Bendigo Consulting Inc.
Geotechnical and Geo-Environmental Consultants

PROJECT NO.: 2021-276-G

May 19, 2022

Phelps Homes Ltd.
166 Main Street West
Grimsby, Ontario
L3M 1S3

Attention: Mr. Jowett Lau
Junior Project Manager

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL TOWNHOUSE DEVELOPMENT
132 COLLEGE STREET, SMITHVILLE, ONTARIO

Dear Mr. Lau,

We have completed the fieldwork, laboratory testing and the report preparation in connection with the above noted project. Our comments and recommendations, based on the findings at the nine borehole locations are presented in the following paragraphs.

1. INTRODUCTION

We understand that the project will involve the construction of a residential development consisting of six live/work units, twelve townhouse units and one hundred and twenty stacked townhouse units. Construction will include the installation of underground municipal services and asphaltic concrete paved roadways, with concrete curbs and sidewalks. The purpose of this geotechnical investigation was to determine the subsurface conditions at the nine borehole locations and to interpret these findings with respect to the design and construction of foundations, the excavation and backfilling operations, installation of underground services, roadway pavement structure and related earthworks for this project from a geotechnical point-of-view.

This report is based on the above summarised project description, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are made to the proposed design, then this office must be consulted to review the new design with respect to the results of this investigation. The information contained in this report does not reflect upon the environmental aspects of the site and therefore have not been addressed in this document.

666 Ardleigh Crescent
Burlington, Ontario
L7L 4K8
Phone: 905-407-4030
www.bendigo.ca

2. PROCEDURE

A total of nine [9] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. Borehole Nos. 1 to 9, inclusive were put down uncased using solid stem continuous flight auger equipment April 14, 2022, under the direction and supervision of a staff member of Niagara Testing & Inspection Ltd. These boreholes were advanced up to depths of between about 5.2 and 6.7 metres below the existing grade. On completion of drilling the boreholes were backfilled in general accordance with Ontario Regulation 903.

Representative samples of the subsoils were recovered from the borings at selected depth intervals using split barrel sampling equipment driven in accordance with the requirements of Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the soil laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on the soil samples recovered from the borings and hand penetrometer testing conducted on select samples.

The boreholes were located in the field by a representative of Niagara Testing & Inspection Ltd. The ground surface elevations at the borehole locations were referenced to a temporary benchmark by representatives of Niagara Testing & Inspection Ltd. The temporary benchmark is described as the top of the manhole lid located on Morgan Avenue opposite House No. 133, about 50 metres east of College Street. The temporary benchmark was assigned Elevation 100.00 metres.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in Borehole Log Nos. 1 to 9, inclusive following the text of this report. It is noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design and therefore should not be construed as the exact planes of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The subject site is located at 132 College Street on the east side of street in the Town of Smithville, Ontario. The site is currently a former school property with a one and two storey structure located along the western limit of the site. The building is surrounded with asphaltic concrete parking and play areas to north and east. Beyond the eastern limit of the asphaltic concrete the area consists of a grassed playfield, with several mature trees

recently cut down, and children's playground equipment. The site is bordered by residential properties to the north and south, by a mix of commercial and residential properties to the west, and by vacant wooded land to the east. The property is relatively flat, with surface drainage directed to the north and east.

The subsurface conditions encountered at the borehole locations are summarised as follows:

Topsoil

A surficial veneer of topsoil, approximately 100 to 150 millimetres, in thickness was encountered at Borehole Nos. 1, 3, 4, 5, 7, 8 and 9. It should be noted that the depth of topsoil must be expected to vary across this area and from the depths encountered at the borehole locations. It should also be noted that the term 'topsoil' has been used from a geotechnical point of view and does not necessary reflect its nutrient content or ability to support plant growth.

Pavement Structure

A pavement structure of 50 and 100 millimetres of asphaltic concrete over 360 and 200 millimetres of compact granular fill was encountered in Borehole Nos. 2 and 6, respectively.

Fill Materials

A silty clay/clayey silt fill material was found to underlie the topsoil in Borehole No. 1. The fill material was found to contain a trace of sand, gravel, and asphaltic concrete fragments. The fill material was found to a depth of about 1.5 metres and to be in a firm to stiff state.

