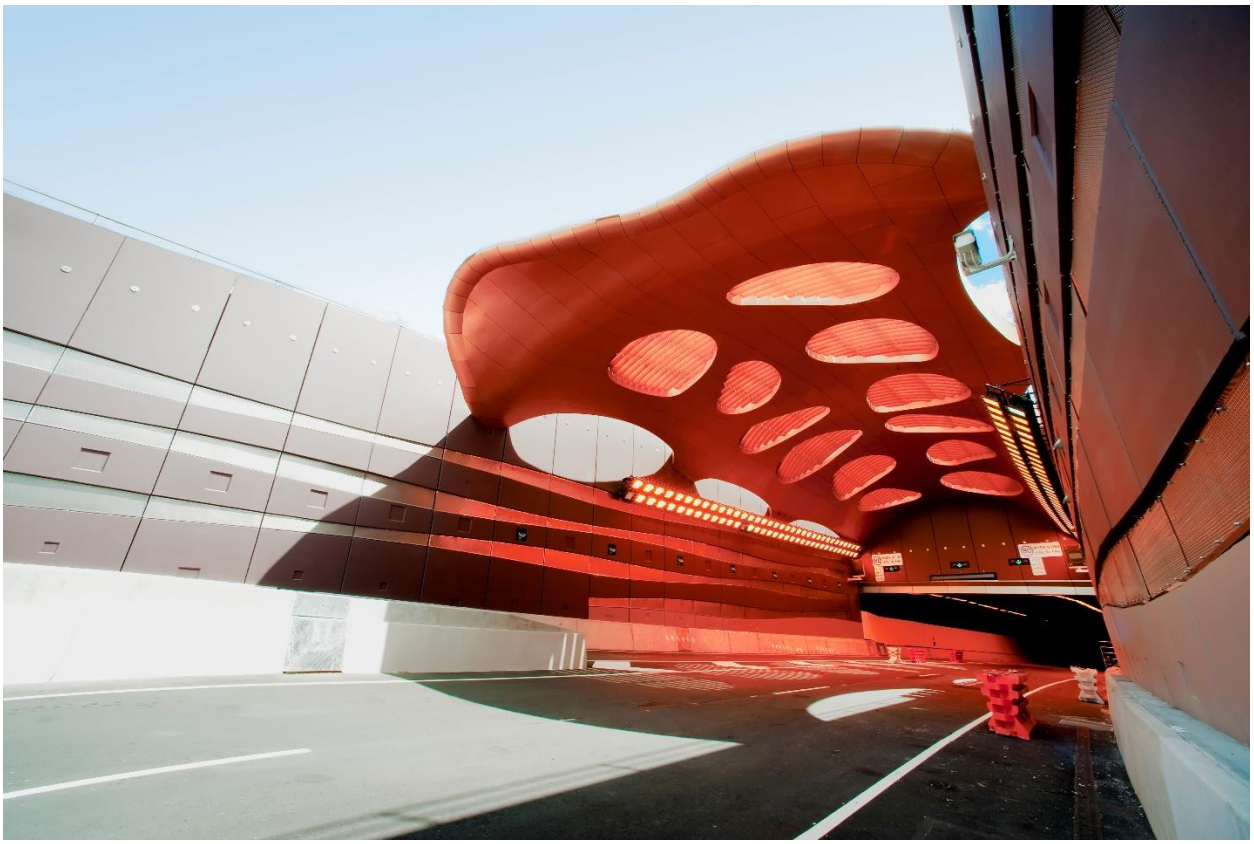
STRAW HAT RESTORATION

774 AND 750 HURONTARIO STREET, 33 FINDLAY DRIVE, 22 CAMPBELL STREET

GEOTECHNICAL INVESTIGATION

APRIL 4, 2018



774 AND 750 HURONTARIO STREET, 33 FINDLAY DRIVE, 22 CAMPBELL STREET

GEOTECHNICAL INVESTIGATION

STRAW HAT RESTORATION

FINAL REPORT

PROJECT NO.: 17M-01364-00
DATE: APRIL 2018

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April 4, 2018

Straw Hat Restoration
325 Willard Avenue
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Dear Sir:

Subject: 774 and 750 Hurontario Street, 33 Findlay Drive, 22 Campbell Street - Geotechnical Assessment

WSP Canada Inc. was retained to complete geotechnical investigation at the above noted property. The purpose of the geotechnical investigation is to identify the subsurface conditions at select borehole locations and to provide design recommendations toward the design of the proposed development, as well as identify any potential constraints which may be encountered during construction.

Kind regards,

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Team Lead - Environment

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Senior Geotechnical Engineer

NL/KM/hm

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1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Straw Hat Restoration to undertake a Geotechnical Investigation for the proposed residential development located at 774 Hurontario Street, 33 Findlay Drive, 22 Campbell Street, as well as a portion of 750 Hurontario Street, in the Town of Collingwood, Ontario. The location of the proposed development is shown on the attached ***Site Location Plan - Drawing 1.***

The scope of this geotechnical investigation was to obtain information about the subsurface conditions through the advancement of nine (9) boreholes and based upon the findings of the boreholes ultimately provide recommendations herein pertaining to the following:

- Site preparation and grading;
- Appropriate foundation type, geotechnical resistances (ULS and SLS) and founding depth;
- Floor slab design and construction;
- General excavation, backfill and bedding requirements; and,
- Groundwater control.

This report deals with geotechnical issues only. Other studies completed by WSP will be submitted under a separate cover.

This report is provided on the basis of the terms of reference presented above and on the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design.

The site investigation and recommendations follow generally accepted practice for Geotechnical Consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for James and Jason Harrison of Straw Hat Restoration. Third party use of this report without WSP consent is prohibited.

2 SITE BACKGROUND AND PROJECT DESCRIPTION

The site is irregular in shape as the properties are located on adjacent streets. A portion of the site is located on the west side of Hurontario Street, north of Poplar Sideroad; the remaining portion of the site is located on the north side of Findlay Drive and connects to the rear portion of 774 Hurontario Street. A small portion of 750 Hurontario is also proposed to be developed as part of the residential development. The site is located in the Town of Collingwood, Ontario.

The portion of the site located at 774 Hurontario was previously an apple orchard; the other two (2) properties are residential. The site is relatively flat; each property includes an existing residential structure.

Based on the latest site concept plan provided to our office, the proposed residential development includes:

- 11 detached 30 foot units
- 6 detached 40 foot units
- 12 detached 30 foot units
- 4 semi-detached 25 foot units

A copy of this concept plan is appended to this report.

3 INVESTIGATION METHODOLOGY

The field investigation consisted of drilling a total of nine (9) boreholes (BH17-01 to BH17-04 and BH18-01 to BH18-05) at the sites on June 23, 2017 and March 2, 2018, as shown on the attached ***Borehole Plan - Drawing 2***. The boreholes were advanced to depths between 3.2 m below existing ground surface (mbgs) to 5.2 mbgs. The boreholes were drilled with both hollow and solid stem continuous flight auger equipment.

Drilling equipment was supplied and operated by a drilling sub-contractor under the direction and supervision of WSP personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer in accordance with the Standard Penetration Test (ASTM D 1586) method. This sampling method recovers samples from the soil strata, and the number of blows required to drive the sampler a 0.3 m depth into the undisturbed soil (SPT 'N' values) gives an indication of the compactness condition or consistency of the sampled soil material. The SPT 'N' values are indicated on the Borehole Logs - ***Enclosures 1-9***.

Soil samples were visually classified in the field and re-evaluated by a senior engineer in our laboratory. All soil samples were tested for moisture contents. Laboratory Grain Size Analyses were carried out on representative samples and the results are provided in ***Enclosures 10 to 14***.

Water level observations were made during the drilling and in the open boreholes upon the completion of drilling operations. Monitoring wells were installed in four (4) of the boreholes to allow for subsequent water level observations.

4 SITE AND SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered are presented on the Borehole Logs and summarized in the following sections. It is noted that subsurface conditions can change between boreholes and the details provided below refer to soil conditions that were encountered at the borehole locations only.

4.1 GENERAL SUBSURFACE CONDITIONS

Based on the results of the field investigation, the subsurface conditions at the site consisted of topsoil overlying either fill or sand to sand and gravel; glacial till was encountered underlying the sand. A lower sand and gravel / silt deposit was encountered underlying the till in two (2) of the boreholes. Minor cohesive deposits were encountered in two (2) of the boreholes. Groundwater was encountered in the majority of the boreholes on completion of drilling as well as in the monitoring wells following the drilling operations.

4.1.1 TOPSOIL

Topsoil was encountered surficially at each of the borehole locations at the site. The topsoil varied between 10 cm and 40 cm in thickness. It should be noted that topsoil quantities should not be calculated from the borehole information, as large variations in depth may exist between boreholes. A detailed topsoil thickness survey is required to determine an accurate evaluation of quantity.

The topsoil is generally dark brown in colour and very moist.

4.1.2 FILL

Fill was encountered underlying the topsoil in boreholes BH18-01, BH18-04 and BH18-05 advanced at the site. The fill comprised moist brown sand to sand and gravel; a cobble was encountered within the fill deposit in Borehole BH18-01. The fill extended to depths between 0.8 mbgs to 1.5 mbgs at the site.

The measured SPT 'N' values in the fill ranged from 6 blows per 0.3 m of penetration to greater than 50 blows per 0.3 m of penetration, indicating that the fill varied from loose to very dense; generally being loose as noted above the high SPT 'N' value was due to a cobble being encountered in the fill.

4.1.3 NON-COHESIVE DEPOSITS

Non-cohesive deposits of soil, ranging from sand to sand and gravel were encountered underlying the topsoil and fill, in BH18-04 and BH18-05, excluding Borehole BH18-01. In addition, a sand and gravel deposit and a silt deposit were encountered underlying the till in Boreholes BH17-03 and Borehole BH18-04, respectively. The upper non-cohesive deposits extended to a maximum depth of 1.9 mbgs in Boreholes BH18-04 and BH18-05. The lower sand and gravel deposit in Borehole BH17-03 was encountered at a depth of 4.3 mbgs; the borehole was terminated in this deposit at a depth of 5.0 mbgs. The lower silt deposit in Borehole BH18-04 was encountered at a depth of 4.6 mbgs; the borehole was terminated in this deposit at a depth of 5.2 mbgs.

The non-cohesive deposits are brown, moist to wet, and contained trace organics near the ground surface at BH17-01.

The measured SPT 'N' values in the non-cohesive deposits ranged from 3 blows per 0.3 m of penetration to 43 blows per 0.3 m of penetration, indicating that the deposits varied from very loose (in samples directly underlying the topsoil) to dense.

The natural moisture content of these soil samples ranged between 7% and 28%.

Grain size analysis of the lower sand and gravel deposit in Borehole BH17-03 was conducted and the gradation curve is presented in ***Enclosure 10***. A review of the grain size analysis indicates the following ranges of clay and silt (fines), sand and gravel percentages:

- Gravel: 23%
- Sand: 47%
- Fines (Silt and Clay): 30%

4.1.4 SANDY SILT TILL

A sandy silt till deposit was encountered in each of the boreholes advanced at the site. The till was brown to grey and contains trace to some gravel and trace to some clay. At the time of the investigation, the till was observed to be moist to wet.

Boulders and cobbles are inferred to be present within the till deposit. Each of the boreholes excluding Boreholes BH17-03 and BH18-04 were terminated in the till deposit at a maximum depth of 5.2 mbgs.

The measured SPT 'N' values in this till deposit ranged from 12 blows per 0.3 m to 68 blows per 0.3 m, indicating that the till varied from compact to very dense.

The natural moisture content of these soil samples ranged between 5% and 20%.

Grain size analyses of three till samples were completed and the gradation curves are presented in ***Enclosures 11, 12, and 13***. A review of the grain size analyses indicate the following ranges of clay, silt, sand and gravel percentages:

- Gravel: 7% to 13%
- Sand: 25% to 30%
- Silt: 40% to 49%
- Clay: 17% - 19%

4.1.5 CLAYEY SILT TO SILT AND CLAY

A minor cohesive deposit was encountered in two (2) of the boreholes advanced at the site. The clayey silt to silt and clay deposit was brown and contains trace sand. At the time of the investigation, the soil was observed to be moist.

The measured SPT 'N' values in this deposit were 14 blows per 0.3 m and 40 blows per 0.3 m, indicating that the clayey silt and silt to clay varied from stiff to hard.

A grain size analysis of one (1) clayey silt sample was completed and the gradation curve is presented in ***Enclosure 14***. A review of the grain size analyses indicates the following ranges of clay, silt, sand and gravel percentages:

- Gravel: 0%
- Sand: 5%
- Silt: 73%
- Clay: 22%

4.1.6 GROUNDWATER

Groundwater was encountered in each of the boreholes. A summary of the groundwater depths encountered at the site is shown below.

BOREHOLE	DATE	GROUNDWATER DEPTH (MBGS)	MEASUREMENT SOURCE
BH17-01	June 23, 2017	1.9	Open Borehole
	June 28, 2017	0.3	Monitoring Well
	March 7, 2018	0.4	Monitoring Well
BH17-02	June 23, 2017	2.5	Open Borehole
BH17-03	June 23, 2017	0.4	Open Borehole
	June 28, 2017	0.3	Monitoring Well
	March 7, 2018	0.4	Monitoring Well
BH17-04	June 23, 2017	3.6	Open Borehole
	June 28, 2017	3.5	Monitoring Well
	March 7, 2018	0.4	Monitoring Well
BH18-01	March 2, 2018	Dry	Open Borehole
	March 7, 2018	1.1	Monitoring Well
BH18-02	March 2, 2018	Dry	Open Borehole
BH18-03	March 2, 2018	4.3	Open Borehole
BH18-04	March 2, 2018	1.5	Open Borehole
BH18-05	March 2, 2018	1.4	Open Borehole

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to major weather events. Further monitoring of the groundwater level is recommended.

