Houle Chevrier Engineering Ltd.
32 Steacie Drive
Ottawa, Ontario
K2K 2A9

tel: 613.836.1422
fax: 613.836.9731
ottawa@hceng.ca
www.hceng.ca

Village at the Schoolyard Inc.
144 Constance Creek Drive, P.O. Box 94
Dunrobin, ON
K0A 1T0

April 13, 2017
Project: 60616.46

Attention: Mr. Brian Saumure

Re: Preliminary Geotechnical Investigation
Proposed Residential Subdivision
1055 Klondike Road
Ottawa, Ontario

INTRODUCTION

This letter presents the results of a preliminary geotechnical investigation carried out for a proposed residential subdivision at 1055 Klondike Road in Ottawa, Ontario (refer to Key Plan, Figure 1). The purpose of the investigation was to identify the subsurface conditions at the site by means of a limited number of boreholes and, based on the results of the factual information obtained, to provide engineering guidelines and recommendations on the geotechnical design aspects of this project, along with construction considerations that could influence design decisions.

This investigation was carried out in general accordance with our proposal dated March 9, 2017.

BACKGROUND INFORMATION

Plans are being prepared for the development of 1055 Klondike Road into a residential subdivision. It is understood that the proposed development is still in preliminary design stages, but will consist of a residential subdivision with an internal roadway and municipal water and sewer services. The site currently consists of grass fields with a gravel laneway through the centre to an old abandoned farm house. The site is bounded by a meandering creek to the north and west, grass fields and a residential house to the east and Klondike Road to the south. There is a residential property located at the southwest corner of the site.

Surficial geology and drift thickness maps of the Ottawa area indicate that the site is underlain by alluvial sediments of fluvial terraces, sand and silt. Bedrock geology maps indicate that the site is underlain by interbedded sandstone and dolomite bedrock of the March formation at depths of about 5 to 10 metres.

PROCEDURE

The field work for this investigation was carried out on March 27, 2017. At the time four (4) boreholes numbered 17-1 to 17-4 were put down using a track mounted, hollow stem auger geotechnical drill rig subcontracted to George Downing Estate Drilling Ltd. of Grenville-sur-la-rouge, Quebec. The borehole locations were selected and positioned in the field by Houle Chevrier Engineering Ltd. and are shown on the attached Borehole Location Plan (Figure 2). The ground surface elevations at the borehole locations were determined using our Trimble R10 GPS survey instrument. The elevations are referenced to geodetic datum.

Standard penetration tests were carried out in the boreholes and samples of the soils encountered were recovered using a 50 millimetre diameter split barrel sampler. In situ vane shear testing was carried out in the clayey deposits to measure the undrained shear strength. All field work was observed by a member of our engineering staff.

Descriptions of the subsurface conditions logged in the boreholes are provided on the Record of Boreholes in Appendix A.

Following the completion of the fieldwork, the soil samples were returned to our laboratory for examination by a geotechnical engineer.

SUBSURFACE AND FOUNDATION CONDITIONS

General

The subsurface conditions described below indicate the conditions at the specific test location only. Boundaries between zones are often not distinct, but rather are transitional and have been interpreted. The precision with which subsurface conditions are indicated depends on the frequency and recovery of samples, the method of sampling and the uniformity of the subsurface conditions. Subsurface conditions at other than the test locations may vary from the conditions encountered in boreholes.

The soil descriptions in this letter are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgment and Houle Chevrier Engineering Ltd. does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The results of the boreholes are provided on the Record of Boreholes sheet in Appendix A. The following presents an overview of the subsurface conditions.

Topsoil

A layer of topsoil was encountered from surface grade at the all borehole locations. The topsoil is composed of dark brown silty sand. The thickness of the topsoil layer ranges from 100 to 150 millimetres.

Sand

Native deposits of brown fine to coarse grained sand with some silt were encountered underlying the topsoil at all borehole locations with the exception of borehole 17-3 where the topsoil layer was underlain by silty clay.