Silty Clay/Clayey Silt

A silty clay/clayey silt was found to underlie the fill material in Borehole No. 1 and the topsoil and pavement structure in the remaining borings. The upper level of the silty clay/clayey silt is expected to have been 'reworked' from past agricultural ploughing and yearly freeze/thaw cycles. The brown silty clay/clayey silt was found to contain a trace of sand and occasional thin grey seams and to be stiff to very stiff in consistency. Hand penetrometer testing conducted on select recovered soil samples measured unconfined compressive strengths of generally greater than 450 to 400 kPa [greater than 4.5 to 4.0 tons per square foot] in the upper 5.0 metres.

Silty Clay

A silty clay was encountered beneath the silty clay/clayey silt in the Borehole Nos. 1 and 2. The silty clay was found to contain gravel and 'bedrock' fragments. The silty clay was noted to be very stiff in consistency.

Dolostone Bedrock

Spilt spoon sampler and auger refusal on inferred bedrock was obtained at depths of about 6.1 metres below the existing ground surface in Borehole Nos. 3, 5 and 9. The bedrock was not cored as part of this investigation. From experience and published information, the bedrock in the Smithville area is Dolostone of the Lockport Formation of the Eramosa Formation. The bedrock is considered very competent in terms of the foundation/excavation requirements for the proposed project.

Groundwater Observations

Groundwater observations are recorded as footnotes on the borehole logs. Borehole Nos. 1, 2, 6 and 9 reported groundwater at a depth of about 6.1, 6.1, 6.1 and 5.3 metres below grade, respectively. Borehole Nos. 3, 4, 5, 7 and 8 were recorded to be 'dry' and 'open' on completion. Given the low permeability of the silty clay/clayey silt soils, insufficient time would have passed for water to infiltrate into the open boreholes during the course of drilling. Based on the observed soil conditions, natural moisture contents, etc., the static water level is estimated to be about 4 to 5 metres below grade. Nevertheless, some minor infiltration of groundwater through the fill materials and more permeable seams in the native soils and from surface runoff should be anticipated.

4. FOUNDATION CONSIDERATIONS

The native silty clay/clayey silt soils are capable of supporting the loads typically associated with residential townhouse structures on conventional spread footings. Foundations constructed at depths of between about 2.0 and 2.5 metres below the existing grade, below the fill material and the upper reworked soil, may be designed using a factored Ultimate Limit State [ULS] bearing capacity of 300 kPa [~6,000 psf]. The contact allowable bearing stress at Serviceability Limit State [SLS] should be limited to 200 kPa [~4,000 psf], based on the total and differential settlements not exceeding 25 and 20 millimetres, respectively. All aspects of construction must comply with the current Ontario Building Code. Should the site grading works require engineered fill below founding elevations, such as in the area of the 'to-be' demolished school building, the general recommendations presented in the Backfill Considerations below should be strictly

adhered to, with compaction to 100 percent standard Proctor maximum dry density, demonstrated by monitoring and testing by a representative of Bendigo Consulting Inc. present of a full-time basis. We note that the founding level may need to be locally lowered should existing services be encountered during the excavation operations.

All basement foundation walls should be suitable damp proofed [with a 'dimple' drainage blanket] and provided with a perimeter drainage tile system. The perimeter weeping tile should consist of a 100-millimetre diameter perforated plastic pipe, encased in a geofabric sock, covered with a minimum of 200 millimetres of 20-millimetre clear crushed stone, in turn encased in a heavy geofabric. The weeping tile system would ideally outlet to a gravity sewer connection. This would eliminate the potential for frequently operating sump pumps for lots at lower founding elevations relative to the static groundwater level. Where a sump pit system is required, it is recommended that an 'over-sized' sump pit be provided to reduce the frequency of pump operation. The outlet should be fitted with suitable back-flow prevention valves.

It is noted that the support conditions afforded by the founding soils are not typically uniform across the site, nor are the loads on the various foundation elements. In this regard it is recommended that all footings and foundation walls be provided with nominal steel reinforcement, particularly in any engineered fill areas. Such nominal reinforcement would typically consist of two continuous 15M bars in the footings and a similar two 15M bars approximately 300 millimetres from the top of the foundation walls. The reinforcing bars should be bent to reinforce around corners and window openings, provided with sufficient overlap and tied at splice locations. The provision of such nominal reinforcing steel is considered good practice as it will work to limit any cracking of foundation walls, reducing the potential need for costly post construction repairs. The reinforcement will also aid the foundation walls in resisting the lateral forces associated with the often early backfill typical in residential construction.

