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2016

PROJECT NO.: SM 166905-G September 29, 2015

Landform Development Group Inc.
980 Fraser Drive, Suite 205
Burlington, Ontario
L7L 5P5

Attention: Mr. Andrew Bear, CPA, CA

GEOTECHNICAL INVESTIGATION
PROPOSED MULTI-STOREY BUILDING
401 TO 417 MARTHA STREET
BURLINGTON, ONTARIO

Dear Mr. Bear,

Further to your authorisation Soil-Mat Engineers & Consultants Ltd. have completed the fieldwork and laboratory testing, and report preparation in connection with the above noted project. The work was conducted in general accordance with our revised proposal number P6343 dated July 15, 2016. Our comments and recommendations, based on our findings at the borehole locations, are presented herein.

1. INTRODUCTION

We understand that the project will involve the construction of a twelve to fifteen [12-15] storey condominium building, including as many as four to five [4-5] underground parking levels. The purpose of this geotechnical investigation was to determine subsurface soils information at the borehole locations and to interpret the results of this investigation with respect to the design and construction of the foundations 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 design may void the recommendations given in this report. If significant changes are made to the proposed design, this office must be consulted to review the new design with respect to the results of this investigation.

2. PROCEDURE

A total of two [2] sampled boreholes were advanced at the locations illustrated on the enclosed Drawing No. 1, Borehole Location Plan. It is noted that the boreholes were located based on access to the subject property, given the presence of existing dwellings. It may be prudent to advance an additional borehole to the rear of the property once access is possible. All boreholes were advanced using solid stem continuous flight auger equipment on August 4, 2016 to a depth of approximately 7.8 metres below ground surface. In addition, the bedrock encountered in Borehole No. 1 was cored from a depth of approximately 7.8 metres to a depth of approximately 15.5 metres. The boreholes were advanced using a track mounted drill rig under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD. Upon completion of drilling, a monitoring well was installed in Borehole No. 1, and the remaining borehole was backfilled in accordance with Ontario Regulation 903, and the grade reinstated roughly even with the existing ground surface.

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 to the routine moisture content tests performed at our laboratory, a total of four [4] selected samples were submitted for background environmental testing. The samples were submitted to AGAT Laboratories Limited, an accredited Canadian Environmental Laboratory for analytical testing including Metals and Inorganics and Petroleum Hydrocarbon parameters, for comparison to the Soil, Ground Water and Sediment Standards for Use Under Park XV.1 of the *Environmental Protection Act.*

The boreholes were located in the field by a representative of SOIL-MAT ENGINEERS. The ground surface elevations were referenced to a site specific temporary benchmark described as the top of the manhole cover immediately south of 417 Martha Street. This benchmark was assigned an elevation of 100.00 metres for convenience.

The results of the subsurface investigation are detailed in Log of Borehole Nos. 1 and 2, which can be found 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 project site is located in Burlington, Ontario and includes 401 to 417 Martha Street. With Martha street taken as running north-south, the study area is bound to the east by the valley lands of Rambo Creek, to the south by a multi-story apartment building, to the west by Martha Street, and to the north by the Waterfront Trail. The properties that constitute the subject site are currently occupied by 1-2 storey single family residential dwellings facing onto Martha Street. The subject lands are relatively flat and even with Marth Street, sloping down from Martha Street east to the creek valley.

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

Gravel

All boreholes were advanced through existing gravel driveways which consisted of a surficial layer of gravel approximately 150 to 200 millimetres in thickness.

Clayey Silty Fill

Clayey silt fill was encountered beneath the gravel layer in Borehole No. 2. The brown cohesive fill contained traces of what appear to be slag fragments and exhibited a generally firm consistency. The clayey silt fill was found to extend to a depth of approximately 1.5 metres.

Clayey Silt

Native clayey silt was encountered beneath the gravel layer in Borehole No. 1 and beneath the clayey silt fill in Borehole No. 2. The brown cohesive soil contained trace gravel and exhibited a generally firm to stiff consistency. The native clayey silt was found to extend to a depth of approximately 1.3 and 2.1 metres in Borehole Nos. 1 and 2, respectively.

Queenston Shale

Queenston Shale was encountered beneath the native clayey silt at both borehole locations. The Shale was red, severely weathered in the upper levels, becoming sounder with depth, and containing occasional more resistant grey layers. The degree of weathering in the upper levels of the Queenston Shale is such that it tends to exhibit the properties of a hard cohesive soil, or weak rock, as evidenced by the ability to penetrate the bedrock with the solid stem augers of the drill.

The bedrock was cored in Borehole No. 1 using NQ-size diamond core barrel equipment and yielded core recovery on the order of 50 to 100 per cent. The Rock Quality Designation [RQD] of the recovered rock cores was determined to range from approximately 60 to 91 per cent, indicative of a relatively sound quality rock mass.

Compressive strength testing was carried out on four [4] core samples, yielding unconfined strengths in the range of approximately 26.3 to 51.6 MPa [3814 to 7483 psi], with an average of 41.0 MPa, summarised as follows.

TABLE A
BEDROCK COMPRESSIVE STRENGTH DATA

Borehole No.	Depth	q_u [MPa]
1	9.9 m	51.6
1	10.2 m	26.3
1	12.8 m	45.1
1	14.8m	40.8

Groundwater Conditions

Free groundwater was encountered at the completion of drilling in Borehole No. 1 at a depth of approximately 2.0 metres, however this would have been influenced by water introduced for the rock coring process. Borehole No. 2 was recorded as 'dry' upon completion of drilling. It should be noted that insufficient time would have passed for the static groundwater level to stabilise in the open borehole after drilling. A monitoring well was installed in Borehole No. 2 to allow for measurement of the stabilised groundwater level. The groundwater level measurements in the monitoring well are summarised in Table B.