The thickness of the sand ranges from 2.14 to 2.44 metres and extends to depths of about 2.29 to 2.59 metres below ground surface.

Standard penetration tests carried out in the sand deposit gave N values ranging between 4 and 12 blows per 0.3 metres of penetration, which reflects a loose to compact relative density.

Weathered Crust/ Silty Clay

Native deposits of grey brown silty clay were encountered underlying the sand at all borehole location with the exception of borehole 17-3 where the silty clay was encountered underlying the topsoil. The upper 1.2 to 4.8 metres of the silty clay is considered to be weathered crust. The weathered crust was encountered at a depth of 0.15 to 2.59 metres below ground surface.

Standard penetration tests carried out in the weathered silty clay gave N values ranging between 4 and 11 blows per 0.3 metres of penetration, which reflects a stiff to very stiff consistency.

Silty Clay

The very stiff grey brown silty clay weathered crust transitions to grey silty clay at depths of of about 3.8 metres below ground surface in all boreholes with the exception of borehole 17-3 were the silty clay weathered crust is underlain by glacial till.

Standard penetration tests carried out in the silty clay gave N values ranging between 1 and 6 blows per 0.3 metres of penetration, which reflects a firm to stiff consistency.

In situ vane strength tests carried in the silty clay generally gave undrained shear strength values ranging from about 32 to 100 kilopascals, which reflects a firm to very stiff consistency. The remoulded vane shear test values generally ranged from 4 to 15, indicating that the sensitivity of the silty clay is medium to extra sensitive.

Boreholes 17-1 and 17-2, inclusive were terminated within the silty clay at depths of 9.6 metres below ground surface (elevation 68.7 and 68.8 metres geodetic datum). Borehole 17-4 was

terminated at a depth of about 8.5 metres below ground surface (elevation 69.7 metres geodetic datum) due to practical auger refusal.

In borehole 17-3 a native deposit of brown silty sand, some clay with small gravel (glacial till) was encountered underlying the silty clay weathered crust at a depth of 4 metres below ground surface.

Borehole 17-3 was terminated at a depth of 4.07 metres below ground surface (elevation 68.6 metres geodetic datum) due to practical auger refusal. Practical refusal can occur on cobbles/boulders within a glacial till deposit, or on bedrock.

Groundwater

No groundwater seepage was observed in the open borehole prior to backfilling. However, samples recovered from boreholes 17-1 and 17-2, inclusive, became saturated at depths of 6.1 to 7.6 metres below ground surface (elevation 72.2 and 70.8 metres geodetic), respectively.

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

PROPOSED RESIDENTAL DEVELOPMENT

General

The information in the following sections is provided for the guidance of the design engineers and is intended for the design of this project only. Contractors bidding on or undertaking the works should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for construction, and make their own interpretation of the factual data as it affects their construction techniques, schedule, safety and equipment capabilities.

The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous uses or activities of this site or adjacent properties, and/or resulting from the introduction onto the site from materials from off site sources are outside the terms of reference for this report.

Grade Raise Restrictions

Much of the site is underlain by a deposit of silty clay, which has a somewhat limited capacity to support loads imposed by grade raise fill material and, to a lesser extent, the foundations of the residential dwellings.

The placement of fill material must therefore be carefully controlled so that the stress imposed by the fill material does not result in excessive consolidation of the grey silty clay deposit. The settlement response of the silty clay deposit to the increase in stress caused by fill material and

groundwater lowering is influenced by variables such as the existing effective overburden pressure, the past pre-consolidation pressure for the silty clay, the compressibility characteristics of the silty clay, and the presence or absence of drainage paths, etc. It is well established that the settlement response of silty clay deposits can be significant when the stress increase is at or near the difference between the preconsolidation pressure (P_c) and the existing overburden stress (σ_{vo}').

The site grade raise restriction is also dependent on the footing depth. The footing depth is assumed to be at 1.5 metres below existing grade for preliminary assessment purposes. Based on this preliminary assessment, a grade raise of 1.5 metres above the original ground surface is likely acceptable. If a grade raise of more than 1.5 metres above original ground surface is required, a more detailed assessment and supplemental investigation should be carried out as the design progresses. This could include oedometer consolidation testing of samples of the grey silty clay.

