SOIL-MAT ENGINEERS & CONSULTANTS LTD.

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Project No.: SM 301639-G June 15, 2021

M5V DEVELOPMENTS
30098 COUNTRYSIDE DRIVE
Brampton, Ontario
L6R 0S9

Attention: Sherard McQueen
CEO

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
LOT 186 KALAR ROAD
NIAGARA FALLS, ONTARIO

Dear Mr. McQueen,

Further to your authorisation, SOIL-MAT ENGINEERS & CONSULTANTS LTD. has completed the fieldwork, laboratory testing, and report preparation in connection with the above noted project. The scope of work was completed in general accordance with our proposal P301639, dated March 31, 2021. Our comments and recommendations based on our findings at the seven [7] borehole locations are presented in the following paragraphs.

1. INTRODUCTION

We understand that the project will involve the construction of a residential development consisting of four basementless low rise apartment buildings, along with the installation of associated underground municipal services along asphalt paved roadways and parking areas, at the property located on the east side of Kalar Road, just north of Mulberry Drive in Niagara Falls, Ontario. The purpose of this preliminary geotechnical investigation work was to assess the subsurface soil and groundwater conditions, and to provide our comments and recommendations with respect to the design and construction of the proposed development, from a geotechnical point of view.

This report is based on the above summarised project description, and on the assumption that the design and construction will be performed in accordance with applicable codes and standards. Any significant deviations from the proposed project design may void the recommendations given in this report. If significant changes are

made to the proposed design, this office must be consulted to review the new design with respect to the results of this investigation. It is noted that the information contained in this report does not reflect upon the environmental aspects of the site.

2. PROCEDURE

A total of seven [7] sampled boreholes were advanced at the locations illustrated in the attached Drawing No. 1, Borehole Location Plan. It should be noted that the heavy overgrowth and wetland areas restricted access for the drill equipment, limiting the placement of the boreholes to the northern half of the site. Once cleared and more accessible, boreholes may be advanced across the remainder of the site. The boreholes were advanced using continuous flight power auger equipment on May 12, 2021 under the direction and supervision of a staff member of SOIL-MAT ENGINEERS & CONSULTANTS LTD., to termination at depths of between approximately 3.7 and 6.7 metres below 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 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. Selected samples were also subjected to laboratory grain size analyses.

Upon completion of drilling, a monitoring well was installed at Borehole Nos. 1 and 2 to allow for the future measurements of the groundwater level. The monitoring wells consisted of 50-millimetre PVC pipe, screened in the lower 3.0 metres. The monitoring well was encased in well filter sand up to approximately 0.3 metres above the screened portion, then with bentonite ‘hole plug’ to the surface and fitted with a protective steel ‘stick up’ casing. The remaining boreholes were backfilled in general accordance with Ontario Regulation 903, and the ground surface was reinstated even with the surrounding grade.

Additionally, three [3] selected samples of the subsurface soils recovered from the boreholes were submitted to AGAT Laboratories, an independent Canadian accredited analytical laboratory for background environmental testing for a standard panel of metals, pH, and petroleum hydrocarbons [PHCs] including BTEX. The purpose of this testing was to assess the background environmental characteristics of the subsurface

soils for comparison to the relevant Standards under Ontario Regulation 406/19 [as amended] and provide comment regarding off-site disposal of surplus soil from the project. The results of this background analytical testing have been appended to the end of this report.

The boreholes were located in the field by representatives of SOIL-MAT ENGINEERS, based accessibility over the site and clearance of underground utilities. The ground surface elevation at the borehole locations have been referenced to a site specific temporary benchmark, described as the top of the manhole lid located on Kalar Road as illustrated in the attached Drawing No. 1. This benchmark was assigned an elevation of 100.0 metres for convenience.

Details of the conditions encountered in the boreholes, together with the results of the field and laboratory tests, are presented in Log of Borehole Nos. 1 to 7, 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 at the exact depths of geological change.

3. SITE DESCRIPTION AND SUBSURFACE CONDITIONS

The subject site is the vacant plot of land located northeast of the intersection of Mulberry Drive and Kalar Road, between 7640 and 7656 Kalar Road, in Niagara Falls, Ontario. The majority of the site is covered with wetland vegetation and other shrubbery as well as young and mature trees, becoming more heavily wooded and dense heading east, away from Kalar Road. The site is bound to the north and south by existing residential dwellings, to the east by wetlands and heavily forested lands, and to the west by Kalar Road. The observable portion of the site was relatively flat and even.

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

Topsoil

A surficial veneer of topsoil approximately 150 to 250 millimetres in thickness was encountered at all borehole locations. It is noted that the depth of topsoil may vary across the site and from the depths encountered at the borehole locations. In particular, greater depths of topsoil would be expected in the area of the designated wetlands, and

a conservative approach should be taken in estimating topsoil quantities. It is also noted that the term 'topsoil' has been used from a geotechnical point of view, and does not necessarily reflect its nutrient content or ability to support plant life.

Silty Clay/Clayey Silt

Native silty clay/clayey silt soils were encountered beneath the topsoil at all borehole locations. The fine-grained cohesive soils were reddish brown in colour, contained sand and gravel, increasing clay content with depth, and were generally stiff to very stiff in the upper levels, becoming firm to soft with depth. A transition to grey was noted at a depth of approximately 5 to 6 metres in Borehole Nos. 1 and 2. A more permeable silt seam was encountered at a depth of approximately 4.6 metres within the majority of the boreholes, which tended to be in a relatively wet to saturated condition. The silty clay/clayey silt was proven to termination within all of the boreholes at depths of between approximately 3.7 and 6.7 metres below the existing ground surface.

A review of available published information [Quaternary Geology of Ontario, Southern Sheet Map 2556] indicate the subsurface soils to consist of fine-textured glaciolacustrine deposits of silt and clay, with minor sand and gravel. These conditions are consistent with our observations during drilling and experience in the surrounding area.

Groundwater Observations

All of the boreholes were noted to be open and 'dry' upon completion of drilling with the exception of Borehole Nos. 1 and 2, which were noted as being open and 'wet' at depths of approximately 4.1 and 6.7 metres, respectively. It is noted that insufficient time would have passed for the static groundwater level to stabilise in the open boreholes. As noted above, a monitoring well was installed at Borehole Nos. 1 and 2, to allow for future measurements of the static groundwater level. The groundwater level readings taken to date conservatively indicate a groundwater level on the order of 2 to 3 metres below the existing grade, at an elevation of roughly 97 to 98 metres, potentially deeper varying with the physical topography of the land. Given the time of year of monitoring, the measured levels would be considered generally representative of a seasonal 'high' condition, and further long-term monitoring with additional monitoring wells may allow for a more accurate estimate of the static groundwater level over the various seasons of the year.

