SOIL-MAT ENGINEERS & CONSULTANTS LTD.

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PROJECT NO.: SM 114139-G

October 3, 2012

URBEX ENGINEERING LIMITED
161 Rebecca Street
Hamilton, Ontario
L8R 1B9

Attention: Mr. Angelo Cameracci, P.Eng.

GEOTECHNICAL SITE INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
SPRINGBROOK AVENUE AND GARNER ROAD EAST
HAMILTON [ANCASTER], ONTARIO

Dear Mr. Cameracci

Soil-Mat Engineers & Consultants Ltd. was retained to undertake a site geotechnical investigation in connection with the project noted above. Our comments and recommendations, based on our findings at the ten borehole locations are presented herein.

1.0 INTRODUCTION

We understand that the project will consist of the construction of a residential subdivision, featuring single family dwellings and townhouse structures, along asphalt paved roadways and associated underground municipal services. We have completed a geotechnical investigation of the lot at the corner of Springbrook Avenue and Garner Road East. The purpose of this geotechnical investigation was to determine the subsurface conditions at the ten borehole locations and to interpret the results of this investigation with respect to the design and construction of the municipal services, roadways and related earthworks for this project.

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, such as increase in traffic configurations, 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, other than comments pertaining to a single analytical test result.

2. PROCEDURE

A total of ten [10] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. The borings were put down uncased using solid stem continuous flight auger equipment on June 27, 2011 [Borehole Nos. 1 to 6, inclusive] and July 4, 2011 [Borehole Nos. 7, 8, 9 and 10] under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD. All boreholes were advanced using track-mounted drill rig equipment. Following encountering a gravel fill deposit, located in the southwest quadrant of the property [Borehole Nos. 3 and 10], it was assessed that additional boreholes should be advanced to investigate the extent of the gravel fill's boundaries. Therefore, Borehole Nos. 7, 8, 9 and 10 were then advanced to depths of between about 1.5 and 3.0 metres below the existing grade on July 4, 2011. In addition, groundwater monitoring wells were installed in Borehole Nos. 3 and 6 to allow for long-term monitoring of the groundwater level.

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 the ASTM test specification D1586, Standard Penetration Resistance Testing. After undergoing a general field examination, the soil samples were preserved and transported to the SOIL-MAT laboratory for visual, tactile, and olfactory classifications. Routine moisture content tests were performed on all soil samples recovered from the borings, in addition, hand penetrometer tests were performed on select cohesive soil samples.

The boreholes were located in the field by representatives of SOIL-MAT ENGINEERS & CONSULTANTS LTD.. The ground surface elevations at the borehole locations were referenced to a temporary benchmark described as the fire hydrant located in front of 460 Springbrook Avenue, just north of the subject property [conveniently assigned Elevation 100.00 metres]. Therefore, it must be stressed that the ground surface elevations at the borehole locations are not geodetic.

Details of the condition encountered in the boreholes, together with the results of the field and laboratory tests, are presented in Borehole Log Nos. 1 to 10 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 geographical span of the site considered includes the entire northeast lot at the intersection of Springbrook Avenue and Garner Road East in Hamilton [Ancaster], Ontario. The site is bounded to the south by Garner Road East [with side ditch], to the north and east by residential properties or vacant fields and to the west by Springbrook Avenue [with side ditch]. There are presently two single family dwellings on the site, one located in the northwest corner [491 Springbrook Avenue, including a concrete slab on grade from a demolished barn structure] and the second in the south-central portion [851 Garner Road East with a detached garage structure and some small sheds and trailer]. A hydro corridor is noted to diagonally bisect the subject site from the southwest to northeast corners. There are a number of vehicles parked beneath the Hydro lines and a 'dirt' track south of the concrete slab noted above, together with some mature trees and scrub vegetation. The southwest corner of the subject site is a 'low-lying' marshy area, with some 'bull rush' vegetation. The remainder of the property is a relatively flat vacant field covered with 'high' grasses with surface drainage into the southwest corner.

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

Topsoil

A layer of topsoil approximately 150 to 200 millimetres was found at the borehole locations. It is noted that the depth of topsoil may vary across the site and from the depths encountered at the borehole locations and therefore additional test pits could be advanced to allow for use in the tender documents. It is noted too that the term "topsoil" has been used from a geotechnical point of view and does not necessarily reflect the suitability of the material to support plant growth.

Gravel and Clayey Silt Fill

A black gravel fill was found in Borehole Nos. 3, 8, and 10 to depths of about 1.80, 2.25 and respectively. The gravel fill was found to be in a compact to dense state. We would recommend that a test pit investigation be undertaken to assess the lateral and horizontal extent of the gravel fill material in order to estimate a volume for the tender documents. A loose clayey silt fill material, with some cobbles and gravel, was found to topsoil in Borehole No. 7.