5 DISCUSSION & RECOMMENDATIONS

5.1 GENERAL

The following recommendations for the proposed site development are based on the information obtained from the borehole investigation and laboratory testing, which we believe fairly represents the subsurface conditions of the site. These recommendations are intended for the guidance of the design engineer to establish constructability and should not be construed as instructions to contractors. If significant differences in the subsurface conditions described above are found, we request to be contacted immediately to review and revise our findings and recommendations, if necessary.

The construction methods described in this report must not be considered as being specifications or recommendations to the prospective contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and in view of the generally wide spacing of the boreholes, conditions may vary significantly between boreholes.

It is noted that, as no detailed design information was available at the time of this investigation, the information and recommendations provided below should be considered preliminary in nature only.

5.2 SITE BACKGROUND

Based on information provided by the client, it is anticipated that the site is proposed to be developed into a residential development. It is anticipated that the residential structures will have full basements.

The results of the geotechnical investigation indicate that the subsurface conditions at the site comprise topsoil overlying either fill or very loose to dense sand to sand and gravel; compact to very dense glacial till was encountered underlying the upper sand deposits. A lower sand and gravel and silt deposit was encountered underlying the till in two (2) of the boreholes. Minor stiff to hard cohesive deposits were encountered in two (2) of the boreholes. Groundwater was measured as high as 0.3 mbgs in one (1) of the monitoring wells following the drilling operations.

5.3 SITE PREPARATION AND GRADING

At the time of our investigation, a portion of the site was an existing apple orchard (774 Hurontario Street); therefore tree removal will be required to facilitate the proposed development on the site. In general the site is relatively flat and as such it is anticipated that only minor site grading will be required. However, if fill greater than one (1) meter in thickness is to be placed at the site, WSP should be contacted to review the fill areas.

Removal of all topsoil and fill will be required to facilitate the proposed development on the site. It is recommended that a topsoil test pit program be completed at the site by WSP prior to construction to refine the topsoil thickness. Regarding the reuse of the site topsoil, the topsoil may be reused in landscaping applications or other non-structural fill applications. WSP should be contacted to review all proposed topsoil reuse on site.

Subsequent to the completion of the required stripping and removal of unsuitable materials (topsoil), the sub-grade should be proof-rolled and inspected by experienced WSP geotechnical engineering personnel. The proof-rolling and compaction of the exposed sub-grade is recommended to be conducted using a vibratory compactor with a minimum static weight of 10 tonnes. The proof-rolling program should consist of a minimum of six (6) passes per unit area and be tested to assure that the sub-grade is compacted to a minimum of 98% of the exposed material's Standard Proctor Maximum Dry Density (SPMDD). Any loose/soft or wet areas identified at the time of proof-rolling that cannot be uniformly compacted are recommended to be sub-excavated and backfilled with approved engineered fill consistent with the recommendations provided in ***Appendix A***.

Where engineered fill is required to develop the design grades and elevations or for use in backfilling excavations created through the removal of unsuitable materials or soils as described above, the excavated on-site materials may be re-used,

subject that these are free of organic and other unsuitable materials and have adequate moisture content. Boulders or cobbles greater than 200 mm in size should be removed from the fill.

Alternatively, Ontario Provincial Standard Specification (OPSS) Granular B – Type I, OPSS Select Subgrade Material (SSM) or approved equal may be used.

All fill materials imported to the site must meet all applicable municipal, provincial and federal guidelines and requirements associated with environmental characterization of the materials.

Engineered fill is to be placed in maximum 200 mm thick loose lifts under full time supervision of qualified geotechnical personnel. Each lift is to be uniformly compacted to achieve a minimum of 100% of the material's SPMDD. Additional information related to the placement and compaction of engineered fill can be found in ***Appendix A***.

5.4 PRELIMINARY FOUNDATION RECOMMENDATIONS

Details of the proposed development such as underside of footing elevations were not available at the time when this report was prepared. When this information is available, the recommendations provided below should be reviewed by WSP to confirm that the recommendations are still valid based on the design information.

Based on the soil conditions encountered in the boreholes and provided that the site is prepared in accordance with the recommendations presented in this report, footings that are founded at a minimum depth of 1.5 mbgs on the compact or stiff original soil or engineered fill soils may be designed based on a preliminary factored ultimate geotechnical resistance at Ultimate Limit States (ULS) of 150 kPa. A preliminary serviceability geotechnical resistance at Serviceability Limit States (SLS) of 100 kPa may be used in the design of the foundations. We note that some subexcavation may be required in some areas due to loose soil conditions (i.e. Borehole BH18-05).

Foundations designed to the specified bearing capacities at the serviceability limit states (SLS) are expected to settle less than 25 mm total and 13 mm differential.

5.4.1 GENERAL FOUNDATION COMMENTS

All footings exposed to seasonal freezing conditions should be provided with at least 1.5 m of earth cover or equivalent thermal insulation against frost. It is recommended to keep footings as high as possible to avoid or minimize penetration below groundwater levels while considering the minimum frost cover requirement.

Variations in the soil conditions are expected in between the borehole locations, and during construction, the geotechnical resistances should be confirmed by experienced WSP site personnel.

Where it is necessary to place footings at different levels, the upper footing must be founded below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper foundations.

The soils at the base of footings can be easily disturbed by construction machinery and foot traffic or lose their strength in contact with surface water. Consideration could be given to placing a 50 mm thick skim coat of low-strength concrete on the founding subgrade immediately after its approval, to prevent its disturbance by construction activities and from ground or surface water, where necessary.

During winter construction, foundations and slab on grades must not be poured on frozen soil. Foundations must be adequately protected at all times from cold weather and freezing conditions.

In the vicinity of the existing buried utilities, all footings must be lowered to undisturbed native soils, or alternatively the services must be structurally bridged.

It should be noted that the recommended geotechnical resistances have been calculated by WSP from the borehole information for the preliminary design stage only. Additional input may be required as new design information becomes available and is refined. For example, more specific information is available with respect to conditions between boreholes when construction is underway. In this regard, the interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by WSP to validate the information for use during the construction stage.

5.5 FLOOR SLAB CONSTRUCTION AND DRAINAGE

The basement floor slabs can be placed on undisturbed native soils or on engineered fill. For bedding and moisture barrier purposes, a 200 mm thick layer of 19 mm clear crushed stone must be provided under the concrete basement floor slab. Where wet and/or fine grained soil conditions exist, the moisture barrier should be separated from the subgrade by a geotextile fabric to avoid loss of soil/fines and settlement problems.

With the assumption of basement levels approximately 3 metres below grade for the proposed residential development, a robust perimeter and underfloor drainage system will be required around the exterior basement walls. It is recommended that, at a minimum, drains be installed along the perimeter of the base of the basement level and underneath the slab to collect water accumulated behind the perimeter foundation walls. The perimeter drains can consist of 100 mm diameter perforated pipes surrounded by a 150 mm thick layer of 19 mm clear stone on all sides. The pipe and bedding stone are to be completely wrapped in a non-woven geotextile with a minimum 600 mm overlap. The subfloor and perimeter drainage system are to be hydraulically connected. The adjacent filter fabric sheets are to be overlapped by not less than 400 mm. In areas where gravity drainage is not feasible, the water collected by the perimeter drain pipes are to be channelled into a sump from where the water could be removed by pumping. A review of the drainage system should be completed by WSP during the detail design stage.

Underfloor and perimeter drainage will likely be required in the basements. A hydrogeological study must be carried out to investigate the feasibility of perimeter and underfloor drainage for basement floors below the groundwater table.

5.6 LATERAL EARTH PRESSURES

The lateral earth pressure for the design of retaining walls, foundation walls, shoring, or trench boxes can be estimated from the following expressions:

Above groundwater table: $p = K(\gamma z + q)$

Below groundwater table: $p = K\{\gamma h_1 + \gamma_1(z - h_1) + q\} + p_w$

Where:

- p = Lateral earth and water pressure in kPa acting at depth z;
- z = Depth below ground surface, in meters;
- K = Active earth pressure coefficient, (K_a);
- γ = Unit weight of soil above groundwater table, in kN/m^3;
- γ_1 = Submerged unit weight of soil below water table;
- h = Thickness of soil above groundwater table, in meters;
- q = Value of Surcharge (kPa);
- p_w = Hydrostatic water pressure

The suggested soil parameters (unfactored) for the retaining wall design and/or ground support systems are summarized below.

SOIL TYPE	UNIT WEIGHT γ (KN/M³)	EFFECTIVE ANGLE OF INTERNAL FRICTION (Φ')	COEFFICIENT OF EARTH PRESSURE		
			ACTIVE K_A	AT REST K_O	PASSIVE K_P
Granular A	22	35	0.27	0.43	3.69
Granular B	21	32	0.31	0.47	3.25
Glacial Till	20	32	0.31	0.47	3.25
Engineered Fill / Native Cohesive and Non-Cohesive Deposits	19	30	0.33	0.50	3.00

It is essential that imported free-draining OPSS Granular 'B' type fill be used as backfill against foundation walls. Backfilling of the footing wall excavations is recommended to be placed in 200 mm thick lifts, uniformly compacted to 100% SPMDD to proposed sub-grade elevations.

5.7 TEMPORARY EXCAVATIONS AND GROUNDWATER CONTROL

The details for the proposed services installations are not available at the time of preparing this report. The recommendations provided below assume that conventional depths for services will be carried out (approximately 3 mbgs to 4 mbgs below existing site grades).

Based upon the subsurface conditions at the borehole locations, excavations can be carried out with heavy hydraulic back-hoes. It is recommended that provision be carried in the contract for the excavation and disposal of obstructions on site, including cobbles and boulders.

All temporary excavations must be carried out in accordance with the Occupational Health and Safety Act (OHSA). In accordance with OHSA, the soils (assuming they are above the groundwater table or properly dewatered) would be classified as a Type 3 soil. If space limitations exist due to adjacent structures or facilities, consideration could be given to the construction of a temporary support system to provide protection to the structures and/or facilities. All excavated spoil should be placed at least the depth of the trench away from the edge of the trench for safety reasons.

As noted above, groundwater was encountered in the majority of the boreholes at the site; groundwater was measured as high as 0.3 mbgs in two (2) of the boreholes. As such, depending on site grading requirements and excavation depths it is likely that dewatering will be required at the Site and an Environmental Activity and Sector Registry (EASR) or a Permit to Take Water (PTTW) will be required for the excavations. It should be noted that the requirements for a PTTW, issued by the Ontario Ministry of the Environment and Climate Change (MOECC) have recently changed; daily water takings of 50 m^3/day require registration of the MOECC EASR database, and daily water takings of 400 m^3/day require a PTTW. Both the EASR and the PTTW require a hydrogeological assessment report to support the specific application. In addition, a permit to discharge the collected water to the sewer system/water body will be required from the applicable agency.

Once site grading information is available, it is recommended that WSP review the information to determine if a hydrogeological assessment is required to be completed at the site to provide input toward an EASR or a PTTW. A PTTW application requires a minimum of 90 days for the MOECC to process; in this regard, appropriate lead time should be factored into the overall project schedule to accommodate the PTTW process, if required.

In any areas requiring dewatering, the groundwater table must be lowered a minimum of one (1) meter below the lowest excavation level. It is recommended that, prior to excavations for site servicing, test pits be carried out in areas where groundwater issues are expected to further explore the groundwater and seepage conditions. A specialized dewatering contractor should be retained to design and install the dewatering system.

5.8 PIPE BEDDING AND COVER

The soils above the groundwater level, or properly dewatered if encountered below the groundwater level, will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150 mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered, especially when the soil at the trench base level consists of wet, dilatant silt. The bedding material should consist of well graded granular material such as Granular 'A' or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300 mm above the obvert of the pipe, or as set out by the local authority or municipality, should be placed. It is recommended that WSP be on site during excavations to assess the suitability of the subgrade materials to support the pipes.

If localized wet trench conditions are encountered, a uniformly graded clear stone may be used provided a suitable, approved filter fabric (geotextile) is placed in conjunction with the clear stone. The geotextile must extend underneath the clear stone, along the sides of the trench, and wrapped on top of the clear stone such that **the clear stone is fully wrapped by the geotextile.** A minimum geotextile overlap of 1 m is required; alternatively stitching of the geotextile could be considered.

Localized, wet and unstable soils encountered within generally stable soil zones can be generally stabilized by 'punching' a 50 mm well graded crusher run limestone pad into the soft subgrade prior to bedding placement. The thickness of the 'pad' will depend on field conditions and should be examined by WSP personnel during the construction operations.

Alternatively, if longer stretches of unstable soils are encountered, Class 'A' bedding could be considered. The rigid concrete bedding (lean mix concrete) should be laid from manhole to manhole to mitigate the potential for differential settlement.

Where the sewer pipe is placed in water bearing soils below the water table, the joints connecting the sewer sections should be very well sealed to prevent piping of fines into the sewer pipe and manhole catch basin risers.

5.9 TRENCH BACKFILL

The excavated soils can be used as construction backfill provided their moisture content at the time of placement is within 2% of the optimum moisture content and that the soils do not contain organic content or other deleterious materials. Boulders or cobbles greater than 200 mm in size should be removed from the trench backfill. WSP should be on site during all trench backfilling operations to confirm the suitability of the material being used.