TABLE B
SUMMARY OF GROUNDWATER MEASUREMENTS

Date	Groundwater Depth [m]
September 9, 2015	5.04
September 13, 2015	5.12

4. EXCAVATIONS

As noted above the proposed building is anticipated to incorporate as many as four to five basement levels. This will be a critical determination with respect to the design of foundations, excavation shoring, construction and permanent dewatering, and water proofing for the basement levels.

It is anticipated that excavations for the proposed foundations, sewers and other underground services will extend to depths of up to perhaps 9 to 15 metres below the present grade, depending on the total number of basement levels. The upper level of the Queenston Shale bedrock is typically highly weathered and should yield to a heavy hydraulic excavator equipped with 'rock' teeth. However, the rate of excavation should be anticipated to slow with depth, below perhaps 3 to 4 metres, as the Shale bedrock becomes sounder and less weathered. As the Shale becomes more competent, or where more resistant layers are encountered, the use of mechanical rock splitters will be required. A test excavation should therefore be considered to allow potential contractors bidding on the work to observe first-hand the performance of a large machine in the Queenston Shale bedrock.

The base of excavations into the Queenston Shale are expected to remain solid and stable. However, the exposed Shale will be prone to surface weathering and softening. It is recommended that a thin concrete 'mud' slab, perhaps 50 millimetres, be placed over the base of the excavations to protect the founding soils from weathering and to provide a clean working surface for the placement of reinforcing steel, formwork, etc.

EXCAVATION SUPPORT

It is anticipated that the new structure will approach the property limits, certainly towards Martha Street. As such is anticipated that open cut excavations may be suitable in some areas, while other sections will require some level of excavation support. It is noted that a preconstruction survey of adjacent above and below grade structures should be conducted to assess the appropriate shoring requirements, as well as establish a baseline condition.

Excavation side slopes will remain stable at a slope of 45 degrees to the horizontal in the upper fill materials and 60 degrees to the horizontal in the native clayey silt for the short construction period. The side slopes in the Queenston Shale should remain stable at near vertical slopes. Where workers are required to enter the excavations the sides should be thoroughly scaled of all loose rock debris and by routinely evaluated by a Senior Engineer from this office. Consideration could be given to covering the excavation faces with heavy construction tarps or debris netting, secured at top and bottom, to direct any lose rock debris that may come loose safely to the bottom of the excavation. Notwithstanding the foregoing, however, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects.

Depending on the final design depths of the structure, along with the proximity to the roadway, some level of excavation support will likely be required to ensure the stability of the excavation faces with little or no horizontal movement. Such support may be accomplished in a number of methods, including rock anchors, 'soldier' pile/caissons and timber lagging, or continuous caisson wall. Deeper excavations would be expected to have greater excavation shoring requirements.

Caissons to support either soldier piles or a continuous caisson wall should extend a minimum of 1.5 metres beyond the final depth of excavation, and may be design on the basis of a nominal end bearing pressure of 1,000 kPa [~20,000 psf]. Where no lateral movements are acceptable the shoring should be designed considering an 'at rest' lateral earth pressure coefficient of Ko = 0.5. Where small lateral movements can be tolerated an 'active' earth pressure coefficient of Ka = 0.25 may be considered.

The caissons should be provided with lateral bracing, either by using a waler beam and raker supports, or with rock anchors. From a contractor's point of view, rock anchors would be preferred, provided permission can be obtained from the neighbouring property owners to extend the anchors under their property. It is noted that significant movements of the shoring system may take place if rakes are used to support the shores since compression of the rakes and the footings supporting the inclined raker loads must occur before the rakes can begin to carry load. In this regard, anchors are preferred since they pre-stress the shoring system to the design load even before the excavations reach their final grade.

The excavation face may also be supported using a rock anchor system, provided permission can be obtained from the neighbouring property owners to extend the anchors under their property. The anchors should be spaced on roughly 1.5 to 2 metre centres, both horizontally and vertically. The anchors should be fitted with larger 'washer plates', perhaps 300 millimetres square, to provide a large bearing area for the anchors on the face of the excavation. As noted above the exposed Shale should be thoroughly scaled to remove any loose fragments and secured with either a heavy geofabric, debris netted, or shotcrete.

Regardless of which method of support is pursued for the Shale excavations the overburden soils will need to be properly cut back or additionally supported. Where space is available to cut back the overburden, the soil should be removed completely a distance of at least 300 millimetres from the face of the Shale excavation and then sloped up. Where there is not sufficient space to accommodate cutting back of the overburden soils they may be supported at near vertical slopes with the provision of a soldier pile [support at depth by caissons] and timber lagging system, or with shotcrete.

The excavation support must be designed as required by the Occupational Health and Safety Act and the Canadian Foundation Engineering Manual. This office should be given the opportunity to review the shoring shop drawings and design parameters before construction, and a representative of SOIL-MAT ENGINEERS should be on site to observe the installation of the shoring. The shoring must be monitored for movements, and a plan must be available before the excavations begin, to rectify the shoring system should movements become apparent.