It is noted that the groundwater elevations indicated are based on reference to a temporary benchmark with an assumed elevation, as noted above, and should be corrected upon determination of the geodetic elevation of the benchmark utilised.

4. FOUNDATION CONSIDERATIONS

It is anticipated that the proposed buildings will have a founding level on the order of approximately 1 to 2 metres. The soil conditions encountered at the borehole locations at these depths are considered suitable to support the proposed development on conventional spread footings founded in the undisturbed native soils, below any fill or otherwise unsuitable material, as noted above. Footings founded within the competent, undisturbed native soils may designed considering a factored Ultimate Limit State [ULS] bearing capacity of 225 kPa [~4,500 psf], and a Serviceability Limit State [SLS] bearing capacity of 150 kPa [~3,000 psf], based on total and differential settlements not exceeding 25 and 20 millimetres, respectively. The exposed footing beds must be hand cleared of any loose or disturbed material, or ponded water, immediately prior to the placement of the concrete. Footing concrete should be placed as soon as possible after excavation to prevent disturbance to the founding soils from weather or construction traffic.

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. There is no direct relationship between ULS and SLS; rather they are a function of the soil type and the tolerable deflections for serviceability, respectively. Evidently, the bearing capacity values would be lower for very settlement sensitive structure and larger for more flexible buildings.

Construction and foot traffic in and around the footing beds, as well as potential groundwater seepage, will tend to result in disturbance to the founding soils and should therefore be kept to a minimum. Consideration should be given to the placement a thin, lean-mix concrete ‘mud-slab’ immediately following excavation and evaluation of the founding soils, to protect the founding soils from such disturbance. This would also serve to provide a ‘clean’ working surface for the placement of formwork and reinforcing steel. All footing beds should be hand-cleaned of any loose or disturbed material immediately prior to the placement of the ‘mud-slab’ or foundation concrete.

The support conditions afforded by the founding soils are usually not uniform across the site, neither are the loads on the various foundation elements. It is therefore recommended that the footings and foundation walls be provided with continuous structural reinforcement to account for potential variable support and loading conditions.

In areas where it will be necessary to provide adjacent footings at different founding elevations, the lower footing should be constructed before the higher footing is constructed, 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 damage. This frost protection would also be required if construction were undertaken during the winter months. All footings and foundations should be designed and constructed in accordance with the current Ontario Building Code.

With foundations designed as outlined above and as required by the Building Code, and with careful attention paid to construction detail, total and differential settlements should be well within normally tolerated limits of 25 and 20 millimetres, respectively, for the type of building and occupancy expected. As is typical in most new construction, 'cosmetic' cracking of plasterboard, foundation walls, etc. should be anticipated within the first year of construction as a result of shrinkage, minor settlement, etc. Subsequent to repair, additional cracking should be minimal.

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

5. FLOOR SLABS AND PERMANENT DRAINAGE

The floor slabs of the proposed apartment buildings may be constructed using conventional slab-on-grade techniques on a prepared subgrade. The exposed subgrade surface should be well compacted in the presence of a representative of SOIL-MAT ENGINEERS. Any soft ‘spots’ delineated during this work must be sub-excavated and replaced with quality backfill material compacted to 100 per cent of its standard Proctor maximum dry density. The subgrade level can then be raised to the design level with

granular soils compacted to 100 per cent of its standard Proctor maximum dry density. Granular fill, such as an imported Ontario Provincial Standard Specification [OPSS] Granular 'B' Type II (crushed bedrock) is preferred within the building footprint due to its relative insensitivity to weather conditions, ease in achieving the required degree of compaction, and its quick response to applied stresses.

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 and/or fibre 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 compacted 20-millimetre clear 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, drainage board products, etc. Where 'poly' sheets are used care should be taken to prevent puncturing and tearing and a sufficiently heavy gauge material be provided.

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 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.

Where the finished floor level is less than 300 millimetres above the finished exterior grade consideration should be given to the provision of a perimeter weeping tile system to prevent the buildup of water against foundations. Where provided, the perimeter drainage system should consist of 100-millimetre diameter perforated pipe, encased in a geofabric sock and covered with a minimum of 200 millimetres of a 20-millimetre clear stone product, and the clear stone in turn encased by a heavy filter geotextile product.

The suppliers of the filter geotextile should be consulted as to the type best suited for this project. This office should examine the installation of the 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 perimeter drains should outlet to a gravity sewer connection, a nearby catch basin, or a sump pit a minimum of 150 millimetres below the underside of finished floor. 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 schematics of the typical perimeter drainage requirements for slab-on-grade foundation construction.

6. EXCAVATIONS

Excavations for the installation of foundations and underground services are anticipated to extend to depths of up to approximately 2 to 3 metres below the existing grade. Excavations through the cohesive silty clay/silty clay soils would be expected to remain stable at inclinations of up to 45 to 60 degrees to the horizontal. Where wet/more permeable seams, moisture sensitive 'silt seams' are encountered, during periods of extended precipitation, or where excavations extend below the static groundwater level, the sides of excavations should be expected to 'slough in' to as flat as 3 horizontal to 1 vertical, or flatter. Not withstanding the foregoing, however, all excavations must comply with the current Occupational Health and Safety Act and Regulations for Construction Projects. The native silt soils anticipated would be considered a Type 2 soil, as outlined in the Ontario Health and Safety Act III – Excavation. Excavation slopes steeper than those required in the Safety Act must be supported and a senior geotechnical engineer from this office should monitor the work.

As noted above the static groundwater level is estimated at depths of approximately 2 to 3 metres, generally below however potentially approaching the proposed depths of construction. Regardless, infiltration of water through permeable seams, as well as runoff into the open excavations, should still be anticipated. However, given the low permeability of the silty clay/clayey silt soils encountered, the rate of infiltration is anticipated to be relatively low, such that it should be possible to adequately control groundwater infiltration for short construction periods using conventional construction dewatering methods, such as pumping from sumps in the base of the excavation. More groundwater should be anticipated when connections are made to existing services, or where relatively deep excavations are required. Surface water should be directed away from the excavations.

The base of the excavations in the native silty clay/clayey silt encountered in the boreholes should generally remain firm and stable. Therefore, standard pipe bedding, as typically specified by the Ontario Provincial Standard Specification should be satisfactory, compacted to 95 per cent of its standard Proctor maximum dry density [SPMDD], should suffice. It is noted that greater depths of bedding or stabilisation efforts may be required where greater depths of excavation are required, due to the soft nature of the native soils at greater depths.