For the granular soils, smooth drum type vibratory rollers are recommended. Cohesive soils, if encountered, should be compacted with sheepsfoot type vibratory compactors. The trench backfill should be placed in maximum 0.3 m lift thickness and compacted to at least 98 percent of its SPMDD. Trench backfilling operations should be avoided during freezing weather.

It is preferable that the native soils be re-used from approximately the position at which they are excavated so that frost response characteristics of the soils after construction remain essentially similar. If required, consideration may also be given to backfilling trenches with a well graded, compacted granular soil such as Granular 'B' material.

It should be noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for the compaction requirements noted above. Stockpiles should therefore be covered with tarpaulins to help minimize moisture increases.

5.10 PRELIMINARY PAVEMENT DESIGN

The investigation has shown that the predominant subgrade soils encountered at the site, after stripping any topsoil will be native cohesive and non-cohesive deposits, glacial till, and possibly engineered fill.

Prior to the placement of granular materials as part of the pavement structure, the subgrade should be prepared and heavily proof-rolled under the supervision of WSP. Any poorly performing areas should be sub-excavated and replaced

with either granular earth fill approved by WSP or imported Granular B, Type I material conforming to the requirements of OPSS.

Based on the above and assuming that traffic usage will be industrial, the following minimum pavement thickness is recommended:

PAVEMENT LAYER	COMPACTION REQUIREMENTS	LOCAL ROAD
Asphaltic Concrete	92.0 to 96.5% Maximum Relative Density (MRD)	40 mm HL 3
		50 mm HL 8
OPSS Granular A Base	100% SPMDD	150 mm
OPSS Granular B	100% SPMDD	300 mm

We note that the pavement design noted above should be considered preliminary only. If required, a more refined pavement structure design can be performed based on specific traffic data and design life requirements and will involve specific laboratory tests to determine frost susceptibility and strength characteristics of the subgrade soils, as well as specific data input from the client.

5.11 LIMITED ENVIRONMENTAL TESTING RESULTS

In order to characterize the quality of the existing soils at the site, 34 soil samples were collected and submitted to an analytical laboratory for analysis of various parameters. Additional details regarding the testing methods and results can be found in ***Appendix B***.

5.12 DESIGN REVIEW, TESTING AND INSPECTIONS

WSP requests to be afforded the opportunity to complete a final review of the proposed development discussed in this report to verify that geotechnical recommendations are appropriate. If not given this opportunity, we cannot assume liability for omissions, misinterpretations or deficiencies in our recommendations.

WSP should be contacted to provide geotechnical testing and inspections during construction operations. Exposed subgrade soils for all structures are to be inspected to confirm the material is stable and competent. Inspections of seepage and groundwater conditions during construction are also required, as discussed in this report. Testing and inspections for general QA/QC are to include sampling and laboratory testing of fill materials and asphalt, compaction testing for the placement of fill materials and asphalt, and field and laboratory testing of concrete (including mix design reviews).

6 LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to WSP Canada Inc.at the time of preparation. Unless otherwise agreed in writing by WSP Canada Inc., it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

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. WSP Canada Inc. 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 accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

DRAWINGS

LEGEND

APPROXIMATE SITE LOCATION

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

wsp

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

PROJECT: GEOTECHNICAL INVESTIGATION 33 FINDLAY DR., 750 & 744 HURONTARIO ST. COLLINGWOOD, ONTARIO	SCALE: 1:30,000	
	DRAWN BY: TP	CHECKED BY: -
TITLE: SITE LOCATION MAP	PROJECT NO: 17M-01364-00 GEO	
	DATE: MARCH 2018	
CLIENT: STRAW HAT RESTORATION	FIGURE NO: 1	REV.: -

Document Path: T:\17M-01364-00\MXD\GEO\17M-01364-00 GEO Figure 1 Location Map.mxd

wsp
126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- APPROXIMATE SITE LOCATION
- BOREHOLE LOCATION
- MONITORING WELL LOCATION

N W E S

20 10 0 20 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016. Imagery, Simcoe County, 2016.

CLIENT:
STRAW HAT RESTORATION

PROJECT:
GEOTECHNICAL INVESTIGATION
33 FINDLAY DR., 750 & 744 HURONTARIO ST.
COLLINGWOOD, ONTARIO

PROJECT NO:	DATE:
17M-01364-00 GEO	MARCH 2018

DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: -

FIGURE NO:	SCALE:
2	1:1,200

TITLE:
BOREHOLE LOCATION PLAN

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: T:\17M-01364-00\MXD\GEO\17M-01364-00 GEO Figure 2 Borehole Location Plan.mxd

ENCLOSURES

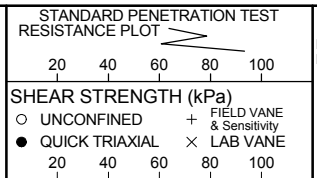
LOG OF BOREHOLE BH17-01

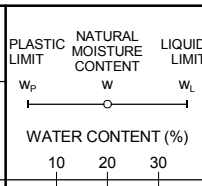
PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Hollow Stem Auger
Diameter: 216 mm
Date: Jun/23/2017

REF. NO.: 17M-01364-00
ENCL NO.: 1

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
	Ground Surface					
0.0	**TOPSOIL**					
0.2	**SAND**, trace silt *organics, brown, layered, loose, very moist*	1	SS	4	W. L. 0.4 mBGL Mar 07, 2018	
0.6	**SANDY SILT TILL**, trace to some clay, trace to some gravel *brown, compact to dense, moist*	2	SS	18		Bentonite
		3	SS	47		
		4	SS	19		
		5	SS	14		Sand Screen
	Increasing clay content becoming grey	6	SS	17		
5.2	**END OF BOREHOLE**					





POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

Notes:
1. Groundwater measured at a depth of 1.9 m below site grades on completion of drilling operations.

Groundwater Levels

Date	Water Level (mbg)
June 28/17	0.3
March 7/18	0.4

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP-SOIL_REPORT-APR01-18-2017.GLB
WSP-SOIL LOG-3-18-GRP PLOT (2).TPL 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

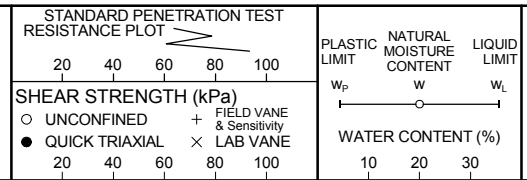
LOG OF BOREHOLE BH17-02

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Hollow Stem Auger
Diameter: 216 mm
Date: Jun/23/2017

REF. NO.: 17M-01364-00
ENCL NO.: 2

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR	SA	SI	CL
	Ground Surface									
0.0	**TOPSOIL**									
0.2	**SAND**, trace silt *orangish brown, very loose to dense, moist*	1	SS	3						
		2	SS	32						
1.2	**SANDY SILT TILL**, trace to some clay, trace to some gravel, occasional cobble *brown, compact to very dense, very moist*	3	SS	68						
		4	SS	31						
		5	SS	17			7	25	49	19
	becoming grey	6	SS	31						
5.2	**END OF BOREHOLE** Notes: 1. Borehole open to a depth of 4.0 m below site grades on completion of drilling. 2. Groundwater measured at a depth of 2.5 m below site grades on completion of drilling operations.									



POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP-SOIL_REC-LAYRS-LB-2017-12-8
WSP-SOIL LOG-STD-GRP PLOT (2)_17M-01364-00 BH LOGS PRELIMINARY.GPJ 1/22/18

LOG OF BOREHOLE BH17-03

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Hollow Stem Auger
Diameter: 216 mm
Date: Jun/23/2017

REF. NO.: 17M-01364-00
ENCL NO.: 3

(m) ELEV / DEPTH	DESCRIPTION (Ground Surface)	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	SHEAR STRENGTH (kPa) (STANDARD PENETRATION TEST RESISTANCE PLOT)	WATER CONTENT (%) (PLASTIC LIMIT w_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT w_L)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL**										
0.3	**SAND**, trace silt *orangish brown, compact, wet*	1	SS	5		W. L. 0.4 mBGL Mar 07, 2018	5				
1		2	SS	23			23				
1.4	**SANDY SILT TILL**, trace to some clay, some gravel, occasional cobbles *grey, compact to dense, moist*					Bentonite					
2		3	SS	39			39				
		4	SS	29			29				
3		5	SS	26			26				
						Sand Screen					
4											
4.3	**GRAVELLY SILTY SAND** *grey, wet, dense*										
5		6	SS	43			43				23 46 31
5.0	**END OF BOREHOLE** Notes: 1. Groundwater measured at a depth of 0.4 m below site grades on completion of drilling operations. Groundwater Levels Date — Water Level (mbg) June 28/17 — 0.3 March 7/18 — 0.4										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^{3}$, $\times^{3}$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP-SOIL INDEX.GPJ WSP.GDT 6-28-17 10:8
WSP-SOIL LOG - 3-5 SHIP PLOT JOB: 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

LOG OF BOREHOLE BH17-04

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Hollow Stem Auger
Diameter: 216 mm
Date: Jun/23/2017

REF. NO.: 17M-01364-00
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	SHEAR STRENGTH (kPa) (STANDARD PENETRATION TEST RESISTANCE PLOT)	WATER CONTENT (%) (PLASTIC LIMIT w_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT w_L)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface										
0.0	**TOPSOIL**										
0.2	**SAND TO SAND AND GRAVEL**, trace silt *orangish brown, very loose to compact, moist*	1	SS	3							
						W. L. 0.7 mBGL Mar 07, 2018					
1		2	SS	29							
1.2	**SANDY SILT TILL**, some clay, some gravel *brown, compact to dense, very moist*					Bentonite					
2		3	SS	42							
		4	SS	20							13 29 41 17
3		5	SS	23							
						Sand Screen					
4	becoming grey										
5		6	SS	43							
5.2	**END OF BOREHOLE**										

Notes:
1. Groundwater measured at a depth of 3.6 m below site grades on completion of drilling operations.

Groundwater Levels

Date	Water Level (mbg)
June 28/17	3.5
March 7/18	0.4

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

WSP-SOIL_BOREHOLE 8.30.17 GLB
WSP-SOIL LOG - 3.75" GRIP PLOT JOB: 17M-01364-00 BH LOGS PRELIMINARY.GPJ 1/22/18

LOG OF BOREHOLE BH18-01

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Hollow Stem Auger
Diameter: 216 mm
Date: Mar/02/2018

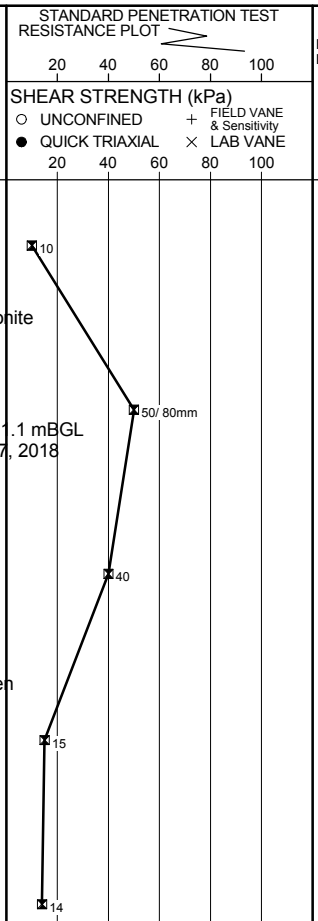
REF. NO.: 17M-01364-00
ENCL NO.: 5

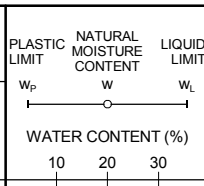
(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION
	Ground Surface					
0.0	**TOPSOIL**					
0.2	**FILL**, sand *brown, moist, loose to compact*	1	SS	10		
					Bentonite	
1	no recovery, spoon possibly pushing cobble *very dense*	2	SS	50/ 80mm	W. L. 1.1 mBGL Mar 07, 2018	
1.5	**SILT AND CLAY** *layered, brown, moist, hard*					
1.8	**SANDY SILT TILL**, some sand, some gravel *grey, moist, compact to dense*	3	SS	40		
2					Sand Screen	
		4	SS	15		
3		5	SS	14		
3.7	**END OF BOREHOLE**					

Notes:
1. Installed 50mm groundwater monitoring well upon completion.