GROUNDWATER CONTROL

As noted above the static groundwater level in the monitoring well installed in Borehole No. 1 has been measured at a depth of approximately 5.0 metres below the existing grade. Evidently excavations to the depths required will extend below the static groundwater level and thus will experience groundwater infiltration through more permeable seams in the bedrock. It is noted the Shale bedrock tends to be layered and fissured, such that permeable seams are intermittently spaced. For excavations extending a short distance below the static groundwater level, accommodating perhaps 2 to 3 basement levels, it may be possible to adequately control any water that may seep into the excavations from more permeable seams in the fill material, clayey silt and Queenston Shale and from surface water using conventional construction 'dewatering' techniques, such as pumping from sumps in the base of the excavations. The need for multiple sumps should be anticipated. Where deeper excavations are required the rate and volume of groundwater infiltration should be anticipated to be much greater. It may be feasible to control such infiltration with pumping, making use of additional pumps. The groundwater control requirements will be significantly influenced by the excavation shoring method implemented, being greatest for open cuts into the Shale and much less for a continuous caisson wall. The volume of water to be controlled during construction should be monitored to aid in the final sizing of permanent dewatering sumps for the building. More water should be expected when connections are made with existing services. Surface water should be directed away from the excavations.

5. FOUNDATION CONSIDERATIONS

It is anticipated that the founding level for the structure will extend to a depth of up to perhaps 9 to 15 metres below the existing grade, depending on the final number of basement levels, into the competent Queenston Shale bedrock. The sound Queenston Shale bedrock at depth is considered very competent in terms of support conditions for the proposed structure. Based on the results of our investigations, including the rock coring and unconfined compressive strength testing of the bedrock, spread footings founded on the competent Shale bedrock may be designed using the following design bearing value:

SLS = ULS = 3,500 kPa [~ 70,000 psf]

It is noted that the SLS value represents the Serviceability Limit State, which is governed by the tolerable deflection [settlement] based on the proposed building type, using unfactored load combinations. The ULS value represents the Ultimate Limit State and is intended to reflect an upper limit of the available bearing capacity of the founding soils in terms of geotechnical design, using factored load combinations. It is case the SLS and ULS values are the same, as in order for serviceability limits of deflection to be realised, failure of the Queenston Shale bedrock would have to occur.

All footing beds must be hand cleaned of all loose or disturbed material, ponded water, etc. prior to the placement of foundation concrete. With footings founded on the competent Shale the amount of total and differential settlements are anticipated to be negligible.

In areas where it will be necessary to have adjacent footings at different founding elevations, the lower footing should be constructed prior to the higher footing, if possible, and the higher footing should be set below an imaginary line drawn up from the edge of the lower footing at 10 horizontal to 7 vertical. This practice will limit stress transfer from the higher footings to lower footings.

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 geotechnical engineer be retained from this office to provide geotechnical engineering services during the excavation support and foundation construction phases of the project. This is to observe compliance with the design concepts and recommendations of this report and to allow changes to be made in the event that subsurface conditions differ from the conditions identified at the Borehole locations.

6. LATERAL EARTH PRESSURE

The lateral earth pressures on basement walls can be estimated on the basis of a retained soil unit weight, [γ_{wet}], of 20 kN/m^3 [~127 pcf]. The coefficient of lateral earth pressure may be taken as, K_o = 0.5 in fill against rigid walls [at rest condition]. Any additional pressures due to surcharge loading, such as adjacent structures, roadways, parked vehicles, floor slab loading, etc. must be included in the design.

7. SEISMIC DESIGN CONSIDERATIONS

The structure shall be designed according to Section 4.1.8 of the Ontario Building Code, Ontario Regulation 332/12. Based on the subsurface soil conditions encountered in this investigation the applicable Site Classification for the seismic design is recommended as Site Class B – Rock.

The seismic data, from Supplementary Standard SB-1 of the Ontario Building Code, for Burlington are as follows:

$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	PGA
0.32	0.170	0.064	0.022	0.180

8. PARKING GARAGE [BASEMENT] FLOOR SLAB

The lower level parking garage floor slab may be constructed using conventional slab-on-grade techniques on the Queenston Shale subgrade. As with all concrete floor slabs, there is a tendency for the floor slabs to crack. The slab thickness, concrete mix design, the amount of steel reinforcement and/or wire mesh placed into the concrete slab, if any, will therefore be a function of the owner's tolerance for cracks in, and movements of, the slabs-on-grade, etc. The 'saw cuts' in the concrete floors, for crack control, should extend to a minimum depth of 1/3 of the thickness of the slab.

A moisture barrier will be required under the floor slabs such as the placement of at least 200 millimetres of well-compacted 20 millimetre clear crushed stone. At a minimum the moisture barrier material should contain no more than 10 per cent passing the No. 4 sieve. Where 'non-damp' floor slabs are required, as for instance under sheet vinyl floor coverings, etc., extra efforts will be required to damp proof the floor slab, as with the additional provisions of a heavy 'poly' sheet, damp proofing sprays/membranes, etc. Where heavy 'poly' sheeting is used care should be taken in its placement, or a sufficiently heavy thickness provided, to prevent damage (puncturing and/or tearing).

Curing of the slab-on-grade must be carefully specified to ensure that slab curl is minimised. This is especially critical during the hot summer months of the year when the surface of the slab tends to dry out quickly while high moisture conditions in the moisture barrier or water trapped on top of any 'poly' sheet at the saw cut joints and cracks, and at the edges of the slabs, maintains the underside of the slab in a moist condition.

It is also important that the concrete mix design provide a limiting water/cement ratio and total cement content, which will mitigate moisture related problems with low permeance floor coverings, such as debonding of vinyl and ceramic tile. It is equally important that excess free water not be added to the concrete during its placement as this could increase the potential for shrinkage cracking and curling of the slab.

9. PERIMETER AND UNDERFLOOR DRAINAGE

A permanent perimeter and underfloor drainage system should be provided around and under the structure to prevent the build-up of water under the slab-on-grade and against the foundation walls. It is anticipated that the foundation wall drainage and/or water proofing system will need to be installed against the excavation shoring, often referred to as 'blind side' waterproofing. A variety of products are available for this application, such as Delta-Drain or TremDrain systems. Any system must include a drainage board layer and/or waterproofing membrane intended for a 'blind side' application. The system should also incorporate a water-stop component between the footing/mat slab and foundation walls.

