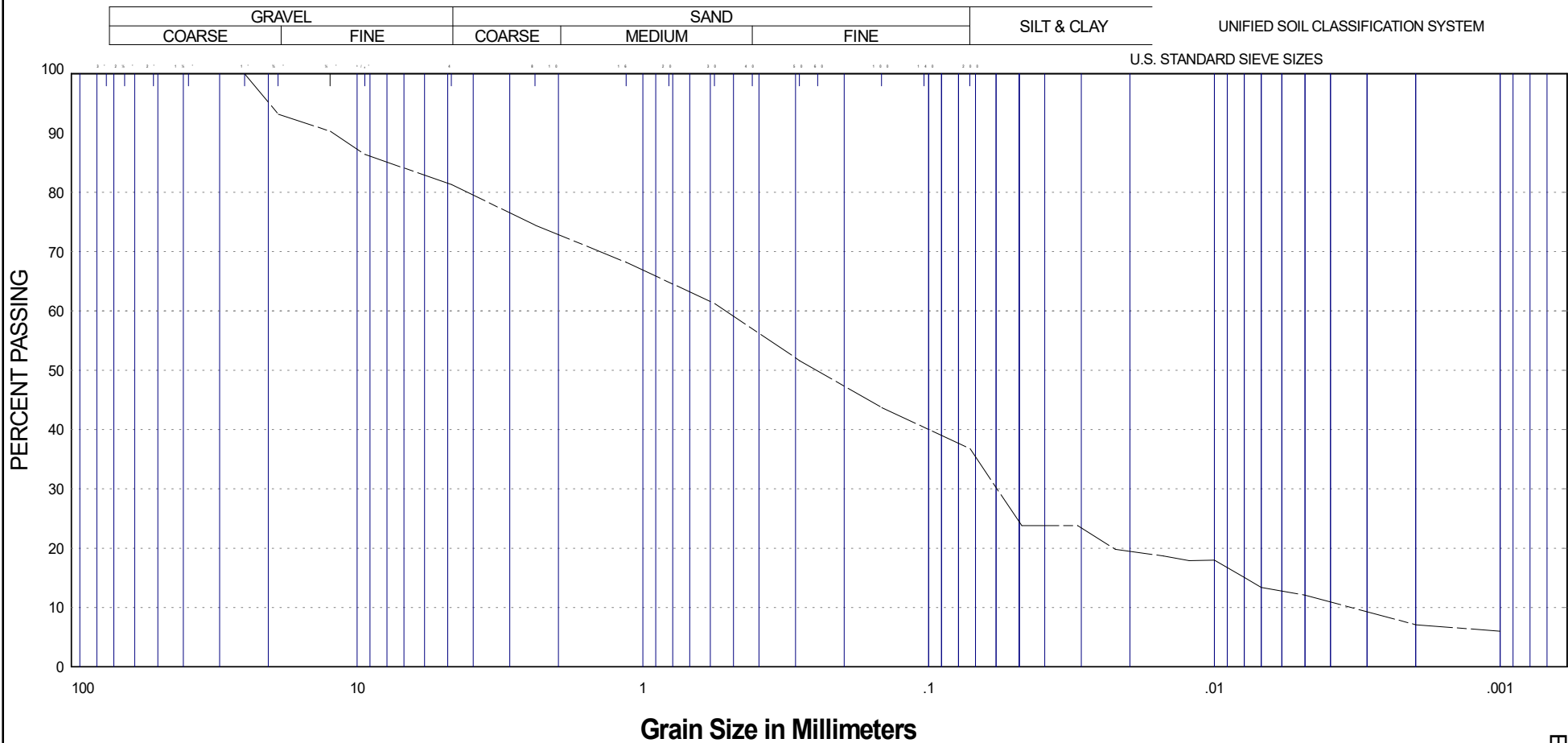
DATUM: Geodetic

DRILL DATE: March 29, 2022

SHEET: 1 of 1

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4524-22-1



PROJECT: Rivers Edge Subdivision
 LOCATION: Scott Street, Grand Valley, ON
 BOREHOLE N°: 1
 SAMPLE N°: 4
 DEPTH: 3.0 - 3.5 m±
 ELEVATION: 455.7 - 455.2 m±

COEFFICIENT OF UNIFORMITY: _____
 COEFFICIENT OF CURVATURE: _____

Classification of Sample and Group Symbol:

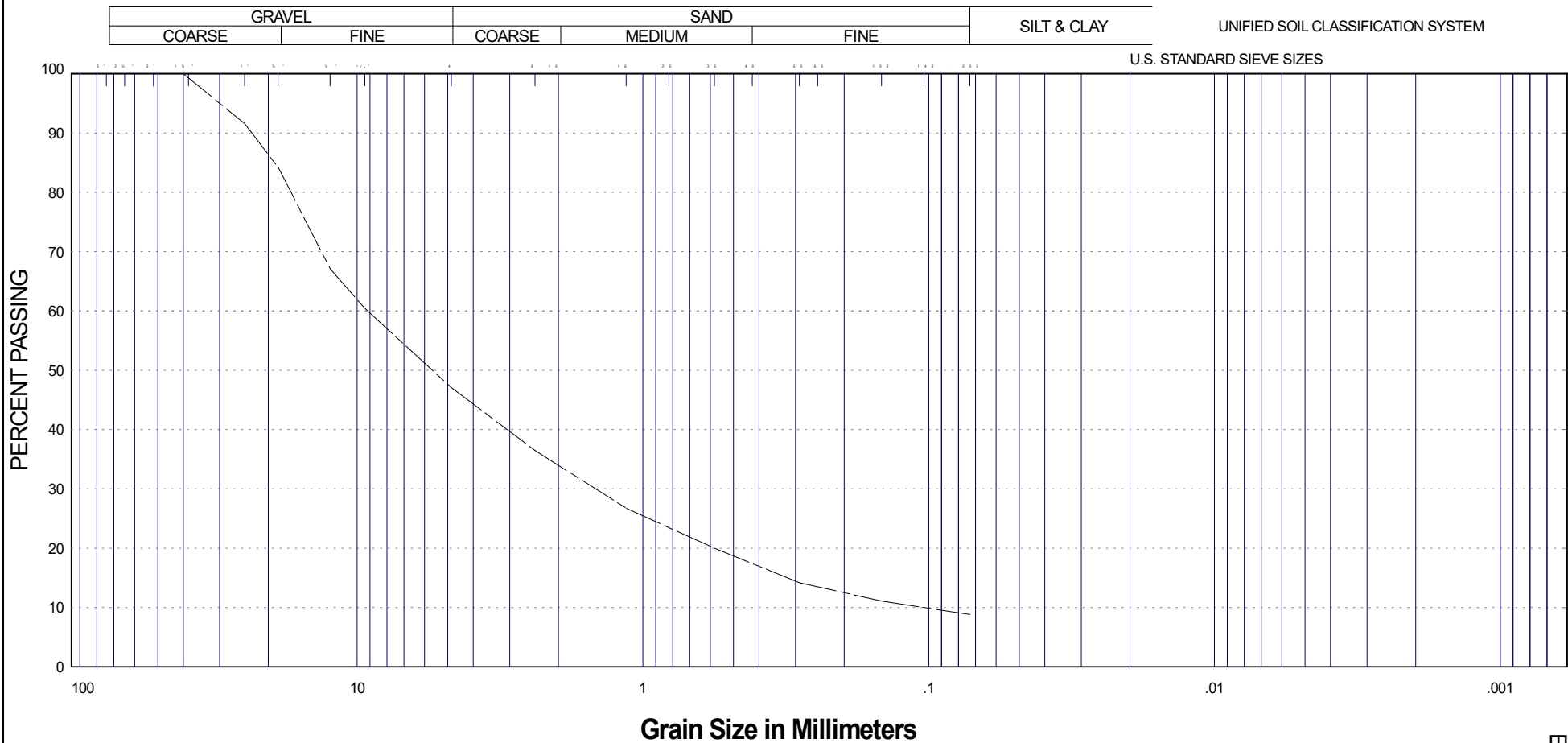
 SILTY SAND, some gravel, trace clay (CL)

PLASTIC PROPERTIES
 LIQUID LIMIT % = 25.1
 PLASTIC LIMIT % = 11.1
 PLASTICITY INDEX % = 14.0
 MOISTURE CONTENT % = 16.1

ENCLOSURE N° 6

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4524-22-1



PROJECT: Rivers Edge Subdivision
 LOCATION: Scott Street, Grand Valley, ON
 BOREHOLE N°: 2
 SAMPLE N°: 2
 DEPTH: 1.5 - 2.0 m±
 ELEVATION: 453.4 - 452.9 m±

COEFFICIENT OF UNIFORMITY: _____
 COEFFICIENT OF CURVATURE: _____

Classification of Sample and Group Symbol:
 SAND AND GRAVEL, trace silt (GP)

PLASTIC PROPERTIES
 LIQUID LIMIT % = _____
 PLASTIC LIMIT % = _____
 PLASTICITY INDEX % = _____
 MOISTURE CONTENT % = 5.1

ENCLOSURE N° 7

Appendix A – Limitations and Use of Report

REPORT TERMS AND CONDITIONS

NOTICE: THE FOLLOWING PROVISIONS SET FORTH IMPORTANT QUALIFICATIONS AND LIMITATIONS ON THE FINDINGS AND RECOMMENDATIONS IN THE REPORT AS WELL AS THE USE OF, AND RELIANCE ON, THE REPORT.