Clayey Silt

A brown native clayey silt was found to underlie the topsoil in Borehole Nos. 1, 2, 4, 5, 6 and 9, the clayey silt fill in Borehole No. 7, and to underlie the gravel fill in Borehole Nos. 8 and 10. The clay silt was found to contain a trace of sand and was general firm to stiff in consistency. There was noted to be some rootlets and organic staining in the upper level of the clayey silt in Borehole No. 10. The clayey silt was proven to termination in Borehole Nos. 2, 8, 9 and 10 at depths of between about 2.1 and 5.0 metres below grade.

Sand/Silty Sand

A native sandy silt was found to underlie the clayey silt in Borehole Nos. 1 to 6, inclusive. The sandy silt was found to contain a trace to some clay and gravel and was generally in a compact to dense state. The sandy silt was found to depths of between about 3.0 to 4.7 metres below grade.

A native sand was found to underlie the sandy silt in Borehole Nos. 1, 3, 5 and 6 at depths of about 3.8 to 4.7 metres below grade. The sand was found to contain a trace of clay and gravel and to be in a compact to dense state. The sand was proven to termination at depths of about 5.0 metres below grade. A silt seam, about 0.5 metres in thickness, was found in Borehole No. 4 at a depth of about 3.0 metres below grade. The silt was found to be in a dense state.

Groundwater Observations

Upon completion of drilling each borehole, groundwater was found at depths of about 3.0 to 4.5 metres below the existing surface. Groundwater monitoring wells were installed in Borehole Nos. 3 and 6 to allow for long-term monitoring of the groundwater level. The groundwater levels were found to be at depths of about 3.04 and 3.93 metres in Borehole Nos. 3 and 6, respectively on October 3, 2012. We note that typically, the transition in colour of the soils encountered in the exploratory borings from brown to grey roughly coincides with the static groundwater level. Based on this and the recent groundwater readings, the static groundwater level would be estimated to be in the range of about 3.0 to 4.0 metres depth. However, the static groundwater level is noted to significant seasonal variation, and may be significantly higher, possibly within 1.5 to 2.0 metres of ground surface. This is consistent with previous work in this area of Ancaster.

Given the potential for wet conditions/static groundwater levels above the anticipated depths of construction it is recommended that a test excavation be conduct on the property. This will allow tendering contractors to observe the conditions first hand and allow them to assess how they will affect their operations.

4. EXCAVATIONS

It is anticipated that excavations for the proposed foundations, sewers and other underground services will extend to depths of up to 3 to 4.5 metres below the present grade. The upper levels of excavations into the clayey silty and sandy silt soils should be relatively straightforward. However where excavations extend deeper, wet seams and groundwater should be anticipated creating some difficulties, such as 'caving' side slopes and base instability. The sides of excavations in the sandy silt and sand soils should remain stable above the groundwater table, for the short construction periods, at slopes of 45 degrees. Where excavations are advanced below the groundwater table or where wet seams are encountered these soils will have a tendency to 'slump-in' to slopes as flat as 3 horizontal to 1 vertical or flatter. The side slopes in the clayey silt should remain stable at slopes as steep as 60 degrees to the horizontal above the groundwater level.

The base of excavations in the fine grained clayey silt and sandy silt and sand soils will have a tendency to become unstable, depending on the groundwater and weather conditions at the time of construction. The excavation bases will be sensitive to disturbance from construction equipment. It may be possible to stabilise the exposed excavation bases using coarse crushed stone 'punched' into the underlying wet fine grained granular soils. The amount and nominal size of the ballast stone used will be a function of the conditions to be stabilised.

The contractor may choose to undertake the excavations in the 'wet', which would result in wider trenches/excavations, requirements to stabilise the base of the trenches along certain sections of the pipe lines where they extend below the ground water table at the time of construction, and additional backfill requirements. The excavations would require continuous pumping from constructed sumps. It might be necessary to install 'sand' filter pressure relief wells in the base of the trenches along certain severe ground water condition sections to reduce disturbance and uplift of the excavation base.

Installation of the services in shallow excavations below the ground water level may be carried out with a trench box for the protection of workers, and to minimise the excavation widths. Time will be of the essence and any section of pipe must therefore be installed as expeditiously as possible. The alternative to the 'open-trench' excavation technique would be the installation of more sophisticated 'dewatering' schemes. This would require estimates of the coefficient of permeability of the sandy silty and sand soils, etc., although for preliminary design purposes, values in the 10^{-2} to 10^{-4} cm/sec range would seem reasonable. Again, as noted above, it is recommended that tendering contractors undertake a number of test excavations in order to observe firsthand how the conditions with effect their operations.

Notwithstanding the foregoing, however, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects. Excavation 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.