Groundwater Levels

Date	Water Level (mbg)
March 7/18	1.1





POCKET PEN. (Cu) (kPa) | NATURAL UNIT WT (kN/m³) | REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

WSP-SOIL_REC-AVRIL-18-2017.GLB
WSP-SOIL LOG-3-18-GRP PLOT.GPJ 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

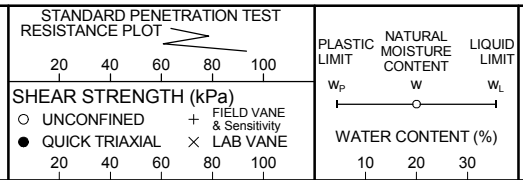
LOG OF BOREHOLE BH18-02

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Solid Stem Auger
Diameter: 150mm
Date: Mar/02/2018

REF. NO.: 17M-01364-00
ENCL NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface								
0.0	**TOPSOIL**								
0.2	**SAND**, some gravel *brown, moist to wet, loose to compact*	1	SS	6					
1.0	**SILTY SAND TILL**, some clay, trace gravel *brown to grey, moist, compact*	2	SS	27					
	some gravel *dense*	3	SS	45					
		4	SS	24					
		5	SS	22					
	increased clay content *wet*	6	SS	12					
5.2	**END OF BOREHOLE** Notes: 1. Borehole was open and dry upon completion								



GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP-SOIL INDEX APRIL 6, 2017 (2.0)
WSP-SOIL LOG - 3.75 GRP PLOT (8) 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

LOG OF BOREHOLE BH18-03

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Solid Stem Auger
Diameter: 150mm
Date: Mar/02/2018

REF. NO.: 17M-01364-00
ENCL NO.: 7

(m) ELEV / DEPTH	DESCRIPTION (Ground Surface)	NUMBER	TYPE	BLOWS / 0.3 m ("N")	SHEAR STRENGTH (kPa)	WATER CONTENT (%)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	**TOPSOIL**						
0.3	**SAND** *brown, moist to wet, loose to compact*	1	SS	4	4		
0.9	**SILTY SAND TILL**, some clay, some gravel *brown, moist, compact*	2	SS	24	24		
	trace gravel *grey, very dense*	3	SS	51	51		10 25 48 17
	some gravel to gravelly	4	SS	54	54		
	cobbles	5	SS	25	25		
4.6	**SAND TILL**, some silt, some clay, some gravel *grey, moist, compact*	6	SS	19	19		
5.2	**END OF BOREHOLE** Notes: 1. Borehole was open and wet at 4.3 mbg upon completion						

STRATA PLOT; GROUND WATER CONDITIONS; ELEVATION; STANDARD PENETRATION TEST RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100); PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%) (10 20 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

WSP-SOIL_REPORT-WRI-18-3017-GLB
WSP-SOIL LOG-18-3017-BH PLOT.GPJ 17M01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

LOG OF BOREHOLE BH18-04

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Solid Stem Auger
Diameter: 150mm
Date: Mar/02/2018

REF. NO.: 17M-01364-00
ENCL NO.: 8

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m ("N")	GROUND WATER CONDITIONS	ELEVATION	SHEAR STRENGTH (kPa) (STANDARD PENETRATION TEST RESISTANCE PLOT)	WATER CONTENT (%) (PLASTIC LIMIT w_P, NATURAL MOISTURE CONTENT w, LIQUID LIMIT w_L)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface										
0.0	**TOPSOIL**										
0.1	**FILL**, sand and gravel *brown, moist, loose to compact*	1	SS	6			6				
	sand	2	SS	10			10				
1.2	**SAND** *brown, moist, loose to compact*	3	SS	14			14				0 5 73 22
1.9	**CLAYEY SILT**, trace sand *brown, moist, stiff*										
2.3	**SANDY SILT TILL**, some clay, some gravel *grey, moist, compact*	4	SS	26			26				
		5	SS	27			27				
4.6	**SILT**, some sand to sandy, some clay *grey, moist, compact*	6	SS	16			16				
5.2	**END OF BOREHOLE** Notes: 1. Borehole was open to 2.4 mbg and wet at 1.5 mbg upon completion										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

WSP-SOIL_SPEC-APR01-05-2017.GLB
WSP-SOIL LOG-3-5 GRP PLOT (CB) 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

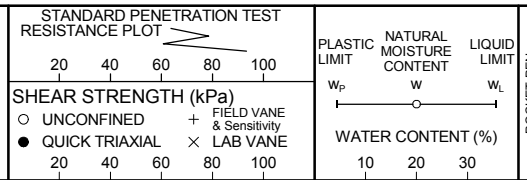
LOG OF BOREHOLE BH18-05

PROJECT: Hurontario Street/Findlay Drive
CLIENT: Straw Hat Restoration
PROJECT LOCATION: Collingwood ON
DATUM: Relative
BH LOCATION: See Figure 2

Method: Solid Stem Auger
Diameter: 150mm
Date: Mar/02/2018

REF. NO.: 17M-01364-00
ENCL NO.: 9

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	SAMPLES NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface						
0.0	**TOPSOIL**	1	SS	7			
0.4	**FILL**, sand, some gravel *brown, moist, loose*						
0.8	**SAND**, trace silt *layered, oxidized, brown, wet, loose*	2	SS	9			
		3	SS	7			
1.9	**SANDY SILT TILL:**, some clay, layers of clayey silt *layered, brown, moist, compact to very dense*	4	SS	26			
		5	SS	50			
		6	SS	48			
5.2	**END OF BOREHOLE** Notes: 1. Borehole was open to 1.5 mbg and wet at 1.4 mbg upon completion						



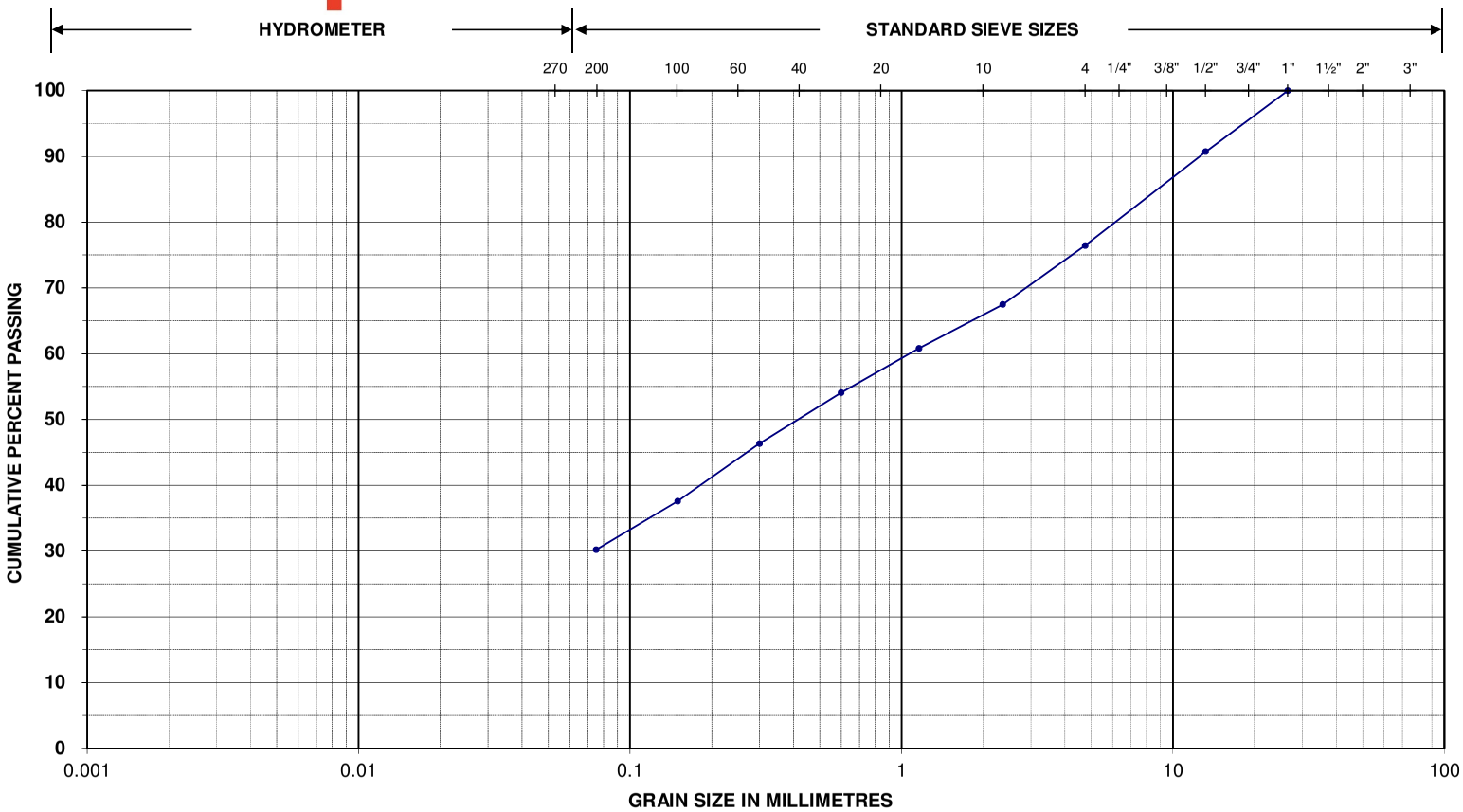
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

WSP-SOIL_REC-APR01-18-2017.GLB
WSP-SOIL LOG-3.75 GRP PLOT (CB) 17M-01364-00 BH LOGS PRELIMINARY.GPJ 3/22/18

PARTICLE SIZE DISTRIBUTION



Unified Classification System

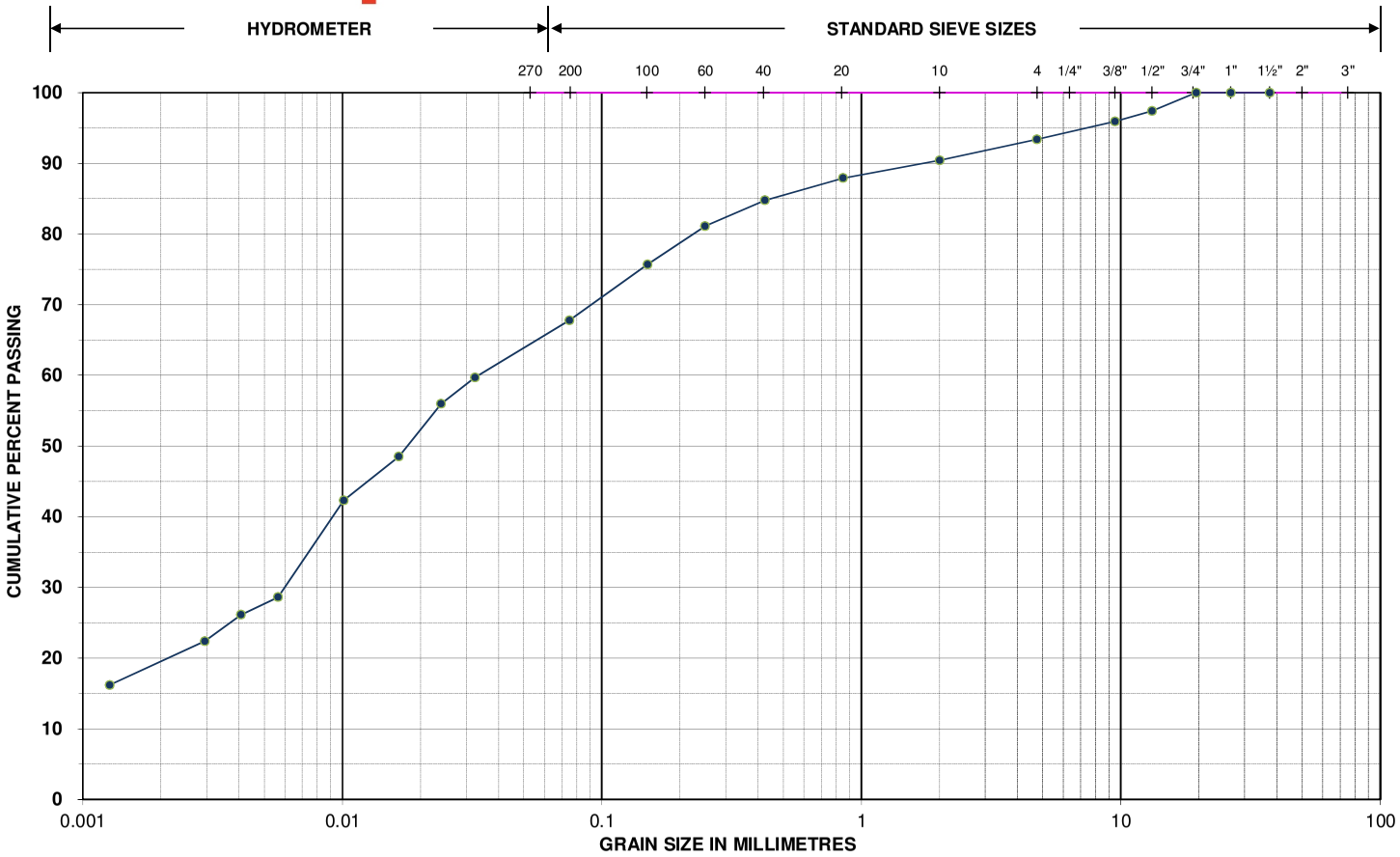
SILT AND CLAY	SAND	GRAVEL

Project Name:	774 Hurontario Street	**Project No.:**	17M-01364-00
Location ID.:	BH17-03	**Sample No./Depth:**	SS6, 4.6-5.2 m

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine
37.5 mm	100.0	**1.16 mm**	60.8
26.5 mm	100.0	**0.60 mm**	54.1
13.2 mm	90.7	**0.30 mm**	46.3
4.75 mm	76.4	**0.15 mm**	37.6
2.36 mm	67.5	**0.075 mm**	30.2