Excavation

Overburden Excavation

The excavations for the foundations will be through topsoil, sand, and possibly silty clay. The sides of the excavations should be sloped in accordance with the requirements in Ontario Regulation 213/91 under the Occupational Health and Safety Act. According to the Act, the shallow native overburden deposits can be classified as Type 3 and, accordingly, allowance should be made for excavation side slopes of 1 horizontal to 1 vertical extending upwards from the base of the excavation.

Excavation of the native soils above the groundwater should not present any excavation constraints. In contrast, excavation for services within sandy below the groundwater level could present constraints. This could require the use of somewhat flatter slopes and/or temporary groundwater lowering.

Bedrock Excavation

As design details were not available at the time of this letter, bedrock may be encountered for site services depending on proposed depth. If bedrock is encountered within the proposed depth, bedrock removal will be required. Bedrock removal techniques and recommendations can be provided as the design progresses, if required.

Groundwater Pumping and Management

The excavations for the site (structures and services) are not likely to extend below the measured groundwater levels. However, possible groundwater inflow from the overburden deposits into the excavations could be controlled by pumping from filtered sumps within the excavations. It is not expected that short term pumping during excavation will have any significant affect on nearby structures and services.

Suitable detention and filtration will be required before discharging water. The contractor should be required to submit an excavation and groundwater management plan for review.

Depending on the depth of proposed services and groundwater level at the time of construction, an Environmental Activity and Sector Registry (EASR) in accordance with Environmental Protection Act Part II may be required. Further details could be provided as the design progresses.

Foundation Design

In general, the native sand and or silty clay is considered suitable to support residential structures founded on conventional spread footing foundations. For this project, we have assumed that the footings will not extend to a depth beyond the weathered crust.

Provided that the grade raise restrictions above are followed, footings for residential buildings founded on the native deposits of sand or silty clay could be sized using a preliminary bearing pressure of 100 kilopascals. The foundation bearing value should be determined on a lot by lot basis by geotechnical personnel at the time of construction.

Slope Stability

A slope stability assessment was carried out to establish the preliminary 'Erosion Hazard Limit' adjacent to the slope and creek which runs along the west to north side of the site. This limit constitutes a safe setback for any proposed development at the site with respect to slope stability. The Erosion Hazard Limit was determined based on the Natural Hazard Policies set forth in Section 3.1 of the Provincial Policy Statements of the Planning Act of Ontario. Current regulations restrict development within the Erosion Hazard Limit.

The slope stability analysis was carried out using SLIDE, a state of the art, two dimensional limit equilibrium slope stability program at Section 'B-B'. Section 'B-B' was selected for analysis by Houle Chevrier Engineering Ltd. personnel based on slope geometry, height and proximity to the proposed development (refer to Figure B3 'Slope Analysis Assessment' in Appendix B).

The geometry of the slope on the subject property was measured at various locations using our Trimble R10 global positioning system survey instrument. Section B-B was considered to be the steepest portion of the slope.

Hand augerholes were advanced at the crest and toe of the existing slope to supplement the subsurface information obtained from the borehole investigation.

Soil Strength Parameters

The soil conditions used in the stability analysis were based on the results of the hand augerholes, site observations and knowledge of local conditions. The slope stability analysis

was carried out using silty clay strength parameters typical for the Ottawa area. Table 1 summarizes the soil parameters used in the analyses:

Table 1 - Soil Parameters

Soil Type	Effective Angle of Internal Friction, ϕ (degrees)	Effective Cohesion, c (kilopascals)	Unit Weight, γ (kN/m^3)
Sand	32	0	19
Silty Clay	32	10	17.5

The results of a stability analysis are highly dependent on the assumed groundwater conditions. No groundwater seepage was observed in the hand augerholes. As groundwater levels were not available, we have assumed that the groundwater level is at the depth that the samples in the boreholes became saturated.