Any utility poles, light poles, etc. located within 3 metres of the top of an excavation slope should be braced to ensure their stability. Likewise, temporary support might be required for other existing above and below ground structures, including existing underground services, roadways, existing dwellings, etc. depending on their proximity to the trench excavations.

7. BACKFILL CONSIDERATIONS

The excavated material will consist primarily of the silty clay/clayey silt soils encountered in the boreholes as described above. These soils are generally considered suitable for use as engineered fill, trench backfill, etc., provided that they are free of organics, construction debris, or other deleterious material, and that its moisture content can be controlled to within 3 per cent of its standard Proctor optimum moisture content.

It is noted that the on-site soils encountered are not considered to be free draining and should not be used where this characteristic is necessary. It is also noted that these cohesive soils will present difficulties in achieving effective compaction where access with compaction equipment is restricted. The on-site soils encountered are generally considered to be slightly ‘wet’ of their standard Proctor optimum moisture content. Some moisture conditioning will be required depending upon the weather conditions at the time of construction. It is noted that these soils will become nearly impossible to compact when wet of its optimum moisture content. Any material that becomes wet to saturated should be spread out to allow to dry, or removed and discarded, or utilised in non-settlement sensitive areas.

We note that where backfill material is placed near or slightly above its optimum moisture content, the potential for long term settlements due to the ingress of groundwater and collapse of the fill structure is reduced. Correspondingly, the shear strength of the ‘wet’ backfill material is also lowered, thereby reducing its ability to support construction traffic and therefore impacting roadway construction. If the soil is well dry of its optimum value, it will appear to be very strong when compacted, but will

tend to settle with time as the moisture content in the fill increases to equilibrium condition. The cohesive soils encountered may require high compaction energy to achieve acceptable densities if the moisture content is not close to its standard Proctor optimum value. It is therefore very important that the moisture content of the backfill soils be within 3 per cent of its standard Proctor optimum moisture content during placement and compaction 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.

A representative of SOIL-MAT should be present on-site during the backfilling and compaction operations to confirm the 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'. Backfill within service trenches, areas to be paved, etc., should be placed in loose lifts not exceeding 300 millimetres in thickness and compacted to a minimum of 98 per cent of its standard Proctor maximum dry density [SPMDD]. All structural fill should be compacted to 100 per cent of its SPMDD. The appropriate compaction equipment should be employed based on soil type, i.e. pad-toe for cohesive soils and smooth drum/vibratory plate for granular soils. A method should be developed to assess compaction efficiency employing the on-site compaction equipment and backfill materials during construction.

8. PAVEMENT STRUCTURE DESIGN CONSIDERATIONS

All areas to be paved must be cleared of all organic and otherwise unsuitable materials, and the exposed subgrade proof rolled with 3 to 4 passes of a loaded tandem-axle truck in the presence of a representative of SOIL-MAT ENGINEERS & CONSULTANTS LTD., immediately prior to the placement of the sub-base material. Any areas of distress revealed by this or other means should be subexcavated and replaced with suitable backfill material. Where the subgrade condition is poorer it may be necessary to implement more aggressive stabilisation methods, such as the use of coarse aggregate [50-millimetre clear stone, ‘rip rap’, etc.] ‘punched’ into the soft areas. It may also be prudent to consider the provision of a heavy geofabric over the subgrade to act as a separator between the subgrade and granular base where the subgrade is wet to saturated.

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 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. SOIL-MAT should be given the opportunity to review the final pavement structure design and subdrain scheme prior to construction to ensure that they are consistent with the recommendations of this report.

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 additional depth of Ontario Provincial Standard Specification [OPSS] Granular 'B', Type II (crushed bedrock) sub-base material. It is also important that the sub-base and base granular layers of the pavement structure be placed as soon as possible after exposure, preparation and approval of the subgrade level.

The suggested pavement structures outlined in Table A below are based on subgrade parameters estimated on the basis of visual and tactile examinations of the on-site soils and past experience, and may be considered for parking lots, etc. around the multi-residential building. The outlined pavement structure may be expected to have an approximate ten to fifteen-year life, assuming that regular maintenance is performed.

TABLE A – SUGGESTED PAVEMENT STRUCTURE

LAYER DESCRIPTION	COMPACTION REQUIREMENTS	LIGHT DUTY SECTIONS	HEAVY DUTY [TRUCK ROUTE]
Asphaltic Concrete Wearing course OPSS HL 3 or HL 3A	Min. 92 % Marshall MRD	65 millimetres	40 millimetres
Binder Course OPSS HL 8	Min. 92 % Marshall MRD		80 millimetres
Base Course OPSS Granular A	100% SPMDD	150 millimetres	150 millimetres
Sub-base Course OPSS Granular B Type II	100% SPMDD	300 millimetres	450 millimetres

* Marshall MRD denotes Maximum Relative Density.
* 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. 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. Of course, the above assumes that the asphalt mix is sufficiently hot to allow the 'back-casting' to be performed.

9. ENVIRONMENTAL CONSIDERATIONS

As noted above, three [3] representative samples of the subsurface soils recovered from the boreholes were submitted to AGAT Laboratories, an independent Canadian accredited analytical laboratory for background analytical testing for a standard panel of metals, pH, as well as petroleum hydrocarbons [PHCs] including BTEX. 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 results of this testing are presented in the attached AGAT Certificate of Analysis [21T746725].

The laboratory test results received in our office 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.
- **Table 2.1**: Full Depth Excess Soil Quality 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 3.1**: Full Depth Excess Soil Quality 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.

Based on SOIL-MAT ENGINEERS' field observations and the analytical test results from AGAT, SOIL-MAT ENGINEERS has the following comments to offer:

1. The sampled material was found to meet the Table 1 [RPI/ICC] Standards for the parameters tested with the exception of Sample BH4 SS2, which exceeded the standard for Barium.
2. The submitted samples were found to meet the Table 2.1 and 3.1 [RPI] Standards for the parameters tested.
3. The submitted samples were found to meet the Table 2.1 and 3.1 [ICC] Standards for the tested parameters.
4. The samples secured for analytical testing are believed to be representative of the soil conditions at the borehole locations only. No hydrocarbon 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 406/19, as amended:

- As the tested material has been shown to exceed the Table 1 [RPI/ICC] Standards, with the exception of BH4 SS2, which was found to exceed the Standard for Barium surplus material may not be accepted at an off-site Table 1 property, including property subject to a Record of Site Condition or MECP Certificate of Authorisation.
    - In the event that it is proposed to take surplus soil to a Table 1 property, additional testing in the vicinity of the samples with reported elevated levels of Barium may show these results to be localised anomalies and that the average value of the noted parameters is within the Table 1 Standards. Failing this, additional testing may serve to provide a lateral and vertical delineation of soil with elevated parameters to allow the material to be sorted out and disposed of separately from the majority of the remaining surplus soil.
- As the tested material has been shown to meet the Table 2.1 and 3.1 [RPI] Standards, surplus material may reasonably be accepted at an off-site RPI property, pending approval of the receiving property owner/QP.
- As the tested material has been shown to meet the Table 2.1 and 3.1 [ICC] Standards, surplus material may reasonably be accepted at an off-site ICC property, pending approval of the receiving property owner/QP.
- Excavated soil may be reused on site.