The volume of groundwater control required during construction should be monitored and used to assist in sizing the permanent drainage requirements. As a minimum it is recommended that the perimeter weeping tile consist of a 150 mm diameter perforated pipe, surrounded with 200 mm of 20 mm clear stone, with the stone in turn encased by a heavy filter fabric. The suppliers of the filter fabric should be consulted as to the type best suited for this project.

To address the potential for the build-up of groundwater beneath the basement floor slabs under-floor drains should also be provided. These could consist of 150 millimetre diameter perforated plastic pipe, with a geofabric sock, placed in the clear stone beneath the floor slabs on nominal 4 metre centres. It is noted that the perimeter and under-floor drain piping should be kept separate from one another to avoid the potential for the perimeter drainage system to 'charge' water into the under-floor drains. The drains may outlet into a common sump pit.

This office should examine the installation of the perimeter drains. Even a small break in the filtering materials could result in loss of fines into the drains with attendant performance difficulties, including settlements of the ground surface. The exterior grade around the structure should be sloped away from the structure to prevent the ponding of water against the foundation walls. The enclosed Drawing No. 2 shows a schematic of the typical requirements for perimeter and under floor drains for basement level construction.

Alternatively the foundations walls and floor slab may be designed to be water-tight, and thus eliminate the need for permanent drainage systems. The choice of excavation shoring system and final basement depth will greatly influence the need for such an approach. Where 4 to 5 basement levels are pursued the need for a water-tight system would be anticipated. In such case the foundation walls should be designed to resist hydrostatic pressure over the full height to ground surface. As well the basement floor slab will be required to be design to resist potential hydrostatic uplift forces. Elevator pit excavations extending below the general basement floor level should be design to be water-tight.

10. BACKFILL CONSIDERATIONS

It is expected that the majority of the material excavated to accommodate the basement levels will be transported off-site. Where required select portions of the fill material and clayey silt soils are considered suitable for use as backfill in service trenches, etc. provided it is free of organics or any other deleterious material. The use of Queenston Shale backfill is not recommended as it will require significant effort and will be prone to ongoing settlement for many years if it is not properly graded and moisture conditioned, even if it is well compacted.

The use of free draining, well-graded granular material, such as an Ontario Provincial Standard Specification [OPSS] Granular B, Type II (crushed bedrock) is often preferred for backfill against foundation walls or to raise the interior grade to the design subgrade level. This material is more readily compacted in restricted access areas, and generally presents a more positive support condition for interior floor slabs and exterior concrete sidewalks, pavement, etc. The use of alternative materials, including recycled concrete aggregates, clear stone materials, etc., may be considered, however should be reviewed and approved by our office prior to use. 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.

Fine-grained cohesive soils such as those encountered on site are sensitive to moisture absorption and will become practically impossible to compact using conventional compaction equipment if they become wet during the 'wet' periods of the year. After a period of heavy precipitation, any near-surface wet, or softened material, should be allowed to air-dry or be removed and discarded. These soils are not considered to be free draining and therefore should not be used where this characteristic is necessary. They should not be used in confined spaces where access for compaction is difficult.

Backfill materials used in service trenches or to raise the subgrade elevation under pavement areas should have its moisture content within 3 per cent of its optimum moisture content. In service trenches the backfill material should be compacted to a minimum of 95 per cent of its standard Proctor maximum dry density [SPMDD] to within about one metre below final grade, and to 100 per cent of SPMDD above this level. Any fill required against the basement walls should consist of free draining granular material compacted to 95 per cent of its standard Proctor maximum dry density. Where asphalt or concrete paving extends up to the building the upper 1 metre of foundation wall backfill should be compacted to 100 per cent of its standard Proctor maximum dry density. Any structural backfill required under or within the building areas should be compacted to 100 per cent of its standard Proctor maximum dry density. Lift thickness would depend on the material type and moisture content of the backfill material and size of the compaction equipment used by the contractor. A representative of SOIL-MAT should be retained to monitor the backfilling and compaction operations to confirm uniform compaction of the backfill material to project specification requirements.

11. PAVEMENT STRUCTURE DESIGN CONSIDERATIONS

All areas to be paved outside the footprint of the structure must be cleared of all disturbed or unsuitable material to provide a stable subgrade. The subgrade should be proof rolled with 3 or 4 passes of a loaded dump truck in the presence of a representative of Soil-Mat Engineers. Any areas of distress revealed by this, or other means, should be sub-excavated and repaired with quality fill compacted to 100 per cent SPMDD. Depending on weather conditions at the time of construction it may be necessary to sub-excavate the subgrade level and provide additional depth of crushed granular sub-base material. 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.

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

The suggested pavement structures outlined in Table B are based on subgrade parameters estimated on the basis of visual and tactile examinations of the on-site soils and past experience. The outlined pavement structure may be expected to have an approximate ten-year life, assuming that regular maintenance is performed. Should a

more detailed pavement structure design be required, site specific traffic information would be needed, together with detailed laboratory testing of the subgrade soils. Although lighter pavement structures might suffice for the present, such lighter structures are expected to lead to premature pavement failures, etc.