Setback Requirements

For unstable slopes, the distance from the unstable slope to the safe setback line is called the 'Erosion Hazard Limit'. In accordance with the Ministry of Natural Resources (MNR) Technical Guide "Understanding Natural Hazards" dated 2001, the Erosion Hazard Limit consists of three components: (1) Stable Slope Allowance, (2) Toe Erosion Allowance, and (3) Erosion Access Allowance.

The Stable Slope Allowance, as described in the MNR procedures, is the area where a factor of safety of less than 1.5 against overall rotational failure is calculated. At Section 'B-B' the slope stability analyses indicate that the existing slope at this site, in its current configuration, has a factor of safety against failure of 1.6, therefore, the Stable Slope Allowance described in the MNR procedure is not required.

In accordance with the MNR documents, a minimum Toe Erosion Allowance of between 5 and 8 metres is required for clay soils. Given the potential for creek meandering and active erosion at this site (refer to Figures B1 and B2) in Appendix B, a Toe Erosion Allowance of 8 metres was applied. The Toe Erosion Allowance is applied at the crest of the slope.

Based on the fact that the slope is considered safe in its current configuration (factor of safety of 1.6), and that we have included an 8 metre setback for toe erosion, in our opinion, the 6 metre Erosion Access Allowance identified in the MNR procedure is not considered necessary.

Therefore, the Erosion Hazard Limit for the slope at this site is located 8 metres from the crest of the existing slope. No development should be permitted within this zone. Also, surface water should not be directed to the slope and vegetation on the slope should remain.

ADDITIONAL CONSIDERATIONS

Effects of Construction Induced Vibration

Some of the construction operations (such as granular material compaction, excavation, etc.) will cause ground vibration on and off of the site. The vibrations will attenuate with distance from the source, but may be felt at nearby structures. However, the magnitude of the vibrations is expected to be much less than what is required to cause damage to the nearby structures or services that are in good condition.

Effect of Trees

Much of the site is underlain by silty clay, a material which is known to be susceptible to shrinkage with a change/reduction in moisture content. Research by the Institute for Research in Construction (formerly the Division of Building Research) of the National Research Council of Canada has shown that trees can cause a reduction of moisture content in the silty clays in the Ottawa area, which can result in significant settlement/damage to nearby buildings supported on shallow foundations, or hard surfaced areas. Therefore, no deciduous trees should be permitted closer to the houses (or any ground supported structures which may be affected by settlement) than the ultimate height of the trees. For groups of trees or trees in rows, the separation distance should be increased to 1.5 times the ultimate height of the trees.

The effects of trees (both existing and proposed) on the dwellings should be considered in the landscape plan for this development.

Winter Construction

The soils that exist at this site are highly frost susceptible and are prone to significant ice lensing. In the event that construction is required during freezing temperatures, the soil below the footings and floor slab should be protected immediately from freezing using straw, propane heaters and insulated tarpaulins, or other suitable means.

Any service trenches should be opened for as short a time as practicable and the excavations should be carried out only in lengths which allow all of the construction operations, including backfilling, to be fully completed in one working day. The materials on the sides of the trenches should not be allowed to freeze. In addition, the backfill should be excavated, stored and replaced without being disturbed by frost or contaminated by snow or ice.

Excess Soil Management Plan

It should be noted that the soil samples recovered during this investigation were not tested to assess the presence of contamination, either naturally occurring or due to human activity. This report does not constitute an excess soil management plan. The disposal requirements for excess soil from the site have not been assessed.

Design Review and Construction Observation

The design details of the proposed residential development were not available to us at the time of preparation of this letter. It is recommended that the design drawings be reviewed by the geotechnical engineer as the design progresses to ensure that the guidelines provided in this report have been interpreted as intended.