Enclosure No.: 10

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

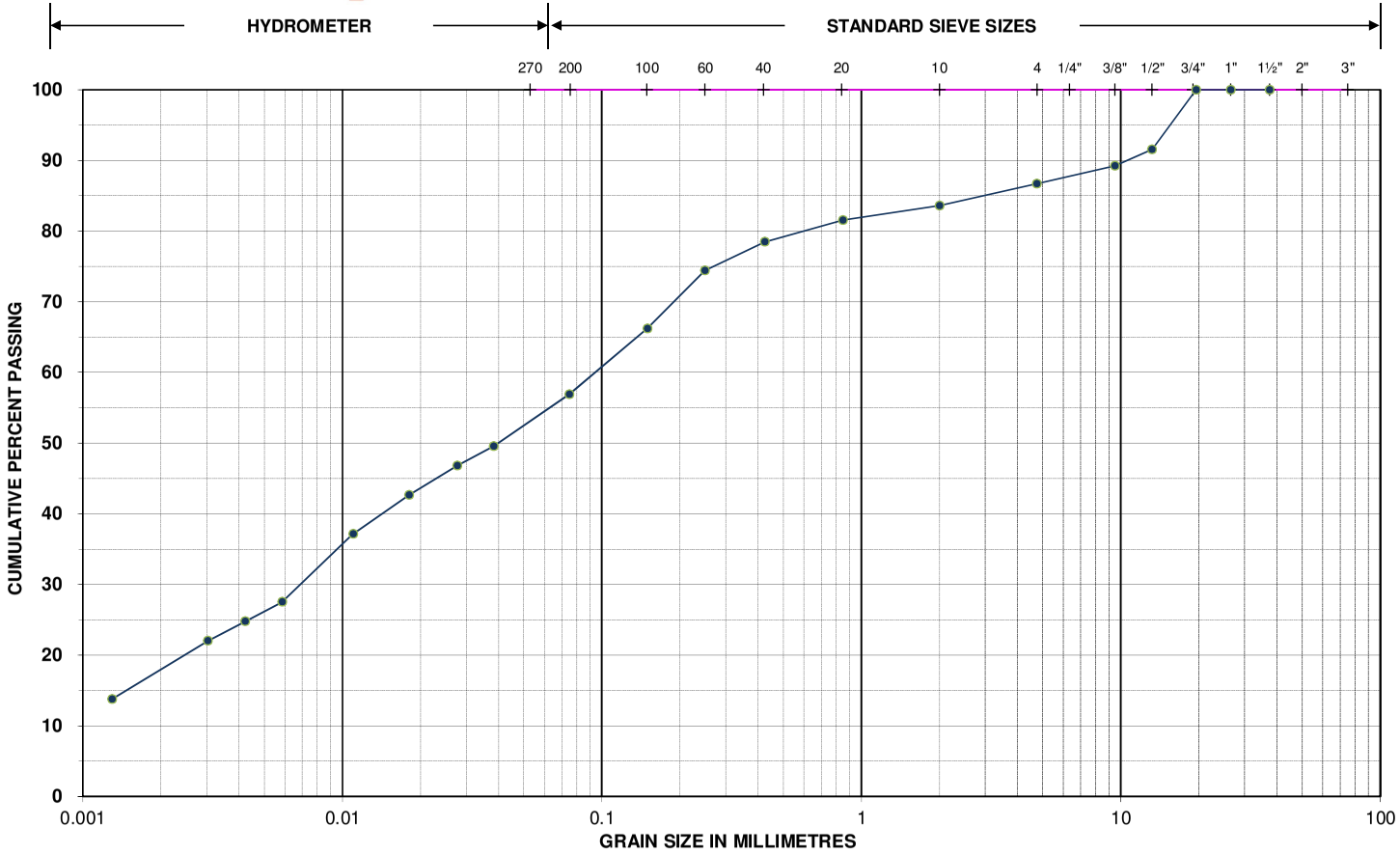
SILT AND CLAY	SAND	GRAVEL

Project Name:	774 Hurontario Street	**Project No.:**	171-01364-00
Location ID.:	BH17-02	**Sample No./Depth:**	SS5, 3.0-3.7 m

Sieve Size	% Passing Coarse	**Sieve Size**	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	87.9	**0.032**	59.7
13.2 mm	97.4	**0.425 mm**	84.8	**0.017**	48.5
9.50 mm	95.9	**0.250 mm**	81.1	**0.006**	28.6
4.75 mm	93.4	**0.106 mm**	75.7	**0.003**	22.4
2.00 mm	90.4	**0.075 mm**	67.8	**0.001**	16.2

Enclosure No. 11

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

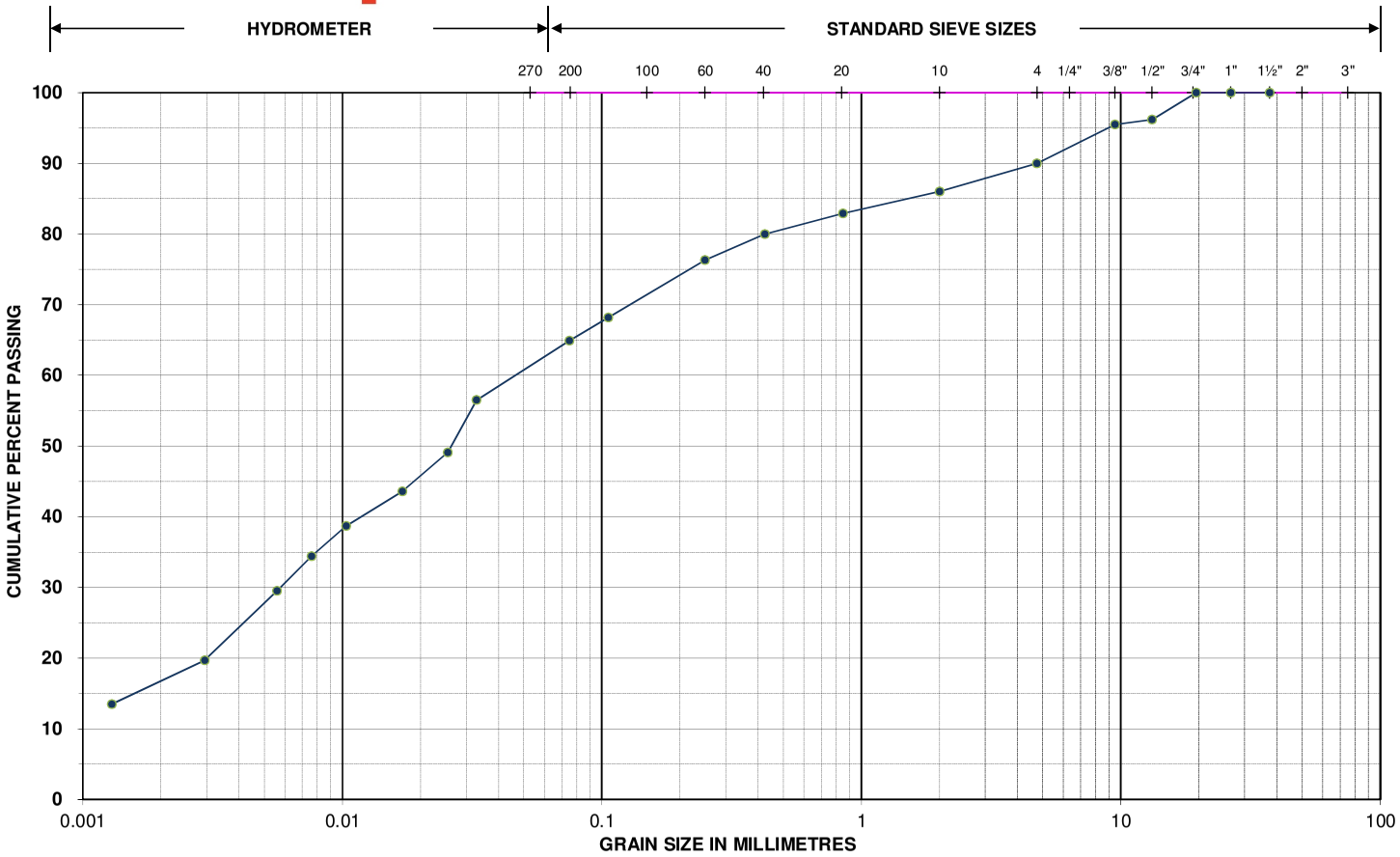
SILT AND CLAY	SAND	GRAVEL

Project Name:	774 Hurontario Street	**Project No.:**	171-01364-00
Location ID.:	BH17-04	**Sample No./Depth:**	SS4, 2.3-2.9 m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	81.5	**0.038**	49.6
13.2 mm	91.6	**0.425 mm**	78.5	**0.018**	42.7
9.50 mm	89.3	**0.250 mm**	74.4	**0.006**	27.5
4.75 mm	86.7	**0.106 mm**	66.2	**0.003**	22.0
2.00 mm	83.6	**0.075 mm**	56.9	**0.001**	13.8

Enclosure No. 12

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

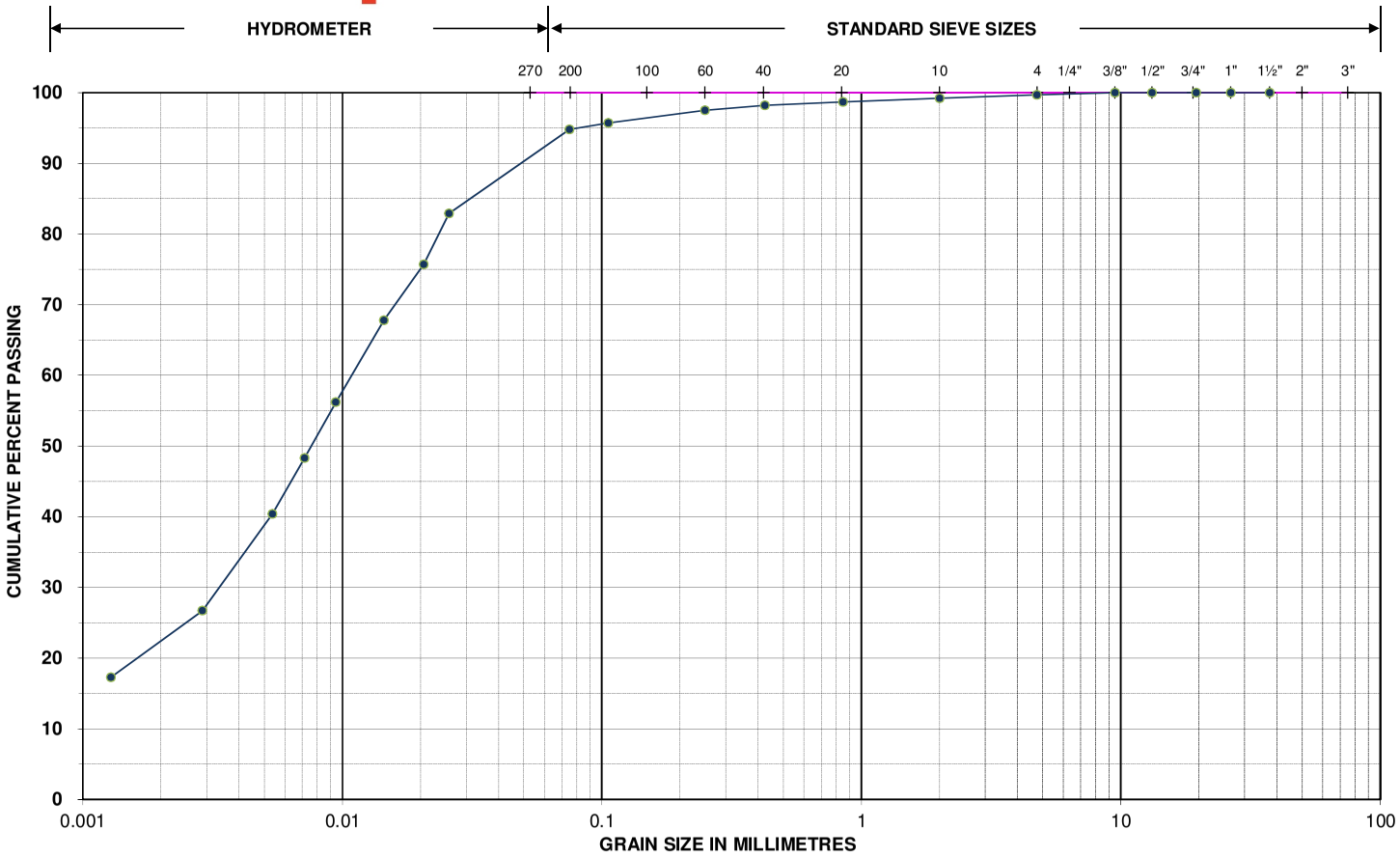
SILT AND CLAY	SAND	GRAVEL

Project Name:	774 Hurontario Street	**Project No.:**	17M-01364-00
Location ID.:	BH18-03	**Sample No./Depth:**	SS3, 1.5 - 2.0 m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	82.9	**0.033**	56.5
13.2 mm	96.2	**0.425 mm**	80.0	**0.017**	43.6
9.50 mm	95.5	**0.250 mm**	76.3	**0.008**	34.4
4.75 mm	90.0	**0.106 mm**	68.2	**0.003**	19.7
2.00 mm	86.0	**0.075 mm**	64.9	**0.001**	13.5

Enclosure No. 13

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

SILT AND CLAY	SAND	GRAVEL

Project Name:	774 Hurontario Street	**Project No.:**	17M-01364-00
Location ID.:	BH18-04	**Sample No./Depth:**	SS3, 1.5 - 2.0 m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
26.5 mm	100.0	**0.850 mm**	98.7	**0.026**	82.9
13.2 mm	100.0	**0.425 mm**	98.2	**0.014**	67.8
9.50 mm	100.0	**0.250 mm**	97.5	**0.007**	48.3
4.75 mm	99.7	**0.106 mm**	95.7	**0.003**	26.7
2.00 mm	99.2	**0.075 mm**	94.8	**0.001**	17.3

Enclosure No. 14

APPENDIX

A ENGINEERED FILL

GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows, however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and WSP Canada Inc. Without this confirmation no responsibility for the performance of the structure can be accepted by WSP Canada Inc. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a WSP Canada Inc. engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by WSP Canada Inc. during placement of engineered fill is required. Work cannot commence or continue without the presence of the WSP Canada Inc. representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

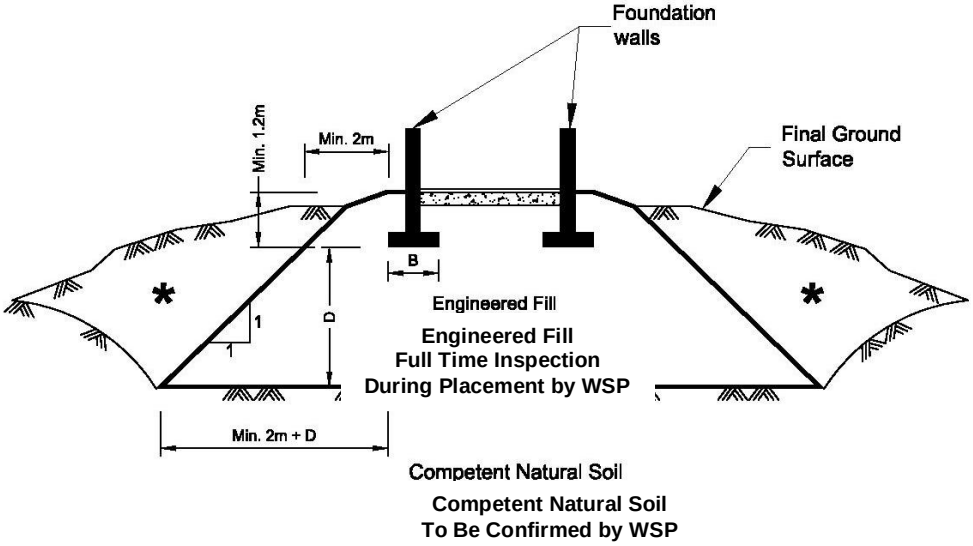
10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from WSP Canada Inc. prior to footing concrete placements. All excavations must be backfilled under full time supervision by WSP Canada Inc. to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of WSP Canada Inc.