5. BACKFILL CONSIDERATIONS

The excavated soils will consist of clayey silt, sandy silt and sand soils. These soils are generally considered suitable for use as engineered fill, trench backfill, etc. However, proper handling of the excavated material based on groundwater and weather conditions during construction will be important to achieving a successful compaction operation. The clayey silt, sandy silt and sand soils will become practically impossible to effectively compact at moisture contents more than about 4 or 5 percent above the Proctor optimum level. Where encountered, the wet to saturated fine-grained granular soils will need to be spread out and allowed to air dry if it will not drain sufficiently fast to allow compaction and, if possible, be covered using a tarp during 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. However, during the dry months of the year, dust may present a problem.

All fill material should be conditioned to contain moisture to within 3 percent of its optimum moisture content, to achieve an efficient compaction operation and to minimise long term subsidence [settlement] of the fill mass. Any imported fill required in service trenches or to raise the subgrade elevation should have its moisture content within 3 per cent of its optimum moisture content and meet the necessary environmental guidelines.

The backfilling and compaction operations should be monitored by a representative of SOIL-MAT to confirm 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', and around manholes and catchbasins. Service trench backfill should be compacted to a minimum of 95 percent of standard Proctor maximum dry density [SPMDD] to within one metre of subgrade, and to 100 percent in the upper metre. Any engineered fill required within the building lots should be compacted to 100 per cent SPMDD. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction. After a period of heavy precipitation, any near surface 'wet' or softened material should be separated and allowed to 'air dry' or be discarded.

6. MANHOLES, CATCHBASINS AND VALVE CHAMBERS

Structures properly founded in the native soils will experience relatively small settlements under the anticipated loads. This might result in the protrusion of such structures above the pavement surface if the compaction of the fill around the structure is poor. Also, there is a potential that the pavement surfaces may rise above the chambers due to 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 granular soils to prevent the intrusion of fines.

Where thrust blocks are to be founded in the wet clayey silt soils, the need for additional ballast material or larger sized thrust blocks should be anticipated. The thrust blocks in the compact to dense sand and silt layers may be conservatively sized as recommended by the applicable Ontario Provincial Standard Specification conservatively using a horizontal allowable bearing pressure of up to 150 kPa [~3000 psf]. Any backfill required behind the blocks should be granular and should be compacted to 100 percent of its standard Proctor Density.

We recommend that the invert levels of any rear yard catch basin storm sewer pipe be constructed so that the foundations of the proposed dwellings adjacent the storm sewer alignment are situated below an imaginary line drawn up from the edge of the trench at one vertical to one horizontal. Alternatively the rear yard catch basin leads should be backfilled with non-shrink fill material up to a minimum of 0.3 metres above the design founding level of the adjacent units.

7. PAVEMENT CONSIDERATION AND ROADWAY CONSTRUCTION

The roadway areas should be cleared and stripped of all topsoil, together with any other organic and unsuitable materials. The exposed subgrade should be proofrolled with 3 to 4 passes of a loaded tandem truck or large smooth drum roller in the present of a representative of SOIL-MAT ENGINEERS AND CONSULTANTS LTD., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this or other means must be sub excavated and replaced with suitable backfill material. Alternatively, the soft areas may be stabilised by placing coarse crushed stone and 'punching' it into the soft areas. The need for the treatment of softened subgrade will be reduced if construction is undertaken during the dry summer months and careful attention is paid to the compaction operations. The fill over shallow utilities cut into or across the subdivision streets such as telephone, hydro, gas, etc., must also be compacted to 100 percent of its standard Proctor maximum dry density.

Good drainage 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 mitigate softening of the subgrade material. Surface water should not be allowed to pond adjacent to the outer limits of the paved areas.

The most severe loading conditions on the subgrade typically occur during the course of construction. 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 during the fall and spring months, it should be anticipated that additional subgrade preparation will be required, such as stabilisation with coarse 'rip-rap stone' and/or additional depth of Granular B sub-base coarse material. It is also important that the sub-base and base coarse layers of the pavement structure be placed as soon after exposure and preparation of the subgrade level as practical.

The proposed pavement structure will be required to adequately supposed cars, delivery and garbage trucks, buses and emergency vehicles. The project's pavement structure should consist of the appropriate City of Hamilton urban cross section. A typical residential pavement structure may consist of 300 millimetres of OPSS Granular 'B' [50 millimetre minus Type II] sub-base coarse, 150 millimetres of OPSS Granular 'A' base coarse, 85 millimetre of HL8 binder coarse and 40 millimetre of HM3 surface course asphaltic concrete. This design is considered adequate, provided the subgrade has been prepared as specified and is good and firm before the base course material is placed. If the subgrade is soft, remedial measures as discussed above may have to be implemented.

The granular sub-base and base courses of asphaltic concrete layers should be compacted to OPSS of the City of Hamilton requirements. A program of in-place density testing must be carried out to monitor that the compaction requirements are being met. We note that this pavement structure is not to be considered as a construction roadway design.