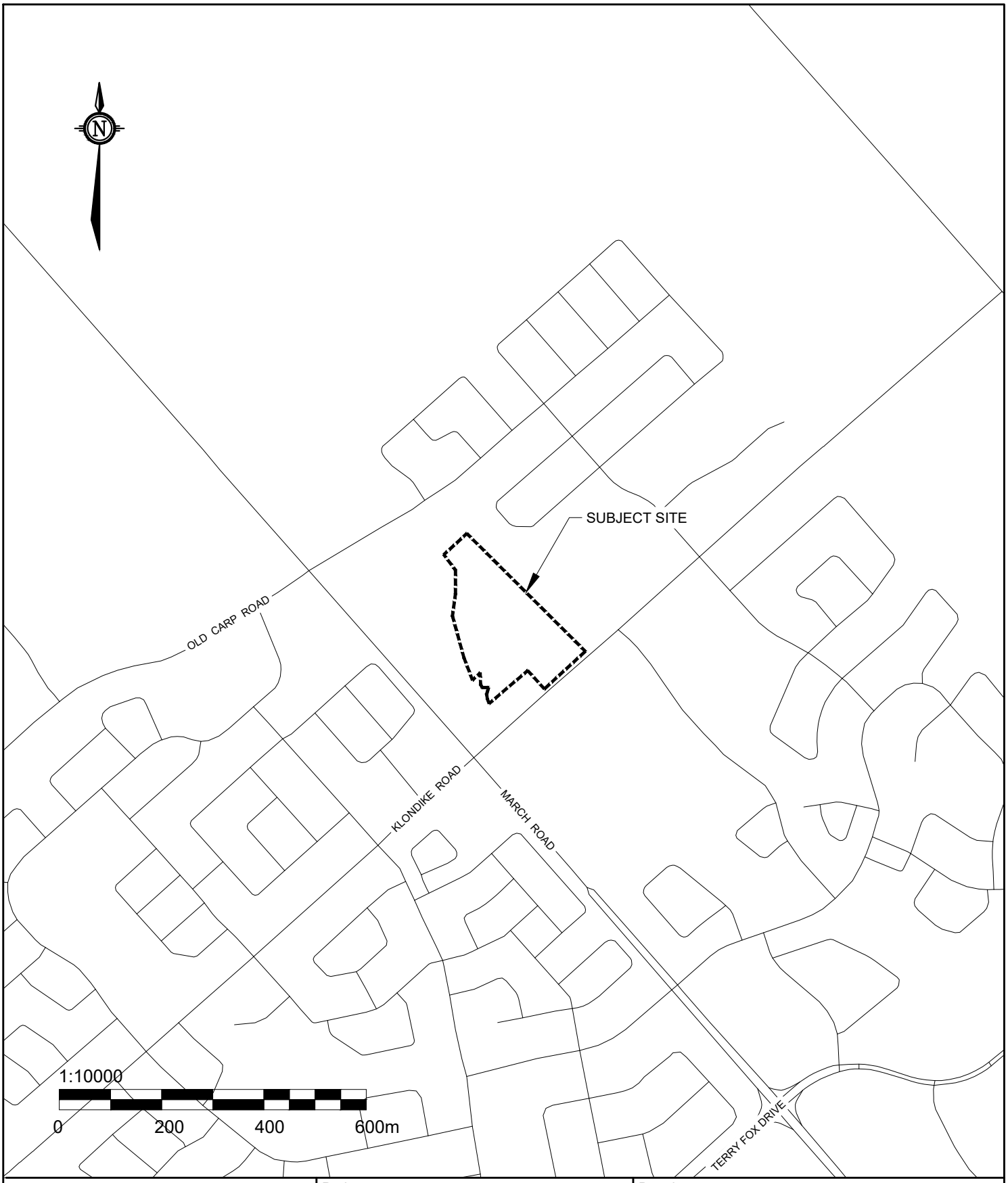
Due to the variable nature of the deposits on this site and the wide spacing between the borehole locations, the allowable bearing pressures and grade raises should be considered preliminary. The final allowable bearing pressure and grade raise restriction should be determined on a lot by lot basis.