The founding soils should be in an undisturbed state, and the footing bases should be hand cleaned of any loose or disturbed material immediately before the placement of concrete. All footings exposed to the environment must be provided with a minimum of 1.2 metres of earth cover or equivalent insulation to protect against frost penetration. This frost protection would also be required if construction were undertaken during the winter months.

It is imperative that a soils engineer be retained from this office to provide geotechnical engineering services during the excavation and foundation construction phases of the project. This is to observe compliance with the design concepts and recommendations of

this geotechnical investigation report, and to allow changes to be made in the event that subsurface conditions differ from the conditions identified at the borehole locations.

5. EXCAVATIONS

It is anticipated that the excavations for the proposed foundations, sewers and other underground services will extend to depths of up to 5.0 metres below the present grade through upper fill material and into the native silty clay/clayey silt and silty clay. Should excavations into the Dolostone bedrock need to be undertaken these will require pneumatic rock splitters and/or heavy construction equipment. The side slope in the fill material and upper 'reworked' native soils should remain stable at slopes of 45 degrees. The side slopes of excavations into the native cohesive soils should remain stable for the short period of construction at slopes of up to 60 degrees to the horizontal, or steeper. Any excavations into the bedrock should remain stable at near vertical side slopes. Nevertheless, all excavations must comply with the current Occupations Health and Safety Act and Regulations for Construction Projects. Excavations slopes steeper than those required in the Safety Act must be supported or a trench box must be provided, and a senior Geotechnical Engineer from this office should supervise the work.

Some infiltration of groundwater through the fill material and from more permeable seams in the native soils and surface runoff should be anticipated. Any water that may seep into the excavations could be removed using conventional construction 'dewatering' techniques, such as pumping from sumps and ditches. More water should be expected when connections are made with existing services. Surface water should be directed away from the excavations. We note that rate of excavation may be slowed should the contractor encounter existing site services, etc.

The base of the excavations in the native cohesive soils encountered in the boreholes should remain firm and stable. Therefore, standard pipe bedding, as typically specified by the Town of Smithville, should suffice. The bedding material should be uniformly compact to at least 95 percent standard Proctor density, with special attention paid to compaction under the pipe haunches.

6. BACKFILL CONSIDERATIONS

The majority of the excavated material will consist of limited portions of the fill material found in Borehole No. 1 and the native cohesive soils, which are considered to be suitable for use as service trench backfill and as engineered fill provided that the moisture content can be controlled to within 3 percent of the standard Proctor optimum value. Some moisture content conditioning of the excavated material may be required, depending upon

the weather conditions experienced at the time of construction to achieve acceptable compaction densities and minimise long-term settlements.

We note that where backfill material is placed near or slightly above its optimum content, the potential for long-term settlements due to the ingress of groundwater and collapse of the fill structure is reduced. Correspondingly, the shear strength of 'wet' backfill material is also lowered, thereby reducing its ability to support construction traffic, and therefore impacting roadway construction. If the soil is well 'dry' of its optimum value, it will appear to be very strong when compacted, but will tend to settle with time as the moisture content in the fill increases to equilibrium condition. The cohesive soils may require high compaction energy to achieve acceptable densities if the moisture content is not close to their standard Proctor optimum value. It is therefore very important that the placement moisture content of the backfill soils be within 3 percent of its standard Proctor optimum moisture content during placement and compaction.

The silty clay/clayey silt and silty clay encountered in the borings are sensitive to moisture absorption and will become practically impossible to compact using conventional compaction equipment if it becomes 'wet' during extended periods of precipitation. After a period of heavy precipitation, any near-surface softened material should be allowed to dry or be removed from the fill surface and discarded.

Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 percent of its optimum moisture content and meet the necessary environmental guidelines.

The backfilling and compaction operations should be monitored by a representative of Bendigo Consulting Inc. to monitor uniform compaction of the backfill material to project specification requirements. Close supervision is prudent in areas that are not readily accessible to compaction equipment, for instance near the end of compaction 'runs', service trenches crossing the roadways and around the foundation walls. Any engineered fill should be compacted to 100 percent standard Proctor maximum dry density. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

7. MANHOLES, CATCH BASINS AND THRUST BLOCKS

With the manholes, catch basins, valve chambers, etc. founded on the native silty clay/clayey silt or silty clay assuming all founding surfaces are carefully prepared to remove all loose and disturbed material, the bearing surfaces will be practically non-yielding under the anticipated loads. Proper preparation of the founding soils will therefore

accentuate the protrusion of these structures above the pavement surface if compaction of the fill around these structures is not adequate, causing settlement of the surrounding paved surfaces. Conversely, the pavement surfaces may rise above the valve chambers under frost action. To alleviate the potential for these types of differential movements, free-draining, non-frost susceptible material should be provided as backfill around the structures located within any paved roadway limits and compacted to 100 percent of its standard Proctor maximum dry density. A geofabric separator should be provided between the free draining material and the on-site fine-grained soils to prevent to intrusion of fines.