TABLE B
SUGGESTED PAVEMENT STRUCTURE

LAYER DESCRIPTION	COMPACTION REQUIREMENTS	LIGHT DUTY SECTIONS	HEAVY DUTY [TRUCK ROUTE]
Asphaltic Concrete Wearing course OPSS HL 3 or HL 3A	97 per cent Marshall	65 millimetres	40 millimetres
Binder Course OPSS HL 8	97 per cent Marshall		65 millimetres
Base Course OPSS Granular A	100% SPMDD	150 millimetres	150 millimetres
Sub-base Course OPSS Granular B Type II	100% SPMDD	200 millimetres	350 millimetres

*SPMDD denotes Standard Proctor Maximum Dry Density, ASTM-D698.

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 honeycomb surface. As the spreader moves forward, a responsible member of the paving crew should monitor the pavement surface, to ensure a smooth uniform surface. He 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. Of course, the above assumes that the asphalt mix is sufficiently hot to allow the 'back-casting' to be performed.

12. ENVIRONMENTAL CONSIDERATIONS

As noted above four [4] representative samples of the subsurface soils recovered from the boreholes was submitted to an independent Canadian accredited analytical laboratory for background analytical testing for a standard panel of metal and inorganic parameters. The purpose of this testing was to characterise the subsurface soils and provide comments with respect to the off-site disposal of surplus soil during construction.

The laboratory test results received were compared to 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 1**: Full Depth Background Site Condition Standards Residential/Parkland/Institutional and Industrial/Commercial/Community land use.
- **Table 2**: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for a Residential/ Parkland/ Institutional property use, [RPI], as well as for an 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 property use, [RPI], as well as for an Industrial/ Commercial/ Community [ICC] property use.

The results of this laboratory testing are presented in the attached AGAT Certificate of Analysis [16H124863].

Based on SOIL-MAT'S field observations and the analytical test results from AGAT, SOIL-MAT offers the following comments:

1. The tested samples were found to be within the Table 1 [All Other] Standards for the tested parameters with the exception of sample BH2 SS2 which was found to exceed the Standard for Sodium Adsorption Ratio [SAR] and Electrical Conductivity [EC] and samples BH1 SS2, BH1 SS4, and BH2 SS4 which were found to exceed the Standard for SAR;

2. The tested samples were found to be within the Table 2 and 3 [RPI] Standards for the tested parameters with the exception of sample BH1 SS2 which was found to exceed the Standards for SAR;

3. All tested samples were found to be within the Table 2 and Table 3 [ICC] Standards for the tested parameters;

4. It is noted that elevated levels of parameters such as EC and SAR are typically associated with the historical application of de-icing salt for safety in parking lots and roadways. They are essentially aesthetic parameters that are non-toxic and do not present a hazard to human or animal health, rather they tend to render the soil environment unsupportive of plant growth and corrosive to buried metal pipe.

5. The soil samples secured for analytical testing are believed to be representative of the soil conditions at the borehole and sample locations only. No evidence of potential impact, i.e. staining or odours were observed during the fieldwork. If any significant changes are noted, i.e., odours, staining etc., SOIL-MAT should be contacted to reassess the environmental characteristics of the soil.

Given the above test results the following disposal options are applicable under Regulation 153/04 [amended by Regulation 511/09 effective July 1, 2011].

- As the tested material has been shown to exceed Table 1 Standards for one or more parameter, surplus soil should not be disposed of at an off-site property subject to a Record of Site Condition of MOE Certificate of Authorisation. Further testing may delineate the extent of material that meets the Table 1 Standards, which may then be accepted at an off-site property subject to the Table 1 Standards, pending approval of the receiving property owner.

- As the tested material from the area of Borehole No. 1 has been shown to exceed the Table 2 and 3 [RPI] Standards, strictly speaking, surplus material from the area of Borehole No. 1 may not be disposed of at an off-site RPI property in a potable groundwater condition. Material shown to meet the Table 2 and 3 RPI Standards may be reasonably accepted at an off-site RPI property, subject to approval of the receiving property owner.

- As the tested material in the area of Borehole No. 1 show only elevated levels of SAR, noted above as an essentially aesthetic parameter, it would be reasonable to accept this surplus material at an off-site RPI property under the 'beneficial use' concept. Such a use would require assessment of the receiving property and approval of the receiving property owner.

- As the tested material has been shown to be within the Table 2 and 3 [ICC] Standards, surplus material may be accepted at an off-site ICC property in a non-potable groundwater condition, subject to approval of the property owner;

13. 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 intended to describe conditions at the borehole locations only. It is the contractors' responsibility to determine how these conditions will effect the scheduling and methods of construction for the project.

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.

Michael Brown, B. Eng., EIT



Ian Shaw, P. Eng.
Senior Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Log of Borehole Nos. 1 to 2, inclusive
Drawing No. 2, Typical Drainage and Backfill Requirements for Basement Walls including Underfloor Drains

Distribution: Landform Development Group Inc. [2, plus pdf]



LEGEND

BH-# Borehole

TBM Temporary Benchmark
[Manhole immediately south of 417 Martha Street, assumed elevation of 100.00 metres]

NOTES:

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. supplemental report number SM 166905-G
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
Landform Development Group Inc.

PROJECT TITLE
Geotechnical Investigation
Proposed Multi-Storey Building
401 - 417 Martha Street
Burlington, Ontario

DRAWING TITLE
Borehole Location Plan

PROJECT No.	SM 166905-G
SCALE	N.T.S.
DATE	September 2016
CHECKED	IS
DRAWN	MB

FILENAME
SM 166905-G Borehole Location Plan.kcw

DRAWING No. 1

Project No: SM 166905-G

Log of Borehole No. 1

Project: Proposed Residential Development

Project Manager: Ian Shaw, P.Eng.

Location: 401-417 Martha St., Burlington, ON

Borehole Location: See Drawing No. 1

Client: Landform Development Group Inc.