All footing surfaces and any engineered fill areas for the houses should be inspected by Houle Chevrier Engineering Ltd. to ensure that a suitable subgrade has been reached and properly prepared. The placing and compaction of granular materials beneath the foundations should be inspected to ensure that the materials used conform to the grading and compaction specifications. The subgrade surfaces for the site services and roadways should be inspected by geotechnical personnel. In-situ density testing should be carried out on the service pipe bedding and backfill and the roadway granular materials.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Greg Davidson, B.Eng

Brent Wiebe, P.Eng
Senior Geotechnical Engineer



Houle Chevrier Engineering

32 Steacie Drive, Ottawa, ON
T: (613) 836-1422 | www.hceng.ca | ottawa@hceng.ca

Project	Drawing
PRELIMINARY GEOTECHNICAL INVESTIGATION 1055 KLONDIKE ROAD OTTAWA, ONTARIO	KEY PLAN

Drwn By	Chkd By	Date	Project No.	Revision No.	
P.C.	G.D.	APRIL 2017	60616.46	0	**FIGURE 1**

P:\0. Files\60600\60616.46\Drafting\Drawings\60616.46_(01)_FG1_V01_2017-04-03.dwg, KEY PLAN, 4/3/2017 12:22:59 PM

LEGEND

BH # 78.30 — BOREHOLE LOCATION IN PLAN (current investigation by Houle Chevrier Engineering Ltd.)
GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM

AH 1 — HAND AUGER HOLE LOCATION IN PLAN (current investigation by Houle Chevrier Engineering Ltd.)

B B — SLOPE CROSS SECTION LOCATION IN PLAN (current investigation by Houle Chevrier Engineering Ltd.)

Scale 1:750

0 15 30 45m

Houle Chevrier Engineering Ltd.
32 Steacie Drive
Ottawa, ON
Tel: (613) 836-1422
www.hceng.ca
ottawa@hceng.ca

Client: Village at the Schoolyard Inc.			Project: 60616.46
Location: 1055 KLONDIKE ROAD, OTTAWA, ON			
Drwn by: P.C.	Chkd by: G.D.	SITE PLAN	
Date: APRIL 2017	Rev.: 0	**FIGURE 2**	

APPENDIX A

Record of Borehole Sheets

RECORD OF BOREHOLE 17-1

PROJECT: 60616.46

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: March 27, 2017

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; drop 0.76 metres

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		78.30			
		Dark brown silty sand (TOPSOIL)		78.15 / 0.15			
		Brown fine to coarse grained SAND, some silt			1	50 D.O.	8
1					2	50 D.O.	9
					3	50 D.O.	10
2				76.01 / 2.29			
		Very stiff, grey brown SILTY CLAY (Weathered crust)			4	50 D.O.	4
3					5	50 D.O.	4
				74.49 / 3.81			
4		Very stiff to firm, grey SILTY CLAY			6	50 D.O.	4
					7	50 D.O.	4
5					8	50 D.O.	3
6					9	50 D.O.	2
7					10	50 D.O.	1
8							
					11	50 D.O.	1
9							
		End of Borehole		68.70 / 9.60			
10							

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: 20 40 60 80 — nat. V - + Q - ● — rem. V - ⊕ U - ○

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-5} 10^{-4} 10^{-3} 10^{-2}

WATER CONTENT, PERCENT: Wp W Wl — 20 40 60 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

Backfilled with soil cuttings

DEPTH SCALE

1 to 50

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MARCH 28 2017.GPJ HOULE CHEVRIER 2015.GDT 30/3/17

PROJECT: 60616.46

RECORD OF BOREHOLE 17-2

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: March 27, 2017

SPT HAMMER: 63.5 kg; drop 0.76 metres

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q - ● rem. V - ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W WI; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		78.43							
		Dark brown silty sand (TOPSOIL)		78.28							
				0.15	1	50 D.O.	4				
		Brown fine to coarse grained SAND									
1					2	50 D.O.	6				
					3	50 D.O.	6				
2											
				75.84	4	50 D.O.	5				
		Very stiff, grey brown SILTY CLAY (Weathered crust)		2.59							
3					5	50 D.O.	4				
				74.62							
		Very stiff to firm, grey SILTY CLAY		3.81	6	50 D.O.	4				
4											
					7	50 D.O.	3				
5											
					8	50 D.O.	3				
6											
					9	50 D.O.	2				
7											Bentonite seal Filter Sand 25 mm Diameter, 0.6 metres long well screen Soil cuttings
8					10	50 D.O.	1				
9											
				68.83							
		End of Borehole		9.60							
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MARCH 28 2017.GPJ HOULE CHEVRIER 2015.GDT 30/3/17