It is noted that where surplus soil is identified to be removed from the site, it may be necessary to undertake additional testing as a function of volume, as outlined in Regulation 406/19, in order to satisfy the requirements of a given receiving site. Likewise, where it is required for fill material to be imported to the site, it would be necessary to develop a Fill Management Plan in accordance with the requirements of Regulation 406/19.

10. GENERAL COMMENTS

The comments provided in this document are intended only for the guidance of the design team. The material in it reflects SOIL-MAT ENGINEERS' best judgement in light of the information available at the time of preparation. The subsurface 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 affect the scheduling and methods of construction for the project. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. SOIL-MAT ENGINEERS accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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.

Scott Wylie, B.Eng., EIT.

Kyle Richardson, P. Eng.
Project Engineer

Enclosures: Drawing No. 1, Borehole Location Plan
Log of Borehole Nos. 1 to 7, inclusive
Drawing No. 2, Recommended Design Requirements for Slab-on-Grade Construction
AGAT Certificate of Analyses [21T746725]

Distribution: M5V Developments [1, plus pdf]

LEGEND

Borehole Location
BH#

Temporary Benchmark
Top of manhole lid.
TBM Assumed elevation of 100.00 metres

NOTES

1. This drawing should be read in conjunction with Soil-Mat Engineers & Consultants Ltd. Geotechnical Report SM 301639-G.

2. Borehole locations are approximate.

SOIL-MAT

ENGINEERS & CONSULTANTS LTD.

Preliminary Geotechnical Investigation
Proposed Residential Development
Lot 186 Kalar Road
Niagara Falls, Ontario

Borehole Location Plan

Project No. SM 301639-G

Date: May 2021

Drawn: PT | Checked: SW

SM 301639-G Borehole Location Plan

Drawing No. 1

Log of Borehole No. 1

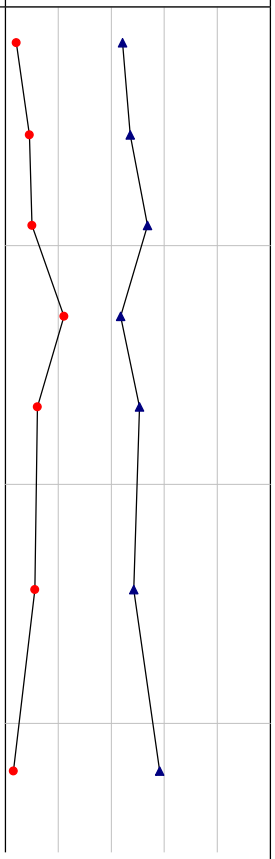
Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P. Eng.
Borehole Location: See Drawing No.1
UTM Coordinates - N: 4769672
E: 651854

Depth (ft)	Depth (m)	Elevation (m)	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		99.97	Ground Surface							
0	0		**Topsoil** Approximately 150 millimetres of topsoil.							
1			**Silty Clay/ Clayey Silt** Reddish brown, trace sand and gravel, increasing clay content with depth, stiff to soft.	SS	1	1 2 2 4	4			
2										
3	1			SS	2	1 4 5 8	9		=3.5	
4										
5				SS	3	3 5 5 7	10		=4.5	
6										
7	2			SS	4	6 9 13 14	22		>4.5	
8										
9				SS	5	3 4 8 10	12		4.0	
10	3									
11										
12										
13	4									
14										
15		95.10	Silt seam							
16				SS	6	1 2 9 9	11			
17	5									
18		94.30	Transition to grey							
19										
20	6									
21				SS	7	0 1 2 2 Wet	3		<1.0	
22		93.30	End of Borehole							
23	7									
24										
25										
26	8									
27										
28										
29										
30	9									
31										
32										
33										

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 May 12, 2021 to termination at a depth of 6.7 metres.
2. Borehole was recorded as open and 'wet' at a depth of 4.1 metres upon completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.
4. A monitoring well was installed. The following free groundwater levels were measured:

May 28, 2021 - 2.74 metres below the existing ground surface

June 14, 2021 - 2.57 metres below the existing ground surface

Drill Method: Solid Stem Auger
Drill Date: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
130 Lancing Drive, Hamilton, ON L8W 3A1
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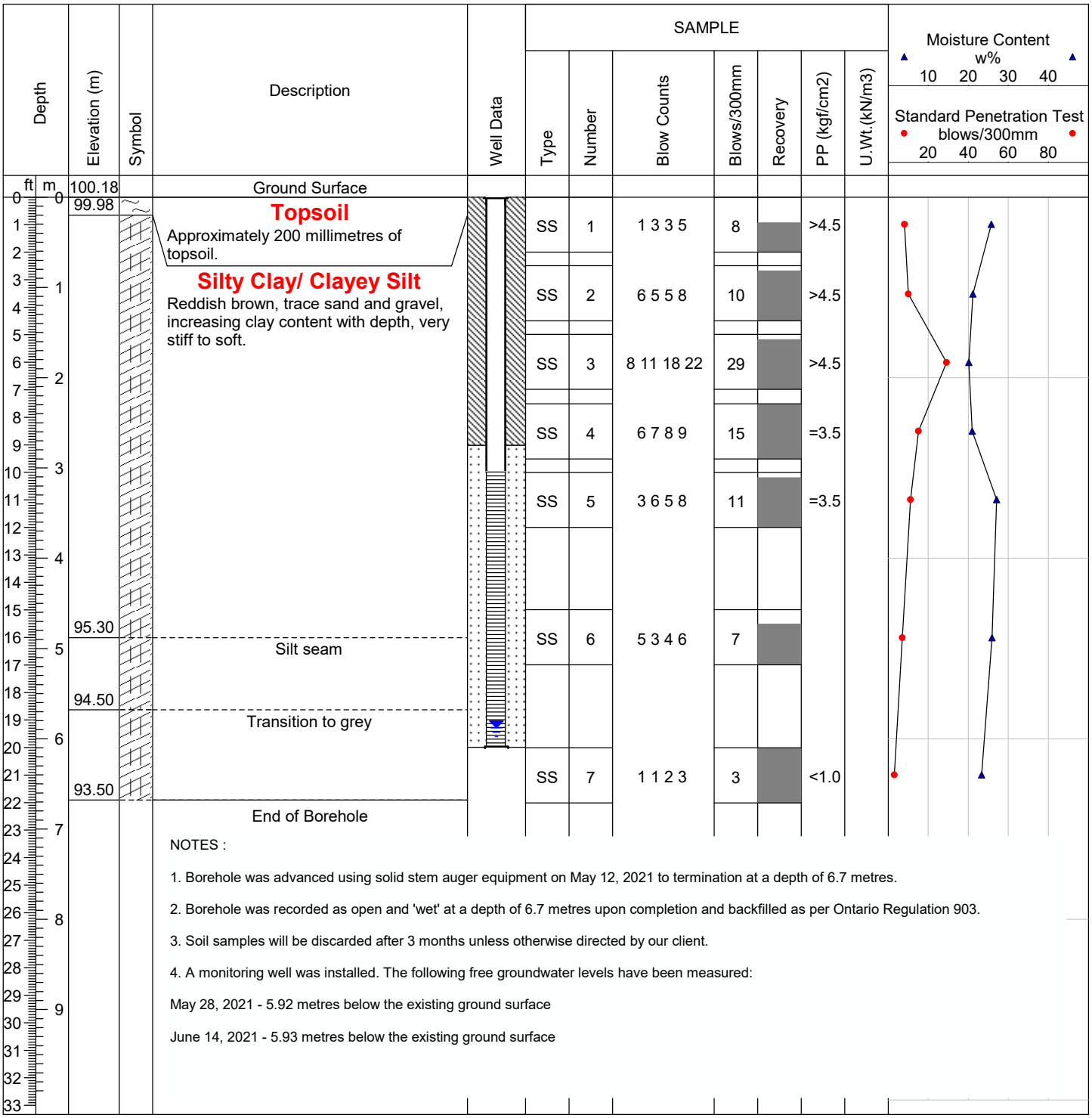
Datum: Temporary Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