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)
		0.00	Ground Surface							
0	0		**Gravel** Approximately 150 millimetres in thickness							
2			**Clayey Silt** Brown, trace gravel, stiff							
4		-1.30		SS	1	5,4,7,13	11			
6	2		**Queenston Shale** Red, severely weathered in the upper level, becoming more sound with depth, occasional more resistant grey layers, hard in terms of soil	SS	2	15,45,50/1"	100			
8				SS	3	22,50/3"	100			
10				SS	4	23,45,50/1"	100			
12	4									
14										
16				SS	5	50/2"	100			
18										
20	6			SS	6	50/2"	100			
22										
24		-7.62		SS	7	50/1"	100			
26	8		Run #1: Cored from 7.62 to 8.54 metres	NQ						
28		-8.54	Recovery= 50% RQD= 91% Run#2 Cored from 8.54 to 10.06 metres							
30			Recovery= 100% RQD= 60% Qu @ 9.9m= 51.6 MPa	NQ						
32		-10.04								

Well Data

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80

Drill Method: Hollow-Stem Auger

Drill Date: August 4, 2016

Hole Size: 150mm

Drill Contractor: Davis Drilling

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Temporary Benchmark

Field Logged by: M. Brown

Checked by: I. Shaw

Project No: SM 166905-G

Log of Borehole No. 1

Project: Proposed Residential Development

Project Manager: Ian Shaw, P.Eng.

Location: 401-417 Martha St., Burlington, ON

Borehole Location: See Drawing No. 1

Client: Landform Development Group Inc.

Soil-Mat

SUBSURFACE PROFILE

SAMPLE

Depth	Elevation [m]	Symbol	Description	Well Data	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
34			Run#3 Cored from 10.06 to 11.58 metres Recover= 98% RQD= 100% Qu @ 10.2m= 26.3 metres		NQ						
36											
38	-11.58		Run #4 Cored from 11.58 to 13.10 metres Recovery= 100% RQD= 82% Qu @ 12.8m= 45.1 MPa		NQ						
40	12										
42	-13.10		Run #5 Cored from 13.10 to 14.62 metres Recovery= 98% RQD= 60%		NQ						
44											
46	14										
48	-14.62		Run #6 Cored from 14.62 to 15.54 metres Recovery= 93% RQD= 80% Qu @ 14.8= 40.8 MPa		NQ						
50	-15.54		End of Borehole								
52	16										
54											
56											
58											
60	18										
62											
64											

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 August 4, 2016 to termination at a depth of 7.6 metres. Bedrock was cored froma depth of 7.6 metres to a depth of 15.5 metres.

2. Borehole was recorded as 'wet' at a depth of 2.0 metres upon completion of drilling and backfilled as per Ontario Regulation 903. It is noted that the majority of waterencountered following drilling was the result of the introduction of water for coring purposes.

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

4. A monitoring well was installed upon the completion of drilling and the following free groundwater levels have been measured:

September 9, 2016- 5.04m
September 3, 2016- 5.12m

Drill Method: Hollow-Stem Auger
Drill Date: August 4, 2016
Hole Size: 150mm
Drill Contractor: Davis Drilling

SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Temporary Benchmark
Field Logged by: M. Brown
Checked by: I. Shaw
Sheet: 2 of 2

Project No: SM 166905-G

Log of Borehole No. 2

Project: Proposed Residential Development

Project Manager: Ian Shaw, P.Eng.

Location: 401-417 Martha St., Burlington, ON

Borehole Location: See Drawing No. 1

Client: Landform Development Group Inc.

Soil-Mat

SUBSURFACE PROFILE

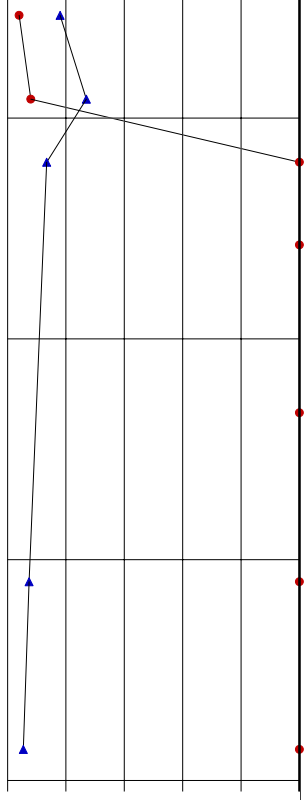
Depth (ft)	Depth (m)	Elevation [m]	Description
0	0	0.00	Ground Surface
		-0.20	**Gravel** Approximately 200 millimetres in thickness
			Clayey Silt Fill Brown, trace coal fragments and slag, firm
		-1.50	**Clayey Silt** Brown, trace gravel, stiff
	2	-2.10	**Queenston Shale** Red, severely weathered in the upper level, becoming more sound with depth, occasional more resistant grey layers, hard in terms of soil
	4		
	6		
	8	-7.82	End of Borehole

SAMPLE

Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
SS	1	4,2,2,6	4			
SS	2	6,4,4,6	8			
SS	3	32,50/3"	100			
SS	4	50/3"	100			
SS	5	50/2"	100			
SS	6	50/2"	100			
SS	7	50/1"	100			

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 August 4, 2016 to termination at a depth of 7.8 metres.
2. Borehole was recorded as 'dry' upon completion of drilling and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.