The thrust blocks in the native cohesive soils may be sized as recommended by the applicable Ontario Provincial Standard Specification [OPSS]. A design allowable bearing pressure of 150 kPa [~3000 psf] may conservatively be used in the design of thrust blocks. Any backfill required behind the blocks should be granular and should be compacted to 100 percent of their standard Proctor density.

8. PAVEMENT CONSIDERATIONS

ROADWAYS

The roadway areas should be stripped of all topsoil and unsuitable materials. The exposed subgrade should be proofrolled with 3 to 4 passes of a loaded tandem truck in the presence of a representative of Bendigo Consulting Inc., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this, or any other means must be subexcavated and replaced with suitable backfill material. Alternatively, the soft areas may be repaired by the placement of coarse aggregate, such as 50-millimetre clear crushed stone. The need for sub-excavations of a softened subgrade will be reduced if construction is undertaken during periods of dry weather and careful attention is paid to the compaction operations. The fill placed over shallow utilities cuts into or across the street must also be compacted to 100 percent of its standard Proctor maximum dry density.

Good draining provisions will optimise the long-term performance of the pavement structure. The subgrade must be properly crowned and shaped to promote drainage to the subdrain system. Subdrains should be installed to intercept excess subsurface water and to prevent softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved area.

The most severe loading conditions on the subgrade typically occur during the course of construction, therefore precautionary measures may have to be taken to ensure that the

subgrade is not unduly disturbed by construction traffic. These measures would include minimising the amount of heavy traffic travelling over the subgrade, such as during the placement of granular base layers.

If construction is conducted under adverse weather conditions, additional subgrade preparation may be required. During wet weather conditions, such as typically experienced during the Fall and Spring months, it should be anticipated that the additional subgrade preparation would be required, such as the provision of a Granular B sub-base coarse material. It is also important that the sub-base and base coarse granular layers of the pavement structure be placed as soon after exposure and preparation of the subgrade level as practical.

The proposed pavement structure would be required to adequately support light-duty cars and trucks and intermittent delivery and garbage trucks. For this project, we would recommend a minimum pavement structure of 450 millimetres of OPSS Granular A base course, 50 millimetres of HL8 HS binder coarse and 40 millimetres of HL3 HS surface course asphaltic concrete. This design is considered adequate, provided that the subgrade has been prepared as specified and is good and firm before the sub-base course material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented and/or the sub-base thickness may have to be increased. The granular sub-base and base courses and asphaltic concrete layers should be compacted to OPSS or the Town of Smithville's requirements. A programme of in-place density testing must be carried out to monitor that compaction requirements are being met. If construction is conducted under adverse weather conditions, additional subgrade preparation may be required. We note that this pavement structure is not to be considered as a construction roadway design.

DRIVEWAYS

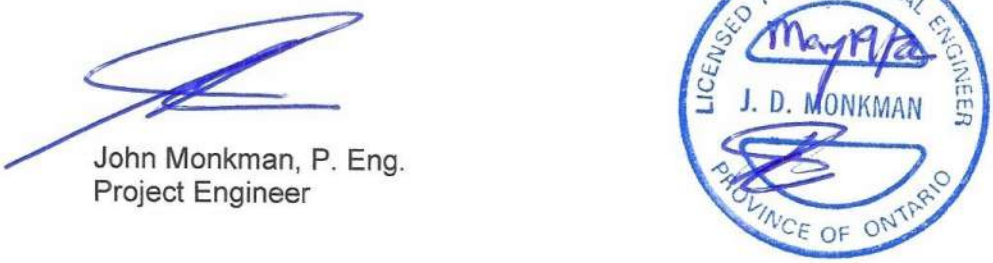
Asphaltic concrete paving of driveways should be consistent with the general recommendations provided above. Proper preparation of the subgrade soils is essential to good long-term performance of the pavement. Likewise, sufficient depth and compaction of granular base materials will be important in achieving good long-term performance, i.e., limit premature cracking, subgrade failure, rutting, etc. A recommended light duty pavement structure for residential driveways would consist of a minimum of 200 millimetres of OPSS Granular A base course, followed by 50 millimetres of HL3 surface course asphaltic concrete.

9. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The subsoil descriptions and borehole information are only intended to describe conditions at the nine borehole locations. Contractors placing bids of undertaking this project should carry out due diligence in order to verify the results of this investigation and to determine how the subsurface conditions will affect their operations.

We trust that this geotechnical report is sufficient for your present requirements. Should you require any additional information or clarifications as to the contents of this document, then please do not hesitate to contact the undersigned.

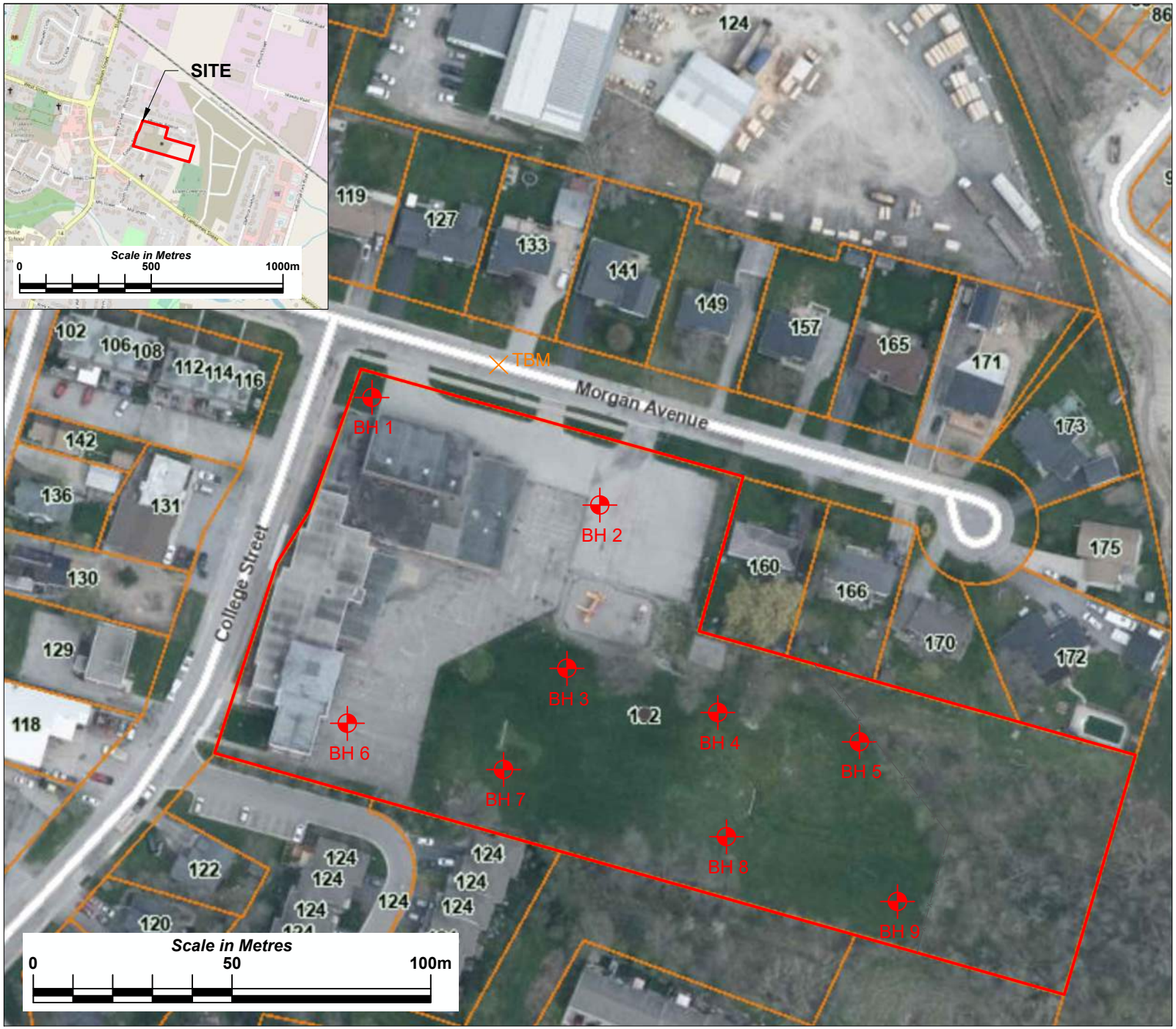
Yours very truly,
Bendigo Consulting Inc.