To minimise segregation of the finished asphalt mat, the asphalt temperature must be maintained uniform throughout the mat during placement and compaction. All too often, significant temperature gradients exist in the delivered and placed asphalt with the cooler portions of the mat resisting compaction and presenting a honeycombed surface. As the spreader moves forward, a responsible member of the paving crew should monitor the pavement surface, ensuring a smooth uniform surface. The contractor can mitigate the surface segregation by 'back-casting' or scattering shovels of the full mix material over the segregated areas and raking out the coarse particles during compaction operations. The above recommendations assume that the asphalt is sufficiently hot to allow the 'back-casting' to the performed.

8. HOUSE AND BUILDING CONSTRUCTION

The native soils may be considered suitable depending on the founding elevation with respect to the groundwater level, the degree of disturbance from excavation equipment, etc. Structures to be founded on the clayey silt, sandy silt and sand soils must be evaluated on a lot by lot basis to assess the in situ conditions. 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. Houses should be founded above the water table, or only slightly below the water table if gravity drainage for underfloor drains is available. All house foundation walls should be suitably damp-proofed and provided with a perimeter drainage tile system.

The use of nominal reinforcement in all footings and foundation walls is strongly recommended, as it will work to limit cracking in foundation walls and reduce the potential need for post construction repairs and aid in resisting the earth pressures generated by the often early backfilling of the basement foundation walls. The nominal reinforcement would typically consist of two continuous 15M steel rods placed in the footings [directly below the foundation wall] and a similar two steel rods placed approximately 300 millimetres from the top of the foundation walls, depending on ground conditions exposed during construction. The reinforcing bars would be bent to reinforce all corners and under basement windows, and be provided with sufficient overlap at staggered splice locations.

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. All footings must be proportioned to satisfy the requirements of the Ontario Provincial Building Code.

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.

9. ENVIRONMENTAL CONSIDERATIONS

As noted above three soil samples of the clayey silt and gravel fill material were selected for background environmental testing. The soil samples were submitted to AGAT Laboratories, an accredited independent testing laboratory, for background chemical analysis consisting of Petroleum Hydrocarbon [CCME Fractions 1 to 4], BTEX, Metal and Inorganic parameter scans.

The laboratory test results received in our Office were compared with the applicable standard from the Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the *Environmental Protection Act*, as follows:

- **TABLE 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for a Residential/ Parkland/ Institutional [RPI] and industrial/ commercial/ community [ICC] property use.

- **TABLE 3**: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for a Residential/ Parkland/ Institutional [RPI] and industrial/ commercial/ community [ICC] property use.

The results of this laboratory testing are presented in the attached AGAT Certificates of Analysis [11H507092]. Based on our field observations and the analytical test results, we offer the following comments:

1. The laboratory test results received in our Office indicate that the sampled material is below the Table 2 and 3 Residential/Parkland/Institutional [RPI] Property Use Standards in all cases for the select tested parameters, with the exception of the F3 fraction [petroleum hydrocarbon] from Sample BH10-SS2 which was found to exceed the Table 2 and 3 RPI Standard.
2. The F3 parameter for Sample BH10-SS2 was found to be within the Table 2 and 3 ICC Standard.
3. The elevated level of F3 hydrocarbons appears to be associated with the gravel fill material encountered in the upper levels. This fill material is also present in Borehole Nos. 3 and 8. Additional sampling and testing could be undertaken in the area of Borehole No. 10 to assess the lateral and vertical extent of the F3 Hydrocarbon exceedance.

10. 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 borehole locations. Contractors placing bids or undertaking this project should carry out the due diligence in order to verify the results of this investigation and to determine for the subsurface conditions will effect their operations.