Drill Method: Hollow-Stem Auger

Drill Date: August 4, 2016

Hole Size: 150mm

Drill Contractor: Davis Drilling

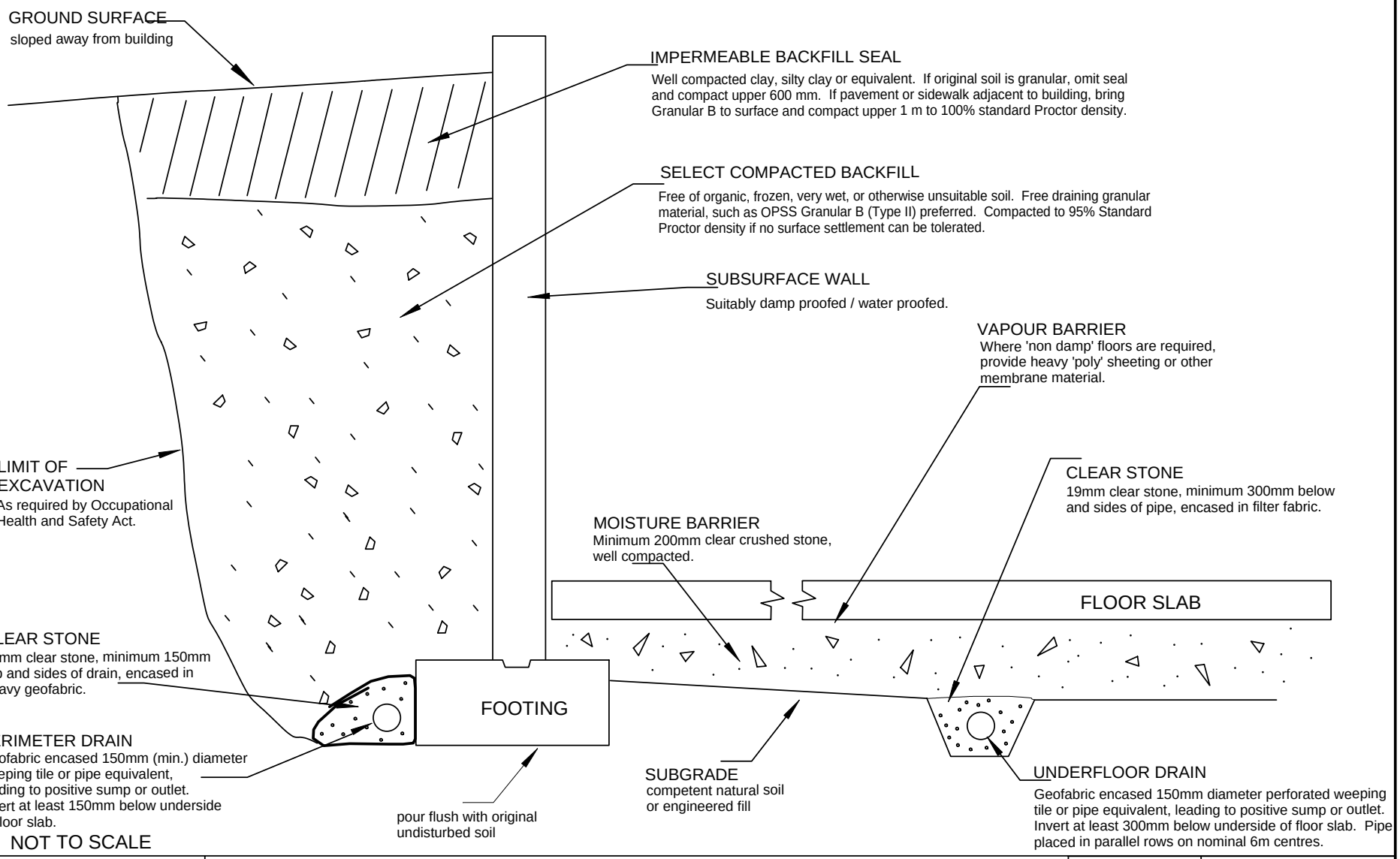
SOIL-MAT ENGINEERS & CONSULTANTS LTD.
130 Lancing Drive, Hamilton, ON L8W 3A1
Phone: (905) 318-7440 Fax: (905) 318-7455
e-mail: info@soil-mat.on.ca

Datum: Temporary Benchmark

Field Logged by: M. Brown

Checked by: I. Shaw

Sheet: 1 of 1



NOT TO SCALE

Soil-Mat

Soil-Mat Engineers & Consultants Ltd.

Typical Design Requirements
Drainage and Backfill for Basement Walls
Including Underfloor Drains

Project No.:	SM 166905-G
Date:	September 2016

DRAWING No. 2

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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
(905) 318-7440

ATTENTION TO: Ian Shaw

PROJECT: 166905

AGAT WORK ORDER: 16H124863

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: Aug 16, 2016

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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

Member of: Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16H124863

PROJECT: 166905

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:Michael Brown

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

DATE RECEIVED: 2016-08-10

DATE REPORTED: 2016-08-16

		SAMPLE DESCRIPTION:		BH1 SS2	BH1 SS4	BH2 SS2	BH2 SS4
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		8/4/2016	8/4/2016	8/4/2016	8/4/2016
Parameter	Unit	G / S	RDL	7761747	7761749	7761751	7761752
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	10	6	5
Barium	µg/g	220	2	41	128	124	133
Beryllium	µg/g	2.5	0.5	0.5	0.9	0.8	0.7
Boron	µg/g	36	5	10	19	15	21
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.20	0.28	1.26	0.87
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	14	23	20	21
Cobalt	µg/g	21	0.5	9.5	15.6	12.1	12.0
Copper	µg/g	92	1	14	10	17	7
Lead	µg/g	120	1	9	15	16	13
Molybdenum	µg/g	2	0.5	0.7	1.2	0.9	1.2
Nickel	µg/g	82	1	19	31	27	25
Selenium	µg/g	1.5	0.4	<0.4	<0.4	0.5	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5	0.5	<0.5	0.6
Vanadium	µg/g	86	1	19	30	26	27
Zinc	µg/g	290	5	46	64	65	57
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.434	0.278	**0.614**	0.251
Sodium Adsorption Ratio	NA	2.4	NA	**5.74**	**3.55**	**3.22**	**3.04**
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.63	7.62	7.63	7.76