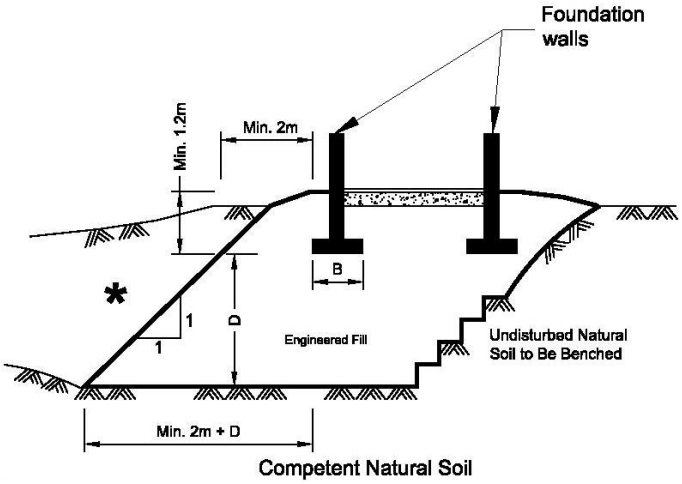
11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with WSP Canada Inc. report attached.





*** Backfill in this area to be as per WSP report.**

APPENDIX

B SOIL QUALITY ASSESSMENT

Project Number: 17M-01364-00 **March 21, 2018**

Straw Hat Restoration
325 Willard Avenue
Toronto, Ontario
M6S 3R1

Re: Soil Quality Assessment
33 Findlay Drive & 774 Hurontario Street
Town of Collingwood, Ontario

INTRODUCTION

WSP Canada Inc. (WSP) was retained by Straw Hat Restoration to complete a geotechnical investigation for the potential development of 33 Findlay Drive and 774 Hurontario Street located in the Town of Collingwood, Ontario.

In order to characterize the quality of the existing materials, a total of thirty-four (34) soil samples were collected by WSP personnel. The samples were submitted to AGAT Laboratories for analysis of Metals and Other Regulated Parameters (ORPs), Organochlorine Pesticides (OCPs), Petroleum Hydrocarbons (PHCs) and benzene, toluene, ethylbenzene and xylenes (BTEX) parameters.

Soil samples from BH17-01 to BH17-04 were collected on June 22 & 23, 2017 and samples from BH18-02 to BH18-04 were collected on March 2, 2018. A summary of the soil samples collected from the boreholes and the parameters analyzed for each sample is summarized in the table below.

Sample Location	Sample ID	Sample Depth (mbg)	Soil Type	Parameters Analyzed
BH17-01	SS2	0.8-1.4	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH17-01	SS3	1.5-2.1	Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-01	SS4	2.3-2.9	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH17-01	SS5	3.1-3.7	Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-02	SS1	0.0-0.6	Topsoil/ Sand	Metals and ORPs, incl. EC & SAR
BH17-02	SS2	0.8-1.4	Sand/ Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-02	SS3	1.5-2.1	Sandy Silt Till	Metals and ORPs, incl. EC & SAR

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wsp.com

BH17-02	SS4	2.3-2.9	Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-03	SS1	0.0-0.6	Topsoil/ Sand	OCPs
BH17-03	SS2	0.8-1.4	Sand	PHCs (F1-F4) incl. BTEX
BH17-03	SS3	1.5-2.1	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH17-03	SS4	2.3-2.9	Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-03	SS5	3.1-3.7	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH17-04	SS1	0.0-0.6	Topsoil/ Sand to Sand and Gravel	OCPs, PHCs (F1-F4) incl. BTEX
BH17-04	SS2	0.8-1.4	Sand to Sand and Gravel	Metals and ORPs, incl. EC & SAR
BH17-04	SS3	1.5-2.1	Sandy Silt Till	OCPs, PHCs (F1-F4) incl. BTEX
BH17-04	SS4	2.3-2.9	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH18-02	SS1	0.0-0.6	Topsoil/Sand	OCPs
BH18-02	SS2	0.8-1.4	Silty Sand Till	Metals and ORPs, incl. EC & SAR, OCPs, PHCs (F1-F4) incl. BTEX
BH18-02	SS3	1.5-2.1	Silty Sand Till	Metals and ORPs, including EC & SAR
BH18-02	SS6	4.6-5.2	Silty Sand Till	PHCs (F1-F4) incl. BTEX
BH18-03	SS1	0.0-0.6	Topsoil/Sand	OCPs, PHCs (F1-F4) incl. BTEX
BH18-03	SS2	0.8-1.4	Silty Sand Till	Metals and ORPs, incl. EC & SAR
BH18-03	SS3	1.5-2.1	Silty Sand Till	OCPs
BH18-03	SS4	2.3-2.9	Silty Sand Till	Metals and ORPs, including EC & SAR
BH18-03	SS5	3.1-3.7	Silty Sand Till	PHCs (F1-F4) incl. BTEX
BH18-04	SS1	0.0-0.6	Topsoil/Fill	Metals and ORPs, incl. EC & SAR, OCPs
BH18-04	SS2	0.8-1.4	Fill/Sand	PHCs (F1-F4) incl. BTEX
BH18-04	SS4	2.3-2.9	Clayey Silt Till	Metals and ORPs, incl. EC & SAR, OCPs, PHCs (F1-F4) incl. BTEX
BH18-05	SS1	0.0-0.6	Topsoil/Fill	Metals and ORPs, incl. EC & SAR, OCPs
BH18-05	SS2	0.8-1.4	Sand	OCPs
BH18-05	SS3	1.5-2.1	Sand/Sandy Silt Till	PHCs (F1-F4) incl. BTEX
BH18-05	SS4	2.3-2.9	Sandy Silt Till	Metals and ORPs, incl. EC & SAR
BH18-05	SS5	3.1-3.7	Sandy Silt Till	PHCs (F1-F4) incl. BTEX

Since the potential purpose of the re-use of soils is unknown, the results were compared to Table 1 Full Depth Background Site Condition Standards for residential/parkland/institutional/ commercial/community property uses and Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition as contained in the Ministry of the Environment (MOE) document "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act" (Standards).

The certificate of analysis from the laboratory is attached to this letter report. A summary of the soil quality analysis is provided in the following section.

SOIL QUALITY ASSESSMENT

Soil samples were collected and handled in accordance with generally accepted procedures used by the environmental consulting industry. Prior to each sampling event, new disposable gloves were used to transfer samples to glass jars and vials supplied by the laboratory. All soil samples were kept under refrigerated conditions during field storage and transportation to the environmental analytical laboratory.

No visual or olfactory evidence of environmental impact (debris or staining) was noted in any of the soil samples collected.

The chemical analysis was conducted by AGAT Laboratories located in Mississauga, Ontario. AGAT is a member of the Canadian Association for Laboratory Accreditation (CALA) and meets the requirements of Section 47 of O.Reg. 153/04 certifying that the analytical laboratory be accredited in accordance with the International Standard ISO/IEC 17025 and with standards developed by the Standards Council of Canada.

Based on the results of the chemical analysis, WSP provides the following conclusions:

- All samples met the Table 1 criteria, for the parameters tested with the exception of the following:
    - BH17-03 SS1 for DDE with 0.13 ug/g (Table 1 criteria is 0.05 ug/g); and,
    - BH17-04 SS1 for DDE with 0.057 ug/g (Table 1 criteria is 0.05 ug/g).
- All samples met the Table 3 criteria, for the parameters tested.

The results of this soil quality assessment are based on the soil samples collected from the borehole locations and the parameters analyzed. The information in this Soil Quality Assessment will be included in the Phase Two Environmental Site Assessment report that is being completed by WSP. Soil quality may vary at locations other than those tested.

We trust this letter report satisfies your needs. If there are questions or you need more information, please do not hesitate to contact our office.

WSP Canada Inc.

Nicole Collins
Environmental Technician

Gord Jarvis
Team Lead - Environment

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CLIENT NAME: **WSP CANADA INC.**
561 BRYNE DRIVE, UNITS C&D
BARRIE , ON L4N9Y3
(705) 735-9771

ATTENTION TO: **Jason Murchison**

PROJECT: **17M-01364-00**

AGAT WORK ORDER: **17T231150**

SOIL ANALYSIS REVIEWED BY: **Yris Verastegui, Report Reviewer**

TRACE ORGANICS REVIEWED BY: **Neli Popnikolova, Senior Chemist**

DATE REPORTED: **Jul 06, 2017**

PAGES (INCLUDING COVER): **12**

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 and Geoscientists of Alberta (APEGA)
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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Certificate of Analysis

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2017-06-27 **DATE REPORTED: 2017-07-04**

		SAMPLE DESCRIPTION:		BH17-01 SS2	BH17-01 SS4	BH17-02 SS1	BH17-02 SS3	BH17-03 SS3	BH17-03 SS5	BH17-04 SS2	BH17-04 SS4
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-06-22	2017-06-22	2017-06-22	2017-06-22	2017-06-23	2017-06-23	2017-06-23	2017-06-23
Parameter	**Unit**	**G / S**	**RDL**	**8512961**	**8512975**	**8512979**	**8512984**	**8513001**	**8513024**	**8513032**	**8513044**
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	3	11	3	3	3	3	3
Barium	µg/g	220	2	10	24	14	24	22	23	12	26
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/g	36	5	<5	9	<5	7	7	7	<5	9
Boron (Hot Water Soluble)	µg/g	NA	0.10	<0.10	0.56	0.25	0.25	0.31	0.50	0.12	0.41
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	5	8	8	8	7	8	6	8
Cobalt	µg/g	21	0.5	2.2	4.5	2.2	3.4	3.2	3.9	2.5	4.2
Copper	µg/g	92	1	4	11	6	10	8	8	6	11
Lead	µg/g	120	1	4	4	32	6	5	4	4	4
Molybdenum	µg/g	2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	82	1	3	9	4	7	6	7	4	8
Selenium	µg/g	1.5	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/g	86	1	9	13	18	11	11	12	12	12
Zinc	µg/g	290	5	13	19	19	20	16	18	14	19
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<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	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.108	0.159	0.119	0.255	0.163	0.169	0.105	0.199
Sodium Adsorption Ratio	NA	2.4	NA	0.090	0.262	0.062	0.157	0.231	0.267	0.201	0.216
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.72	7.76	7.80	7.94	8.01	8.06	7.86	8.05

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

8512961-8513044 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: Iris Verástegui

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

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-06-27 **DATE REPORTED: 2017-07-05**

		SAMPLE DESCRIPTION:		BH17-01 SS3	BH17-01 SS5	BH17-02 SS2	BH17-02 SS4	BH17-03 SS1	BH17-03 SS4	BH17-04 SS1	BH17-04 SS3
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-06-22	2017-06-22	2017-06-22	2017-06-22	2017-06-23	2017-06-23	2017-06-23	2017-06-23
Parameter	**Unit**	**G / S**	**RDL**	**8512963**	**8512976**	**8512980**	**8512985**	**8512992**	**8513021**	**8513025**	**8513041**
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	**0.13**	<0.007	**0.057**	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	0.014	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	7.7	12.2	13.3	10.0	24.4	8.2	7.7	7.7
Surrogate	**Unit**	**Acceptable Limits**									
TCMX	%	50-140		74	62	62	59	60	62	72	80
Decachlorobiphenyl	%	60-130		73	68	74	62	71	61	96	90

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

8512963-8513041 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By: NPopnikolof

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2017-06-27 **DATE REPORTED: 2017-07-04**

		SAMPLE DESCRIPTION:		BH17-01 SS3	BH17-01 SS5	BH17-02 SS2	BH17-02 SS4	BH17-03 SS2	BH17-03 SS4	BH17-04 SS3
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-06-22	2017-06-22	2017-06-22	2017-06-22	2017-06-23	2017-06-23	2017-06-23
Parameter	**Unit**	**G / S**	**RDL**	**8512963**	**8512976**	**8512980**	**8512985**	**8512996**	**8513021**	**8513041**
Benzene	µg/g	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	0.2	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g	25	5	<5	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	50	<50	<50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA	NA	NA	NA	NA
Moisture Content	%		0.1	7.7	12.2	13.3	10.0	22.9	8.2	7.7
Surrogate	**Unit**	**Acceptable Limits**								
Terphenyl	%	60-140		78	95	89	81	74	93	74

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

8512963-8513041 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By: NPopnikolof

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Certificate of Analysis

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F2 - F4 (Soil)

DATE RECEIVED: 2017-06-27

DATE REPORTED: 2017-06-30

		SAMPLE DESCRIPTION:		BH17-04 SS1
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		2017-06-23
Parameter	**Unit**	**G / S**	**RDL**	**8513025**
F2 (C10 to C16)	µg/g	10	10	<10
F3 (C16 to C34)	µg/g	240	50	<50
F4 (C34 to C50)	µg/g	120	50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA
Moisture Content	%		0.1	15.6
Surrogate	**Unit**	**Acceptable Limits**		
Terphenyl	%	60-140		75

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

8513025 Results are based on sample dry weight.
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.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By: NPopnikolof

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Guideline Violation

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

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CLIENT NAME: WSP CANADA INC.