1. **DEFINITIONS.** The following capitalized terms have the following meanings:

- (a) **"Additional Investigations"** means investigations that JLP has indicated to the Client should be undertaken to take into account any Out-of-Scope Requirements, but that are not otherwise specifically within the scope of investigations conducted for the purpose of the Report.
- (b) **"Applicable Laws"** means and includes without limitation all applicable provincial laws, regulations, guidelines, policies, standards, protocols, and objectives administered by the Ministry of the Environment and Climate Change or any other duly-constituted governmental authority, all as in force as of the date of the Report.
- (c) **"Client"** means the Client as referred to in the Report.
- (d) **"Client Information"** means the information, representations, and instructions provided by the Client, the Client's representatives, and/or others and upon which the Report is based, in whole or in part.
- (e) **"Findings"** means the evaluations and conclusions set forth in the Report.
- (f) **"JLP"** means JLP Services Inc.
- (g) **"Out-of-Scope Requirements"** means special concerns or requirements of the Client in respect of the subject matter of the Report.
- (h) **"Recommendations"** mean the findings and recommendations referred to in the Report, taking into account any Out-of-Scope Requirements that were disclosed to JLP prior to the date of the Report.
- (i) **"Report"** means the report to which these Terms and Conditions are attached and form part.
- (j) **"Report Documents"** means the underlying documents, records, data, and files, in any medium whatsoever, generated in connection with the preparation of the Report, including without limitation, the instructions and objectives communicated to JLP by the Client, communications between JLP and the Client, and other reports, proposals, or documents prepared by JLP for the Client in connection with the Site.
- (k) **"Site"** means the site in respect of which the Report was prepared.
- (l) **"Site Conditions"** means Site conditions known as a result of, or reasonably imputed by, the investigations that were undertaken as of the date of the Report.

2. **BASIS OF REPORT.** The Report is based on the Site Conditions. Any changes to the Site Conditions after the date of the Report that could or will affect the Site Conditions may or will have a corresponding effect on the Recommendations. The Report does not take into account any (a) Additional Investigations that were not undertaken, or (b) Out-of-Scope Requirements that were not communicated prior to completion of the investigations that were been undertaken as of the date of the Report. Where recommended field services are referred to, they are the minimum services necessary to determine compliance of construction with Applicable Laws,

generally accepted industry-standard practices, and the Recommendations.

3. **RELIANCE & USE.** The Report has been prepared only for the Site and the related design, development, building, or building assessment objectives identified by the Client. The Findings and Recommendations are based on the Site Conditions and the Client Information. In preparing the Report, JLP has relied upon the Client Information and disclaims any responsibility for any inaccuracy, misstatement, omission, unintentional misrepresentation, or other deficiency contained in the Report as a result of such reliance. Unless specifically stated otherwise, the applicability and reliability of the Findings and the Recommendations expressed in the Report are only valid to the extent that (a) there has been no material change to or variation from any of the Client Information, (b) the Client Information contains no untrue statement of a material fact, or (c) the Client Information omits no statement of a material fact necessary in order to make the Client Information not misleading.

The Report and the Findings and Recommendations are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the prior written consent of JLP, which may be arbitrarily withheld or conditioned.

RELIANCE UPON THE REPORT OR ANY OF THE DETERMINATIONS MADE HEREIN BY A THIRD PARTY WITHOUT JLP'S CONSENT IS PROHIBITED AND JLP MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY IN FAVOUR OF ANY THIRD PARTY WITH RESPECT TO THE REPORT WHATSOEVER. JLP FULLY DISCLAIMS, AND WILL HAVE NO LIABILITY FOR, ANY LOSS, DAMAGES, OR EXPENSES WHICH ANY THIRD PARTY MAY INCUR OR SUFFER AS A RESULT OF THE USE OF OR RELIANCE ON THIS REPORT WHERE JLP HAS NOT EXPRESSLY AUTHORIZED SAME. ANY THIRD PARTY WHO RELIES ON THE REPORT TO ANY EXTENT DOES SO AT SUCH PARTY'S OWN RISK AND COMPLETELY WAIVES ANY AND ALL CLAIMS AGAINST JLP IN CONNECTION WITH THE REPORT, REGARDLESS OF THE THEORY OF LAW (WHETHER IN CONTRACT, TORT, OR ANY THEORY OF LAW COMING INTO EXISTENCE HEREAFTER).

4. **STANDARD OF CARE.** The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances. No other warranty, expressed or implied, is made or intended in the Report. It is intended that the Findings and Recommendations are meant to assist in reducing the Client's risk associated with environmental impairment at the Site. The Report should not be considered risk mitigation.
5. **ENTIRE REPORT.** The Report also includes the Report Documents. In order to properly understand the Findings and Recommendations, reference must be made to the Report in its entirety. JLP is not responsible for use by any party of a part of the Report only.
6. **GOVERNING FORMAT.** Notwithstanding that JLP may have submitted an electronic version of the Report or any document forming part of the Report, only the signed and sealed physical copy of the Report shall be deemed to be the original and in the event of any dispute or discrepancy, the physical copy shall govern. JLP makes no representation about the compatibility of its electronic or digital file format with the Client's current or future software and/or hardware systems. The documents described herein are JLP's instruments of professional service and shall not be altered without the written consent of JLP.
7. **GENERAL LIMITATIONS.**
- (a) Unless specifically stated otherwise, the Report does not contain environmental consulting advice.
 - (b) The Report contains no opinion or determination as to any matters governed by laws other than the laws of the Province of Ontario and the federal laws of Canada applicable therein as of the date hereof.
 - (c) During any future development of the Site, conditions not observed during JLP's investigations may become apparent. If this occurs, JLP should be contacted to assess the situation and whether there is a need for additional testing.