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

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

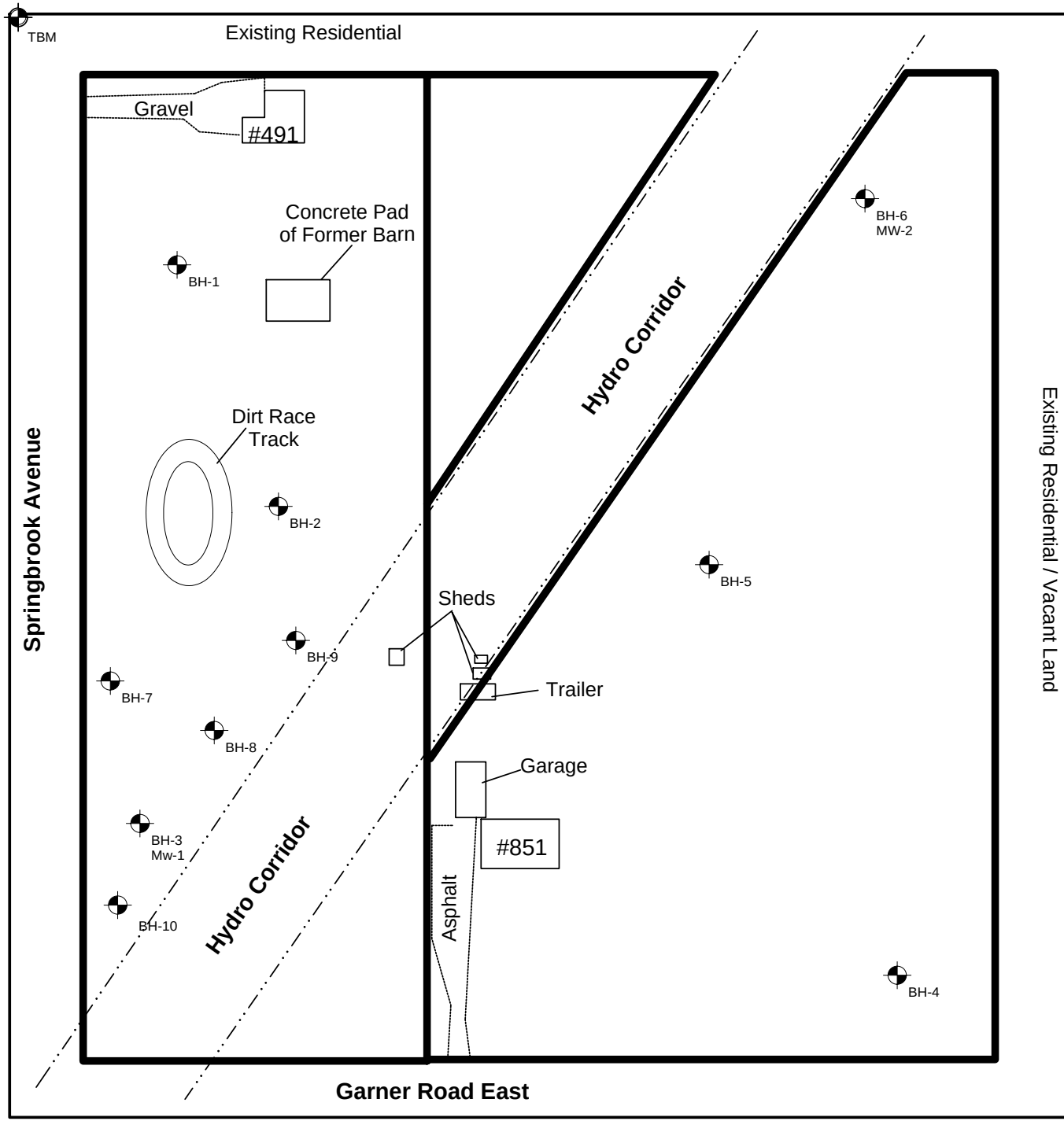
Kyle Richardson, B. Eng., EIT

Ian Shaw, P. Eng.
Project Engineer

John Monkman, P. Eng.
Review Egnineer

Enclosures: Drawing No. 1, Borehole Location Plan
Borehole Log Nos. 1 to 10, inclusive
AGAT Certificate of Analysis [11H507092]

Distribution: Urbex Engineering Limited [2, plus pdf]



LEGEND

BH-# Borehole

Subject Site Boundary

TBM Temporary Benchmark
Top nut of fire hydrant located at 460 Springbrook Ave.
Assumed elevation 100.00 metres.

NOTES:

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. report number SM 114139.
2. Borehole locations are approximate.
3. Soil samples will be discarded after 3 months unless directed otherwise by client.

Soil-Mat

Engineers & Consultants Ltd.

CLIENT

Urbex Engineering Ltd.

PROJECT TITLE

Geotechnical Investigation
Springbrook and Garner
Hamilton, Ontario

DRAWING TITLE

Borehole Location Plan

PROJECT No.	SM 114139
SCALE	N.T.S.
DATE	July 2011
CHECKED	
DRAWN	
FILENAME	114139 Borehole Location Plan.kcw

DRAWING No. 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 1

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

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SUBSURFACE PROFILE

SAMPLE

Depth (ft / m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)	Well Data
0 / 0	99.65	Ground Surface								
0 / 0		**Topsoil** Approximately 150 mm of topsoil								
2 /		**Clayey Silt** Brown, trace of sand, stiff	SS	1	4 8 9	17				
4 /										
6 / 2	97.85	**Sandy Silt** Brown, trace to some clay, increasing clay content with depth, compact to dense	SS	2	3 5 9	14				
8 /			SS	3	4 6 10	16				
10 /			SS	4	8 21 18	39				
12 /	95.90									
14 / 4		**Sand** Brown, wet, compact								
16 /	94.65		SS	5	5 11 14	25				
18 /		End of Borehole								
20 / 6										
22 /										
24 /										
26 / 8										
28 /										
30 /										
32 /										

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

NOTES:

1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 5.0 metres.

2. Borehole 'wet' at a depth of 3.45 metres below surface on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Augers

Drill Date: June 27, 2011

Hole Size: 150 mm

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Datum: Temporary Benchmark

Checked by: JM

Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Springbrook and Garner

Client: Urbex Engineering Ltd.