PROJECT: 60616.46

RECORD OF BOREHOLE 17-3

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: March 27, 2017

SPT HAMMER: 63.5 kg; drop 0.76 metres

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (nat. V - +, rem. V - ⊕, Q - ●, U - ○)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		72.74							
		Dark brown silty sand (TOPSOIL)		72.59	1	50 D.O.	7				
				0.15							
1		Very stiff, grey brown SILTY CLAY (Weathered crust)			2	50 D.O.	11				
2					3	50 D.O.	7				
					4	50 D.O.	6				
3					5	50 D.O.	4				
4				68.74	6	50 D.O.	>50 for 75 mm				
		Brown silty sand, some clay with small gravel (Glacial Till)		4.00							
		End of Borehole		4.07							
		Practical Auger Refusal									
5											
6											
7											
8											
9											
10											

PIEZOMETER OR STANDPIPE INSTALLATION: Bentonite seal; Filter Sand 25 mm Diameter, 0.6 metres long well screen

DEPTH SCALE

1 to 50

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MARCH 28 2017.GPJ HOULE CHEVRIER 2015.GDT 30/3/17

PROJECT: 60616.46

RECORD OF BOREHOLE 17-4

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: March 27, 2017

SPT HAMMER: 63.5 kg; drop 0.76 metres

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80) / SHEAR STRENGTH Cu, kPa (20 40 60 80) nat. V - + Q - ● rem. V - ⊕ U - ○	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-5} 10^{-4} 10^{-3} 10^{-2}) / WATER CONTENT, PERCENT (Wp W WI; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		78.14							
		Dark brown silty sand (TOPSOIL)		78.04 / 0.10							
		Brown fine to coarse grained SAND			1	50 D.O.	4				Backfilled with soil cuttings
1					2	50 D.O.	8				
					3	50 D.O.	12				
2				75.70 / 2.44							
		Very stiff, grey brown SILTY CLAY (Weathered crust)			4	50 D.O.	7				
3					5	50 D.O.	5				
				74.33 / 3.81							
4		Very stiff to firm, grey SILTY CLAY			6	50 D.O.	6				
					7	50 D.O.	3				
5					8	50 D.O.	3				
6					9	50 D.O.	3	⊕ +			
7								⊕ +			
					10	50 D.O.	1				
8								⊕ +			
		End of Borehole Practical Auger Refusal		69.68 / 8.46							
9											
10											

DEPTH SCALE

1 to 50

Houle Chevrier Engineering

LOGGED: M.L.

CHECKED:

BOREHOLE LOG GINT LOGS MARCH 28 2017.GPJ HOULE CHEVRIER 2015.GDT 30/3/17

APPENDIX B

Slope Stability Assessment

Houle Chevrier Engineering

EXISTING SLOPE SECTION 'B-B'
1055 KLONDIKE ROAD
OTTAWA, ONTARIO

FIGURE B1

PROJECT: 60616.46
DATE: April 2017

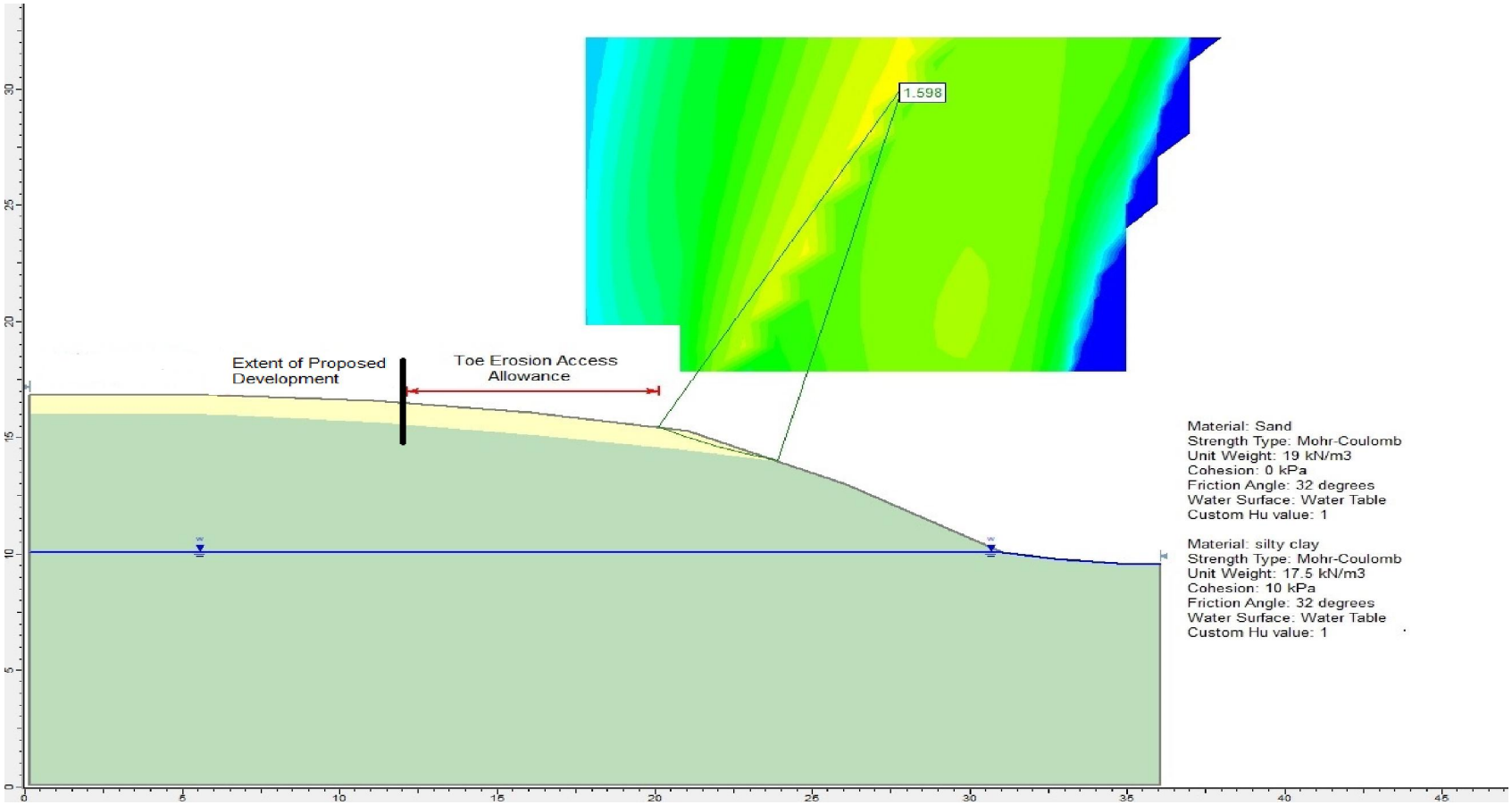
Houle Chevrier Engineering

EXISTING SLOPE SECTION 'B-B'
1055 KLONDIKE ROAD
OTTAWA, ONTARIO

FIGURE B2

PROJECT: 60616.46
DATE: April 2017

Loading Conditions: Static
Groundwater Conditions: Hydrostatic



Houle Chevrier Engineering
32 Steacie Drive
Ottawa, Ontario
K2K 2A9

SLOPE STABILITY ASSESSMENT
SECTION B-B
1055 KLONDIKE ROAD
OTTAWA, ONTARIO

FIGURE B3

PROJECT: 60616.46
DATE: April 2017