ATTENTION TO: Jason Murchison

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8512992	BH17-03 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - OC Pesticides (Soil)	DDE	µg/g	0.05	0.13
8513025	BH17-04 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - OC Pesticides (Soil)	DDE	µg/g	0.05	0.057

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8512961	8512961	<0.8	<0.8	NA	< 0.8	106%	70%	130%	96%	80%	120%	84%	70%	130%
Arsenic	8512961	8512961	3	3	NA	< 1	111%	70%	130%	90%	80%	120%	93%	70%	130%
Barium	8512961	8512961	10	12	18.2%	< 2	109%	70%	130%	100%	80%	120%	99%	70%	130%
Beryllium	8512961	8512961	<0.5	<0.5	NA	< 0.5	75%	70%	130%	98%	80%	120%	90%	70%	130%
Boron	8512961	8512961	<5	<5	NA	< 5	73%	70%	130%	99%	80%	120%	90%	70%	130%
Boron (Hot Water Soluble)	8512961	8512961	<0.10	<0.10	NA	< 0.10	93%	60%	140%	104%	70%	130%	97%	60%	140%
Cadmium	8512961	8512961	<0.5	<0.5	NA	< 0.5	99%	70%	130%	95%	80%	120%	97%	70%	130%
Chromium	8512961	8512961	5	5	NA	< 2	87%	70%	130%	99%	80%	120%	82%	70%	130%
Cobalt	8512961	8512961	2.2	2.3	NA	< 0.5	98%	70%	130%	91%	80%	120%	93%	70%	130%
Copper	8512961	8512961	4	5	NA	< 1	95%	70%	130%	99%	80%	120%	90%	70%	130%
Lead	8512961	8512961	4	4	NA	< 1	105%	70%	130%	96%	80%	120%	85%	70%	130%
Molybdenum	8512961	8512961	<0.5	<0.5	NA	< 0.5	100%	70%	130%	103%	80%	120%	108%	70%	130%
Nickel	8512961	8512961	3	3	NA	< 1	102%	70%	130%	93%	80%	120%	93%	70%	130%
Selenium	8512961	8512961	<0.4	<0.4	NA	< 0.4	101%	70%	130%	98%	80%	120%	99%	70%	130%
Silver	8512961	8512961	<0.2	<0.2	NA	< 0.2	92%	70%	130%	91%	80%	120%	89%	70%	130%
Thallium	8512961	8512961	<0.4	<0.4	NA	< 0.4	99%	70%	130%	96%	80%	120%	91%	70%	130%
Uranium	8512961	8512961	<0.5	<0.5	NA	< 0.5	90%	70%	130%	95%	80%	120%	96%	70%	130%
Vanadium	8512961	8512961	9	9	0.0%	< 1	94%	70%	130%	101%	80%	120%	87%	70%	130%
Zinc	8512961	8512961	13	13	NA	< 5	100%	70%	130%	98%	80%	120%	95%	70%	130%
Chromium VI	8509348		<0.2	<0.2	NA	< 0.2	99%	70%	130%	103%	80%	120%	93%	70%	130%
Cyanide	8512961	8512961	<0.040	<0.040	NA	< 0.040	91%	70%	130%	103%	80%	120%	110%	70%	130%
Mercury	8512961	8512961	<0.10	<0.10	NA	< 0.10	107%	70%	130%	99%	80%	120%	86%	70%	130%
Electrical Conductivity	8512961	8512961	0.108	0.111	2.7%	< 0.005	96%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8512961	8512961	0.090	0.095	5.4%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8513001	8513001	8.01	7.98	0.4%	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: Iris Verástegui

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Quality Assurance

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8509490		< 0.01	< 0.01	NA	< 0.01	99%	50%	140%	70%	50%	140%	84%	50%	140%
Gamma-Hexachlorocyclohexane	8509490		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	74%	50%	140%	74%	50%	140%
Heptachlor	8509490		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	90%	50%	140%	90%	50%	140%
Aldrin	8509490		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	90%	50%	140%	90%	50%	140%
Heptachlor Epoxide	8509490		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	102%	50%	140%	100%	50%	140%
Endosulfan	8509490		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	87%	50%	140%	88%	50%	140%
Chlordane	8509490		< 0.007	< 0.007	NA	< 0.007	108%	50%	140%	102%	50%	140%	92%	50%	140%
DDE	8509490		< 0.007	< 0.007	NA	< 0.007	106%	50%	140%	109%	50%	140%	100%	50%	140%
DDD	8509490		< 0.007	< 0.007	NA	< 0.007	111%	50%	140%	93%	50%	140%	93%	50%	140%
DDT	8509490		< 0.007	< 0.007	NA	< 0.007	114%	50%	140%	86%	50%	140%	84%	50%	140%
Dieldrin	8509490		< 0.005	< 0.005	NA	< 0.005	107%	50%	140%	102%	50%	140%	96%	50%	140%
Endrin	8509490		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	102%	50%	140%	98%	50%	140%
Methoxychlor	8509490		< 0.005	< 0.005	NA	< 0.005	112%	50%	140%	94%	50%	140%	102%	50%	140%
Hexachlorobenzene	8509490		< 0.005	< 0.005	NA	< 0.005	105%	50%	140%	96%	50%	140%	96%	50%	140%
Hexachlorobutadiene	8509490		< 0.01	< 0.01	NA	< 0.01	108%	50%	140%	74%	50%	140%	92%	50%	140%
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	8509842		< 0.02	< 0.02	NA	< 0.02	114%	60%	130%	117%	60%	130%	108%	60%	130%
Toluene	8509842		< 0.08	< 0.08	NA	< 0.08	114%	60%	130%	116%	60%	130%	115%	60%	130%
Ethylbenzene	8509842		< 0.05	< 0.05	NA	< 0.05	115%	60%	130%	114%	60%	130%	111%	60%	130%
Xylene Mixture	8509842		< 0.05	< 0.05	NA	< 0.05	111%	60%	130%	111%	60%	130%	109%	60%	130%
F1 (C6 to C10)	8509842		< 5	< 5	NA	< 5	76%	60%	130%	86%	85%	115%	71%	70%	130%
F2 (C10 to C16)	8515718		< 10	< 10	NA	< 10	100%	60%	130%	95%	80%	120%	72%	70%	130%
F3 (C16 to C34)	8515718		< 50	< 50	NA	< 50	94%	60%	130%	105%	80%	120%	74%	70%	130%
F4 (C34 to C50)	8515718		< 50	< 50	NA	< 50	86%	60%	130%	92%	80%	120%	81%	70%	130%

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: NPopnikolof

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

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

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Method Summary

CLIENT NAME: WSP CANADA INC.

AGAT WORK ORDER: 17T231150

PROJECT: 17M-01364-00

ATTENTION TO: Jason Murchison

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

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 consumed by humans)

Laboratory Use Only

Work Order #: 17T231150

Cooler Quantity: leave

Arrival Temperatures: 4.6 4.2 4.5 / 3.4 2.7 3

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: WSP Canada Inc.
Contact: Nick LaPosta
Address: 561 Bryne Dr. Units C+D
Barrie, ON L4N 9Y3
Phone: 705-735-9771 Fax:

Reports to be sent to:
1. Email: nick.la.posta@wspgroup.com
2. Email: nicole.collins@wspgroup.com

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*
☐ MISA

☐ Regulation 558
☐ CCME
☐ 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 ☒ 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: 17M-01364-00
Site Location: 774 Huronta rio
Sampled By: NC
AGAT Quote #: 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 (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (exc. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	PHCs (F1-F4)	BTEX
BH17-01 SS2	06/22/17	PM		S			X														
BH17-01 SS3	↓	↓		↓												X			X	X	
BH17-01 SS4							X														
BH17-01 SS5																X			X	X	
BH17-02 SS1							X														
BH17-02 SS2																X			X	X	
BH17-02 SS3							X														
BH17-02 SS4																X			X	X	
BH17-03 SS1	06/23/17	AM														X					
BH17-03 SS2																			X	X	
BH17-03 SS3							X														

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Brian Cooper	June 27/17	11:40		2017/06/27	11:40
	2017/06/27	4:29			

Page 1 of 2

N°: T 054091

Document ID: DIV-78-1513-014

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Date Issued: February 22, 2017

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 consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity: 1 cooler

Arrival Temperatures: 4.6 | 4.2 | 4.5 | 3.4 | 2.7 | 3

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes:

Report Information:

Company: WSP Canada Inc.
Contact: Nick La Posta
Address: 561 Bryne Dr. Units C&D
Barrie, ON L4N 9G3
Phone: 705-735-9771 Fax:

Reports to be sent to:
1. Email: nick.la.posta@wspgroup.com
2. Email: nicole.collins@wspgroup.com

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)
☐ MISA

☐ Regulation 558
☐ CCME
☐ 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 ☒ 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: 17M-01364-00
Site Location: 774 Huronteria St.
Sampled By: NC
AGAT Quote #: 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 (Y/N)	Metals and Inorganics (O. Reg 153; ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	PHCs (F1-F4)	BTEX				
BH17-03 SS4	06/23/17	AM		S													X			X	X					
BH17-03 SS5	↓	↓		↓			X																			
BH17-04 SS1																	X			X	X					
BH17-04 SS2							X																			
BH17-04 SS3																	X			X	X					
BH17-04 SS4	↓	↓		↓			X																			

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Brian Gagnon	Jun 27/17	11:45	Rey	2017/6/27	11
Samples Relinquished By (Print Name and Sign):	2017/6/27	4:39	Samples Received By (Print Name and Sign):		
Samples Relinquished By (Print Name and Sign):			Samples Received By (Print Name and Sign):		

Page 2 of 2

Nº: T 054092

Document ID: DW-78-1511-014

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Date Issued: February 22, 2017

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

CLIENT NAME: WSP CANADA INC
14 RONELL CRESCENT UNIT 1
COLLINGWOOD, ON L9Y 4J7
(705) 445-0064

ATTENTION TO: Nicole Collins

PROJECT: 17M-01364-00

AGAT WORK ORDER: 18T317303

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Mar 15, 2018

PAGES (INCLUDING COVER): 10

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

Certificate of Analysis

AGAT WORK ORDER: 18T317303

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC

ATTENTION TO: Nicole Collins

SAMPLING SITE:774 Hurontario/ Findlay Dr.

SAMPLED BY:Brian Cooper/Nicole Collins

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

DATE RECEIVED: 2018-03-06

DATE REPORTED: 2018-03-15

		SAMPLE DESCRIPTION:		BH18-02 SS2	BH18-02 SS3	BH18-03 SS2	BH18-03 SS4	BH18-04 SS1	BH18-04 SS4	BH18-05 SS1	BH18-05 SS4
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02
Parameter	Unit	G / S	RDL	9104422	9104466	9104482	9104485	9104496	9104505	9104512	9104524
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	4	4	3	3	6	4	7	3
Barium	µg/g	220	2	41	29	29	26	28	33	44	35
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/g	36	5	10	11	10	10	6	11	6	9
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.27	0.55	0.22	0.41	0.21	0.34	0.37	0.24
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	15	13	10	10	12	13	15	13
Cobalt	µg/g	21	0.5	8.4	6.9	6.0	5.1	5.2	8.0	5.4	7.2
Copper	µg/g	92	1	17	15	12	10	26	17	17	17
Lead	µg/g	120	1	6	6	4	4	11	6	18	6
Molybdenum	µg/g	2	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	82	1	16	15	12	11	14	17	12	15
Selenium	µg/g	1.5	0.4	<0.4	<0.4	<0.4	<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	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.6	0.5	<0.5	<0.5	<0.5	0.5	<0.5	0.5
Vanadium	µg/g	86	1	19	15	14	13	15	17	19	18
Zinc	µg/g	290	5	34	26	23	21	32	31	46	30
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<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	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.176	0.206	0.164	0.237	0.144	0.189	0.149	0.218
Sodium Adsorption Ratio	NA	2.4	NA	0.327	0.231	0.126	0.138	0.030	0.158	0.040	0.208
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.58	7.82	7.78	7.80	7.60	7.71	7.54	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
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.

9104422-9104524 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: Divine Basily

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

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 18T317303

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC

ATTENTION TO: Nicole Collins

SAMPLING SITE:774 Hurontario/ Findlay Dr.

SAMPLED BY:Brian Cooper/Nicole Collins

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2018-03-06

DATE REPORTED: 2018-03-15

		SAMPLE DESCRIPTION:		BH18-02 SS2	BH18-02 SS1	BH18-03 SS1	BH18-03 SS3	BH18-04 SS1	BH18-04 SS4	BH18-05 SS1	BH18-05 SS2
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02
Parameter	Unit	G / S	RDL	9104422	9104459	9104477	9104486	9104496	9104505	9104512	9104516
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	0.014	0.022	<0.007	<0.007	<0.007	0.048	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	0.011	0.008	<0.007	<0.007	<0.007	0.050	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	14.8	17.4	23	8.7	10.6	11.3	13.7	14.7
Surrogate	Unit	Acceptable Limits									
TCMX	%	50-140		68	66	62	102	60	72	68	70
Decachlorobiphenyl	%	60-130		84	74	90	88	76	82	80	80

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
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.