John Monkman, P. Eng.
Project Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Log Nos. 1 to 9, inclusive

Distribution: Phelps Homes Ltd. [1 plus pdf copy]



LEGEND

- BH 1 — Borehole Location
- TBM — Temporary Benchmark: Manhole cover on Morgan Avenue, in front of house #133
- Site Boundary
- Chain Link Fence

NTiL
NIAGARA TESTING & INSPECTION LTD.

CLIENT:
PHELPS HOMES LTD.

PROJECT:
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
132 COLLEGE STREET
SMITHVILLE, ONTARIO

TITLE:
BOREHOLE LOCATION PLAN

DRAWN BY: DN

CHECKED BY: JM

DATE: APRIL 2022

PROJECT NO: BG22000

SCALE: AS SHOWN

NO:
DRAWING 1

REFERENCE: BASE MAP PROVIDED BY NIAGARA NAVIGATOR, https://maps-beta.niagararegion.ca/Navigator/
NOTE: FOR ILLUSTRATION PURPOSES ONLY, ALL LOCATIONS APPROXIMATE.

RECORD OF BOREHOLE: BH-1

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618485 E, 4772871 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.81	Ground Surface										
	0.00	**Topsoil** 150 mm Topsoil - rootlets and organics										
		Fill Material Silty Clay / Clayey Silt Fill brown trace sand, gravel and asphaltic concrete	SS	1	6			6		22.9		
			SS	2	9			9		36.8		
	99.36											
	1.45	**Silty Clay / Clayey Silt Reworked** brown stiff	SS	3	13			13		23.8		
	98.60											
	2.21	**Silty Clay / Clayey Silt** brown trace grey seams very stiff - stiff trace wet seams ~4.8 mbgs	SS	4	20			20 450		24.8		
			SS	5	15			15 450		27.9		
	96.69											
	4.11	trace wet seams	SS	6	14			14 200		28.3	6.1 mbgs - April 14, 2022	
	95.17											
	5.64	**Silty Clay** brown with gravel possible bedrock fragments very stiff	SS	7	18			18		28.7		
	94.10											
	6.71	End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: 6.1 mbgs
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-2

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618539 E, 4772840 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.32	Ground Surface										
	0.00	**Asphaltic Concrete** 50 mm Asphaltic Concrete										
	99.91	**Gravel** 360 mm Gravel	SS	1	10			10		28.6		
	0.41	**Silty Clay / Clayey Silt Reworked** brown trace sand, gravel and rootlets stiff	SS	2	8			8		30.5		
			SS	3	12			12		23.7		
	98.11											
	2.21	**Silty Clay / Clayey Silt** brown trace grey seams stiff - very stiff	SS	4	20			20	450	23.0		
			SS	5	19			19	450	24.5		
			SS	6	14			14	450	30.9		
	94.68										6.1 mbgs - April 14, 2022	
	5.64	**Silty Clay** brown with gravel possible bedrock fragments very stiff	SS	7	19			19		16.4		
	93.61											
	6.71	End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: 6.1 mbgs
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-3

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618537 E, 4772807 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.51	Ground Surface										
	0.00	**Topsoil** 100 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets firm - stiff	SS	1	6			6		24.1		
			SS	2	10			10		29.6		
	99.06											
	1.45	**Silty Clay / Clayey Silt** brown trace sand and grey seams very stiff - stiff	SS	3	20			20	450	27.4		
			SS	4	16			16	450	24.4		
			SS	5	14			14	450	27.3		
	94.41											
	6.10	**Possible Weathered Bedrock** weathered in upper level fragments recovered hard	SS	6	39			39				
	93.88											
	6.63	End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-4

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618569 E, 4772803 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.04	Ground Surface										
	0.00	**Topsoil** 100 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets firm - stiff	SS	1	7			7		24.4		
			SS	2	11			11		23.8		
	98.59											
	1.45	**Silty Clay / Clayey Silt** brown trace grey seams very stiff	SS	3	25			25 450		21.9		
			SS	4	27			27 450		23.3		
			SS	5	15			15 450		25.4		
			SS	6	16			16 300		24.5		
	94.86											
	5.18	End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-5