Log of Borehole No. 2

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

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SUBSURFACE PROFILE

SAMPLE

Depth (ft / m)	Elevation [m]	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	99.83	Ground Surface								
		Topsoil Approximately 175 mm of topsoil								
		Clayey Silt Brown, trace of sand, stiff.		SS	1	3 5 7	12			
	98.33									
		Sandy Silt Brown, trace of clay and gravel, compact.		SS	2	4 5 6	11			
2 /				SS	3	6 10 12	22			
	96.53									
		Clayey Silt Grey, wet, trace of sand and gravel, sand seam at 4.75 metre depth, compact		SS	4	7 12 17	19			
4 /	94.83			SS	5	5 6 6 Wet Spoon	12			
		End of Borehole								
6 /										
8 /										

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 5.0 metres.

2. Borehole 'wet' at a depth of 2.7 metres below surface on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: June 27, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 3

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

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SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0	0	99.15	Ground Surface							
		98.95	**Topsoil** Approximately 200 mm of topsoil over native brown sandy silt with occasional clayey silt seams							
			Gravel Fill Black, compact.	SS	1	13 22 8	30			
		97.35		SS	2	7 6 8	14			
	2		**Clayey Silt** Dark grey, organic stained, trace to some organics, firm.							
		96.72		SS	3	3 3 4	7			
			Sandy Silt Brown and grey, trace of rootlets, trace of clay and gravel, occasional clayey silt seams, compact.	SS	4	2 3 7	10			
	4	94.65								
		94.15	**Sand** Brown, saturated, trace of clay and gravel, compact	SS	5	5 6 9 Wet Spoon	15			
			End of Borehole							
	6									
	8									

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

NOTES:

1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 5.0 metres.

2. Borehole 'wet' at a depth of 3.45 metres below surface on completion and backfilled as per Ontario Regulation 903.

3. Water level was recorded at 3.04 metres on October 4, 2012.

4. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: June 27, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 4

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

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SUBSURFACE PROFILE

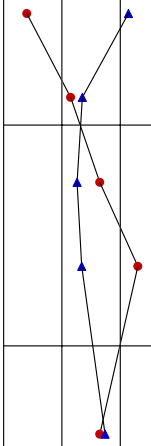
SAMPLE

Depth (ft / m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	99.25	Ground Surface							
		Topsoil Approximately 150 mm of topsoil							
2		***Clayey Silt*** Brown, trace of sand, stiff.	SS	1	1 3 7	8			
4	97.75								
6 / 2		***Sandy Silt*** Brown, grey below approximately 4.0 metres, trace of clay and gravel, occasional clayey silt seams, occasional thin oxidised seams in upper level,, compact to dense.	SS	2	6 10 13	23			
8			SS	3	10 15 18	33			
10			SS	4	14 18 28	46			
12 / 4									
14									
16	94.25		SS	5	14 15 18 Wet Spoon	33			
		End of Borehole							
18									
20 / 6									
22									
24									
26 / 8									
28									
30									
32									

Well Data

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



NOTES:

1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 5.0 metres.

2. Borehole 'wet' at a depth of 4.5 metres below surface on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: June 27, 2011

Hole Size: 150 mm

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Checked by: JM

Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 5

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		99.84	Ground Surface							
0	0		**Topsoil** Approximately 150 mm of topsoil							
2			**Clayey Silt** Brown, trace of gravel, stiff.							
6	2	97.74		SS	2	4 7 8	15			
8			**Sandy Silt** Brown, trace of clay and gravel, compact to dense.	SS	3	8 31 14	45			
10				SS	4	10 15 22	37			
12	4	95.84								
14			**Sand** Brown, saturated, trace of clay and gravel, compact.							
16		94.84		SS	5	4 6 8 Wet Spoon	14			
18			End of Borehole							
20	6									
22			NOTES:							
24			1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 4.95 metres.							
26	8		2. Borehole 'wet' at a depth of 1.8 metres below surface on completion and backfilled as per Ontario Regulation 903.							
28			3. Soil samples will be discarded after 3 months unless otherwise directed by our client.							
30										
32										

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

Drill Method: Solid Stem Auger

Drill Date: June 27, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 6

Project Manager: John Monkman, P. Eng

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

SUBSURFACE PROFILE

Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	99.64	Ground Surface
			Topsoil
			Approximately 175 mm of topsoil
			Clayey Silt
			Brown, trace of gravel, firm to very stiff.
		96.74	
			Sandy Silt
			Brown, compact to dense.
		94.99	
		94.64	**Sand**
			Brown, trace of clay and gravel, dense.
			End of Borehole

NOTES:

1. Borehole was advanced using solid stem auger equipment on June 27, 2011 to termination at a depth of 4.95 metres.

2. Borehole 'wet' at a depth of 4.2 metres below surface on completion and backfilled as per Ontario Regulation 903.

3. Water level was recorded at 3.93 metres on October 3, 2012.

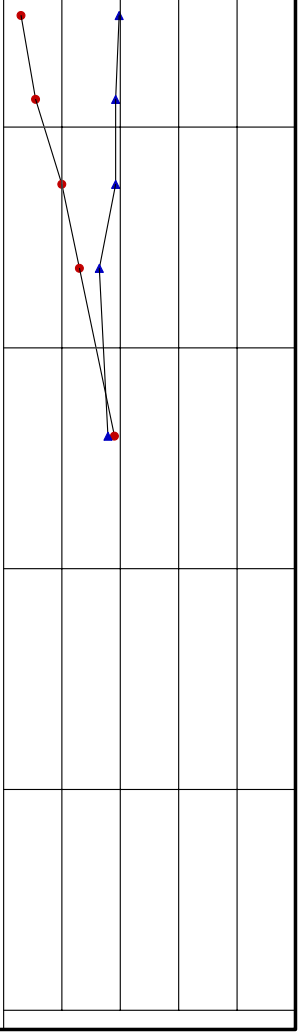
4. Soil samples will be discarded after 3 months unless otherwise directed by our client.

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	2 2 4	6			
SS	2	4 4 7	11			
SS	3	5 9 11	20			
SS	4	10 14 12	26			
SS	5	14 18 20	38			

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)



Drill Method: Solid Stem Auger

Drill Date: June 27, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 7

Project Manager: John Monkman, P. Eng.

Borehole Location: See Drawing No. 1

: **::**

Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth (ft / m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0 / 0	99.22	Ground Surface							
		Topsoil Approximately 150 millimetres of topsoil							
		Clayey Silt Fill Brown, some gravel, cobble encountered at approximately 1.7 metres, loose.	SS	1	2 3 2 2	5			
			SS	2	8 50/0" Bouncing				
2 / 6	96.97	**Clayey Silt** Brown, moist to wet, trace of sand, firm.	SS	3	2 2 3 2	5			
			SS	4	4 9 12 14	4			
4 / 12	95.62	End of Borehole							

Moisture Content w% (10 20 30 40)

Standard Penetration Test blows/300mm (20 40 60 80)

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 4, 2011 to termination at a depth of 3.6 metres.

2. Borehole 'wet' at a depth of 2.65 metres on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: July 4, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 8

Project Manager: John Monkman, P. Eng.

Borehole Location: See Drawing No. 1

: **::**

Soil-Mat

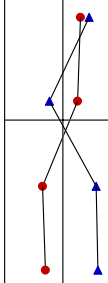
SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		99.21		Ground Surface								
0	0			**Topsoil** Approximately 150 millimetres of topsoil								
2				**Gravel Fill** Black, compact.		SS	1	8 10 16 11	26			
4												
6	2	96.96				SS	2	12 13 12 3	25			
8				**Clayey Silt** Brown, traces of sand in lower level, stiff.		SS	3	4 5 8 8	13			
10												
12		95.61		End of Borehole		SS	4	3 5 9 14	14			
14	4											
16												
18												
20	6											
22												
24												
26	8											
28												
30												
32												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



NOTES:

1. Borehole was advanced using solid stem auger equipment on July 4, 2011 to termination at a depth of 3.6 metres.

2. Borehole 'wet' at a depth of 2.7 metres on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: July 4, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 9

Project Manager: John Monkman, P. Eng.

Borehole Location: See Drawing No. 1

: **::**

Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		99.41	Ground Surface							
0	0		***Topsoil*** Approximately 150 millimetres of topsoil							
2			***Clayey Silt*** Brown, trace of sand, firm.	SS	1	4 2 2 2	4			
4										
6	2	97.31		SS	2	2 6 4 7	7			
8			End of Borehole							
10										
12	4									
14										
16										
18										
20	6									
22										
24										
26	8									
28										
30										
32										

Well Data

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80

NOTES:

1. Borehole was advanced using solid stem auger equipment on July 4, 2011 to termination at a depth of 2.1 metres.

2. Borehole 'dry' on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: July 4, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

Project No: SM 114139-G

Project: Springbrook and Garner

Location: Hamilton, Ontario

Client: Urbex Engineering Ltd.

Log of Borehole No. 10

Project Manager: John Monkman, P. Eng.

Borehole Location: See Drawing No. 1

: ::

Soil-Mat

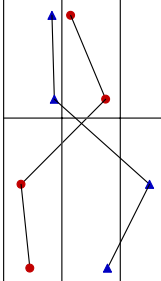
SUBSURFACE PROFILE

SAMPLE

Depth (ft)	Depth (m)	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		0.00		Ground Surface								
0	0			**Topsoil** Approximately 150 millimetres of topsoil								
2				**Gravel Fill** Black, pieces of styrofoam encountered in upper level, compact to dense.		SS	1	13 8 15 18	23			
4												
6	2	-2.10				SS	2	12 23 12 4	35			
8				**Clayey Silt** Black with trace of rootlets in upper level, brown with trace of sand in lower level, firm to stiff.		SS	3	2 3 3 4	6			
10												
12		-3.60		End of Borehole		SS	4	2 2 7 9	9			
	4											
14												
16												
18												
20	6											
22												
24												
26	8											
28												
30												
32												