Log of Borehole No. 2

Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769638
E: 651956



NOTES :

1. Borehole was advanced using solid stem auger equipment on May 12, 2021 to termination at a depth of 6.7 metres.
2. Borehole was recorded as open and 'wet' at a depth of 6.7 metres upon completion and backfilled as per Ontario Regulation 903.
3. Soil samples will be discarded after 3 months unless otherwise directed by our client.
4. A monitoring well was installed. The following free groundwater levels have been measured:

May 28, 2021 - 5.92 metres below the existing ground surface

June 14, 2021 - 5.93 metres below the existing ground surface

Drill Method: Solid Stem Augers
Drill Date: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
130 Lancing Drive, Hamilton, ON L8W 3A1
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Datum: Temporary Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

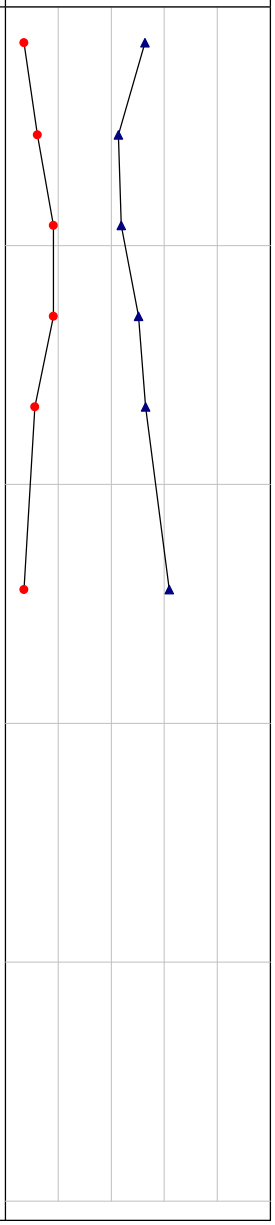
Log of Borehole No. 3

Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769627
E: 651940

Depth (ft)	Depth (m)	Elevation (m)	Description	Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		100.14	Ground Surface							
0	0		**Topsoil** Approximately 150 millimetres of topsoil.							
1			**Silty Clay/ Clayey Silt** Reddish brown, trace sand and gravel, stiff to soft.	SS	1	2 2 5 6	7		=3.0	
2										
3	1			SS	2	5 5 7 10	12		=4.5	
4										
5										
6				SS	3	4 7 11 12	18		>4.5	
7	2									
8				SS	4	7 9 9 10	18		=4.5	
9										
10	3									
11				SS	5	4 5 6 8	11		=3.0	
12										
13	4									
14										
15										
16				SS	6	1 3 4 3	7		<1.0	
17	5	95.00	End of Borehole							
18										
19										
20	6									
21										
22										
23	7									
24										
25										
26	8									
27										
28										
29										
30	9									
31										
32										
33										

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 May 12, 2021 to termination at a depth of 5.2 metres.

2. Borehole was recorded as open and 'dry' upon 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: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

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130 Lancing Drive, Hamilton, ON L8W 3A1
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E: info@soil-mat.ca

Datum: Temporary Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

Log of Borehole No. 4

Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769654
E: 651944

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
0	0	100.26	Ground Surface								
0	0	100.01	**Topsoil** Approximately 250 millimetres of topsoil.								
3	1		**Silty Clay/ Clayey Silt** Reddish brown, trace sand and gravel, increasing clay content with depth, very stiff to stiff.		SS	1	1 3 4 6	7			
4	1				SS	2	5 7 10 10	17		=4.5	
6	2				SS	3	5 9 12 14	21		>4.5	
8	2				SS	4	6 7 10 10	17		=4.5	
10	3				SS	5	4 4 5 6	9		=3.0	
16	5	95.10			SS	6	1 5 7 3	12		<1.0	
17	5		End of Borehole								

NOTES:

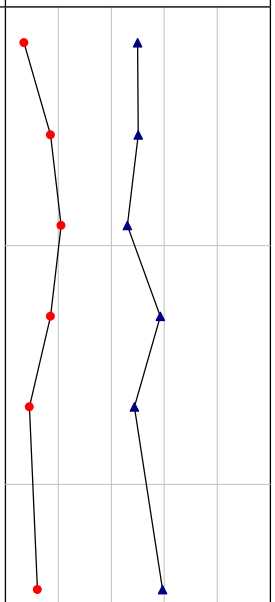
1. Borehole was advanced using solid stem auger equipment on May 12, 2021 to termination at a depth of 5.2 metres.

2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903.