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618606 E, 4772774 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	98.40	Ground Surface										
	0.00	**Topsoil** 150 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets firm - stiff	SS	1	5			5		14.7		
			SS	2	13			13		28.2		
	96.95											
	1.45	**Silty Clay / Clayey Silt** brown trace grey seams very stiff - stiff	SS	3	26			26 / 450		21.2		
			SS	4	13			13 / 450		28.3		
			SS	5	9			9 / 250		25.5		
	92.30											
	6.10	**Possible Weathered Bedrock** weathered in upper level fragments recovered hard										
		End of Borehole										

ft / m: 0.0 / 0.0, 1.0 / 2.0, 2.0 / 3.0, 3.0 / 4.0, 4.0 / 5.0, 5.0 / 6.0, 6.0 / 7.0

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

NTiL NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-6

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618478 E, 4772785 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING			
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40		WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	101.08	Ground Surface											
	0.00	**Asphaltic Concrete** 100 mm Asphaltic Concrete											
	100.78 0.30	**Gravel** 200 mm Gravel	SS	1	7			7		26.3			
	100.32 0.76	**Silty Clay / Clayey Silt Reworked** brown trace sand, gravel and rootlets firm	SS	2	16			16		24.7			
		Silty Clay / Clayey Silt brown trace grey seams very stiff - stiff	SS	3	22			22		25.8			
			SS	4	15			15 / 450		23.8			
			SS	5	13			13 / 450		24.1			
			SS	6	16			16 / 450		25.4			
			SS	7	16			16 / 400		28.7			
	94.38 6.71	End of Borehole											

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: 6.1 mbgs
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-7

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618505 E, 4772764 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.76	Ground Surface										
	0.00	**Topsoil** 150 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets stiff - very stiff	SS	1	7			7		26.9		
			SS	2	17			17		25.8		
	99.31											
	1.45	**Silty Clay / Clayey Silt** brown trace grey seams very stiff - stiff	SS	3	22			22 / 450		25.2		
			SS	4	19			19 / 450		24.4		
			SS	5	14			14 / 450		26.7		
			SS	6	13			13 / 400		23.9		
	95.58											
	5.18	End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