9104422-9104516 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:

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

AGAT Laboratories

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CANADA L4Z 1Y2
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 18T317303

PROJECT: 17M-01364-00

CLIENT NAME: WSP CANADA INC

ATTENTION TO: Nicole Collins

SAMPLING SITE:774 Hurontario/ Findlay Dr.

SAMPLED BY:Brian Cooper/Nicole Collins

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

DATE RECEIVED: 2018-03-06

DATE REPORTED: 2018-03-15

		SAMPLE DESCRIPTION:		BH18-02 SS2	BH18-02 SS6	BH18-03 SS1	BH18-03 SS5	BH18-04 SS2	BH18-04 SS4	BH18-05 SS3	BH18-05 SS5
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02	2018-03-02
Parameter	Unit	G / S	RDL	9104422	9104468	9104477	9104494	9104501	9104505	9104520	9104527
Benzene	µg/g	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	µg/g	0.2	0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Ethylbenzene	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene Mixture	µg/g	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
F1 (C6 to C10)	µg/g	25	5	<5	<5	<5	<5	<5	<5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g	25	5	<5	<5	<5	<5	<5	<5	<5	<5
F2 (C10 to C16)	µg/g	10	10	<10	<10	<10	<10	<10	<10	<10	<10
F3 (C16 to C34)	µg/g	240	50	<50	<50	<50	<50	<50	<50	<50	<50
F4 (C34 to C50)	µg/g	120	50	<50	<50	<50	<50	<50	<50	<50	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA	NA	NA	NA	NA	NA
Moisture Content	%		0.1	14.8	7.8	16.8	9.7	14.9	11.3	16.5	13.4
Surrogate	Unit	Acceptable Limits									
Terphenyl	%	60-140		76	73	79	67	62	70	79	96

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
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.

9104422-9104527 Results are based on sample dry weight.
The C6-C10 fraction is calculated using Toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

Certified By:

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

AGAT Laboratories

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Quality Assurance

CLIENT NAME: WSP CANADA INC

PROJECT: 17M-01364-00

SAMPLING SITE:774 Hurontario/ Findlay Dr.

AGAT WORK ORDER: 18T317303

ATTENTION TO: Nicole Collins

SAMPLED BY:Brian Cooper/Nicole Collins

Soil Analysis

RPT Date: Mar 15, 2018			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	9104422	9104422	<0.8	<0.8	NA	< 0.8	96%	70%	130%	104%	80%	120%	87%	70%	130%
Arsenic	9104422	9104422	4	4	NA	< 1	104%	70%	130%	107%	80%	120%	105%	70%	130%
Barium	9104422	9104422	41	40	2.5%	< 2	99%	70%	130%	99%	80%	120%	95%	70%	130%
Beryllium	9104422	9104422	<0.5	<0.5	NA	< 0.5	99%	70%	130%	110%	80%	120%	94%	70%	130%
Boron	9104422	9104422	10	11	NA	< 5	74%	70%	130%	104%	80%	120%	86%	70%	130%
Boron (Hot Water Soluble)	9104422	9104422	0.27	0.27	NA	< 0.10	101%	60%	140%	98%	70%	130%	99%	60%	140%
Cadmium	9104422	9104422	<0.5	<0.5	NA	< 0.5	98%	70%	130%	97%	80%	120%	102%	70%	130%
Chromium	9104422	9104422	15	15	0.0%	< 2	89%	70%	130%	100%	80%	120%	100%	70%	130%
Cobalt	9104422	9104422	8.4	8.3	1.2%	< 0.5	101%	70%	130%	107%	80%	120%	103%	70%	130%
Copper	9104422	9104422	17	17	0.0%	< 1	92%	70%	130%	104%	80%	120%	102%	70%	130%
Lead	9104422	9104422	6	6	0.0%	< 1	100%	70%	130%	105%	80%	120%	100%	70%	130%
Molybdenum	9104422	9104422	<0.5	<0.5	NA	< 0.5	97%	70%	130%	107%	80%	120%	109%	70%	130%
Nickel	9104422	9104422	16	16	0.0%	< 1	95%	70%	130%	100%	80%	120%	94%	70%	130%
Selenium	9104422	9104422	<0.4	<0.4	NA	< 0.4	109%	70%	130%	98%	80%	120%	101%	70%	130%
Silver	9104422	9104422	<0.2	<0.2	NA	< 0.2	75%	70%	130%	101%	80%	120%	90%	70%	130%
Thallium	9104422	9104422	<0.4	<0.4	NA	< 0.4	96%	70%	130%	101%	80%	120%	96%	70%	130%
Uranium	9104422	9104422	0.6	0.6	NA	< 0.5	90%	70%	130%	101%	80%	120%	99%	70%	130%
Vanadium	9104422	9104422	19	19	0.0%	< 1	92%	70%	130%	103%	80%	120%	95%	70%	130%
Zinc	9104422	9104422	34	34	0.0%	< 5	98%	70%	130%	105%	80%	120%	109%	70%	130%
Chromium VI	9104531		<0.2	<0.2	NA	< 0.2	77%	70%	130%	103%	80%	120%	97%	70%	130%
Cyanide	9104422	9104422	<0.040	<0.040	NA	< 0.040	94%	70%	130%	100%	80%	120%	97%	70%	130%
Mercury	9104422	9104422	<0.10	<0.10	NA	< 0.10	106%	70%	130%	103%	80%	120%	102%	70%	130%
Electrical Conductivity	9104422	9104422	0.176	0.181	2.8%	< 0.005	96%	90%	110%						
Sodium Adsorption Ratio	9104422	9104422	0.327	0.331	1.2%	NA									
pH, 2:1 CaCl2 Extraction	9107591		7.52	7.51	0.1%	NA	100%	80%	120%						

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: Divine Basily

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.

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Quality Assurance

CLIENT NAME: WSP CANADA INC

PROJECT: 17M-01364-00

SAMPLING SITE:774 Hurontario/ Findlay Dr.

AGAT WORK ORDER: 18T317303

ATTENTION TO: Nicole Collins

SAMPLED BY:Brian Cooper/Nicole Collins

Trace Organics Analysis

RPT Date: Mar 15, 2018			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) - OC Pesticides (Soil)															
Hexachloroethane	9104512		< 0.01	< 0.01	NA	< 0.01	81%	50%	140%	90%	50%	140%	70%	50%	140%
Gamma-Hexachlorocyclohexane	9104512		< 0.005	< 0.005	NA	< 0.005	60%	50%	140%	55%	50%	140%	94%	50%	140%
Heptachlor	9104512		< 0.005	< 0.005	NA	< 0.005	93%	50%	140%	114%	50%	140%	87%	50%	140%
Aldrin	9104512		< 0.005	< 0.005	NA	< 0.005	87%	50%	140%	92%	50%	140%	88%	50%	140%
Heptachlor Epoxide	9104512		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	103%	50%	140%	89%	50%	140%
Endosulfan	9104512		< 0.005	< 0.005	NA	< 0.005	86%	50%	140%	91%	50%	140%	78%	50%	140%
Chlordane	9104512		< 0.007	< 0.007	NA	< 0.007	86%	50%	140%	100%	50%	140%	86%	50%	140%
DDE	9104512		< 0.007	< 0.007	NA	< 0.007	95%	50%	140%	117%	50%	140%	90%	50%	140%
DDD	9104512		< 0.007	< 0.007	NA	< 0.007	97%	50%	140%	110%	50%	140%	86%	50%	140%
DDT	9104512		< 0.007	< 0.007	NA	< 0.007	97%	50%	140%	103%	50%	140%	99%	50%	140%
Dieldrin	9104512		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	107%	50%	140%	92%	50%	140%
Endrin	9104512		< 0.005	< 0.005	NA	< 0.005	91%	50%	140%	113%	50%	140%	108%	50%	140%
Methoxychlor	9104512		< 0.005	< 0.005	NA	< 0.005	110%	50%	140%	110%	50%	140%	112%	50%	140%
Hexachlorobenzene	9104512		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	84%	50%	140%	89%	50%	140%
Hexachlorobutadiene	9104512		< 0.01	< 0.01	NA	< 0.01	90%	50%	140%	95%	50%	140%	80%	50%	140%
O. Reg. 153(511) - PHCs F1 - F4 (Soil)															
Benzene	9102931		< 0.02	< 0.02	NA	< 0.02	93%	60%	130%	94%	60%	130%	107%	60%	130%
Toluene	9102931		< 0.08	< 0.08	NA	< 0.08	89%	60%	130%	97%	60%	130%	115%	60%	130%
Ethylbenzene	9102931		< 0.05	< 0.05	NA	< 0.05	88%	60%	130%	99%	60%	130%	116%	60%	130%
Xylene Mixture	9102931		< 0.05	< 0.05	NA	< 0.05	85%	60%	130%	96%	60%	130%	115%	60%	130%
F1 (C6 to C10)	9102931		< 5	< 5	NA	< 5	85%	60%	130%	89%	85%	115%	102%	70%	130%
F2 (C10 to C16)	9105581		< 10	< 10	NA	< 10	94%	60%	130%	86%	80%	120%	74%	70%	130%
F3 (C16 to C34)	9105581		< 50	< 50	NA	< 50	97%	60%	130%	84%	80%	120%	75%	70%	130%
F4 (C34 to C50)	9105581		< 50	< 50	NA	< 50	86%	60%	130%	86%	80%	120%	77%	70%	130%

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:

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http://www.agatlabs.com

Method Summary

CLIENT NAME: WSP CANADA INC

AGAT WORK ORDER: 18T317303

PROJECT: 17M-01364-00

ATTENTION TO: Nicole Collins

SAMPLING SITE:774 Hurontario/ Findlay Dr.

SAMPLED BY:Brian Cooper/Nicole Collins

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

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Method Summary

CLIENT NAME: WSP CANADA INC

AGAT WORK ORDER: 18T317303

PROJECT: 17M-01364-00

ATTENTION TO: Nicole Collins

SAMPLING SITE:774 Hurontario/ Findlay Dr.

SAMPLED BY:Brian Cooper/Nicole Collins

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE
Benzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Toluene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Ethylbenzene	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
Xylene Mixture	VOL-91-5009	EPA SW-846 5035 & 8260	P & T GC/MS
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method	P & T GC/FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

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

Laboratory Use Only

Work Order #: 18T317303

Cooler Quantity:

Arrival Temperatures: 2.1 | 2.2 | 2.5°C

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: ice

Chain of Custody Record

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

Report Information:

Company: WSP Canada Inc.
Contact: Nicole Collins
Address: 14 Ronell Cres. Unit 1
Collingwood, ON
Phone: (705)445-0064 Fax: (705)445-0067
Reports to be sent to:
1. Email: nicole.collins@wsp.com
2. Email: gord.jarvis@wsp.com

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)
☐ MISA

☐ Regulation 558
☐ CCME
☐ 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 ☒ 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: 17M-01364-00
Site Location: 774 Hurontario / Findlay Dr.
Sampled By: Brian Cooper / Nicole Collins
AGAT Quote #: ____ 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: Payables.Ontario@wsp.com

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 (Y/N)	O. Reg 153: Metals and Inorganics	☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides)	ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	PHCs & BTEX
BH18-02 SS2	03/02/18	AM	4	S			X											X			X
BH18-02 SS1	"	"	1	S														X			
BH18-02 SS3	"	"	1	S			X														
BH18-02 SS6	"	"	2	S																	X
BH18-03 SS1	"	"	3	S														X			X
BH18-03 SS2	"	"	1	S			X														
BH18-03 SS4	"	"	1	S			X														
BH18-03 SS3	"	"	1	S														X			
BH18-03 SS5	"	"	2	S																	X
BH18-04 SS1	"	PM	2	S			X											X			
BH18-04 SS2	"	"	2	S																	X

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Nicole Collins Nicole Collins	03/05/18	4:00pm			
			Tex S [signature]	Mar 6	9:00

Page 1 of 2

Nº: T 064506

AGAT Laboratories

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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 consumed by humans)

Laboratory Use Only

Work Order #:

Cooler Quantity:

Arrival Temperatures: 2.1 | 2.2 | 2.5°C

Custody Seal Intact: ☐Yes ☐No ☐N/A

Notes: ice

Report Information:

Company: WSP Canada Inc.
Contact: Nicole Collins
Address: 14 Ronell Cres. Unit 1
Collingwood, ON
Phone: (705)445-0064 Fax: (705)445-0067
Reports to be sent to:
1. Email: nicole.collins@wsp.com
2. Email: gord.jarvis@wsp.com

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*
☐ MISA

☐ Regulation 558
☐ CCME
☐ 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 ☒ 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: 17M-01364-00
Site Location: Huronbrio / Findlay, Collingwood
Sampled By: Brian Cooper / Nicole Collins
AGAT Quote #: 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: Payables.Ontario@wsp.com

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 (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN⁻ ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	PHCs + BTEX				
BH18-04 S54	03/02/18	PM	4	S			X										X			X				
BH18-05 SS1	03/02/18	PM	2	S			X										X							
BH18-05 SS2	"	"	1	S													X							
BH18-05 SS3	"	"	2	S																X				
BH18-05 SS4	"	"	1	S			X																	
BH18-05 SS5	"	"	2	S																X				

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Nicole Collins Nicole Collins	03/05/18	4:00pm			
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
			Ens	Mar 6	9:00

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