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

Moisture Content w% 10 20 30 40

Standard Penetration Test blows/300mm 20 40 60 80



Drill Method: Solid Stem Auger
Drill Date: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
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E: info@soil-mat.ca

Datum: Geodetic Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

Log of Borehole No. 5

Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769648
E: 651918

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		100.31	Ground Surface								
0	0	100.06	**Topsoil** Approximately 250 millimetres of topsoil.		SS	1	1 2 3 5	5		=2.5	
3	1		**Silty Clay/ Clayey Silt** Reddish brown, trace sand and gravel, increasing clay content with depth, stiff to very stiff.		SS	2	5 5 8 9	13		>4.5	
7	2				SS	3	5 8 12 14	20		>4.5	
10	3				SS	4	4 8 9 10	17		>4.5	
11					SS	5	4 6 7 8	13		=4.5	
16	5	95.10			SS	6	4 8 7 6	15		<1.0	
17			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 May 12, 2021 to termination at a depth of 5.2 metres.

2. Borehole was recorded as open and 'dry' upon 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: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
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E: info@soil-mat.ca

Datum: Temporary Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

Log of Borehole No. 6

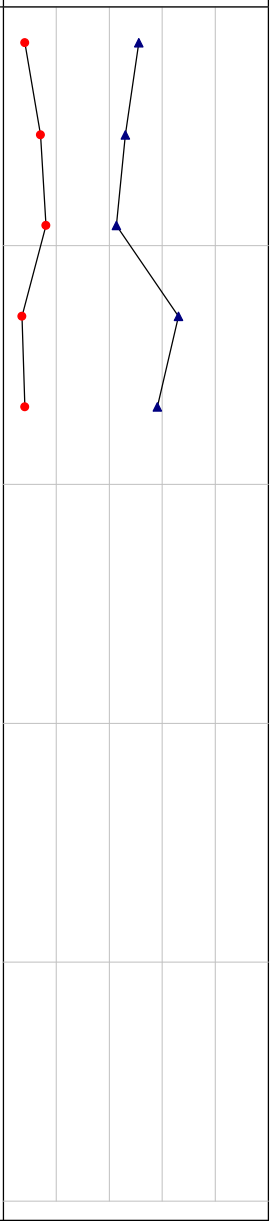
Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769672
E: 651893

Depth (ft / m)	Elevation (m)	Description	Well Data	SAMPLE Type	Number	Blow Counts	Blows/300mm	Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
	100.17	Ground Surface								
0 / 0	99.92	**Topsoil** Approximately 250 millimetres of topsoil.		SS	1	2 4 4 7	8		=4.5	
3 / 1		**Silty Clay/ Clayey Silt** Reddish brown, trace sand and gravel, increasing clay content with depth, stiff to firm.		SS	2	5 6 8 9	14		=4.5	
6 / 2				SS	3	6 7 9 11	16		=4.5	
9 / 3				SS	4	2 3 4 5	7		=2.5	
11 / 3.5				SS	5	3 3 5 5	8		=3.5	
12 / 4	96.50	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 May 12, 2021 to termination at a depth of 3.7 metres.

2. Borehole was recorded as open and 'dry' upon 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: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

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Datum: Temporary Benchmark
Field Logged by: P.T
Checked by: S.W
Sheet: 1 of 1

Log of Borehole No. 7

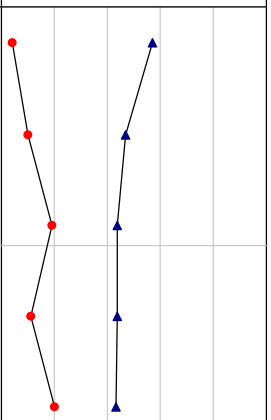
Project No: SM 301639-G
Project: Proposed Residential Development
Location: Lot 186 Kalar Road, Niagara Falls
Client: M5V Developments

Project Manager: Kyle Richardson, P.Eng.
Borehole Location: See Drawing No. 1
UTM Coordinates - N: 4769646
E: 651879

Depth (ft)	Depth (m)	Elevation (m)	Description	Well Data	SAMPLE Type	SAMPLE Number	SAMPLE Blow Counts	SAMPLE Blows/300mm	SAMPLE Recovery	PP (kgf/cm2)	U.Wt.(kN/m3)
		100.07	Ground Surface								
0	0	99.82	**Topsoil** Approximately 250 millimetres of topsoil.		SS	1	1 2 2 3	4			
3	1		**Silty Clay/ Clayey Silt** Reddish browm, trace sand and gravel, increasing clay content with depth, stiff to very stff.		SS	2	4 4 6 9	10		=3.5	
6	2				SS	3	6 8 11 14	19		>4.5	
9	3				SS	4	5 5 6 8	11		>4.5	
11		96.40			SS	5	7 9 11 12	20		=4.0	
12	4		End of Borehole NOTES: 1. Borehole was advanced using solid stem auger equipment on May 12, 2021 to termination at a depth of 3.7 metres. 2. Borehole was recorded as open and 'dry' upon completion and backfilled as per Ontario Regulation 903. 3. Soil samples will be discarded after 3 months unless otherwise directed by our client.								
18	5										
21	6										
24	7										
27	8										
30	9										
33											

Moisture Content w%
10 20 30 40

Standard Penetration Test blows/300mm
20 40 60 80



Drill Method: Solid Stem Augers
Drill Date: May 12, 2021
Hole Size: 150 millimetres
Drilling Contractor: Elite Drilling

Soil-Mat Engineers & Consultants Ltd.
130 Lancing Drive, Hamilton, ON L8W 3A1
T: 905.318.7440 F: 905.318.7455
E: info@soil-mat.ca