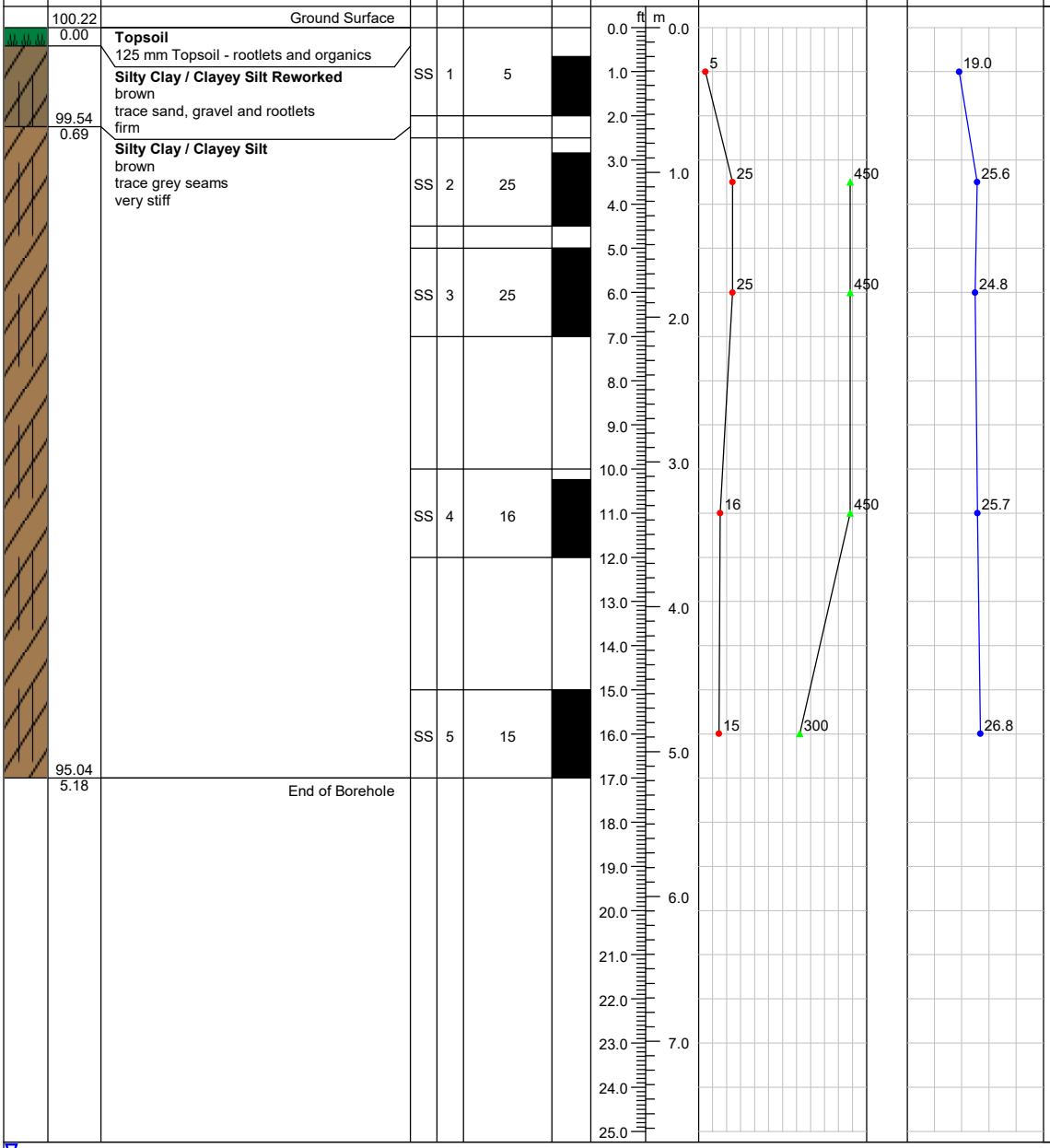
RECORD OF BOREHOLE: BH-8

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618568 E, 4772769 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	100.22	Ground Surface										
	0.00	**Topsoil** 125 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets firm	SS	1	5							
	99.54 0.69	**Silty Clay / Clayey Silt** brown trace grey seams very stiff	SS	2	25							
			SS	3	25							
			SS	4	16							
			SS	5	15							
	95.04 5.18	End of Borehole										



Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: Dry
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

NTiL
NIAGARA TESTING & INSPECTION LTD.

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6

RECORD OF BOREHOLE: BH-9

PROJECT NO.: BG22000 - 132 College St
PROJECT: Proposed Residential Development
LOCATION: 132 College Street, Smithville, Ontario
CLIENT: Phelps Homes Ltd.

DRILLING COMPANY: Elements Geo
DRILLING METHOD: 150 mm Solid Stem Augers
DRILL RIG: Track Mounted D-70
BOREHOLE COORDINATE (UTM): 618615 E, 4772738 N

SHEET 1 of 1
DATE STARTED: April 14, 2022
DATE COMPLETED: April 14, 2022
DATUM: Temporary Benchmark

SOIL PROFILE			SAMPLES					FIELD TESTING		LAB TESTING		
LITHOLOGY PLOT	ELEVATION (m / mbgs)	DESCRIPTION	TYPE	NUMBER	SPT 'N' VALUE	RECOVERY (%)	DEPTH SCALE ft / m	SPT (N) 25 50 75 100 / HAND PENETROMETER (kPa) 100 200 300 400	COV (ppm / %LEL)	MOISTURE CONTENT (%) 10 20 30 40	WELL INSTALLATION	COMMENTS and ADDITIONAL LAB TESTING
	97.96	Ground Surface										
	0.00	**Topsoil** 125 mm Topsoil - rootlets and organics										
		Silty Clay / Clayey Silt Reworked brown trace sand, gravel and rootlets firm	SS	1	5			5		23.4		
	97.27 0.69	**Silty Clay / Clayey Silt** brown trace sand and grey seams very stiff - stiff	SS	2	19			19 / 450		22.5		
			SS	3	25			25 / 450		26.3		
			SS	4	14			14 / 450		24.6		
			SS	5	16			16 / 350		24.3		
			SS	6	8			8 / 250		32.4	5.3 mbgs - April 14, 2022	
	91.86 6.10											
	91.71 6.25	**Possible Weathered Bedrock** weathered in upper level fragments recovered hard	SS	7	50/25mm			50		21.6		
		End of Borehole										

Groundwater Level Upon Completion:
Secondary Groundwater Level:

INITIAL WATER LEVEL: 5.3 mbgs
SECONDARY WATER LEVEL: NA
BOREHOLE CAVE UPON COMPLETION: Open

INITIAL WATER LEVEL DATE: April 14, 2022
SECONDARY WATER LEVEL DATE: NA

LOGGED: DN
COMPILED: DN
CHECKED: JM

Niagara Testing & Inspection Ltd.
3300 Merrittville Highway, Unit 5
Thorold, Ontario, L2V 4Y6