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7761747-7761752 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: Amanjot Bhela

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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FAX (905)712-5122
http://www.agatlabs.com

Guideline Violation

AGAT WORK ORDER: 16H124863

PROJECT: 166905

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Ian Shaw

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7761747	BH1 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	5.74
7761749	BH1 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	3.55
7761751	BH2 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Electrical Conductivity	0.57	0.614
7761751	BH2 SS2	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	3.22
7761752	BH2 SS4	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Sodium Adsorption Ratio	2.4	3.04

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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 16H124863

PROJECT: 166905

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:Michael Brown

Soil Analysis

RPT Date: Aug 16, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	7762637		<0.8	<0.8	NA	< 0.8	120%	70%	130%	108%	80%	120%	111%	70%	130%
Arsenic	7762637		1	1	NA	< 1	115%	70%	130%	103%	80%	120%	110%	70%	130%
Barium	7762637		12	10	18.2%	< 2	106%	70%	130%	99%	80%	120%	105%	70%	130%
Beryllium	7762637		<0.5	<0.5	NA	< 0.5	97%	70%	130%	107%	80%	120%	108%	70%	130%
Boron	7762637		<5	<5	NA	< 5	75%	70%	130%	100%	80%	120%	102%	70%	130%
Boron (Hot Water Soluble)	7763554		0.14	0.13	NA	< 0.10	101%	60%	140%	91%	70%	130%	93%	60%	140%
Cadmium	7762637		<0.5	<0.5	NA	< 0.5	109%	70%	130%	102%	80%	120%	104%	70%	130%
Chromium	7762637		6	4	NA	< 2	91%	70%	130%	99%	80%	120%	105%	70%	130%
Cobalt	7762637		1.6	1.3	NA	< 0.5	104%	70%	130%	101%	80%	120%	107%	70%	130%
Copper	7762637		3	3	NA	< 1	97%	70%	130%	103%	80%	120%	103%	70%	130%
Lead	7762637		2	2	NA	< 1	109%	70%	130%	104%	80%	120%	106%	70%	130%
Molybdenum	7762637		<0.5	<0.5	NA	< 0.5	113%	70%	130%	111%	80%	120%	116%	70%	130%
Nickel	7762637		2	1	NA	< 1	101%	70%	130%	102%	80%	120%	106%	70%	130%
Selenium	7762637		<0.4	<0.4	NA	< 0.4	121%	70%	130%	100%	80%	120%	106%	70%	130%
Silver	7762637		<0.2	<0.2	NA	< 0.2	104%	70%	130%	110%	80%	120%	112%	70%	130%
Thallium	7762637		<0.4	<0.4	NA	< 0.4	115%	70%	130%	104%	80%	120%	107%	70%	130%
Uranium	7762637		0.6	0.5	NA	< 0.5	102%	70%	130%	105%	80%	120%	113%	70%	130%
Vanadium	7762637		13	13	0.0%	< 1	99%	70%	130%	97%	80%	120%	105%	70%	130%
Zinc	7762637		8	7	NA	< 5	103%	70%	130%	106%	80%	120%	115%	70%	130%
Chromium VI	7761624		<0.2	<0.2	NA	< 0.2	94%	70%	130%	95%	80%	120%	99%	70%	130%
Cyanide	7763820		<0.040	<0.040	NA	< 0.040	102%	70%	130%	102%	80%	120%	118%	70%	130%
Mercury	7762637		<0.10	<0.10	NA	< 0.10	122%	70%	130%	100%	80%	120%	104%	70%	130%
Electrical Conductivity	7763644		1.88	1.88	0.0%	< 0.005	99%	90%	110%	NA			NA		
Sodium Adsorption Ratio	7764637		8.38	8.57	2.2%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	7761752	7761752	7.76	7.78	0.3%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL

Certified By: Amanjot Bhela

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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 16H124863

PROJECT: 166905

ATTENTION TO: Ian Shaw

SAMPLING SITE:

SAMPLED BY:Michael Brown

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only

Work Order #: 16H124863

Cooler Quantity: 1 @ cooler

Arrival Temperatures: 15.5 | 15.1 | 14.6
8.7 | 9.0 | 7.0

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: NO ICE

Report Information:

Company: Soil-Mat Engineers
Contact: Ian Shaw
Address: 130 Lancing Drive
Hamilton, ON
Phone: 905-318-7440 Fax:
Reports to be sent to:
1. Email: Mike Brown
2. Email: Ian Shaw

Regulatory Requirements:

☐ No Regulatory Requirement

(Please check all applicable boxes)

☑ Regulation 153/04
Table 1 *Indicate One*
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture *(Check One)*
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region _____ *Indicate One*

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
_____ *Indicate One*

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:

Project: 166905
Site Location: 401-417 Martha St., Burlington
Sampled By: M. Brown
AGAT Quote #: _____ PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Please Circle) Y / N	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
BH1 SS2	Aug. 7/16		1	S			X													
BH1 SS4	↓		1	↓			X													
BH2 SS2			1				X													
BH2 SS4			1				X													

Sampled/Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Michael A Brown	Aug-7/16	11:00am	Daniella Jaic	8/10/16	11:00am
Daniella Jaic	8/10/16	3:10pm		2016/08/10	3:10
	2016/08/10	7:05		16/8/10	4:05

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