Datum: Geodetic Benchmark
Field Logged by: P.T
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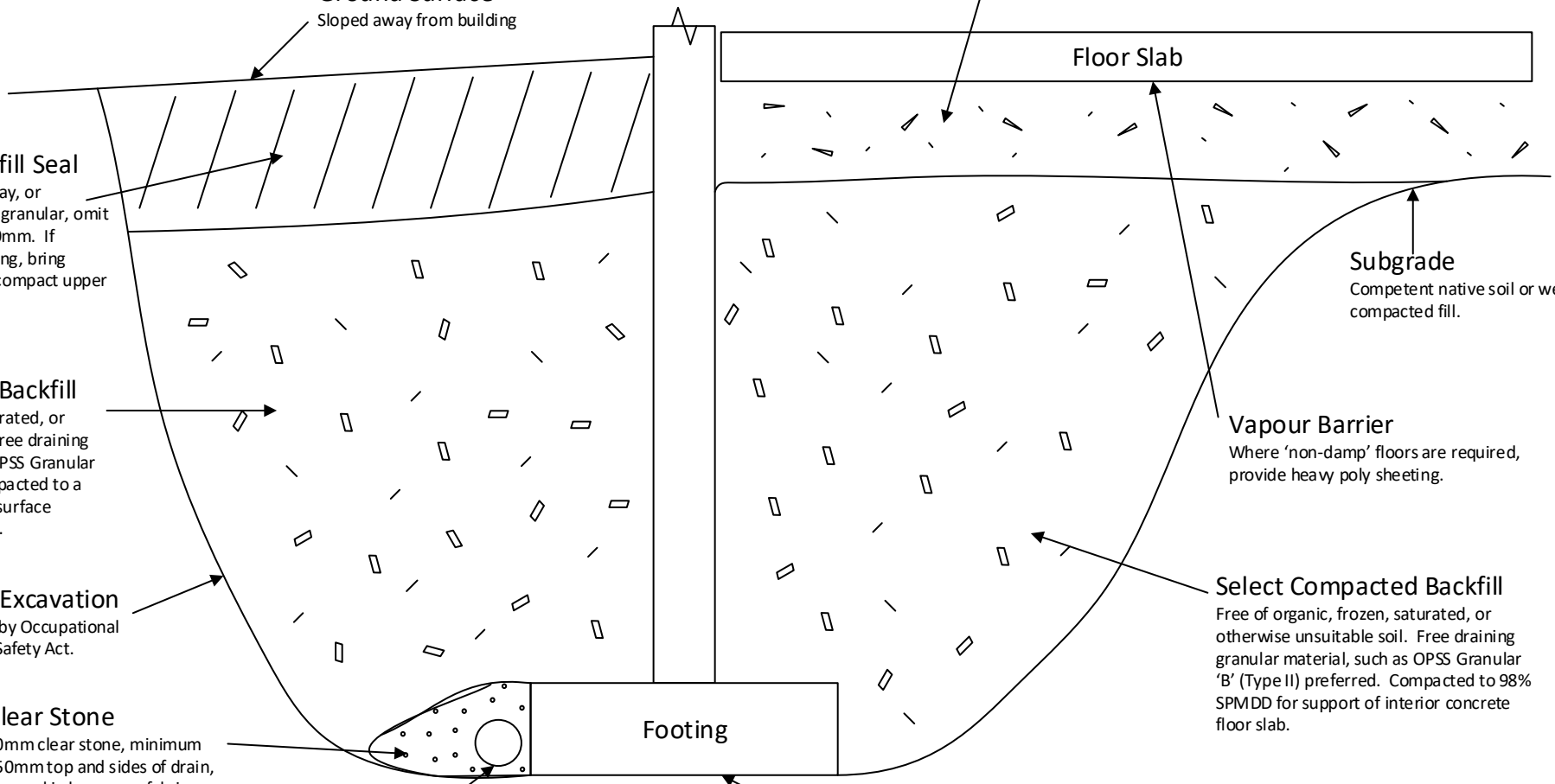
Sheet: 1 of 1



Note:
Drainage system not required if final exterior grade is at least 0.3 metres below finished floor.

NOT TO SCALE

Soil-Mat

Soil-Mat Engineers & Consultants Ltd.

Project No.:	SM 301639-G
Date:	June 2021

Typical Design Requirements
Slab-on-Grade with Perimeter Drainage

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: Scott Wylie

PROJECT: 186 Kallar Road, 301639

AGAT WORK ORDER: 21T746725

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer

DATE REPORTED: May 18, 2021

PAGES (INCLUDING COVER): 9

VERSION*: 1

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

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
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- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*

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Certificate of Analysis

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

O. Reg. 406/19 Characterization Package - Inorganics (Soil)

DATE RECEIVED: 2021-05-13

DATE REPORTED: 2021-05-18

		SAMPLE DESCRIPTION:		BH1 SS2	BH5 SS2	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2021-05-12	2021-05-12	2021-05-12
Parameter	Unit	G / S	RDL	2465707	2465708	2465709
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	6	5	5
Barium	µg/g	220	2.0	172	174	**272**
Beryllium	µg/g	2.5	0.4	0.7	0.7	0.7
Boron	µg/g	36	5	9	12	11
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	5	33	36	34
Cobalt	µg/g	21	0.5	13.5	18.3	16.5
Copper	µg/g	92	1.0	27.0	34.6	24.8
Lead	µg/g	120	1	11	11	10
Molybdenum	µg/g	2	0.5	0.7	0.6	<0.5
Nickel	µg/g	82	1	32	37	34
Selenium	µg/g	1.5	0.8	<0.8	<0.8	<0.8
Silver	µg/g	0.5	0.5	<0.5	<0.5	<0.5
Thallium	µg/g	1	0.5	<0.5	<0.5	<0.5
Uranium	µg/g	2.5	0.50	0.65	1.23	1.29
Vanadium	µg/g	86	0.4	47.2	49.3	47.3
Zinc	µg/g	290	5	72	87	66
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.76	7.89	7.88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 406/19 TABLE 1: Full Depth Background Site Condition - RPIC
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

2465707-2465709 pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Analysis perfomed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2021-05-13

DATE REPORTED: 2021-05-18

		SAMPLE DESCRIPTION:		BH1 SS2	BH5 SS2	BH4 SS2
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2021-05-12	2021-05-12	2021-05-12
Parameter	**Unit**	**G / S**	**RDL**	**2465707**	**2465708**	**2465709**
Benzene	µg/g	0.02	0.02	<0.02	<0.02	<0.02
Toluene	µg/g	0.2	0.05	<0.05	<0.05	<0.05
Ethylbenzene	µg/g		0.05	<0.05	<0.05	<0.05
m & p-Xylene	µg/g		0.05	<0.05	<0.05	<0.05
o-Xylene	µg/g		0.05	<0.05	<0.05	<0.05
Xylenes (Total)	µg/g	0.05	0.05	<0.05	<0.05	<0.05
F1 (C6 - C10)	µg/g		5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	10	<10	<10	<10
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g		50	NA	NA	NA
Moisture Content	%		0.1	22.0	17.8	21.9
Surrogate	**Unit**	**Acceptable Limits**				
Terphenyl	%	60-140		112	109	102

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (Soil)

DATE RECEIVED: 2021-05-13 **DATE REPORTED: 2021-05-18**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 406/19 TABLE 1: Full Depth Background Site Condition - RPIC
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

2465707-2465709 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylene and o-Xylene.
C6–C10 (F1 minus BTEX) is a calculated parameter. The calculated value is F1 minus BTEX.
The calculated parameters are non-accredited. The parameters that are components of the calculation are accredited.
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.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contribution.
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.