Moisture Content
w%
10 20 30 40

Standard Penetration Test
blows/300mm
20 40 60 80



NOTES:

1. Borehole was advanced using solid stem auger equipment on July 4, 2011 to termination at a depth of 3.6 metres.

2. Borehole 'dry' on completion and backfilled as per Ontario Regulation 903.

3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Solid Stem Auger

Drill Date: July 4, 2011

Hole Size: 150 mm

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Sheet: 1 of 1

AGAT Laboratories

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT
130 LANCING DRIVE
HAMILTON, ON L8W3A1

ATTENTION TO: Ian Shaw

PROJECT NO: 114139

AGAT WORK ORDER: 11H507092

SOIL ANALYSIS REVIEWED BY: Anthony Dapaah, PhD (Chem), Inorganic Lab Manager

TRACE ORGANICS REVIEWED BY: Jacky Takeuchi, BScH (Chem Eng), BSc (Bio), C.Chem, Laboratory Manager

DATE REPORTED: Jul 12, 2011

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712 5100, or at 1-800-856-6261

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 11H507092

PROJECT NO: 114139

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153(511) - Metals & Inorganics (Soil)

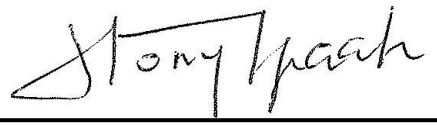
DATE SAMPLED: Jul 04, 2011 | **DATE RECEIVED: Jul 05, 2011** | **DATE REPORTED: Jul 12, 2011** | **SAMPLE TYPE: Soil**

Parameter	Unit	G / S	RDL	BH7-SS1 2521700	BH8-SS2 2521702	BH10-SS2 2521705
Antimony	µg/g	7.5	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	6	6	4
Barium	µg/g	390	2	125	89	26
Beryllium	µg/g	4	0.5	0.9	0.6	<0.5
Boron	µg/g	120	5	11	9	8
Boron (Hot Water Soluble)	µg/g	1.5	0.10	0.69	0.28	0.57
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5
Chromium	µg/g	160	2	27	19	8
Cobalt	µg/g	22	0.5	11.6	10.7	3.2
Copper	µg/g	140	1	28	33	14
Lead	µg/g	120	1	38	11	61
Molybdenum	µg/g	6.9	0.5	0.7	<0.5	0.7
Nickel	µg/g	100	1	26	23	14
Selenium	µg/g	2.4	0.4	<0.4	<0.4	<0.4
Silver	µg/g	20	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4
Uranium	ug/g	23	0.5	0.7	0.5	0.5
Vanadium	µg/g	86	1	36	27	27
Zinc	µg/g	340	5	123	60	101
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.05	<0.05	<0.05	<0.05
Mercury	µg/g	0.27	0.01	0.03	0.02	0.02
Electrical Conductivity (2:1)	mS/cm		0.002	0.289	0.229	0.312
Sodium Adsorption Ratio (2:1)	N/A	5	N/A	0.111	1.15	0.187
pH, 2:1 CaCl2 Extraction	pH Units			7.43	7.76	7.85

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(RPI) - New

2521700-2521705 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 11H507092

PROJECT NO: 114139

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil

DATE SAMPLED: Jul 04, 2011 | **DATE RECEIVED: Jul 05, 2011** | **DATE REPORTED: Jul 12, 2011** | **SAMPLE TYPE: Soil**

Parameter	Unit	G / S	RDL	BH7-SS1 2521700	BH8-SS2 2521702	BH10-SS2 2521705
Benzene	µg/g	0.21	0.02	<0.02	<0.02	<0.02
Toluene	µg/g	2.3	0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	1.1	0.05	<0.05	<0.05	<0.05
Xylene Mixture (Total)	µg/g	3.1	0.05	<0.05	<0.05	<0.05
C6 - C10 (F1)	µg/g		5	<5	<5	<5
C6 - C10 (F1 minus BTEX)	µg/g	55	5	<5	<5	<5
C>10 - C16 (F2)	µg/g	98	10	<10	<10	<10
C>16 - C34 (F3)	µg/g	300	50	<50	110	**1200**
C>34 - C50 (F4)	µg/g	2800	50	<50	1400	2700
Gravimetric Heavy Hydrocarbons	µg/g		50	NA	NA	NA
Moisture Content	%		0.1	17.2	9.5	7.3

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T2(RPI) - New

2521700-2521705 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By: Jordy Takewaki

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Guideline Violation

AGAT WORK ORDER: 11H507092

PROJECT NO: 114139

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
2521705	BH10-SS2	T2(RPI) - New	O. Reg. 153 - Petroleum Hydrocarbons F1 - F4 (C6 - C50) in Soil	C>16 - C34 (F3)	300	1200