Analysis perfomed at AGAT Toronto (unless marked by *)

Certified By: Jinkal Patel

AGAT Laboratories

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Exceedance Summary

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

ATTENTION TO: Scott Wylie

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
2465709	BH4 SS2	ON 406/19 T1 RPIC	O. Reg. 406/19 Characterization Package - Inorganics (Soil)	Barium	µg/g	220	272

AGAT Laboratories
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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: May 18, 2021			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. 406/19 Characterization Package - Inorganics (Soil)															
Antimony	2466307		5.9	6.1	3.3%	< 0.8	105%	70%	130%	99%	80%	120%	85%	70%	130%
Arsenic	2466307		5	5	0.0%	< 1	109%	70%	130%	100%	80%	120%	106%	70%	130%
Barium	2466307		67.7	69.6	2.8%	< 2.0	102%	70%	130%	100%	80%	120%	102%	70%	130%
Beryllium	2466307		<0.4	<0.4	NA	< 0.4	70%	70%	130%	85%	80%	120%	83%	70%	130%
Boron	2466307		<5	<5	NA	< 5	99%	70%	130%	101%	80%	120%	89%	70%	130%
Cadmium	2466307		1.3	1.4	NA	< 0.5	107%	70%	130%	98%	80%	120%	106%	70%	130%
Chromium	2466307		11	12	NA	< 5	100%	70%	130%	104%	80%	120%	101%	70%	130%
Cobalt	2466307		5.2	5.2	0.0%	< 0.5	101%	70%	130%	103%	80%	120%	104%	70%	130%
Copper	2466307		48.2	48.4	0.4%	< 1.0	93%	70%	130%	106%	80%	120%	104%	70%	130%
Lead	2466307		176	178	1.1%	< 1	100%	70%	130%	94%	80%	120%	95%	70%	130%
Molybdenum	2466307		0.9	1.0	NA	< 0.5	108%	70%	130%	103%	80%	120%	109%	70%	130%
Nickel	2466307		9	9	0.0%	< 1	97%	70%	130%	101%	80%	120%	100%	70%	130%
Selenium	2466307		<0.8	<0.8	NA	< 0.8	114%	70%	130%	97%	80%	120%	104%	70%	130%
Silver	2466307		<0.5	<0.5	NA	< 0.5	91%	70%	130%	105%	80%	120%	98%	70%	130%
Thallium	2466307		<0.5	<0.5	NA	< 0.5	99%	70%	130%	98%	80%	120%	101%	70%	130%
Uranium	2466307		<0.50	<0.50	NA	< 0.50	102%	70%	130%	92%	80%	120%	97%	70%	130%
Vanadium	2466307		25.7	25.9	0.8%	< 0.4	106%	70%	130%	102%	80%	120%	103%	70%	130%
Zinc	2466307		413	422	2.2%	< 5	101%	70%	130%	107%	80%	120%	120%	70%	130%
pH, 2:1 CaCl2 Extraction	2467308		7.57	7.62	0.7%	NA	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Certified By:

AGAT Laboratories
5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: May 18, 2021			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) - PHCs F1 - F4 (Soil)															
Benzene	2465709	2465709	<0.02	<0.02	NA	< 0.02	99%	60%	140%	87%	60%	140%	87%	60%	140%
Toluene	2465709	2465709	<0.05	<0.05	NA	< 0.05	94%	60%	140%	90%	60%	140%	90%	60%	140%
Ethylbenzene	2465709	2465709	<0.05	<0.05	NA	< 0.05	101%	60%	140%	98%	60%	140%	99%	60%	140%
m & p-Xylene	2465709	2465709	<0.05	<0.05	NA	< 0.05	98%	60%	140%	105%	60%	140%	103%	60%	140%
o-Xylene	2465709	2465709	<0.05	<0.05	NA	< 0.05	101%	60%	140%	94%	60%	140%	102%	60%	140%
F1 (C6 - C10)	2465709	2465709	<5	<5	NA	< 5	96%	60%	140%	99%	60%	140%	96%	60%	140%
F2 (C10 to C16)	2449203		< 10	< 10	NA	< 10	108%	60%	140%	107%	60%	140%	94%	60%	140%
F3 (C16 to C34)	2449203		< 50	< 50	NA	< 10	117%	60%	140%	88%	60%	140%	72%	60%	140%
F4 (C34 to C50)	2449203		< 50	< 50	NA	< 50	101%	60%	140%	94%	60%	140%	80%	60%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: Jinkal Patel

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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Method Summary

CLIENT NAME: SOIL MAT ENGINEERS & CONSULTANTS LT

AGAT WORK ORDER: 21T746725

PROJECT: 186 Kallar Road, 301639

ATTENTION TO: Scott Wylie

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Arsenic	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Barium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Beryllium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Boron	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cadmium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Chromium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Cobalt	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Copper	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Lead	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Molybdenum	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Nickel	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Selenium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Silver	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Thallium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Uranium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Vanadium	MET-93-6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
Zinc	MET 93 -6103	modified from EPA 3050B and EPA 6020B and ON MOECC	ICP-MS
pH, 2:1 CaCl2 Extraction	INOR-93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Trace Organics Analysis			
Benzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Toluene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Ethylbenzene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
m & p-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
o-Xylene	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
Xylenes (Total)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/MS
F1 (C6 - C10)	VOL-91-5009	modified from CCME Tier 1 Method	(P&T)GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	modified from CCME Tier 1 Method	P&T GC/FID
F2 (C10 to C16)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F3 (C16 to C34)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
F4 (C34 to C50)	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	modified from CCME Tier 1 Method	BALANCE
Moisture Content	ORG-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009	modified from CCME Tier 1 Method	GC/FID

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 21T746725

Cooler Quantity:

Arrival Temperatures: 7.2 | 7 | 17.4 / 16.6 | 16.4

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: ice pack

Report Information:

Company: Soil Mat Eng.

Contact:

Address: 130 Lancing Dr Hamilton, ON

Phone: Fax:

Reports to be sent to:

1. Email: swylie@soilmat.ca.
2. Email: ploeppe@soilmat.ca.

Regulatory Requirements:

(Please check all applicable boxes)

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

☑ Excess Soils R406
Table 1 (Indicate One)

☐ Regulation 558

☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
Region

☐ Prov. Water Quality Objectives (PWQO)

☐ Other
Indicate One

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

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

Turnaround Time (TAT) Required:

Regular TAT (Most Analysis) ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT

**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 186 Kellar Rd, 301639-

Site Location: Niagara Falls

Sampled By: Paul T

AGAT ID #: PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

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, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs; Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: Total PCBs ☐ Aroclor	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	Potentially Hazardous or High Concentration (Y/N)
BH1 SS2	May12	AM PM	3	Soil											X		
BH5 SS2	"	AM PM	3	"											X		
BH4 SS2	"	AM PM	3	"											X		
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															
		AM PM															

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Billy Olds	MAY/13/21	10:45	John Chyepha		
	Date	Time	John Chyepha	Date	Time
	Date	Time	John Chyepha	May13	5:30

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Date Issued: December 9, 2020